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THE EFFECT OF BUDGET PLANNING, HUMAN RESOURCE QUALITY, REGULATION, AND ORGANIZATIONAL COMMITMENT ON BUDGET ABSORPTION AT THE NATIONAL CYBER AND CRYPTO AGENCY (BADAN SIBER DAN SANDI NEGARA)

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Abstract:

This study analyzes the effect of budget planning, human resource quality, regulation, and organizational commitment on budget absorption at the National Cyber and Crypto Agency (BSSN), motivated by a back-loaded spending pattern in which realization through the third quarter remained below 60 percent in 2023 to 2025 despite year-end absorption above 98 percent in 2023 and 2024. Data from 148 BSSN employees involved in budget management, selected through purposive sampling, were analyzed using SEM-PLS. The measurement model met all validity and reliability criteria. Budget planning ($\beta = 0.302$), human resource quality ($\beta = 0.242$), regulation ($\beta = 0.318$), and organizational commitment ($\beta = 0.237$) each have a positive and significant effect on budget absorption (all $p < 0.001$), with regulation showing the strongest influence. The model explains 30.8 percent of the variance in budget absorption ($R^2 = 0.308$). The findings support the complementary use of agency theory and stewardship theory and suggest that strengthening early-year planning, staff competency, regulatory socialization, and a collective accountability culture can reduce year-end spending accumulation.

Keywords:

Budget Planning; Human Resource Quality; Regulation; Organizational Commitment; Budget Absorption; SEM-PLS; Public Sector

BACKGROUND

The state budget is the government's principal instrument for financing national development programs and public services. In Indonesia's public financial management system, this instrument takes the form of the State Revenue and Expenditure Budget (Anggaran Pendapatan dan Belanja Negara/APBN), which under Law No. 17 of 2003 on State Finance functions as a tool of authorization, planning, supervision, allocation, distribution, and stabilization to support equitable and efficient national development. Effective and efficient budget management is therefore a key determinant of development success.

One of the most widely used indicators of government budget performance is budget absorption, which reflects the extent to which allocated funds are actually realized to implement planned programs and

activities (Fitri et al., 2025). High absorption indicates that programs are carried out effectively and on schedule, whereas low absorption often signals problems in planning, execution, or financial management (Darmini & Susanti, 2026; Lusiawati & Nugaraha, 2024).

National data illustrate this concern: through the third quarter of fiscal year 2025, total state expenditure realization reached only about 63-64 percent of the total budget ceiling of Rp3,527.5 trillion, with realization concentrated disproportionately toward the end of the year - a phenomenon commonly referred to as a back-loaded spending pattern (Yusuf & Muthi'ah, 2023). Ministries and non-ministerial government institutions (Lembaga Pemerintah Non-Kementerian/LPNK) experience a similar pattern, with aggregate realization for ministries and agencies reaching only about 62.8 percent of the total budget ceiling by September 2025.

The National Cyber and Crypto Agency (BSSN) is an LPNK mandated to safeguard national interests in cyberspace through the protection of government electronic systems, data, and national information infrastructure (Wati et al., 2024; Maharani & Atman, 2025). Year-end absorption at BSSN has historically been very high: 98.99 percent of a budget of Rp605.32 billion in 2023, 98.84 percent of Rp894.55 billion in 2024, and 80.73 percent of Rp1,321.63 billion in 2025. However, realization through the third quarter tells a different story. Only 54.96 percent in 2023, 56.28 percent in 2024, and 36.61 percent in 2025. indicating a pronounced and, in fact, worsening back-loaded spending pattern. Such concentration of spending near year-end raises the risk of rushed implementation, administrative errors, and diminished programmatic benefit, even though the annual absorption figures themselves appear favorable.

Prior studies have identified several organizational factors associated with budget absorption in the public sector, including budget planning (Puluala, 2021; Hakim & Makmur, 2019), human resource competence (Syahwildan & Damayanti, 2021; Patria, 2021), regulatory clarity and compliance (Sutono et al., 2022; Kurniawan & Yamin, 2025), and organizational commitment (Nurbaverischa et al., 2024; Shaleh & Firman, 2018). However, empirical findings remain inconsistent: while Nurchayati and Nawatmi (2022), Almi et al. (2022), and Oktari et al. (2020) reported positive and significant effects of these factors, other studies - such as Budi et al. (2023), Ayuningtyas (2024), Tanor et al. (2024), Erliyani and Sulastiningsih (2023), and Lastri et al. (2026) - found some of these relationships to be non-significant or even negative. This inconsistency, together with the fact that most prior research has focused on regional governments or village administrations rather than strategic non-ministerial national security agencies, constitutes the research gap that this study addresses.

Based on this background, the research questions guiding this study are: (1) does budget planning affect budget absorption at BSSN; (2) does human resource quality affect budget absorption at BSSN; (3) does regulation affect budget absorption at BSSN; and (4) does organizational commitment affect budget absorption at BSSN? Accordingly, the objective of this study is to empirically analyze the effect of budget planning, human resource quality, regulation, and organizational commitment on budget absorption at BSSN. Theoretically, the study is expected to enrich the empirical literature on agency theory and stewardship theory in public budget management; practically, it is expected to provide BSSN and comparable government institutions with an evidence base for improving the timeliness and evenness of budget realization throughout the fiscal year.

THEORETICAL FRAMEWORK

Agency and Stewardship Theory

Agency theory (Jensen & Meckling, 1976) conceptualizes a relationship in which a principal delegates authority to an agent (Ardini, 2023). In the public sector, the public is the principal and the bureaucratic apparatus the agent (Wardoyo et al., 2023). Information asymmetry can give rise to opportunistic behavior (Prasetyo, 2022), so absorption indicates how faithfully agents discharge their mandate (Wijayanti, 2025). This study uses agency theory to argue that sound planning, adequate human resources, and regulatory compliance reduce information asymmetry and align agents' actions with the principal's interests. Stewardship theory complements it by assuming that managers are intrinsically motivated to pursue collective organizational goals (Donaldson & Davis, 1991; Schillemans & Bjurstrøm, 2022). It is used here to explain organizational commitment: employees who identify with their organization exert discretionary effort beyond what formal control can achieve (Prabowo & Rahmawati, 2025).

Budget and Budget Absorption

A budget is a systematically prepared, periodic financial plan, expressed in monetary terms, that guides an organization's operational activities (Tajeri, 2023; Hardana, 2022). Budgets serve planning, coordination, and control functions (Sulistyowati et al., 2020) and, in the public sector, additionally serve as instruments of authorization, allocation, distribution, and stabilization. Budget absorption refers to the extent to which the allocated budget is actually realized to implement planned programs and activities (Fitri et al., 2025); it is one of the principal indicators used to evaluate the performance of public financial management and the effectiveness of program implementation.

Budget Planning

Budget planning is the initial stage of the public financial management cycle, in which programs and activities to be carried out by a government organization are formulated and their resource requirements are estimated (Hakim & Makmur, 2019). Comprehensive, realistic, and prioritized planning facilitates smoother implementation and reduces the likelihood of budget revisions and schedule delays that would otherwise depress realization (Afdhal et al., 2021).

Human Resource Quality

Human resource quality reflects the competence, knowledge, skills, and professionalism of employees in carrying out their duties (Patria, 2021). In budget management, competent staff are better able to understand procurement and financial regulations, execute activities, and complete the administrative processes required for budget realization, whereas limited competence tends to generate delays that suppress absorption.

Regulation

Regulation encompasses the body of rules governing the management of state finances, intended to ensure accountability, transparency, and efficiency in the use of public funds (Juliani, 2010). Clear, consistent, and well-socialized regulation gives budget managers confidence in executing activities according to established procedures, while complex or frequently changing regulation tends to generate hesitancy and delay for fear of audit findings (Kurniawan & Yamin, 2025).

Organizational Commitment

Organizational commitment reflects the degree of employees' attachment, loyalty, and sense of responsibility toward their organization, encompassing affective, continuance, and normative dimensions

(Dwiyanti et al., 2024; Shaleh & Firman, 2018). Employees with strong organizational commitment tend to work more disciplined and target-oriented, whereas weak commitment is associated with delayed or suboptimal program implementation (Widianto et al., 2024).

Conceptual Framework and Hypothesis Development

Building on the theoretical review and prior empirical findings, this study proposes that budget absorption at BSSN is jointly influenced by budget planning (X1), human resource quality (X2), regulation (X3), and organizational commitment (X4). Comprehensive planning provides clear targets and schedules; competent human resources translate plans into executed activities with fewer administrative errors; clear and consistently applied regulation gives budget managers the confidence to execute; and organizational commitment ensures that achieving absorption targets is treated as a shared responsibility rather than a purely administrative obligation. Weakness in any one of these elements is expected to create a bottleneck in budget realization. Based on this reasoning and consistent with the findings of Wirastuti et al. (2024) and Sutono et al. (2022) regarding planning and regulation, Puluala (2021), Wandari et al. (2021), and Tanor et al. (2024) regarding human resource quality, and Wirastuti et al. (2024) and Purba and Sari (2022) regarding organizational commitment, the following hypotheses are proposed:

H1: Budget planning has a positive effect on budget absorption.

H2: Human resource quality has a positive effect on budget absorption.

H3: Regulation has a positive effect on budget absorption.

H4: Organizational commitment has a positive effect on budget absorption.

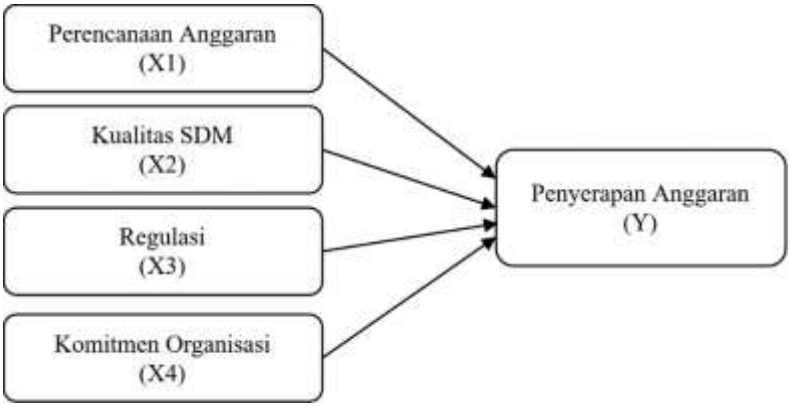


Figure 1. Hypotheses Analysis

METHOD

This study employed a quantitative approach designed to test the hypothesized relationships between budget planning, human resource quality, regulation, and organizational commitment (as exogenous variables) and budget absorption (as the endogenous variable) at BSSN. The research was conducted between April and June 2026.

The population comprised all 1,830 BSSN employees as of April 2025. Because not all employees are directly involved in budget management, respondents were selected using non-probability purposive sampling, targeting employees holding budget-related positions or assignments, such as Budget User Authority (KPA), Commitment-Making Officers (PPK) and their staff, Payment Order Signing Officers (PPSPM), procurement officers, treasurers, financial managers, and functional planning, finance, and audit officers. The minimum sample size was determined using Hair et al.'s (2022) 10-times rule for SEM-PLS, based on the construct with the largest number of indicators (Regulation, 12 items), yielding a minimum requirement of 120 respondents; the study ultimately obtained responses from 148 employees, exceeding this threshold.

Data were collected through an online, self-administered questionnaire using a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5), with reverse scoring applied to unfavorably worded items. Budget Planning, Human Resource Quality, and Organizational Commitment were each measured with 10 indicators, Regulation with 12 indicators, and Budget Absorption (the dependent variable) with 10 indicators, all adapted from established prior instruments.

Data were analyzed using Structural Equation Modeling-Partial Least Squares (SEM-PLS) with SmartPLS software, chosen for its suitability for complex models with relatively limited sample sizes and its capacity to estimate relationships among latent variables simultaneously (Hair et al., 2022). The analysis proceeded in two stages: evaluation of the measurement model (outer model), comprising tests of convergent validity (outer loading and Average Variance Extracted/AVE), discriminant validity (cross loading, Fornell-Larcker criterion, and Heterotrait-Monotrait ratio/HTMT), and reliability (Cronbach's alpha and composite reliability); and evaluation of the structural model (inner model), comprising tests of multicollinearity (VIF), the coefficient of determination (R^2), effect size (f^2), model fit (SRMR), and hypothesis testing via path coefficients and bootstrapped significance (t-statistics and p-values), with a relationship considered significant at the 5 percent level when $t > 1.96$ and $p < 0.05$.

RESULT

Respondent Profile

A total of 148 valid responses were obtained from BSSN employees involved in budget management. The majority of respondents were male (91 respondents, 61.49%) compared with female (57 respondents, 38.51%). By age, the largest group was over 40 years old (41 respondents, 27.70%), followed by 31-35 years (35 respondents, 23.65%), and 26-30 and 36-40 years (32 respondents each, 21.62%), with respondents aged 25 years or younger the smallest group (8 respondents, 5.41%). By educational attainment, most respondents held a bachelor's degree (S1/D4) (109 respondents, 73.65%), followed by a master's degree (S2) (28 respondents, 18.92%) and a diploma (Diploma I-III) (11 respondents, 7.43%). By tenure, the largest group had worked for more than 15 years (61 respondents, 41.22%), followed by 1-5 years and 6-10 years (32 respondents each, 21.62%), and 11-15 years (23 respondents, 15.54%). Overall, respondents were predominantly experienced, well-educated male employees, consistent with the profile expected of staff assigned to budget-management functions.

Descriptive Statistics

Descriptive analysis of the 148 responses showed that all indicators had minimum values between 1.00 and 2.00 and maximum values of 5.00, indicating responses spanning nearly the full Likert range. Budget Planning indicator means ranged from 3.777 to 3.838 (median 4.00; SD 0.863-0.954), and Human Resource

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Quality means ranged from 3.743 to 3.932 (median 4.00; SD 0.984-1.106), both reflecting generally positive perceptions. Regulation indicators showed comparatively lower and more dispersed means (3.216-3.385; median mostly 3.00; SD 1.041-1.208), suggesting more moderate and varied perceptions of regulatory clarity and consistency. Organizational Commitment indicators had the most concentrated and favorable distribution (means 3.845-3.959; median 4.00; SD 0.815-0.911). Budget Absorption indicators ranged from 3.541 to 3.736 (median 4.00; SD 0.832-0.954), indicating a moderately positive perception of realization performance.

Measurement Model (Outer Model)

Convergent validity was assessed via outer loadings and AVE. All 52 indicators produced outer loadings above the 0.70 threshold: 0.845-0.897 for Budget Planning, 0.716-0.833 for Human Resource Quality, 0.742-0.840 for Regulation, 0.713-0.840 for Organizational Commitment, and 0.764-0.841 for Budget Absorption. AVE values for all constructs exceeded 0.50 (Budget Planning = 0.756; Human Resource Quality = 0.610; Regulation = 0.635; Organizational Commitment = 0.611; Budget Absorption = 0.646), confirming convergent validity across the model.

Construct	Cronbach's Alpha	rho_a	Composite Reliability (rho_c)	AVE
Budget Planning (X1)	0.964	0.971	0.969	0.756
Human Resource Quality (X2)	0.930	0.943	0.940	0.610
Regulation (X3)	0.948	0.954	0.954	0.635
Organizational Commitment (X4)	0.929	0.935	0.940	0.611
Budget Absorption (Y)	0.939	0.942	0.948	0.646

Table 1. Reliability and Convergent Validity (Source: SmartPLS output, 2026)

Discriminant validity was confirmed through cross-loading analysis, the Fornell-Larcker criterion, and the Heterotrait-Monotrait ratio (HTMT), all of which indicated that each construct was empirically distinct from the others. Reliability tests showed Cronbach's alpha and composite reliability values well above the 0.70 threshold for all constructs (Table 1), confirming that the measurement instrument was internally consistent and reliable.

Structural Model (Inner Model)

Multicollinearity testing produced VIF values within acceptable limits for all exogenous constructs, indicating no problematic collinearity among predictors. The coefficient of determination (R^2) for Budget Absorption was 0.308 (adjusted $R^2 = 0.288$), indicating that Budget Planning, Human Resource Quality, Regulation, and Organizational Commitment jointly explain 30.8 percent of the variance in Budget Absorption, a weak-to-moderate level of explanatory power (Hair et al., 2022), with the remaining 69.2 percent attributable to factors outside the model.

Effect size (f^2) analysis showed that Regulation ($f^2 = 0.143$) and Budget Planning ($f^2 = 0.131$) each had a medium effect on Budget Absorption, while Human Resource Quality ($f^2 = 0.084$) and Organizational Commitment ($f^2 = 0.079$) had small effects. Model fit evaluation via the Standardized Root Mean Square

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Residual (SRMR) yielded a value of 0.057 for both the saturated and estimated models, indicating an acceptable fit between the model and the empirical data (supplementary fit indices: d_ULS = 4.549; d_G = 2.086; Chi-square = 1,463.000; NFI = 0.785).

Hypothesis Testing

Path coefficients and bootstrapped significance tests are summarized in Table 2. All four hypothesized relationships were positive and statistically significant at the 5 percent level (t-statistics > 1.96; $p < 0.05$, reported as $p < 0.001$ given SmartPLS output precision).

Hypothesis	Relationship	Path Coefficient (β)	t-statistics	p-value	Decision
H1	Budget Planning → Budget Absorption	0.302	4.655	< 0.001	Supported
H2	Human Resource Quality → Budget Absorption	0.242	3.679	< 0.001	Supported
H3	Regulation → Budget Absorption	0.318	5.130	< 0.001	Supported
H4	Organizational Commitment → Budget Absorption	0.237	3.551	< 0.001	Supported

Table 2. Path Coefficients and Hypothesis Testing Results (Source: SmartPLS output, 2026)

Regulation exhibited the strongest relative influence on Budget Absorption (β = 0.318; the highest t-statistic among the four predictors, 5.130), followed by Budget Planning (β = 0.302), Human Resource Quality (β = 0.242), and Organizational Commitment (β = 0.237). Overall, all four independent variables were found to partially and significantly affect Budget Absorption in a positive direction, confirming H1 through H4.

DISCUSSION

The Effect of Budget Planning on Budget Absorption

The finding that budget planning has a positive and significant effect on budget absorption (β = 0.302; t = 4.655; $p < 0.001$) supports H1 and indicates that more systematic, measurable planning aligned with organizational needs provides clearer direction for program implementation, helps determine activity priorities and budget allocation, and reduces the likelihood of mid-year budget revisions that would otherwise delay execution. This result is consistent with Wirastuti et al. (2024), Sutono et al. (2022), Puluala (2021), and Harahap et al. (2020), all of which found planning to significantly affect absorption. It diverges, however, from Ayuningtyas (2024), who found no significant effect, and from Tanor et al. (2024), who found a significant negative effect - a divergence plausibly attributable to differences in organizational characteristics, implementation environment, and budget-management mechanisms across research settings. In the BSSN context, the result suggests that planning grounded in a clear assessment of unit-level needs and priorities provides a firmer foundation for units to execute activities and realize their budgets.

The Effect of Human Resource Quality on Budget Absorption

Human resource quality was found to have a positive and significant effect on budget absorption ($\beta = 0.242$; $t = 3.679$; $p < 0.001$), supporting H2. Employees with adequate knowledge, skills, and professionalism are better equipped to understand regulations, execute activities, manage budget administration, and complete the processes required for realization, effectively converting allocated funds into executed outputs. This result aligns with Puluala (2021), Wandari et al. (2021), Tanor et al. (2024), and Lestari and Yuliani (2022), though it contrasts with Purba and Sari (2022) and Satria et al. (2024), who found no significant effect of human resource quality on absorption in their respective settings. This divergence points to an existing research gap regarding the role of human resource quality across different organizational contexts; within BSSN specifically, staff competence in budget-related tasks appears to be an important enabler of realization, suggesting that continued investment in staff capability - including training in procurement regulation, state financial governance, and digital systems such as SAKTI - can meaningfully support absorption improvement.

The Effect of Regulation on Budget Absorption

Regulation had the strongest positive and significant effect on budget absorption among the four predictors ($\beta = 0.318$; $t = 5.130$; $p < 0.001$), supporting H3. Clear, consistent, and well-communicated regulation provides budget managers with certainty about required procedures, whereas unclear, complex, or frequently changing rules generate uncertainty and can slow implementation. This is consistent with Sutono et al. (2022), Wirastuti et al. (2024), and Kuntadi and Rosdiana (2022), but contrasts with Erliyani and Sulastiningsih (2023) and Darmini and Susanti (2026), who found regulation to be non-significant in their respective contexts (with the latter study finding internal control systems and budget revisions to matter more). The prominence of regulation in this study's results suggests that, within BSSN, consistent socialization of budget-management rules to KPA, PPK, and activity implementers - and reducing the hesitancy that stems from fear of audit findings or abrupt rule changes - may be a particularly high-leverage area for improving absorption.

The Effect of Organizational Commitment on Budget Absorption

Organizational commitment - encompassing affective, continuance, and normative dimensions - was found to have a positive and significant effect on budget absorption ($\beta = 0.237$; $t = 3.551$; $p < 0.001$), supporting H4. Employees with stronger attachment and sense of responsibility toward BSSN appear more inclined to complete activities on schedule and ensure that allocated funds are realized in support of organizational goals. This finding is consistent with Nursela et al. (2022), Wirastuti et al. (2024), and Azzahra (2025), but differs from Ayuningtyas (2024), Lestari and Yuliani (2022), and Satria et al. (2024), who reported no significant effect - again pointing to a context-dependent research gap. Within BSSN, the result suggests that treating absorption targets as a shared, collective responsibility rather than a narrow administrative task of specific units can meaningfully support more consistent budget realization.

CONCLUSION

This study analyzed the effect of Budget Planning, Human Resource Quality, Regulation, and Organizational Commitment on Budget Absorption at the National Cyber and Crypto Agency (BSSN) using SEM-PLS on data from 148 respondents. All four hypotheses were supported: Budget Planning ($\beta = 0.302$; $t = 4.655$; $p < 0.001$), Human Resource Quality ($\beta = 0.242$; $t = 3.679$; $p < 0.001$), Regulation ($\beta = 0.318$; $t = 5.130$; $p < 0.001$), and Organizational Commitment ($\beta = 0.237$; $t = 3.551$; $p < 0.001$) each exert a positive and significant effect on Budget Absorption, with Regulation showing the strongest relative influence.

Collectively, the four predictors explain 30.8 percent of the variance in Budget Absorption ($R^2 = 0.308$; adjusted $R^2 = 0.288$), a weak-to-moderate level of explanatory power indicating that the majority of variance (about 69.2%) is attributable to factors beyond the scope of this model.

Theoretically, the significant effects of Budget Planning, Human Resource Quality, and Regulation reinforce the relevance of agency theory in public budget management, as these mechanisms reduce information asymmetry and the risk of opportunistic behavior between principals (the state/legislature) and agents (budget-executing units). The significant effect of Organizational Commitment reinforces the complementary relevance of stewardship theory, indicating that absorption is driven not only by formal control mechanisms but also by employees' intrinsic sense of responsibility as stewards of organizational resources - supporting a dual-theory approach to explaining budget-absorption behavior in the public sector. The moderate R^2 further suggests that budget absorption is a multicausal construct requiring a broader theoretical framework that incorporates structural, leadership, or digital-system factors not yet captured in this model.

Practically, the findings suggest several actionable priorities for BSSN and comparable government institutions: strengthening early-year planning through sharper needs analysis, more measurable implementation schedules, and fewer repeated budget revisions; enhancing staff capability through continuous training on procurement regulation, state financial governance, and digital systems such as SAKTI; ensuring consistent and accessible socialization of budget-management regulations to reduce execution hesitancy stemming from fear of audit findings or abrupt rule changes; and cultivating a collective, accountability-oriented work culture - for example through periodic monitoring of realization and recognition of budget-performance achievements - to mitigate the tendency of absorption to accumulate at year-end.

This study has several limitations. Its cross-sectional design means that the term “effect” refers to statistical association rather than temporally verified causation. All variables, including Budget Absorption, were measured through self-reported perceptions collected from a single source at a single point in time, raising the possibility of common method bias, which was not formally tested (e.g., via Harman's single-factor test) or triangulated against actual budget-realization data. The use of non-probability purposive sampling within a single institution limits the generalizability of the findings to other government agencies with different organizational characteristics, regulatory environments, or work cultures. The relatively modest R^2 (0.308) indicates that important explanatory factors - such as leadership style, digital-system readiness, or procurement-process dynamics - remain unaccounted for, and bootstrapped confidence intervals were unavailable, so hypothesis decisions relied solely on path coefficients, t-statistics, and p-values. Finally, because respondents evaluated conditions within their own institution, particularly for the Regulation and Organizational Commitment constructs, social desirability bias cannot be ruled out.

Future research is encouraged to incorporate actual budget-realization data as a complement to, or substitute for, perceptual measures of Budget Absorption to reduce common method bias; to extend the population and sample to multiple ministries, agencies, or non-ministerial institutions using probability sampling to improve external validity; to adopt longitudinal or time-lagged designs - for example, measuring independent variables early in the fiscal year and Budget Absorption at year-end - to strengthen causal inference; to incorporate additional explanatory variables such as leadership style or top-management support, digital financial-system readiness and literacy, organizational culture, or procurement complexity; to examine Organizational Commitment or other constructs as mediators or moderators within the model; and to employ qualitative or mixed-method approaches to more deeply explore the mechanisms underlying

the year-end budget-spike phenomenon identified in this study's conceptual framework, which quantitative methods alone could not fully explain.

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