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Improving Accuracy and Integration of Budgeting Process with the E-Budget Application

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Abstrak

Penyusunan anggaran merupakan kewajiban mendasar PT Perkebunan Nusantara IV sebagai anak perusahaan Badan Usaha Milik Negara (BUMN) sesuai ketentuan Menteri BUMN, yang diwujudkan dalam dokumen Rencana Kerja dan Anggaran Perusahaan (RKAP). RKAP berfungsi sebagai instrumen strategis dalam mengarahkan rencana operasional, alokasi sumber daya finansial, dan proyeksi keuangan tahunan. Dalam praktiknya, penyusunan anggaran manual masih menghadapi tantangan berupa kesalahan perhitungan, inkonsistensi data, keterlambatan penyajian informasi, dan rendahnya transparansi lintas bagian. Sejalan dengan perkembangan teknologi digital, sistem aplikasi e-budget menawarkan alternatif berbasis otomatisasi dan integrasi data untuk meningkatkan efektivitas proses anggaran. Gladi karya ini bertujuan merancang model e-budget yang ideal bagi PT Perkebunan Nusantara IV melalui pendekatan deskriptif analitis, dengan menelaah kebutuhan sistem, alur proses, serta implikasi penerapannya terhadap kualitas penganggaran. Hasil kajian menunjukkan bahwa pemanfaatan aplikasi e-budget mampu menurunkan tingkat kesalahan perhitungan, mempercepat proses kompilasi dan verifikasi dokumen, meningkatkan transparansi serta integrasi data antarunit kerja, dan mendukung pengambilan keputusan secara lebih responsif dan berbasis informasi. Selain itu, sistem memberikan mekanisme pengawasan anggaran yang lebih terkontrol melalui fitur persetujuan digital dan penelusuran penggunaan anggaran secara real time. Secara keseluruhan, implementasi e-budget berpotensi meningkatkan akurasi, efisiensi, serta akuntabilitas pengelolaan keuangan, sekaligus memperkuat tata kelola dan penciptaan nilai jangka panjang bagi perusahaan.

Kata Kunci: RKAP; e-budget; anggaran berbasis digital; akuntabilitas; tata kelola perusahaan

Abstract

Budget preparation is a mandatory requirement for PT Perkebunan Nusantara IV as a subsidiary of a State-Owned Enterprise (SOE), in accordance with regulations issued by the Ministry of SOEs, and is formalized in the Corporate Work Plan and Budget (RKAP). The RKAP functions as a strategic instrument that outlines operational plans, resource allocation, and yearly financial projections. In practice, manual budgeting still encounters challenges such as calculation errors, data inconsistencies, delayed information flow, and limited transparency across business units. In line with advancing digital transformation, an e-budget application offers an automated and integrated approach to enhance the effectiveness of the budgeting process. This project aims to design an ideal e-budget model for PT Perkebunan Nusantara IV using a descriptive analytical method by examining system requirements, process flows, and the implications of system implementation on budgeting performance. The findings indicate that the application of e-budgeting reduces calculation errors, accelerates document compilation and verification, enhances transparency and data integration between departments, and supports faster data-driven decision-making. Furthermore, the system strengthens budgetary oversight through digital approval controls and real-time tracking of fund utilization. Overall, the implementation of e-budgeting has the potential to improve accuracy, efficiency, and accountability in financial management while reinforcing corporate governance and long-term value creation for the company.

Keywords: RKAP; e-budget; digital budgeting; accountability; corporate governance

1. Introduction

PT Perkebunan Nusantara IV (PTPN IV), a subsidiary of a State-Owned Enterprise (SOE) in Indonesia, is mandated to prepare an annual Corporate Work Plan and Budget (RKAP) in accordance with regulatory directives issued by the Ministry of State-

Owned Enterprises. The RKAP serves not only as a formal compliance instrument but also as a strategic management tool that sets operational priorities, allocates financial resources, and provides the basis for performance measurement. Consequently, the quality, accuracy, and internal consistency of the budgeting process directly influence managerial decision-making and the achievement of organizational targets. In practice, budgeting within PTPN IV is still predominantly supported by semi-manual spreadsheet-based systems and decentralized coordination mechanisms. While such methods remain common in plantation enterprises, they introduce structural limitations, including inconsistent data entry, vulnerability to manual calculation errors, lengthy consolidation cycles, and restricted visibility into budget allocation and execution. These weaknesses reduce organizational responsiveness, weaken monitoring and control mechanisms, and constrain financial accountability—factors increasingly recognized as critical in modern agribusiness governance (Anthony & Govindarajan, 2020).

Although PTPN IV has recently initiated the development of a web-based e-budget platform in Region IV, adoption remains partial and uneven across operational units. The inconsistency in system utilization creates fragmented data flows, non-standardized input structures, and potential divergence in reporting accuracy. This condition underscores a research gap, as existing studies on digital budgeting systems within the Indonesian plantation sector often assume uniform technological adoption and do not consider the operational implications of partial system deployment within a single multi-location corporation. Academic literature highlights the strategic importance of budgeting digitalization. Piosik and Karmańska (2023) demonstrate that digital budgeting platforms enhance planning coherence, coordination, monitoring, and performance evaluation. Similarly, Ramadhani and Riyadi (2019) show that e-budgeting implementation in palm oil enterprises improves reporting completeness, data structure consistency, and managerial accessibility. However, prior research has not addressed two critical issues observable in PTPN IV: (1) how uneven adoption of digital budgeting tools affects organization-wide planning efficiency, and (2) what governance and capability frameworks are required to scale digital budgeting across estates and regional divisions.

Responding to these limitations, this study aims to formulate an integrated digital budgeting framework for PTPN IV that can improve data accuracy, standardization, and managerial control across all operational regions. The scope of the research involves assessing the current budgeting landscape, developing a standardized model for e-budget adoption, and proposing implementation stages and performance indicators aligned with organizational readiness.

2. Literature Review

Budgeting is widely recognized as a key managerial mechanism for planning, decision-making, and control. Within large enterprises such as plantation corporations, budgeting aligns organizational targets with resource allocation, ensuring that financial strategies are translated into actionable operational directives. Budget accuracy reflects the extent to which planned figures correspond to actual outcomes, and can be assessed by comparing budgeted and realized values in both physical and monetary units. Wattimury (2023) highlights that budget accuracy can be evaluated through variance analysis, an approach that examines discrepancies between projected and actual costs. Such analyses provide insight into managerial forecasting capabilities and the influence of internal and external conditions on execution outcomes. A budget refers to a systematic financial plan expressed quantitatively to guide future organizational activities within a fixed period (Zulhawati & Rofiqoh, 2016). From this standpoint, budgeting is both anticipatory and comprehensive, capturing planned expenditures, operational activities, and expected outcomes. Hansen and Mowen (2007) conceptualize budgets as structured financial blueprints that support operational guidance, resource prioritization, and performance benchmarking. Complementing this, Anthony and Govindarajan (2020) frame budgeting within broader management control systems, stressing its role as an integrative mechanism linking strategy, resource deployment, and performance accountability.

Budget accuracy is defined as the degree to which planned figures align with actual realizations. Wattimury (2023) identifies variance analysis as an essential diagnostic method to examine deviations and assess forecasting reliability. Accuracy is influenced by several key determinants:

- a) **Data Quality and Availability**
Valid historical records support more credible projections and cost estimates. Forecasting errors increase when organizations lack structured data repositories.
- b) **Managerial Analytical Competence**
Budget formulation depends heavily on analytical skill, information interpretation, and financial literacy. Anggita and Budi (2023) demonstrate that managerial capacity development improves budget formulation quality and execution outcomes.
- c) **Information Systems Support**
Advanced budgeting information systems reduce manual entry errors and enhance reporting speed and precision. Almuttaqin et al. (2021) argue that digital budgeting tools strengthen transparency, accountability, and financial governance through centralized data management and automated validation.

Traditional spreadsheet-based budgeting often produces inefficiencies related to data duplication, human error, and limited traceability (Shim & Siegel, 2008). These weaknesses become increasingly problematic as operational complexity rises,

particularly in multi-regional enterprises. E-budgeting addresses these limitations through automation, integrated data flows, and real-time monitoring features (Piosik & Karmańska, 2023). Empirical studies show that digital systems:

- Improve computational accuracy,
- Foster coordination among dispersed operating units,
- Accelerate reporting cycles, and
- Enhance managerial oversight (Sidik et al., 2021; Sonjaya, 2024).

Integration with enterprise resource planning (ERP) platforms further strengthens process consistency and strategic alignment by creating seamless interfaces between planning functions and operational execution (Pratama & Samopa, 2019). Despite these demonstrated benefits, the application of digital budgeting tools in plantation enterprises remains under-examined. Agribusiness operations comprise hierarchical structures, diverse estates, and multiple cost centers requiring specialized tracking. Understanding digital adoption within this sector is therefore both theoretically relevant and practically necessary. Budgeting platforms automate computation and reduce clerical intervention, which directly minimizes input mistakes and improves information reliability (Daoud & Triki, 2021; Warren et al., 2015). This aligns with the Information Systems Success Model, which posits that system quality and information accuracy determine organizational performance impacts. The Beyond Budgeting framework challenges annual fixed-budget logic, advocating dynamic planning, rolling forecasts, and decentralized decision-making (Hope & Fraser, 2003). Although not widely implemented in plantation sectors, Beyond Budgeting offers conceptual insights for digital transformation—emphasizing agility, autonomy, and data transparency. Participative budgeting asserts that involving operational-level managers produces more realistic forecasts, enhances commitment, and improves coordination (Brownell, 1983).

This is particularly relevant for plantation organizations where estates and field units possess vital cost and productivity information not easily captured at headquarters. Contingency Theory suggests that no single budgeting approach is universally optimal; rather, budgeting systems must align with contextual variables such as organizational structure, environmental uncertainty, and technology adoption (Otley, 2016). Integrated e-budget applications enforce standardized formats and accounting assumptions, resulting in more consistent financial outputs across units (Piosik & Karmańska, 2023). From a data governance perspective, structure and uniformity are prerequisites for accountable decision-making (Daoud & Triki, 2021). E-budgeting enables real-time data sharing and budget consolidation, shortening preparation cycles and reducing redundant revisions (Valle-Cruz et al., 2022). This improvement reflects good governance principles, where transparency and data visibility improve oversight and accountability (Bovens, 2007; Meijer, 2009).

Even superior digital systems require user acceptance, training, and confidence to be fully adopted, as explained by Technology Acceptance Theory (Venkatesh et al., 2016). This helps explain why most PT Perkebunan Nusantara IV regions still rely on spreadsheets despite the availability of digital tools. Digital transformation literature indicates that information systems shift financial tasks toward analytical, predictive, and managerial functions (Margherita & Braccini, 2020; Wirtz et al., 2022). Evidence from Region IV supports this pattern, where staff spend less time on manual compilation and more time on scenario planning. Because e-budgeting records changes automatically and creates audit trails, it increases traceability and reduces opportunities for manipulation (Sgueo, 2015; Misuraca & Viscusi, 2015). This supports public financial management theory, which emphasizes transparency for control and compliance. Adoption of e-budgeting should be seen not as automation alone but as a strategic initiative intended to increase agility and responsiveness (Sun & Medaglia, 2019; Williams, 2021). Strategic alignment theory shows that technology has maximum effect only when embedded in organizational transformation goals. For PTPN IV, divided into multiple estates with uneven digital maturity, contingency logic provides an appropriate analytical perspective for assessing e-budgeting adoption readiness. This study addresses these gaps by proposing an integrated digital budgeting model adapted to the practical realities of a multi-location plantation enterprise.

3. Research Method

This study employs a descriptive analytical research approach to examine budgeting practices within PT Perkebunan Nusantara IV. The purpose is to diagnose systemic deficiencies in the current budgeting process and assess the potential contribution of a web-based e-budget application in enhancing budgeting accuracy, standardization, and integration across business units. The focus of the study is therefore not the technical programming of the system, but the strategic design principles, organizational requirements, and institutional conditions necessary for its implementation. The research draws from both primary and secondary data sources. Primary data were collected through structured questionnaires and semi-structured interviews conducted with key personnel directly involved in budget formulation. Respondents included finance officers stationed at regional estates, budget coordinators at the Head Office, and early adopters of the e-budget platform located in Regional IV. Secondary data comprised internal organizational records such as budget preparation templates, standard operating procedures (SOPs), financial projection reports, and archival documents from previous budget periods. A Likert-scale questionnaire, consisting of both closed-ended and open-ended items, was designed to capture perceptions of the existing budgeting process. Key constructs assessed included accuracy and timeliness, integration across functional departments, process constraints and bottlenecks, and user needs and expectations regarding future system functionalities. Complementing this, in-depth interviews with senior finance managers and

division heads were undertaken to explore contextual constraints, leadership support, and organizational readiness for transitioning from semi-manual to digital budgeting systems.

A documentation study was conducted to triangulate findings and ensure alignment between reported experiences and existing institutional procedures. To strengthen the rigor of interpretation, the study applies a comparative framework, contrasting budget performance outcomes in Regional IV—which has already deployed the e-budget system—with those in six other regional units that continue to rely on spreadsheet-based tools such as Microsoft Excel or Google Sheets. This comparison provides a natural benchmark for evaluating differences in budgeting accuracy, process efficiency, and auditability. Data analysis was executed in three sequential stages. First, survey responses were tabulated and analyzed thematically to identify recurring operational issues, including inconsistent data inputs, non-standardized templates, consolidation delays, and estimation errors in cost calculations. Second, interview transcripts were coded using qualitative content analysis to distill key themes related to organizational constraints, functional gaps in existing tools, and expectations for digital system enhancements. These insights were triangulated with SOPs, internal memos, and budget documentation to validate findings and ensure contextual reliability.

Third, the synthesized insights were systematically translated into a conceptual e-budget system design, mapping stakeholder needs to key functional modules such as standardized input formats, automated validation controls, alignment with SAP's Chart of Accounts (COA), real-time dashboard reporting, and integrated monitoring for budget submissions and approvals. The design development followed the Plan–Do–Check–Act (PDCA) cycle, supporting iterative refinement and stakeholder validation. Through this structured methodological process, the study ensures that the proposed e-budget framework is not only technically feasible, but also substantively responsive to operational pain points, capacity constraints, and institutional realities observed within PT Perkebunan Nusantara IV. This alignment between empirical findings and system features helps ensure that e-budget implementation supports improved accuracy, greater transparency, and more effective managerial decision-making across the organization.

4. Results and Discussion

The analysis revealed significant performance disparities between regions that remained reliant on manual budgeting platforms and those utilizing the e-budget system. In six out of seven regions, budget preparation continued to depend heavily on spreadsheet-based tools, resulting in recurring operational issues such as data inconsistencies, delayed consolidation processes, and frequent calculation errors. By contrast, Region IV—the only region employing the e-budget platform—demonstrated marked improvements, including shorter preparation cycles, increased reliability of cost estimates, and greater consistency in reporting formats across units. The automation of calculations, cost allocation structures, and validation mechanisms proved particularly impactful. Users in Region IV reported significantly fewer miscalculations and reduced time spent correcting formula errors. Built-in standardizations—such as production assumptions, labor cost templates, and agronomic variable presets—enhanced internal consistency, improved accuracy, and reduced the cognitive load on finance personnel responsible for data entry and verification.

A notable advantage of the e-budget application was its capability to consolidate budget submissions from multiple estates in real time. This capacity eliminated repetitive version tracking, reduced multiple layers of manual revisions, and ensured uniform formatting and coding structures across the organization. A comparison of historical data indicated that the consolidation timeline was shortened by approximately 40 percent following system adoption. The centralized dashboard further strengthened vertical transparency. Both regional units and the Head Office gained the ability to monitor progress dynamically, review input completeness, and identify deviations at early stages of budget development. However, one limitation remained evident: the absence of embedded budget execution monitoring, which must still be tracked through external accounting workflows.

The finding underscores that full-cycle digital transformation requires integration beyond planning and approval modules. Beyond improvements in accuracy and efficiency, the shift to e-budgeting altered the nature of financial work. Finance staff transitioned from clerical data compilation roles to strategic advisory functions, supported by timely, structured, and validated financial information. Decision-making at managerial levels benefited from faster access to reliable data, enabling more proactive assessment of operational risks, resource reallocation, and sensitivity analyses linked to changing commodity market conditions.

To systematically evaluate the performance impact of e-budget implementation, the study established a set of Key Performance Indicators (KPIs) categorized into three primary dimensions: budgeting accuracy, transparency, and process efficiency. These indicators enable both qualitative and quantitative evaluation and provide a foundation for continuous performance improvement.

Table 1. Accuracy Indicator Parameters

Sub-Indicator	Achievement Formula	Ideal Target	Target Timeline
Production Volume Deviation	$(\text{Realization} - \text{Budget Volume}) / \text{Budget Volume} \times 100\%$	< 5%	2 years post implementation
Revenue Deviation	$(\text{Realization} - \text{Budget Revenue}) / \text{Budget Revenue} \times 100\%$	< 10%	2 years post-implementation
Cost Deviation	$(\text{Realization} - \text{Budget Cost}) / \text{Budget Cost} \times 100\%$	< 5% per cost account	2 years post-implementation
Cash Flow Deviation	$(\text{Actual} - \text{Budget Cash Flow}) / \text{Budget Cash} \times 100\%$	< 10%	2 years post-implementation

Note. Higher deviation tolerance for revenue and cash flow reflects uncertainties linked to global commodity prices, which are less controllable than internal variables.

Table 2. Transparency Indicator Parameters

Sub-Indicator	Achievement Formula	Ideal Target	Target Timeline
Business Unit Data Accessibility	% of units accessible by Regional & Head Office	100%	3 months post-implementation
Real-Time Data Access	Delay from input to system visibility	< 1 day	3 months post-implementation
Data Security	Number of unauthorized access incidents	0 violations	3 months post-implementation

Transparency ensures decision-makers have equal access to complete and reliable budgeting information, thereby enhancing accountability, responsiveness, and alignment across organizational levels.

Table 3. Process Efficiency Indicator Parameters

Sub-Indicator	Achievement Formula	Ideal Target	Target Timeline
Budget Preparation Time	Days from initiation to finalization	$\geq 20\%$ faster than manual method	1 year post-implementation
Physical Document Reduction	% of replaced physical documentation	$\geq 80\%$ reduction	1 year post-implementation
Automated Processes	Number of automated core budgeting functions	≥ 5 main processes	1 year post-implementation
Consolidation and Review Time	Duration for regional and HO consolidation review	≤ 7 working days	1 year post-implementation

Together, these indicators evaluate how effectively system adoption impacts resource use, workflow compression, and operational reliability.

Table 4. Roadmap for E-Budget Implementation

No	Activity	Timeline	Output	PIC
1	Team formation for development and rollout	Month 1	Cross-functional implementation team	HR Division
2	Contracting with IT consultant	Month 1–2	Signed e-budget development contract	Procurement & IT
3	FGD with Region IV for feedback and evaluation	Month 2	Problem–solution matrix	Implementation Team & Consultant
4	FGD across all regions for standardization	Month 2–3	SOPs, norms & templates	Implementation Team & Consultant
5	Application enhancement	Month 4–5	Upgraded system	Implementation Team & Consultant
6	Training of Trainers (ToT)	Month 5	Trained key users	HR Division
7	End-user training	Month 6–7	Trained local operators	Regional Key Users
8	IT infrastructure provisioning	Month 2–6	Networks & devices ready	IT & Regions
9	Full rollout	Month 8	Nationwide adoption	Implementation Team & Consultant
10	Monitoring and evaluation	Month 8–12	M&E report and improvements	Implementation Team & Consultant

The implications of this study extend beyond PT Perkebunan Nusantara IV. Organizations operating through decentralized multi-unit structures—such as healthcare networks, logistics chains, retail groups, and government agencies—face similar challenges in financial coordination and data integrity. The principles underpinning this e-budget model—automation, standardization, transparency, and integration—are broadly transferable. While specific budgeting categories may differ, organizations engaged in complex planning environments stand to benefit from adopting digitally integrated systems aligned to local operational models and compliance requirements. With appropriate customization, the framework proposed in this study has the potential to strengthen financial governance, reduce administrative burden, and enhance strategic agility in diverse institutional contexts.

5. Conclusion

A This study highlights the strategic importance of adopting an integrated e-budgeting system in addressing the limitations inherent in traditional, semi-manual budgeting processes at PT Perkebunan Nusantara IV. The findings demonstrate that the current spreadsheet-based workflow contributes to recurring inaccuracies, delayed consolidation, and fragmented reporting structures. In contrast, the implementation of a centralized digital budgeting platform significantly improves planning quality and organizational control. First, the adoption of e-budgeting demonstrably improves budget accuracy. By minimizing manual intervention and enforcing standardized cost structures across regions, the system reduces computational errors and increases reliability of financial estimates. Second, system integration across business units accelerates consolidation processes, enhances horizontal and vertical transparency, and facilitates the real-time monitoring of budget performance indicators.

Third, the e-budget platform strengthens managerial decision-making by providing traceable data structures and timely financial information, thereby supporting evidence-based governance and aligning operational activities with strategic objectives. Taken together, these outcomes affirm that digitalization in budgeting functions yields tangible efficiency gains while also strengthening internal control environments. The proposed framework and implementation roadmap therefore offer a practical, sequential guide for transitioning toward a fully digital budgeting ecosystem. The most immediate and foundational benefits observed lie in the standardization of input templates and automation of cost calculations, which eliminate redundancy, reduce cycle times, and improve the consistency of submissions across estate and regional levels. The rollout of a unified interface also establishes a baseline for cross-unit transparency and short-term governance improvement.

In the longer term, aligning budget processes with organizational digital transformation strategies is expected to enhance competitiveness, operational resilience, and corporate agility. The e-budget framework enables predictive resource allocation, supports faster decision cycles, and generates auditable data trails that reinforce accountability and ensure compliance with regulatory and internal oversight requirements. As a result, PT Perkebunan Nusantara IV is better positioned to achieve its broader corporate imperatives, including value creation for stakeholders, improved profitability, and sustained competitive advantage in the dynamic agribusiness sector. These findings are consistent with prior research. Sonjaya (2024) has demonstrated that digital budget platforms support both operational alignment and strategic adaptability, while Sidik et al. (2021) show that object-oriented e-budgeting strengthens monitoring and integration in large enterprises. Furthermore, the analytical dimensions of accuracy, integration, transparency, and efficiency parallel the framework proposed by Piosik and Karmańska (2023), confirming the reliability and relevance of the variables adopted in this study. The convergence of results across multiple organizational contexts reinforces the validity and potential transferability of the model developed for PTPN IV.

Future research may expand on this work through quantitative validation of system impacts, cost–benefit analyses of e-budget deployment at scale, and examination of integration pathways with broader enterprise resource planning modules. Such extensions would provide a more comprehensive assessment of the long-term economic and strategic value of digital budgeting transformation.

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