



Article Type: Research Paper

Reducing budgetary slack through government internal control system: insights from structural equation modelling and artificial neural network approach

Fara Fitriyani^{1,2*}, and Dwi Ratmono³

Abstract

Research aims: This study investigates the important role of Government Internal Control System (GICS) elements in reducing budgetary slack in Public Higher Education Institutions (HEIs).

Design/Methodology/Approach: Partial Least Squares Structural Equation Modelling (PLS-SEM) and Artificial Neural Network (ANN) were used to test the significance and strength of the relationship between GICS and budgetary slack. Survey data was collected from managers of Public HEIs in Indonesia. Statistical analysis was conducted using WarpPLS 8.0 for PLS-SEM, while ANN was implemented using SPSS.

Research findings: Government Internal Control Systems are effective in reducing budgetary slack. However, the relationship between elements of ICS and budgetary slack is not always linear and can be influenced by interactions between elements.

Theoretical contribution/Originality: This study contributes to the literature on management accounting by providing insights into a more complex process that explains the vital role of effective implementation of GICS in Public HEIs in reducing budgetary slack in the budgeting process.

Practitioner/Policy implication: This study demonstrates that the Government's Internal Control System effectively reduces budgetary slack in Higher Education Institutions. Therefore, practitioners should strengthen GICS implementation, particularly focusing on the control of the environment and recognizing the complex interplay between GICS elements. Furthermore, policymakers should prioritize strengthening regulations and oversight, encouraging innovation, and integrating GICS with other systems to enhance accountability and resource allocation.

Research limitation/Implication: Collecting data through questionnaires may lead to common method bias. This can be mitigated by the implementation of a longitudinal design and the collection of data at a number of points in time.

Keywords: Budgetary Slack; Government Internal Control System



AFFILIATION:

¹Doctoral Program in Economics, Department of Accounting, Faculty of Economics and Business, Universitas Diponegoro, Central Java, Indonesia

²Department of Accounting, Faculty of Economics and Business, Universitas Sultan Ageng Tirtayasa, Banten, Indonesia

³Department of Accounting, Faculty of Economics and Business, Universitas Diponegoro, Central Java, Indonesia

*CORRESPONDENCE:

fara_0606@untirta.ac.id

DOI: 10.18196/jai.v25i3.21810

CITATION:

Fitriyani, F., & Ratmono, D. (2024). Reducing budgetary slack through government internal control system: insights from structural equation modelling and artificial neural network approach. *Journal of Accounting and Investment*, 25(3), 935-953.

ARTICLE HISTORY

Received:

07 Mar 2024

Revised:

16 Jun 2024

05 Aug 2024

27 Aug 2024

Accepted:

03 Sep 2024



This work is licensed under a Creative Commons Attribution-Non-Commercial-No Derivatives 4.0 International License

JAI Website:



Introduction

Higher education institutions (HEIs) are crucial for advancing not only education but also various other aspects, including economics, management, and innovation (Carton & Lucas, 2018). This is because, in addition to being places for knowledge enhancement, HEIs significantly impact the economy through research, innovation, and technology transfer. In supporting the development of these aspects, budgetary policies are essential.

A central consideration in formulating budgetary policies is how the allocation of funds can maximize impact across various developmental needs within HEIs. Therefore, careful consideration of appropriate budget allocation strategies is necessary to ensure the efficient and effective utilization of resources.

The process of budget preparation is crucial for coordinating resource allocation and implementing behavioral control (Luft & Shields, 2003; Zimmerman, 2000). However, effectively measuring budget implementation has proven challenging. One contributing factor to this difficulty is dysfunctional behavior in gaming, specifically budgetary slack. This occurs when subordinates establish easily achievable budget targets, leading to a range of problematic budgeting behaviors (Waller, 1988; Schiff & Lewin, 1970). Such practices can result in suboptimal resource allocation, inefficient spending, and diminished accountability within the organization.

Merchant (1985) highlighted the detrimental impact of budgetary slack on organizational value. By inflating budget estimates, managers divert resources from productive activities toward unnecessary expenditures, ultimately diminishing organizational efficiency and profitability. This misallocation of resources underscores the need for robust internal controls within the budgeting process. Such controls may include independent verification of budget proposals, regular performance monitoring, and stringent approval processes for budget adjustments. By implementing these measures, higher education institutions can foster a more transparent and accountable budgeting environment, thereby mitigating the risk of undetected budgetary slack. Therefore, this study investigates the following research questions: what factors contribute to reducing budgetary slack at public higher education institutions? More specifically, what is the role of internal control systems in reducing budgetary slack at public HEIs?

In higher education, poor governance practices can lead to financial mismanagement (Krambia-Kapardis, 2002; Halbouni et al., 2016). The Republic of Indonesia Financial Audit Agency (RIFAG) identified several issues in the financial management of Public HEIs. As a result, the government has implemented detailed regulations to enhance governmental practices in higher education and address these problems. Government Regulation Number 60 of 2008 regarding the Government's Internal Control System is one of them.

Numerous studies have underscored the critical role of internal control systems in mitigating fraud within organizations (Sofyani et al., 2022a; Nawawi & Salin, 2018; Rendon & Rendon, 2016). Research further suggests that implementing such systems within tertiary institutions positively impacts financial performance (Sofyani et al., 2023; Suuna, 2011; Duh et al., 2014; Abdullahi et al., 2016). However, there remains a significant gap in understanding how these systems are implemented within higher education institutions and the extent of their impact. Furthermore, existing research exploring the relationship between internal control systems and budgetary slack predominantly relies on PLS-SEM, focusing on linear relationships while overlooking potentially significant non-linear and uncompensated relationships (Salman et al., 2023; Riyadh et al., 2023; Macinati et al., 2016). Consequently, this study aims to address this gap by employing a more nuanced approach to examine the complex interplay between internal control systems and

budgetary slack within higher education institutions. It is crucial to recognize that the relationship between internal control and budgetary slack may not always be directly proportional. Excessively tight controls could potentially lead to increased slack, highlighting the need to identify an optimal balance. Additionally, while robust internal controls can mitigate certain types of budgetary slack, they may not entirely eliminate them. Other factors, such as organizational culture and individual behavior, likely play a significant role and warrant further investigation.

Furthermore, the existing literature often focuses on analyzing individual elements of the internal control system in isolation, potentially contributing to inconsistent findings. This approach neglects the inherent interconnectedness of these elements and their collective influence on the effectiveness of the overall system. Isolating a single element risk overlooks crucial interactions and contextual factors, leading to several shortcomings. These include erroneous generalizations, the disregard of significant determinants, and an unduly narrow research focus. Therefore, a comprehensive understanding of the relationship between internal control and budgetary slack necessitates a holistic approach. This approach should consider the intricate interplay between all elements of the internal control system and the contextual factors influencing its effectiveness.

This research makes several significant contributions to the literature on government internal control systems and budgetary slack. First, it advances conceptual understanding by proposing a comprehensive model that integrates all elements of a government's internal control system. This addresses a critical gap in the literature, which has traditionally focused on isolated elements and overlooked the complex interplay within the system. Second, the study provides empirical validation in a novel context. Examining the influence of internal control systems on budgetary slack within Indonesian public higher education institutions offers crucial empirical evidence within a context characterized by increasing emphasis on accountability and performance. These findings are particularly relevant for both policymakers and practitioners in the sector. Finally, the research demonstrates methodological rigor and enhanced forecasting by employing a robust approach that combines Partial Least Squares Structural Equation Modeling with Artificial Neural Networks. This innovative combination facilitates a more nuanced understanding of the complex relationships between variables and provides more accurate budgetary slack predictions compared to traditional models. This methodological advancement holds significant potential for enriching future research in this domain. By addressing these key areas, this research offers valuable theoretical and practical insights that can inform policymaking, improve internal control practices, and ultimately contribute to greater accountability and efficiency within public sector organizations.

Literature Review and Hypotheses Development

Agency Theory

Agency theory provides a robust theoretical framework for understanding the occurrence of budgetary slack within public higher education institutions (Eisenhardt, 1989; Jensen & Meckling, 1976). This theory, as articulated by Jensen and Meckling (1976), posits that conflicts of interest may arise between principals (e.g., government or governing boards) and agents (e.g., university administrators) due to information asymmetrical and divergent goals. This potential for conflict is further exacerbated by the delegation of decision-making authorities from principals to agents, creating opportunities for agents to engage in self-serving actions, such as budgetary slack, by inflating resource requests or concealing available funds (Onsi, 2009; Ross, 1973). GICS, as a comprehensive system of internal controls, emerges as a crucial mechanism to mitigate such agency problems. By promoting transparency, accountability, and ethical conduct, GICS strengthens monitoring capabilities, reduces information asymmetry, and aligns agent behavior with organizational objectives, thereby minimizing opportunities for budgetary slack and fostering responsible resource allocation within public HEIs.

Government Internal Control System in Higher Education

Internal control, as defined by COSO:

[. . .] process, affected by an entity's board of directors, management, and other personnel, designed to provide reasonable assurance of the achievement of three objectives in the following categories: (1) effectiveness and efficiency of operations, (2) reliability of financial reporting, and (3) compliance with applicable laws and regulations (COSO, 2013).

Following Government Regulation No. 60 of 2008 on the Government Internal Control System, internal control is defined as:

An integral process of actions and activities carried out on an ongoing basis by management and all employees to provide reasonable assurance of the achievement of the entity's objectives through effective and efficient operations, reliability of financial reporting, security of government assets, and compliance with laws and regulations.

Specifically, for Public HEIs in Indonesia, the implementation of internal control is regulated by the Minister of National Education Regulation No. 16 of 2009 on Internal Control Units. The Financial and Development Supervisory Agency is involved in improving the implementation of internal control.

A high level of compliance with all components of the internal control system will lead the company to achieve excellent performance, in this case, profitability (Ali, 2013; Al-Thuneibat et al., 2015; Zhou et al., 2016). However, all these studies have been conducted in the context of the industrial sector and focused on the impact of internal control on financial performance. A review by Chalmers et al. (2019) of 60 US and 34 non-US or cross-national articles published between 2013 and 2016 found that a majority of research on

internal management comes from industry. In contrast, research on internal control in the not-for-profit sector remains an unexplored area and a worthwhile opportunity to pursue.

Government Internal Control System and Budgetary Slack

The budget preparation process aims to optimize resource usage in the upcoming period to enhance organizational performance (Zimmerman, 2000). Internal control assists organizations in setting appropriate targets. An internal control system can be effective and efficient in reducing corruption (Manurung et al., 2015; Islam, 2014), bribery, and fraud (Shonhadji & Maulidi, 2020; Peltier-Rivest, 2018), increasing public asset efficiency, optimizing resource utilization, enhancing accountability, and improving transparency (Reginato et al., 2016; Aziz et al., 2015). HEIs will collaborate through the New Public Management to develop solutions to problems in their respective areas.

In essence, the budget formulation and implementation process involve the exchange of information. It requires horizontal communication, coordination among superiors and subordinates, and active participation. The government expects HEIs to optimize their budget preparation process and enhance higher education performance by utilizing all elements of the government's internal control system (GICS), including the control environment, risk assessment, control activities, information and communication, and monitoring.

TT Hoai et al. (2022) used a questionnaire obtained from 319 middle managers in public sector organizations in Vietnam, and the results showed that internal control has a positive effect on organizational performance. Based on interviews conducted with internal auditors and members of internal control units at Public HEIs in Indonesia, it was explained that the implementation of internal control at Public HEIs is related to fraud mitigation because it places more emphasis on compliance with regulations related public financial management needs and the reliability of financial reports. The government provides autonomy to Public HEIs in developing internal control and information technology to support internal control (Sofyani et al., 2022b). In an ideal scenario, organizations that invest in information technology have a significant impact on budgeting behavior, as it can reduce budget slack and improve budget control activities, especially for non-BUMN enterprises (Shu, W. et al., 2023). Investing in information technology can reduce errors and fraud in the creation and transmission of information while increasing efficiency.

Based on the theoretical framework and forgoing discussions, the research model was formulated as presented in Figure 1, and the hypotheses were developed as follows:

H₁: The government's internal control system (GICS) has an impact on budgetary slack.

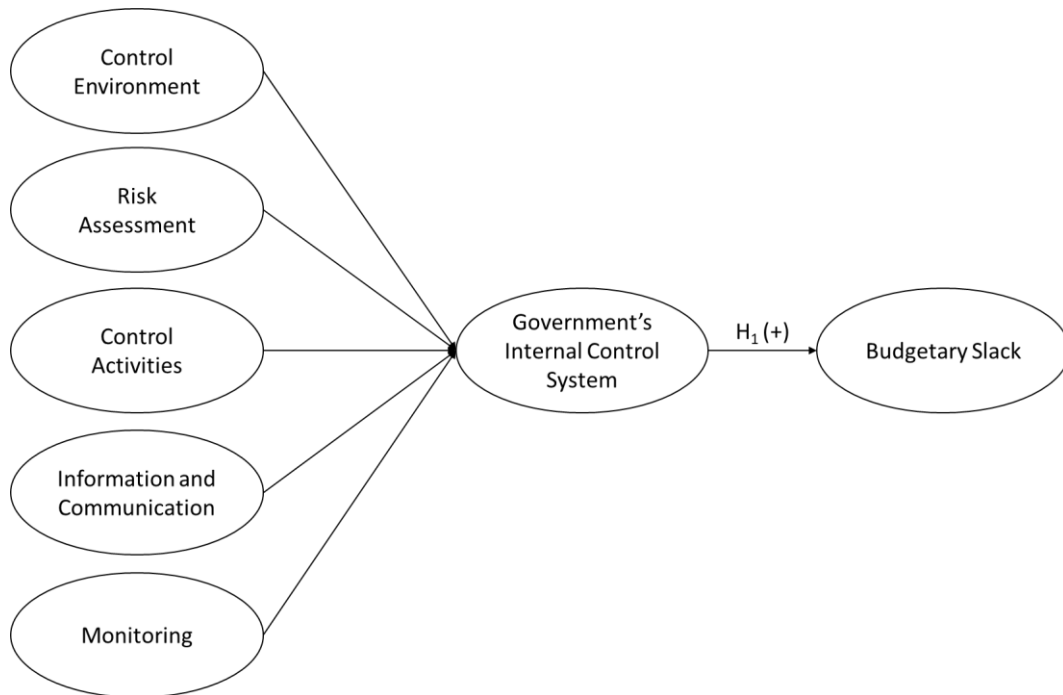


Figure 1 Research Model

Research Method

Research design and sample size

This quantitative research used cross-sectional studies involving respondents from different faculties in Public HEIs in Indonesia. The approach used was a non-probability approach using the method of purposive sampling. This method allows for the choice of participants according to particular criteria (Maqdllyan & Setiawan, 2023). Criterion one concerns managers in Public HEIs with an Internal Supervisory Unit (ISU), such as directors, deans, heads of institutions, heads of departments, coordinators, deputy deans, deputy directors, heads of departments, and members of the Internal Control Unit. Second, respondents participated in and influenced the budget preparation process. This method enabled the researchers to choose the participants who were most relevant to answering the questionnaire questions.

Moreover, the intercept technique involved asking the respondent a series of questions before answering the questionnaire. These questions include whether the respondent holds any of the following positions: director, dean, head of institution, head of department, coordinator, deputy dean, deputy director, head of unit, and member of the internal audit unit. If so, go on to the next question: does the respondent participate in the budgeting process in his/her organization? All these steps were designed to ensure the ethical integrity of the researchers in this study. Respondents received a comprehensive description of their rights to the research objectives, and the confidentiality of their responses was ensured (Khoa, 2023). Before data capture,

respondents provided an agreement form, and then steps were taken to ensure that anonymity was maintained during the research (Khoa, 2023).

Common method bias

The use of the same instrument for collecting both intrinsic and extrinsic data introduces the possibility of common method bias. To mitigate this, procedural and statistical strategies were employed, as recommended by Podsakoff et al., (2003). Procedurally, respondent anonymity was assured, and the absence of right or wrong answers was emphasized, following the approach of Leong et al., (2020). This aligns with the preventive measures suggested by Podsakoff et al., (2003), which include ensuring confidentiality, incorporating reverse-coded items, and separating data sources for independent and dependent variables. Statistically, Harman's single-factor test was conducted. The unrotated exploratory factor analysis in SPSS revealed that the maximum variance explained by a single factor was 46.161%, falling below the 50% threshold. This suggests that common method bias is unlikely to be a significant concern in this study.

Variable measurement

Chiu and Wang (2019) proposed a formative scale based on the COSO framework to measure the internal control system. To measure budgetary slack, the instrument developed by Anthony, R. N., and Govindarajan, V. (2007) was used.

Respondents received a concise description of the research objectives to assist them in answering the questionnaire accurately. To gain insight into the respondents, the researchers asked the respondents demographic questions, including age, education, length of service, and occupation. The research instrument's items were adapted from various existing studies. A pilot study validated the instruments used in this research. All constructs had high internal consistency, with Cronbach's alpha greater than 0.7, based on the pilot study. The constructs were measured using 5-point Likert scales. Responses ranged from 1 (strongly disagree) to 5 (strongly agree).

Partial Least Square Structural Equation Modelling (PLS-SEM) was used to test hypotheses. PLS is a popular choice for field research projects in information systems and accounting (Urbach & Ahlemann, 2010) due to its ability to make few data assumptions, require a small sample size, and use hypotheses with a simple theoretical basis (Chin et al., 2003). This research conducted a high-level construct analysis of the five elements that form the construct of an internal control system (Becker et al., 2012).

Result and Discussion

To estimate the measurement and structural model, this study used partial least squares structural equation modeling (PLS-SEM) with WarpPLS v.8. Constructs with reflective scales were tested for reliability using composite reliability (CR), while validity was assessed using the external loading of each indicator and average variance extracted

(AVE). The CR value for the acceptable reflective scale is 0.70-0.90, and the outer loading value is 0.708 or higher (Hair, 2022). In Table 1, it is known that the composite reliability value for the reflective scale was more than 0.70, indicating a high level of reliability of the measurement scale. As the AVE value was greater than 0.50, the measurement model demonstrated a satisfactory level of convergent validity.

Table 1 Scale Evaluation

Item	Weight/loading
Internal control systems	
<i>Control environment (formative scale)*</i>	
The organization demonstrates a commitment to integrity and ethical values.	0.247
The board of directors demonstrates independence from management and exercises oversight of the development and performance of internal control.	0.253
Management establishes, with board oversight, structures reporting lines, and appropriate authorities and responsibilities: in the pursuit of objectives.	0.239
The organization demonstrates a commitment to attract, develop, and retain competent individuals in alignment with objectives.	0.240
The organization holds individuals accountable for their internal control responsibilities in the pursuit of objectives.	0.258
<i>Risk assessment (formative scale)*</i>	
The organization specifies objectives with sufficient clarity to enable the identification and assessment of risks relating to objectives.	0.312
The organization identifies risks to the achievement of its objectives across the entity and analyzes risks as a basis for determining how the risks should be managed.	0.332
The organization considers the potential for fraud in assessing risks to the achievement of objectives.	0.355
The organization identifies and assesses changes that could significantly impact the system of internal control.	0.306
<i>Control activities (formative scale)*</i>	
The organization selects and develops control activities that contribute to the mitigation of risks to the achievement of objectives to acceptable levels.	0.411
The organization selects and develops general control activities over technology to support the achievement of objectives.	0.433
The organization deploys control activities through policies that establish what is expected and in procedures that put policies into action."	0.367
<i>Information and communication (formative scale)*</i>	
The organization obtains or generates and uses relevant, quality information to support the functioning of internal control.	0.381
The organization internally communicates information, including objectives and responsibilities for internal control, necessary to support the functioning of internal control.	0.394
The organization communicates with external parties about matters affecting the functioning of internal control.	0.385
<i>Monitoring (formative scale)*</i>	
The organization selects, develops, and performs ongoing and/or separate evaluations to ascertain whether the components of internal control are present and functioning.	0.564
The organization evaluates and communicates internal control deficiencies in a team.	0.564
Budgetary slack (CR = 0,879; AVE = 0,710; VIF = 3.498)	
Difference between budget and best estimate"	0.350
Budget targets	0.413
Framework conditions	0.420

Note: *CR and AVE are not available for formative scales;

Table 2 displays the results of the discriminant validity analysis using cross-loadings. The correlation coefficient's absolute value among each pair of constructs was consistently less than the square root of the AVE value and did not exceed the CR value. These results suggest that discriminant validity is very good (Fornell & Larcker, 1981).

Table 2 Discriminant Validity Assessment

	1	2	3	4	5	6
Control environment	N/A					
Risk assessment	0.633	N/A				
Control activities	0.809	0.644	N/A			
Information and communication	0.601	0.373	0,409	N/A		
Monitoring	0.770	0.608	0.717	0.507	N/A	
Budgetary Slack	-0.832	-0.505	-0.739	-0.624	-0.790	0.843

Notes: The correlation among variables is shown off-diagonal. The square root of AVE is indicated in bold on the diagonal. Correlation significance levels are denoted by *, ** for 5% and 1% levels, respectively, using a 2-tailed t-test. N/A (Not Applicable) is used to indicate that the square root of AVE is not applicable for formative constructs.

The measurement model, incorporating a higher-order formative construct, was assessed for validity. As shown in Table 3, an examination of the outer weights and loadings, along with their significance values, revealed that each first-order construct demonstrated a statistically significant and positive contribution to its respective higher-order construct (Hair et al., 2022). This fulfillment of the specified criteria supports the validity of the measurement model. Consequently, the data collected in this study are deemed suitable for subsequent structural model assessment and hypothesis testing.

Table 3 Outer Weight, Loading and Significance Values

First Order Contribution	Outer Weight	Loading
	P-Value	P-Value
CE → GICS	<0.001	<0.001
RA → GICS	<0.001	<0.001
CA → GICS	<0.001	<0.001
IC → GICS	<0.001	<0.001
Mo → GICS	<0.001	<0.001

Notes: CE = Control Environment; RA = Risk Assessment; CA = Control Activities; IC = Information and communication; Mo = Monitoring; GICS = Government's Internal Control System.

Structural model

PLS-SEM tested the hypothesis and validated the measurement model (Table 4). As suggested by Hair (2022), reporting included the results of the coefficient of determination ($R^2 = 0.724$), predictive relevance ($Q^2 = 0.731$), and path coefficient (-0.851). The problem of collinearity was tested to make sure that it did not affect the results of the regression (Ng et al., 2022). Based on Hair (2022), the maximum limit for collinearity is a tolerance of less than 0.20 and a VIF greater than 5. The outcomes showed that all objects did not exceed the level of 5. The tolerance values were within the adequate range (0.1 and 1). It can be seen that the data set did not show any multicollinearity.

Table 4 Results of Hypotheses Testing

	St. Beta	St. Error	P-value	Result
GICS → BS	-0.851	0.043	<0.001	Supported

Notes: GICS: "Government's Internal Control System", BS: "Budgetary Slack"

Artificial Neural Network (ANN)

Following the approach of Liébana-Cabanillas et al. (2017), this study utilized significant factors identified through SEM-PLS path analysis as input neurons for an artificial neural network model. This integration aimed to confirm the PLS-SEM findings and further explore potential non-linear relationships between exogenous and endogenous variables.

ANN is preferred for its ability to identify both linear and non-linear correlations between variables, providing highly accurate results. Additionally, ANN is more robust to outliers and misses data, leading to more reliable results even with imperfect datasets. This approach can also accommodate non-compensatory models, where a decrease in one factor does not necessitate an increase in another. By combining PLS and ANN, this study aims to provide a more comprehensive understanding of how internal control system elements influence budgetary slack. Identifying the most influential dimensions is crucial for management to prioritize improvement efforts in critical areas.

SPSS v26 was used to conduct the ANN analysis. As highlighted by Leong et al., both artificial neural networks and PLS-SEM offer flexibility and do not require fulfilling multivariate assumptions such as normality and linearity. This study employed a multilayer perception with a "feed-forward back-propagation" algorithm, utilizing significant predictors from the PLS path analysis as input neurons. This model is widely accepted and commonly used for this type of research.

Table 5 Artificial Neural Network Values

Neural Network	Training			Testing			Total
	N	SSE	RMSE	N	SSE	RMSE	
1	37	8.26	0.47	17	4.53	0.52	54
2	42	9.54	0.47	12	3.01	0.50	54
3	37	7.61	0.45	17	5.01	0.54	54
4	34	8.87	0.51	20	4.84	0.49	54
5	39	8.55	0.47	15	3.63	0.49	54
6	39	10.13	0.51	15	3.71	0.50	54
7	36	7.71	0.46	18	4.31	0.49	54
8	36	6.94	0.44	18	5.37	0.55	54
9	40	7.48	0.43	14	3.08	0.47	54
10	37	6.44	0.42	17	4.45	0.51	54
Mean		8.15	0.46		4.20	0.51	
SD		1.15	0.03		0.80	0.02	

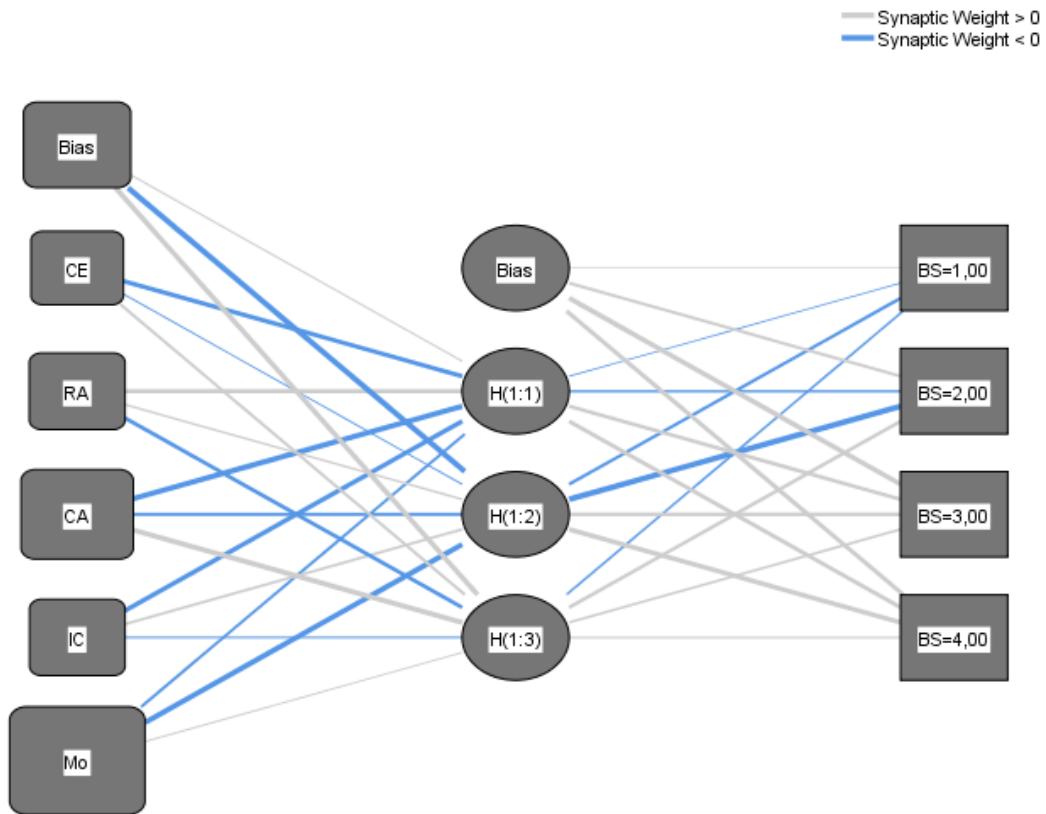
The RMSE values, multiplied by ten, are presented in Table 5. RMSE was used in this study to assess the predictive ability of the ANN. Table 5 illustrates that the average RMSE values for training and testing were 0.46 and 0.51, respectively. These results demonstrate that the ANN model depicted in Figure 2 exhibited strong predictive accuracy and a good fit with the data.

Table 6 Relative Importance

Neural Network	CE	RA	CA	IC	Mo
1	0.098	0.124	0.243	0.122	0.413
2	0.098	0.124	0.243	0.122	0.413
3	0.098	0.124	0.243	0.122	0.413
4	0.164	0.175	0.096	0.099	0.465
5	0.120	0.017	0.357	0.052	0.455
6	0.099	0.276	0.235	0.131	0.259
7	0.141	0.180	0.276	0.096	0.307
8	0.135	0.169	0.251	0.121	0.325
9	0.248	0.165	0.291	0.102	0.194
10	0.241	0.223	0.256	0.026	0.254
Mean Relative Importance	0.144	0.158	0.249	0.099	0.350
Normalized importance %	45.3%	50.7%	75.9%	29.5%	100%

Notes: CE = "Control Environment", RA = "Risk Assessment"; CA = "Control Activities"; IC = "Information and communication"; Mo = "Monitoring"

Further insights into the independent variables within the ANN model can be gleaned from Tables 5 and 6. Table 5 presents the number of non-zero synaptic weight connections to the hidden neurons. Table 6 displays the results of the sensitivity analysis, ranking each significant predictor based on its normalized relative importance (percentage). In terms of normalized relative importance, monitoring emerged as the top predictor of budgetary slack at 100%, followed by control activities and risk assessment at 76% and 55%, respectively (Kandasamy & Baker, 2023; Lee et al., 2020). These findings suggest that monitoring is the most influential element of the internal control system, underscoring its crucial role in mitigating budgetary slack.



Hidden layer activation function: Hyperbolic tangent

Output layer activation function: Identity

Notes: CE = "Control Environment"; RA = "Risk Assessment"; CA = "Control Activities"; IC = "Information and communication"; Mo = "Monitoring"; GICS = "Government's Internal Control System"; BS = "Budgetary Slack"

Figure 2 ANN Model Developed

Discussion

Elements of the system of internal control (GICS) play a significant role in ensuring that resource selection is carried out with integrity, accountability, and transparency. This finding is in line with Sofyani et al. (2023), Suuna (2011), Duh et al. (2014), and Abdullahi et al. (2016). The test results showed that the first element of GICS, an effective control environment, enables HEIs to reduce budgetary leakage (Treisman, 2000). A good control environment provides oversight, structure, and authority and enforces ethical behavior and accountability because the control of the environment determines the style of an organization. Research also suggests that control activities, which include procedures and activities designed, policies, and implemented by organizations to mitigate identified risks, can reduce budgetary slack (Simons, 1995; Merchant & Van Der Stede, 2007). These control activities include performance audits, technological controls, physical controls, and segregation of duties. The internal control element of information and communication includes appropriate and adequate internal and external communication, and the accounting information system is also capable of reducing budgetary slippage.

The integration of robust risk assessments within the budgeting process is crucial for fostering transparency, accountability, and evidence-based decision-making. This integration creates an environment where budgetary slack is readily identifiable and difficult to conceal, thereby promoting a more efficient and responsible budgeting culture. Specifically, state universities in Indonesia would benefit significantly from implementing comprehensive risk assessments across all units. By systematically identifying and analyzing risks related to their objectives, these institutions can establish a robust foundation for informed risk management strategies. This proactive approach enables more effective resource allocation, strengthens accountability, and ultimately contributes to the achievement of institutional goals (Kaplan & Norton, 2004).

Transparency, integrity, and accountability throughout the organization are essential. Monitoring activities, which are a continuous process of assessing the quality of internal control over time to ensure that organizational objectives are being achieved, can reduce budgetary slack. Monitoring activities require adjustments or changes to control procedures and other aspects of organizational policies when necessary and practical to ensure that organizational objectives are achieved.

Table 7 Comparison Between PLS-SEM and ANN Findings

IV	Total Effect	Finding	PLS-SEM		ANN	
			Ranking (PLS) (based on Path Coefficient)	Ranking (ANN) [based on Normalized Relative Importance (%)]	ANN results: Normalized relative importance (%)	Matched or Not
CE	0.293	Significant	1	4	45.3%	Not
RA	0.053	Significant	5	3	50.7%	Not
CA	0.238	Significant	4	2	75.9%	Not
IC	0.249	Significant	3	5	29.5%	Not
Mo	0.289	Significant	2	1	100%	Not

Notes: CE = "Control Environment", RA = "Risk Assessment"; CA = "Control Activities"; IC = "Information and communication"; Mo = "Monitoring"

The statistical power of the path coefficient and the normalized relative importance of the variables determine the order of the variables in PLS-SEM and ANN. The study found that the control environment (CE) had the highest influence in Partial Least Squares Structural Equation Modelling (PLS-SEM); however, it was ranked fourth in the artificial neural networks (ANN) ranking. In PLS-SEM, monitoring (Mo) held the second rank in terms of influence, while in ANN, it held the first rank. Information and communication (IC) ranked third in terms of influence in Partial Least Squares Structural Equation Modelling (PLS-SEM) and fifth in ANN. Similarly, control activities (CA) ranked fourth in PLS-SEM but second in ANN. Risk assessment was ranked fifth in terms of PLS-SEM influence but third in ANN analysis. The ability of artificial neural networks (ANNs) to capture both linear and non-linear associations may explain the differences observed. This study clearly exhibits the increased importance of CE when the non-linear relationship with BS is taken into account. The combination of PLS-SEM and ANNs

provides a comprehensive perspective, which increases the strength and validity of the findings of this study. This integrated approach provides a richer and more nuanced understanding of the relationships between variables, whereas many studies use one of these techniques separately.

This study's findings on the impact of the government's internal control system on budgetary slack address skepticism surrounding the effectiveness of GICS in mitigating such slack. The results demonstrate that a strong control environment, robust control activities, effective information and communication, and comprehensive monitoring can significantly reduce budgetary irregularities within higher education institutions. This research makes a significant contribution by moving beyond the predominantly linear analyses of previous studies on the relationship between GICS and budgetary slack. By examining the complexities of non-linear and non-compensatory relationships within the GICS model, this study enriches the existing body of knowledge in management accounting literature.

Conclusion

This study examines the impact of the government's internal control system (GICS) on budget slack in Indonesian Public HEIs. The research findings indicate that Internal Control Systems have proven to be effective in reducing budgetary slack. In addition, the results of Partial Least Squares Structural Equation Modelling (PLS-SEM) and Artificial Neural Networks (ANN) have shown that the order of significance of the variables undergoes significant changes after non-linear relationships are captured. Both Partial Least Squares Structural Equation Modeling (PLS-SEM) and Artificial Neural Networks (ANN) produce other rankings for the five GICS elements. This study provides empirical evidence that the relationship between elements of Internal Control Systems and budgetary slack is not always linear and can be influenced by complex interactions between elements. This finding enriches previous literature that generally uses linear approaches, such as regression, to analyze this relationship. This emphasizes the role of GICS as an important factor capable of reducing budgetary slack. This study's research findings can guide decision-makers in designing more inclusive budgeting processes through the implementation of effective GICS. As Public HEIs aim for continuous improvement and excellence, it is crucial to consider these recommendations.

This study makes significant contributions to agency theory by elucidating the role of GICS elements as control mechanisms in mitigating budgetary slack within Public HEIs. The findings provide empirical support for the effectiveness of GICS in curbing this agency problem, particularly highlighting the crucial role of a strong control environment. This underscores the importance of leadership commitment, ethical conduct, and a culture of accountability in shaping agent behavior and aligning it with organizational objectives. Furthermore, the integrated use of PLS-SEM and ANN reveals the complex, non-linear relationships between GICS elements and budgetary slack, suggesting that a multifaceted approach is necessary to effectively address this issue. These findings contribute to a more nuanced understanding of agency problems and control mechanisms within Public HEIs,

offering valuable insights for both theory development and practical application in strengthening governance and ensuring responsible resource allocation.

This research offers several key managerial implications. The demonstrated impact of GICS on budgetary slack underscores the critical need for its effective implementation within Public HEIs. While GICS has seen widespread adoption in the private sector, it has yet to gain similar traction within Public HEIs in Indonesia. This research strongly recommends that Public HEI leaders prioritize and optimize GICS implementation to enhance governance and curb budgetary irregularities. This can be achieved through concrete steps such as building awareness and commitment towards GICS across all organizational levels; developing a comprehensive and tailored GICS framework; strengthening internal control systems through rigorous risk assessment and standardized procedures; enhancing information and communication channels for transparency and informed decision-making; investing in continuous human resource development to build capacity in GICS implementation; and establishing a culture of integrity and accountability while regularly evaluating and refining the GICS framework for optimal effectiveness.

This study investigates the influence of government internal control system elements on budget slack within public higher education institutions. However, several limitations should be acknowledged. Firstly, the reliance on questionnaires for data collection introduces the potential for methodological biases inherent to self-reported data. Future research could mitigate this by employing a longitudinal design collecting data at multiple points in time to enhance the robustness of findings. Secondly, while this study focused specifically on GICS elements, other organizational factors may moderate their relationship with budget slack. For instance, organizational culture and leadership style could influence how internal controls are implemented and perceived, warranting further investigation. Finally, the sample exclusively comprised managers within institutions possessing established internal supervisory units. This deliberate focus limits the generalizability of findings to other higher education settings lacking a comparable internal supervisory structure. Future research should consider incorporating institutions with diverse organizational structures to provide a more comprehensive understanding of the relationship between GICS elements and budget slack across different contexts.

References

- Abdullahi, M. H., Abdullahi, M. & Muturi, W. (2016). Effect of internal control systems on financial performance of higher education institutions in Puntland. *International Journal of Economics, Commerce and Management*, 4(12), 762-780. <https://ijecm.co.uk/wp-content/uploads/2016/12/41251.pdf>
- Ali, K.H. (2013). *Contribution of Internal Control System to the Financial Performance of Financial Institution a Case of People's Bank of Zanzibar*. Master's dissertation, Mzumbe University, Tanzania.
- Al-Thuneibat, A.A., Al-Rehaily, A.S., & Basodan, Y.A. (2015). The Impact of Internal Control Requirements on Profitability of Saudi Shareholding Companies. *International*

- Journal of Commerce and Management*, 25 (2), 196-217.
<https://doi.org/10.1108/IJCOMA-04-2013-0033>
- Anthony, R. N. and Govindarajan, V. (2007). *Management Control System 12th. Edition*. New York: McGraw-Hill
- Aziz, M.A.A., Rahman, H.A., Alam, M.M. & Said, J. (2015). Enhancement of the Accountability of Public Sectors Through Integrity System, Internal Control System, and Leadership Practices: a Review Study. *Procedia Economics and Finance*, 28, 163–169.
[https://doi.org/10.1016/S2212-5671\(15\)01096-5](https://doi.org/10.1016/S2212-5671(15)01096-5)
- Becker, P. M., Meulen, J. van der, Jansman, A. J. M. & Wikselaar, P. G. Van. (2012). In vitro inhibition of ETEC K88 adhesion by pea hulls and of LT enterotoxin binding by faba bean hulls. *Journal of Animal Physiology and Animal Nutrition*, 96 (6): 1121-1126.
<https://doi.org/10.1111/j.1439-0396.2011.01229.x>
- Carton, A. M. & Lucas, B. J. (2018). How can leaders overcome the blurry vision bias? Identifying an antidote to the paradox of vision communication. *Academy of Management Journal*, 61(6), 2106–2129. <https://doi.org/10.5465/amj.2015.0375>
- Chalmers, K., Hay, D. & Khlif, H. (2019). Internal Control in Accounting Research: a Review. *Journal of Accounting Literature*, 42, 80-103.
<https://doi.org/10.1016/j.acclit.2018.03.002>
- Chin, W.W., Marcolin, B.L. & Newsted, P.R. (2003). A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study. *Information Systems Research*, 14, 189-217. <http://dx.doi.org/10.1287/isre.14.2.189.16018>
- Chiu, T. & Wang, T. (2019). The Coso Framework in Emerging Technology Environments: An Effective In-Class Exercise on Internal Control. *Journal of Emerging Technologies in Accounting*, 16 (2), 1–10. <https://doi.org/10.2308/jeta-52500>
- COSO. (2013). *Internal Control-Integrated Framework*, American Institute of Certified Public Accountants (AICPA), Durham
- Duh, R.R., Chen, K.T., Lin, R.C. & Kuo, L.C. (2014). Do Internal Controls Improve the Operating Efficiency of Universities? *Annals of Operations Research*, 22 (1), 173-195
<http://dx.doi.org/10.1007/s10479-011-0875-6>
- Dunk, A.S. (1993). The Effect of Budget Emphasis and Information Asymmetry on the Relation Between Budgetary Participation and Slack. *The Accounting Review*, 68 (2), 400–410. <https://www.jstor.org/stable/248408>
- Eisenhardt, K. M. (1989). Agency Theory: An Assessment and Review. *Academy of Management Review*, 14, 57–74. <https://doi.org/10.2307/258191>
- Fornell, C. & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50.
<https://doi.org/10.2307/3151312>
- Government Regulation Number 60 of 2008 concerning Internal Control Systems for Government Agencies
- Hair, J.F., Hult, G.T.M., Ringle, C.M. & Sarstedt, M. (2022). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage.
- Halbouni, S.S., Obeid, N. & Garbou, A. (2016). Corporate Governance and Information Technology in Fraud Prevention and Detection: Evidence from the UAE. *Managerial Auditing Journal*, 31(6/7). 589-628. <https://doi.org/10.1108/MAJ-02-2015-1163>
- Islam, M.A. (2014). Bribery and Corruption in Australian Local Councils. *Public Money & Management*, 34 (6), 441–446. <https://doi.org/10.1080/09540962.2014.962372>
- Jensen, M. C. & Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics*, 3, 305–360.
[https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)

- Kandasamy, Y. & Baker, S. (2023). An Exploratory Review on the Potential of Artificial Intelligence for Early Detection of Acute Kidney Injury in Preterm Neonates. *Diagnostics*, 13, 2865. <https://doi.org/10.3390/diagnostics13182865>
- Kaplan, R. S. & Norton, D. P. (2004). *Strategy maps: converting intangible assets into tangible outcomes*. Harvard Business School Press
- Khoa, B.T. (2023). The Role of Self-Efficacy and Firm Size in the Online Advertising Services Continuous Adoption Intention: Theory of Planned Behavior Approach. *Journal of Open Innovation: Technology, Market, and Complexity*, 9 (1). <https://doi.org/10.1016/j.joitmc.2023.100025>
- Krambia-Kapardis, M. (2002). A Fraud Detection Model: A Must for Auditors. *Journal of Financial Regulation and Compliance*, 10(3), 266-278. <https://doi.org/10.1108/13581980210810256>
- Lee, D.H., Kim, Y.T. & Lee, S.R. (2020). Shallow Landslide Susceptibility Models Based on Artificial Neural Networks Considering the Factor Selection Method and Various Non-Linear Activation Functions. *Remote Sens*, 12, 1194. <https://doi.org/10.3390/rs12071194>
- Leong, L.Y., Hew, T.S., Ooi, K.B. & Chong, A.Y.L., (2020). Predicting The Antecedents Of Trust In Social Commerce – A Hybrid Structural Equation Modeling With Neural Network Approach. *Journal of Business Research*, 110, 24–40. <https://doi.org/10.1016/j.jbusres.2019.11.056>
- Liébana-Cabanillas, F., Marinković, V., & Kalinić, Z. (2017). A SEM-neural network approach for predicting antecedents of m-commerce acceptance. *International Journal of Information Management*, 37(2), 14-24. <http://dx.doi.org/10.1016/j.ijinfomgt.2016.10.008>
- Luft, J. & Shields, M. D. (2003). Mapping management accounting: graphics and guidelines for theory-consistent empirical research. *Accounting, organizations and society*, 28(2-3), 169-249. [https://doi.org/10.1016/S0361-3682\(02\)00026-0](https://doi.org/10.1016/S0361-3682(02)00026-0)
- Macinati, M.S., Bozzi, S. & Rizzo, M.G. (2016). Budgetary Participation and Performance: The Mediating Effects of Medical Managers' Job Engagement and Self-Efficacy. *Health Policy* 120 (9), 1017–1028. <https://doi.org/10.1016/j.healthpol.2016.08.005>.
- Manurung, D., Suhartadi, A.R. & Saefudin, N. (2015). The Influence of Organizational Commitment on Employee Fraud with Effectiveness of Internal Control and Organizational Justice as a Moderating Variable. *Procedia-Social and Behavioral Sciences*, 211, 1064–1072. <https://doi.org/10.1016/j.sbspro.2015.11.142>
- Maqdliyan, R. & Setiawan, D. (2023). Antecedents and consequences of public sector organizational innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 9(2), 100042. <https://doi.org/10.1016/j.joitmc.2023.100042>
- Merchant, K. (1985). Budgeting and the Propensity to Create Budgetary Slack. *Accounting, Organizations and Society*, 10(2), 201–210. [https://doi.org/10.1016/0361-3682\(85\)90016-9](https://doi.org/10.1016/0361-3682(85)90016-9)
- Merchant, K. A. & Van der Stede, W. A. (2007). *Management control systems: performance measurement, evaluation and incentives*. Pearson Education.
- Nawawi, A. & Salin, A. S. A. P. (2018). Internal control and employees' occupational fraud on expenditure claims. *Journal of Financial Crime*, 25(3), 891-906. <https://doi.org/10.1108/JFC-07-2017-0067>
- Ng, S.I., Lim, Q.H., Cheah, J.H., Ho, J.A. & Tee, K.K., (2022). A moderated-mediation model of career adaptability and life satisfaction among working adults in Malaysia. *Current Psychology*, 41 (5), 3078–3092. <https://doi.org/10.1007/s12144-020-00837-7>

- Onsi, M. (2009). Determinants of budgetary slack: Evidence from the Tunisian manufacturing companies. *International Journal of Accounting and Financial Reporting*, 1, 195–210
- Peltier-Rivest, D. (2018). A Model for Preventing Corruption. *Journal of Finance Crime* 25 (2), 545–561. <https://doi.org/10.1108/JFC-11-2014-0048>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.Y. & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Reginato, E., Fadda, I. & Paglietti, P. (2016). The Influence of Resistance to Change on Public Sector Reform Implementation: The Case of Italian Municipalities' Internal Control System. *International Journal of Public Administration*, 39 (12), 989–999. <https://doi.org/10.1080/01900692.2015.1068325>
- Rendon, J.M. & Rendon, R.G. (2016). Procurement fraud in the US Department of Defense. *Managerial Auditing Journal*, 31 (6/7), 748-767. <http://dx.doi.org/10.1108/MAJ-11-2015-1267>
- Riyadh, H.A., Nugraheni, F.R. & Ahmed, M.G. (2023). Impact of Budget Participation and Leadership Style on Managerial Performance with Organizational Commitment as Intervening Variable. *Cogent Business & Management*, 10 (1). <https://doi.org/10.1080/23311975.2023.2175440>
- Ross, S. A. (1973). The Economic Theory of Agency: The Principal's Problem. *The American Economic Review*, 63(2), 134–139. <https://www.jstor.org/stable/1817064>
- Salman, F., Hashemi, S.A. & Foroghi, D. (2023). Feasibility of Establishing Operational Budgeting in Iraqi Public Universities. *Risks*, 11 (2), 44. <https://doi.org/10.3390/risks11020044>
- Schiff, M. & Lewin, A.Y. (1970). The Impact of People on Budgets. *The Accounting Review*, 45(2), 259–268. <https://www.jstor.org/stable/244377>
- Shonhadji, N. & Maulidi, A. (2022). Is It Suitable for Your Local Governments? A Contingency Theory-Based Analysis on the Use of Internal Control in Thwarting White-Collar Crime. *Journal Financial Crime*, 29 (2), 770-786. <http://dx.doi.org/10.1108/JFC-10-2019-0128>
- Shu, W. Chen, Y. & Chen, X. (2023). Information technology empowerment and corporate budget control: Evidence from China. *Pacific-Basin Finance Journal*, 82. <https://doi.org/10.1016/j.pacfin.2023.102131>
- Simons, R. (1995). Control in an age of empowerment. *Harvard Business Review*, 73, 80-88
- Sofyani, H., Hasan, H. A. & Saleh, Z. (2022a). Internal Control Implementation in Higher Education Institutions: Determinants, Obstacles and Contributions Toward Governance Practices and Fraud Mitigation. *Journal of Financial Crime*, 29(1), 141-158. <https://doi.org/10.1108/JFC-12-2020-0246>
- Sofyani, H., Hasan, H. A. & Saleh, Z. (2022b). The Moderating Role of IT Development on the Relationship between Internal Control and the Quality Performance of Higher Education Institutions. *Quality Innovation Prosperity*, 26(2). <https://doi.org/10.12776/qip.v26i2.1711>
- Sofyani, H., Saleh, Z. & Hasan, H. A. (2023). Internal Control Implementation and quality of higher education institutions: a moderation effect testing. *Asian Journal of Accounting Research*, 8 (4), 425-435. <https://doi.org/10.1108/AJAR-09-2022-0277>
- Suuna, P.M. (2011). *Effects of Internal Control Systems on Financial Performance in an Institution of Higher Learning in Uganda: A Case of Uganda Martyrs University*. Uganda Martyrs University.

Fitriyani & Ratmono

Reducing budgetary slack through government internal control system: ...

- T.T. Hoai et al. (2022). The Impact of Internal Control Systems on The Intensity of Innovation and Organizational Performance of Public Sector Organizations in Vietnam: The Moderating Role of Transformational Leadership. *Helijon* 8 (2). <https://doi.org/10.1016/j.helijon.2022.e08954>
- Treisman, D. (2000). The causes of corruption: a cross-national study. *Journal of Public Economics*, 76, 399-430. [http://dx.doi.org/10.1016/S0047-2727\(99\)00092-4](http://dx.doi.org/10.1016/S0047-2727(99)00092-4)
- Urbach, N. & Ahlemann, F. (2010). Structural Equation Modeling in Information Systems Research Using Partial Least Squares. *Journal of Information Technology Theory and Application (JITTA)*, 11 (2). <https://aisel.aisnet.org/jitta/vol11/iss2/2>
- Waller, W. S. (1988). Slack in participative budgeting: The joint effect of a truth-inducing pay scheme and risk preferences. *Accounting, Organizations and Society*, 13(1), 87-98. [https://doi.org/10.1016/0361-3682\(88\)90027-X](https://doi.org/10.1016/0361-3682(88)90027-X)
- Zhou, H., Chen, H. & Cheng, Z. (2016). Internal Control, Corporate Life Cycle, and Firm Performance. The Political Economy of Chinese Finance. *International Finance Review*, 17, 189-209. <https://doi.org/10.1108/S1569-376720160000017013>
- Zimmerman, J.L. (2000). *Accounting for Decision Making and Control*. McGraw-Hill/Irwin Company.
-

About the Authors

Fara Fitriyani (F.F.) is a student in the Doctoral Program at the Department of Accounting, Diponegoro University (UNDIP), Semarang and a lecturer at the Department of Accounting, Sultan Ageng Tirtayasa University (UNTIRTA), Banten. Her research interests cover management accounting. Email address: fara_0606@untirta.ac.id

Dwi Ratmono (D.R.) is a lecturer at the Department of Accounting, Diponegoro University (UNDIP), Semarang. His research interests cover management control systems; email address: dwi.ratmono2@gmail.com

Author Contributions

Conceptualisation, F.F., and D.R.; Methodology, F.F.; Investigation, F.F., and D.R.; Analysis, D.R.; Original draft preparation, F.F.; Review and editing, D.R.; Visualization, F.F.; Supervision, D.R.; Funding acquisition, F.F., and D.R.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study, in the collection, analyses, or interpretation of data, in the writing of the manuscript, or in the decision to publish the results.



© 2024 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC-BY-NC-ND 4.0) license (<http://creativecommons.org/licenses/by/4.0/>).