Designing an Integrated Purchasing and Cash Disbursement Accounting Information System: A Tiered Authorization and Bank Reconciliation Framework for Strengthening Internal Control

Mipo[1], Petrus Gani[2], Andriasan Sudarso[3], Fajrillah[4*], Hasrul Siregar[5], Almastoni[6], Awan[7]

[1]Department of Digital Business, Institut Modern Arsitektur dan Teknologi, Medan, Indonesia

[2,6]Department of Accounting, Faculty of Social Sciences and Humanities, Universitas IBBI, Medan, Indonesia

[3,4,5]Department of Management, Faculty of Social Sciences and Humanities, Universitas IBBI, Medan, Indonesia

[7]Department of Information Systems, Faculty of Science and Technology, Universitas IBBI, Medan, Indonesia

***Corresponding Author**

DOI: https://doi.org/10.47772/IJRISS.2026.101100078

Received: 04 November 2026; Accepted: 09 November 2026; Published: 21 November 2026

ABSTRACT

The purchasing and cash disbursement cycle is where an organization's resources physically leave its control, making it one of the most fraud-prone areas of any accounting information system (AIS). Many Indonesian small and medium-sized entities still operate this cycle with fragmented documents, informal approvals, and irregular bank reconciliation. This study designs an integrated purchasing and cash disbursement AIS that embeds internal control in the document flow, the payment authorization structure, the recording process, and the reconciliation routine. Using a design science research approach, eight design requirements were derived from a protocol-based literature review and mapped to the COSO 2013 principles and agency theory. The artifact comprises a five-document chain with a three-way match, a tiered authorization matrix calibrated to materiality, transaction volume, and risk exposure, a segregation-of-duties matrix, recording rules for periodic and perpetual inventory systems, a two-sided bank reconciliation, and a risk–control matrix. Guided by the FEDS framework, the artifact was evaluated ex ante through requirement-based analysis, a walk-through of seven fraud and error scenarios, and arithmetic verification of an illustrative case. All eight requirements were addressed, and six of the seven scenarios were prevented or detected within one reporting cycle; collusion and management override remain residual risks. In the case, reconciliation reduced cash by IDR 1.5 million and raised receivables by IDR 3.0 million. Net profit margin on sales rose from 32.78% to 33.61% solely because of non-operating interest income, whereas operating profit margin fell from 32.78% to 32.50%, showing why sales and other income must be separated in ratio analysis. Implementation options for spreadsheet-based and ERP environments, with their limitations and cost drivers, are discussed. The study offers a theory-grounded blueprint for practitioners, system developers, and educators, and a basis for subsequent expert and field evaluation.

Keywords: accounting information system, cash disbursement, internal control, payment authorization, bank reconciliation

INTRODUCTION

Cash is the most liquid and therefore the most vulnerable asset of any organization. Within the accounting information system (AIS), the purchasing and cash disbursement cycle, often called the expenditure cycle, governs how goods and services are requested, ordered, received, recorded, approved for payment, and finally paid (Romney et al., 2021). Because this is the cycle in which economic resources physically leave the entity, weaknesses in its design translate directly into financial loss, misstatement, and opportunities for occupational

fraud. Empirical studies of firms reporting material weaknesses show that deficient internal control is associated with lower accrual quality and less reliable financial reporting (Ashbaugh-Skaife et al., 2008; Doyle et al., 2007).

In the Indonesian context, recent studies consistently report that the effectiveness of cash disbursement controls depends heavily on whether the AIS is well designed. Rachman and Marselly (2023) found that the AIS for sales and cash disbursement has a significant positive effect on internal control in a single-company case study, while Parera et al. (2019) and Fadilah et al. (2023) documented that the strength of cash disbursement control in public-sector entities is determined by authorization procedures, documentation, and supervision. At the same time, studies on fraud in Indonesia identify internal control and governance mechanisms as important determinants of fraud risk (Didi & Kusuma, 2018; Wijaya & Kuang, 2023). A review of Indonesian AIS research further indicates that much of the literature is survey-based and tests associations, while comparatively few studies propose concrete, testable system designs (Penatari et al., 2020).

This creates a clear research gap. Practitioners and students frequently understand the individual elements of the expenditure cycle, such as purchase orders, vouchers, and bank reconciliation, but these elements are often taught and implemented as isolated procedures. In practice, the control value of each element depends on how it is connected to the others: a payment voucher is only meaningful if it is supported by a matched purchase order, receiving report, and invoice; an authorization limit is only effective if the person who approves cannot also record or pay; and bank reconciliation is only a detective control if it is performed by someone independent of cash custody (COSO, 2013; Romney et al., 2021).

The objective of this study is therefore to design an integrated purchasing and cash disbursement AIS in which internal control is embedded in the document flow, the payment authorization structure, the recording process, and the bank reconciliation routine, and to evaluate the artifact against explicitly defined design requirements and control objectives. The study addresses three research questions: (1) What documents, functions, and controls should constitute an integrated purchasing and cash disbursement AIS? (2) How should payment authorization and segregation of duties be structured, and calibrated to the size and risk profile of an organization, to reduce fraud risk? (3) How does a properly designed bank reconciliation affect the reliability of financial statements and of the financial ratios used for decision-making? The contribution of the paper is a practical, theory-grounded blueprint, together with an evaluation of its control coverage and guidance for implementation in spreadsheet-based and enterprise resource planning (ERP) environments.

LITERATURE REVIEW

Accounting information systems and the expenditure cycle

An AIS collects, records, stores, and processes data to produce information for decision-makers, and it is organized around transaction cycles (Romney et al., 2021). The expenditure cycle comprises four basic activities: ordering goods and services, receiving them, approving supplier invoices, and paying for them. ERP research shows that integrating these activities in a common database improves data consistency and accounting benefits, although the benefits depend on how controls are configured (Grabski et al., 2011; Kanellou & Spathis, 2013). Information systems success theory adds that the value of a system is determined by its information quality, system quality, and service quality, which in turn drive use, user satisfaction, and net benefits (DeLone & McLean, 2003). For the expenditure cycle, information quality largely means that recorded cash and payables are complete, accurate, and authorized.

Internal control and the COSO 2013 framework

The COSO (2013) Internal Control–Integrated Framework defines internal control as a process designed to provide reasonable assurance regarding the achievement of operations, reporting, and compliance objectives, and it organizes control into five components, namely control environment, risk assessment, control activities, information and communication, and monitoring activities, which are operationalized through seventeen principles. Control activities in the expenditure cycle include authorization, segregation of duties, documentation, physical safeguards, and independent verification. Rae and Subramaniam (2008) show that the quality of internal control procedures is shaped by the organizational environment, including ethical climate and risk management, which implies that procedures alone are insufficient without a supporting control environment.

Internal audit plays a complementary monitoring role in preventing and detecting fraud (Petraşcu & Tieanu, 2014).

Agency theory and fraud risk in cash disbursement

Agency theory explains why controls are needed: when owners delegate decision rights to managers and employees, information asymmetry and divergent interests create incentives for opportunistic behavior (Jensen & Meckling, 1976). In the expenditure cycle, typical opportunistic behaviors include fictitious vendors, duplicate payments, kickbacks, and payments for goods never received. Monitoring mechanisms such as tiered authorization, segregation of duties, and independent reconciliation reduce agency costs by making such behavior harder to commit and easier to detect. Indonesian evidence shows that internal control significantly influences the tendency toward fraud among local government employees (Didi & Kusuma, 2018) and that ESG implementation strengthens the role of intellectual capital in reducing accounting fraud in listed companies (Wijaya & Kuang, 2023).

Technology-enabled control and continuous monitoring

Digitalization is changing how expenditure controls are performed. Continuous auditing in ERP environments allows exceptions such as unmatched invoices or payments above authorization limits to be detected automatically (Kuhn & Sutton, 2010). Big data analytics, robotic process automation, and artificial intelligence enable full-population testing of disbursements instead of sampling (Appelbaum et al., 2017; Kokina & Davenport, 2017; Moffitt et al., 2018), while blockchain-based accounting promises tamper-evident audit trails (Dai & Vasarhelyi, 2017). Business intelligence further allows management to monitor cash outflows in near real time (Rikhardsson & Yigitbasioglu, 2018). These technologies, however, do not replace sound control design; they automate and enforce the logic of documents, authorization, and reconciliation that must be specified first. Many small entities still rely on spreadsheets, whose error-proneness is well documented (Panko, 1998), so the design must also be workable without an ERP system.

Conceptual framework

Building on the literature, this study proposes the conceptual framework in Figure 1. Three groups of design elements, namely documentary controls, tiered authorization with segregation of duties, and recording with bank reconciliation, are integrated into a single purchasing and cash disbursement AIS structured by the five COSO components. The expected outcomes are reliable cash information and financial statements, as well as fraud prevention, accountability, and better managerial decisions.

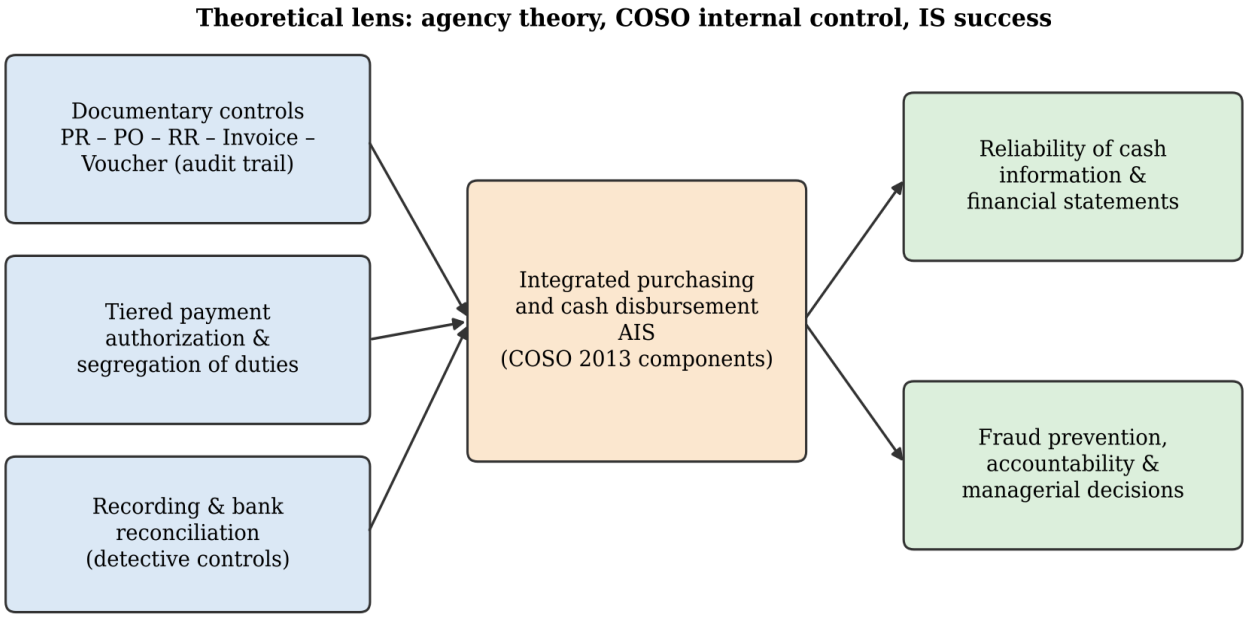

Figure 1. Conceptual framework of the integrated purchasing and cash disbursement AIS

METHODOLOGY

Research design

This study employs a qualitative, design-oriented approach following the design science research (DSR) paradigm, whose purpose is to build and evaluate artifacts that solve identified organizational problems (Hevner et al., 2004). The research followed the six activities of the DSR methodology proposed by Peffers et al. (2007): problem identification, definition of objectives for a solution, design and development, demonstration, evaluation, and communication. The artifact is a conceptual and procedural model of an integrated purchasing and cash disbursement AIS, comprising document flows, an authorization matrix with calibration rules, a segregation-of-duties matrix, recording rules, reconciliation procedures, and a risk–control matrix.

Literature review protocol

To make the knowledge base of the design transparent, the literature was identified with the protocol summarized in Table 1. Searches were run in Scopus and Google Scholar for international sources and in SINTA and its Garuda portal for Indonesian sources. Titles and abstracts were screened first, after which full texts were assessed against the inclusion criteria. Seminal theoretical and methodological works were retained regardless of publication year because they define the constructs used in the design, whereas empirical and technology-related studies were limited to the period 2007–2025. The final knowledge base consists of 24 peer-reviewed journal articles, two professional standards, one government regulation, and two textbooks, all of which are listed in the references.

Table 1. Literature review protocol

Element	Specification
Databases	Scopus; Google Scholar; SINTA (via Garuda portal) for Indonesian journals
Search strings (English)	("accounting information system" OR "expenditure cycle" OR "cash disbursement" OR "purchasing") AND ("internal control" OR "fraud" OR "segregation of duties" OR "bank reconciliation" OR "ERP" OR "continuous auditing")
Search strings (Indonesian)	("sistem informasi akuntansi" OR "pengeluaran kas" OR "pembelian") AND ("pengendalian internal" OR "kecurangan" OR "rekonsiliasi bank")
Publication period	Empirical and technology studies: 2007–2025; seminal theory and method works: no year restriction
Inclusion criteria	Peer-reviewed journal article indexed in Scopus or in a recognized index (SINTA/Garuda or DOAJ); addresses the expenditure cycle, internal control, fraud, AIS/ERP, or audit technology; full text accessible; DOI or stable link available
Exclusion criteria	Theses, non-peer-reviewed reports, discontinued or predatory outlets, duplicate records, studies unrelated to the expenditure cycle or internal control
Supplementary sources	COSO (2013) framework, ISA 320, Government Regulation No. 7/2021, and established AIS and intermediate accounting textbooks
Synthesis	Thematic coding into control requirements, mapped to COSO principles and agency problems (Table 2)

Design requirements and control objectives

Thematic synthesis of the reviewed literature produced eight design requirements (DR), each linked to a control objective and to the COSO (2013) principles it operationalizes (Table 2). These requirements serve as the explicit evaluation criteria for the artifact.

Table 2. Design requirements, control objectives, and COSO principles

DR	Design requirement	Control objective	COSO principle(s)
DR1	Every disbursement must originate from an approved need and be supported by evidence of receipt	Validity / occurrence	P10, P12
DR2	Approval authority must be commensurate with the value and risk of the payment	Authorization	P10, P12
DR3	Authorization, custody, recording, and reconciliation must be performed by different persons	Segregation of duties; fraud deterrence	P8, P10
DR4	All approved disbursements must be recorded once, accurately, and in the correct period	Completeness, accuracy, cut-off	P10, P13
DR5	Cash and payment instruments must be protected from unauthorized access	Safeguarding of assets	P10, P11
DR6	Differences between company and bank records must be detected and corrected periodically	Detection and correction	P16, P17
DR7	Every ledger entry must be traceable to its source documents and approvals	Auditability (audit trail)	P13, P16
DR8	The controls must be scalable to entity size and feasible in spreadsheet and ERP settings	Feasibility and cost-effectiveness	P10, P11

Evaluation strategy

Evaluation followed the Framework for Evaluation in Design Science (FEDS) of Venable et al. (2016). Because the artifact has not yet been deployed, this study reports the first, ex ante and artificial, evaluation episode, which FEDS recommends for assessing the soundness of a design before costly naturalistic trials. Three complementary methods were used: (a) requirement-based analytical evaluation, in which each design requirement was traced to the artifact components that satisfy it and to residual limitations; (b) scenario-based walk-through, in which seven fraud and error scenarios derived from the literature were run through the process to determine whether, where, and how each would be prevented or detected; and (c) arithmetic verification of an illustrative case, testing whether the reconciliation closes and whether every adjustment is reflected consistently in the statement of financial position, the income statement, and the financial ratios.

Illustrative case data

The case concerns a hypothetical trading company, PT Sentosa Abadi, for the month of June 2026. Monthly sales of IDR 180,000,000 imply annual sales of about IDR 2.16 billion, which places the company in the small-enterprise category under Government Regulation No. 7/2021 (annual sales above IDR 2 billion up to IDR 15 billion) (Government of the Republic of Indonesia, 2021). The figures were adapted from instructional material used in an undergraduate AIS course and corrected for internal consistency. They are illustrative and do not represent a real company; they demonstrate the logic and consequences of the design rather than support statistical generalization.

RESULTS

Document architecture and process flow

The first component of the design is a five-document chain that creates a complete audit trail from the initial request to final payment. Table 3 summarizes each document, the function responsible for preparing it, and its control objective, while Figure 2 depicts the end-to-end process flow.

Table 3. Documents in the purchasing and cash disbursement cycle

Document	Prepared by	Control objective	COSO component
Purchase requisition (PR)	Requesting department	Ensures purchases arise from a genuine operational need	Control activities
Purchase order (PO)	Purchasing department	Authorizes the commitment to a supplier at agreed price and quantity	Control activities
Receiving report (RR)	Warehouse / receiving	Provides independent evidence of quantity and condition of goods received	Control activities; information
Supplier invoice	Supplier; verified by accounts payable	Establishes the liability; basis for the three-way match	Information and communication
Payment voucher / cash disbursement slip	Accounts payable; approved per Table 4	Documents authorized payment and serves as the posting source	Control activities; monitoring

The core preventive control in this chain is the three-way match: a payment voucher can only be prepared when the PO, RR, and supplier invoice agree on supplier, quantity, and price. Every voucher carries a unique, pre-numbered identifier, the payee, the amount, the purpose of payment, and the signature or electronic approval of the authorized officer. Pre-numbering allows gaps and duplicates to be detected, which directly addresses duplicate-payment risk.

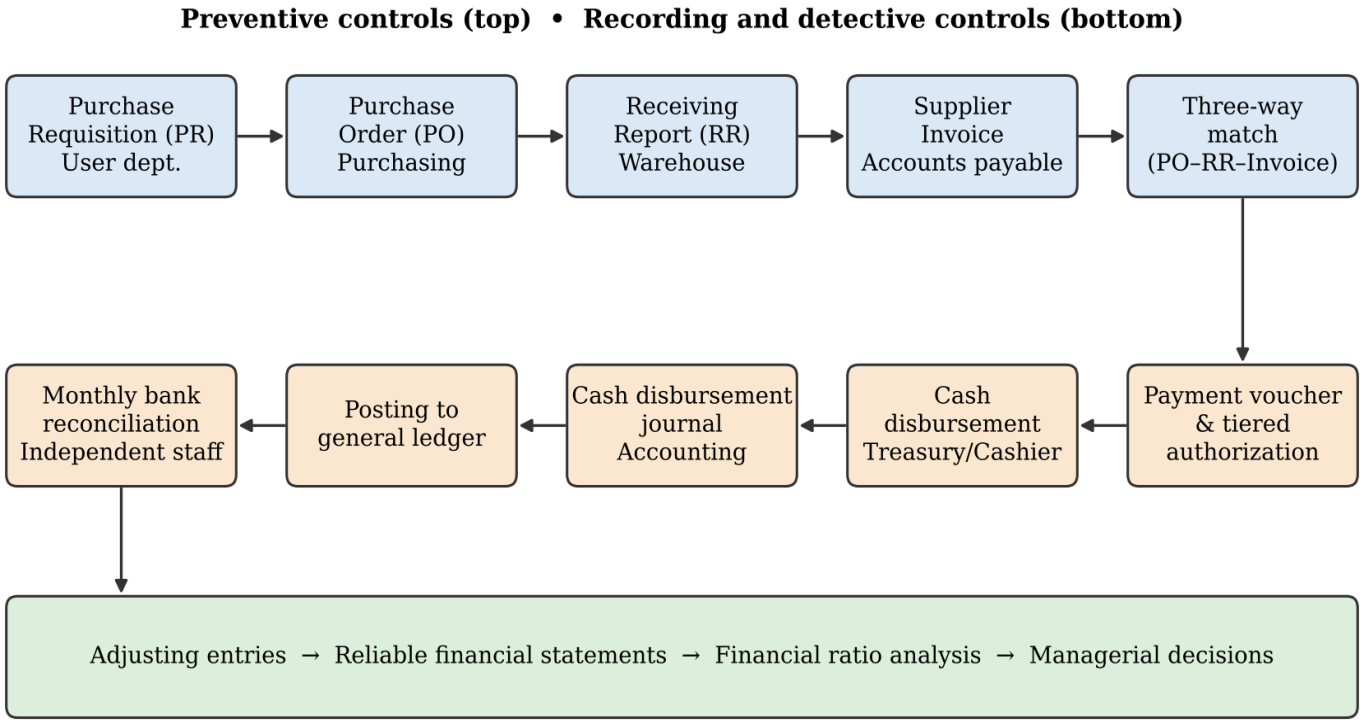

Figure 2. Integrated process flow of the purchasing and cash disbursement cycle

Tiered payment authorization

The second component is a value-based authorization matrix (Table 4). Higher-value payments require approval from progressively more senior officers and stronger supporting evidence. This structure applies the principle that the level of scrutiny should be commensurate with the risk of loss, and it limits the ability of any single individual to commit large amounts of cash.

Table 4. Reference tiered payment authorization matrix (calibrated for overall materiality of about IDR 50 million)

Transaction value (IDR)	Authorized approver	Required supporting documents	Form of authorization
≤ 10,000,000	Supervisor / departmental manager	Invoice, PO, receiving report	Manual or electronic signature
10,000,001 – 50,000,000	Head of department / finance manager	Invoice, PO, proof of receipt	Written approval + voucher
50,000,001 – 250,000,000	Finance director	Invoice, PO, contract, proof of receipt	Written approval + ERP workflow
> 250,000,000	President director / board of commissioners	Invoice, PO, contract, proof of receipt	Multi-level approval + full audit trail

Justification and calibration of authorization thresholds

Authorization thresholds are not universal constants; they should reflect the entity's size, transaction volume, and risk exposure. This study therefore anchors the thresholds in overall materiality (OM), a concept that auditors use to judge which amounts could influence users' decisions. ISA 320 gives benchmarks such as a percentage of profit before tax or of total revenue (IAASB, 2009); this study uses 1% of annual revenue as a simple, stable benchmark. The tiers are then set as multiples of OM: Tier 1 up to 0.2 × OM, Tier 2 up to 1 × OM, Tier 3 up to 5 × OM, and Tier 4 above 5 × OM. The logic is that any single payment that could by itself be material (above OM) requires director-level approval, and any payment several times OM requires board-level approval. The reference matrix in Table 4 corresponds to OM of IDR 50 million, i.e., an entity with annual revenue of about IDR 5 billion. Table 5 shows how the same rule rescales the thresholds for entities of different sizes, using the revenue bands of Government Regulation No. 7/2021.

Table 5. Calibration of authorization thresholds by entity size (illustrative, IDR)

Entity profile (annual revenue)	OM (1% of revenue)	Tier 1 (≤ 0.2 OM)	Tier 2 (≤ 1 OM)	Tier 3 (≤ 5 OM)	Tier 4 (> 5 OM)
PT Sentosa Abadi, small (≈ 2.16 billion)	≈ 21.6 million	≤ 5 million*	≤ 20 million*	≤ 100 million*	> 100 million
Reference entity, small (≈ 5 billion)	50 million	≤ 10 million	≤ 50 million	≤ 250 million	> 250 million
Medium enterprise (≈ 30 billion)	300 million	≤ 60 million	≤ 300 million	≤ 1.5 billion	> 1.5 billion
Large enterprise (≈ 100 billion)	1 billion	≤ 200 million	≤ 1 billion	≤ 5 billion	> 5 billion

*Rounded for practical use. Two further adjustments refine the calibrated limits. First, transaction volume: the Tier 1 limit should be checked against the actual distribution of payment values so that routine, low-value payments, which are usually the majority by count, can be approved quickly, while senior approvers concentrate on the minority of payments that carry most of the value; if senior approvers face an unmanageable queue, the matrix is mis-calibrated. Second, risk exposure: limits should be lowered, for example halved, or an additional approver required, for higher-risk categories such as payments to newly registered vendors, changes to vendor bank details, cash or non-transfer payments, related-party transactions, and payments without a purchase order. The calibration rule is offered as a transparent starting point that management and internal auditors should review annually, rather than as a prescriptive standard.

To prevent circumvention, the system should reject the splitting of a single obligation into several payments below a threshold, for example by flagging multiple payments to the same supplier within a short period whose

combined value exceeds the approver's limit. In an ERP environment these limits can be enforced as hard-coded workflow rules rather than as policies that depend on manual compliance (Kuhn & Sutton, 2010).

Segregation of duties

The third component separates the four incompatible functions of authorization, custody, recording, and reconciliation (Table 6). The design ensures that no individual can both initiate and conceal an irregular payment.

Table 6. Segregation-of-duties matrix

Activity	Responsible function	Incompatible functions the same person must not perform
Request and order goods	Requesting department / purchasing	Approving the payment; receiving the goods; recording
Receive and inspect goods	Warehouse / receiving	Ordering; recording; custody of cash
Match documents and prepare voucher	Accounts payable / accounting	Approving the payment; releasing cash
Approve payment	Authorized approver per Table 4 (never the requester)	Requesting the same purchase; releasing cash; recording
Release cash or transfer	Treasury / cashier	Recording; reconciling; approving
Record journal and post to ledger	Accounting	Releasing cash; approving
Prepare bank reconciliation	Independent reviewer	Custody of cash; recording cash disbursements

Recording of purchases and cash disbursements under different inventory systems

Under a voucher system, recording takes place in two steps: the liability is recognized when the matched invoice is approved, and cash is credited only when the approved voucher is paid. The accounts debited depend on whether the entity uses a periodic or a perpetual inventory system (Kieso et al., 2020). Under the periodic system, purchases, freight-in, and purchase discounts are accumulated in temporary accounts and inventory is adjusted through a physical count at period end. Under the perpetual system, every acquisition cost element is charged directly to the inventory account, so that inventory and cost of goods sold are updated continuously. Table 7 illustrates the entries for PT Sentosa Abadi, where voucher BK-001 pays a merchandise invoice of IDR 15,000,000 on terms of 2/10, net 30, and voucher BK-002 pays IDR 8,500,000 for inbound transport.

Table 7. Journal entries under the periodic and perpetual inventory systems (IDR)

Transaction	Periodic inventory system	Perpetual inventory system
(1) Matched invoice approved; merchandise 15,000,000 on 2/10, n/30	Dr Purchases 15,000,000 Cr Accounts payable 15,000,000	Dr Merchandise inventory 15,000,000 Cr Accounts payable 15,000,000
(2) Voucher BK-001 paid within discount period	Dr Accounts payable 15,000,000 Cr Purchase discounts 300,000 Cr Cash 14,700,000	Dr Accounts payable 15,000,000 Cr Merchandise inventory 300,000 Cr Cash 14,700,000
(3) Voucher BK-002: inbound transport (freight-in) 8,500,000 paid	Dr Freight-in 8,500,000 Cr Cash 8,500,000	Dr Merchandise inventory 8,500,000 Cr Cash 8,500,000
(4) Alternative: transport for deliveries to customers (freight-out)	Dr Delivery expense 8,500,000 Cr Cash 8,500,000	Dr Delivery expense 8,500,000 Cr Cash 8,500,000

Two clarifications apply. First, freight-in is part of the cost of inventory, whereas freight-out is a selling expense under both systems, so the purpose stated on the voucher determines the account. Second, input value-added tax on purchases, where applicable, is recorded in a separate prepaid tax account and is omitted here for simplicity. In every case the voucher number is carried into the journal, so each ledger entry can be traced back to its supporting documents.

Bank reconciliation and adjusting entries

The fourth component is a monthly two-sided bank reconciliation performed by a staff member independent of cash custody. Items known to the company but not yet to the bank (deposits in transit and outstanding checks) adjust the bank balance, whereas items known to the bank but not yet to the company (interest, bank charges, and dishonored checks) adjust the book balance. Table 8 presents the illustrative case of PT Sentosa Abadi.

Table 8. Two-sided bank reconciliation, PT Sentosa Abadi, 30 June 2026 (illustrative, IDR)

Item	Bank statement	Company books
Unadjusted balance	247,500,000	247,000,000
Add: deposit in transit	5,000,000	–
Less: outstanding checks	(7,000,000)	–
Add: bank interest earned (net of final tax)	–	2,000,000
Less: bank administration charge	–	(500,000)
Less: dishonored (NSF) customer check	–	(3,000,000)
Adjusted (true) cash balance	**245,500,000**	**245,500,000**

Both sides converge to the same true cash balance of IDR 245,500,000, which confirms the arithmetical integrity of the procedure. Only the book-side items require journal entries, as presented in Table 9. Bank-side items need no entry because they will clear in the bank's records in the following period.

Table 9. Adjusting journal entries arising from the bank reconciliation (IDR)

Date	Debit account	Credit account	Amount
30/06/2026	Bank administration expense	Cash	500,000
30/06/2026	Cash	Bank interest income (other income)	2,000,000
30/06/2026	Accounts receivable	Cash	3,000,000

Three points clarify the accounting treatment. Bank interest is non-operating income and is presented as other income, separate from sales revenue. Interest on Indonesian current accounts is generally subject to final income tax withheld by the bank, so the amount credited on the statement is net; the illustration records this net amount, although an entity may instead record the gross interest and the tax separately. The dishonored check does not affect profit at recognition; it reinstates the customer's receivable, which must then be assessed for collectability and, where necessary, an allowance for expected credit losses.

Effect on financial statements and ratios

Table 10 traces every adjustment through the statement of financial position, the income statement, and the ratios. Before adjustment, the company reported accounts receivable of IDR 30,000,000, inventory of IDR 60,000,000, current liabilities of IDR 100,000,000, sales revenue of IDR 180,000,000, and operating expenses of IDR 121,000,000. Taxes on profit are ignored to isolate the effect of the reconciliation. Net profit margin is computed on sales revenue only, and operating profit margin is reported alongside it so that the effect of non-operating income is visible.

Table 10. Financial statement items and ratios before and after reconciliation (illustrative, IDR)

Item / ratio	Before reconciliation	After reconciliation	Change
Statement of financial position			
Cash	247,000,000	245,500,000	−1,500,000
Accounts receivable	30,000,000	33,000,000	+3,000,000
Inventory	60,000,000	60,000,000	0
Total current assets	337,000,000	338,500,000	+1,500,000
Current liabilities	100,000,000	100,000,000	0
Income statement (June 2026)			
Sales revenue	180,000,000	180,000,000	0
Operating expenses (incl. bank charges)	(121,000,000)	(121,500,000)	−500,000
Operating profit	59,000,000	58,500,000	−500,000
Other income: bank interest	0	2,000,000	+2,000,000
Net profit before tax	**59,000,000**	**60,500,000**	**+1,500,000**
Ratios			
Current ratio	3.370	3.385	+0.015
Quick ratio (cash + receivables)	2.770	2.785	+0.015
Cash ratio	2.470	2.455	−0.015
Operating profit margin (operating profit / sales)	32.78%	32.50%	−0.28 pp
Net profit margin (net profit / sales)	32.78%	33.61%	+0.83 pp

The table is internally consistent: the increase of IDR 1,500,000 in total current assets equals the increase in net profit, and therefore in retained earnings, while liabilities are unchanged. Three substantive insights follow. First, reconciliation changes the quality as well as the amount of liquid assets: cash, the most certain asset, falls, while receivables, which carry collection risk, rise, so the cash ratio declines even though the current and quick ratios rise slightly. Second, sales revenue is unaffected; the higher net profit margin is caused entirely by non-operating interest income, whereas the operating profit margin actually falls because of bank charges. Third, an analyst who added interest to sales revenue, or who looked only at net profit margin, would wrongly conclude that operating efficiency had improved. Separating sales from other income is therefore essential when reconciliation adjustments enter ratio analysis.

Risk–control matrix

The fifth component consolidates the design into a risk–control matrix (Table 11), linking the principal fraud and error risks of the cycle to specific preventive and detective controls.

Table 11. Risk–control matrix for the purchasing and cash disbursement cycle

Risk	Preventive control	Detective control
Purchases without genuine need	Approved PR required before PO	Budget-to-actual review by management
Fictitious supplier	Approved vendor master file; restricted access	Periodic review of new vendors and bank accounts

Risk	Preventive control	Detective control
Payment for goods not received	Three-way match PO–RR–invoice	Exception report of unmatched vouchers
Duplicate payment	Pre-numbered vouchers; invoices canceled after payment	Analytics on duplicate supplier, amount, and date
Payment above authority / split payments	Tiered authorization (Tables 4–5) enforced by workflow	Monitoring of cumulative payments per supplier
Misappropriation of cash	Segregation of custody and recording (Table 6)	Independent monthly bank reconciliation (Table 8)
Unrecorded bank charges, interest, NSF checks	Timely receipt of bank statements	Adjusting entries (Table 9)

Evaluation results

Table 12 reports the requirement-based evaluation. Each design requirement is addressed by at least one artifact component, and the evidence column states how this was verified in the present evaluation episode.

Table 12. Requirement-based evaluation of the artifact

DR	Satisfied by	Evaluation evidence	Residual limitation
DR1	PR–PO–RR chain; three-way match	Walk-through: no voucher can be prepared without matched PO and RR (scenarios S1, S4)	Fictitious need approved by a colluding manager
DR2	Tiered matrix with calibration rule (Tables 4–5)	Thresholds derived from OM and rescaled for four entity sizes; split-payment rule tested in S3	Thresholds require annual review
DR3	Segregation-of-duties matrix (Table 6)	No row in Table 6 assigns two incompatible functions to one role (S5, S7)	Small entities may lack staff; compensating review needed
DR4	Pre-numbered vouchers; recording rules (Table 7)	Entries balance under both inventory systems; numbering gaps detectable (S2)	Cut-off still depends on timely invoice processing
DR5	Custody separated from recording; transfer-based payment	Cashier cannot record or reconcile (S5)	Physical petty cash remains exposed
DR6	Two-sided reconciliation; adjusting entries (Tables 8–9)	Arithmetic check: both sides close at IDR 245,500,000; adjustments flow consistently to Table 10 (S6)	Detection lag of up to one month
DR7	Voucher number carried from source documents to ledger	Each entry in Tables 7 and 9 traceable to a voucher or bank statement item	Audit trail weaker in unprotected spreadsheets
DR8	Calibration rule; spreadsheet and ERP options (Table 14)	Each control mapped to a spreadsheet and an ERP implementation	Not yet tested in a live organization

Table 13 reports the scenario-based walk-through. Six of the seven scenarios are either prevented or detected within one monthly cycle. The seventh, self-approval, is fully prevented in an ERP workflow but, in a spreadsheet setting, depends on a detective review, which is why it is classified as only partially controlled there. Collusion between an approver and a payee, and management override, remain residual risks that no process design can eliminate and that must be addressed through the control environment, internal audit, and whistle-blowing channels (Petraşcu & Tieanu, 2014; Rae & Subramaniam, 2008).

Table 13. Scenario-based walk-through of fraud and error cases

Scenario	Control that responds	Stage	Outcome
S1 Invoice from a fictitious supplier	Vendor master approval; three-way match	Voucher preparation	Prevented
S2 Same invoice submitted twice	Pre-numbered vouchers; invoice canceled after payment; duplicate analytics	Voucher preparation / monthly review	Prevented or detected
S3 Large payment split below a tier limit	Cumulative per-supplier monitoring; workflow rule	Approval / monitoring	Detected
S4 Invoice for more goods than delivered	RR quantity compared with invoice	Three-way match	Prevented (payment limited to quantity received)
S5 Cashier diverts a transfer to a personal account	Segregation of custody and recording; independent reconciliation	Monthly reconciliation	Detected within one month
S6 Bank charges, interest, NSF check unrecorded	Two-sided reconciliation; adjusting entries	Month-end	Detected and corrected
S7 Requester approves own payment	Requester ≠ approver rule	Approval	Prevented in ERP; partially controlled in spreadsheet

DISCUSSION

The findings answer the first research question by showing that an effective expenditure-cycle AIS is not a collection of forms but an architecture in which each document validates the preceding one. This supports the view in ERP research that the accounting benefits of integration depend on how controls are configured within the process (Grabski et al., 2011; Kanellou & Spathis, 2013). It also clarifies the findings of Indonesian survey studies that report a positive association between cash disbursement AIS and internal control (Rachman & Marselly, 2023): the association is plausibly driven by specific design features such as the three-way match and pre-numbered vouchers.

With respect to the second research question, the tiered authorization and segregation-of-duties matrices operationalize agency theory's monitoring mechanisms (Jensen & Meckling, 1976). Separating authorization, custody, recording, and reconciliation means that an irregular payment would require collusion between at least two parties, raising the cost of fraud. This is consistent with evidence that weak control activities, including the absence of job separation, are the main cause of ineffective cash control in Indonesian organizations (Fadilah et al., 2023; Parera et al., 2019) and with evidence that internal control influences the tendency to commit fraud (Didi & Kusuma, 2018). The materiality-based calibration rule adds a transparent rationale for authorization limits, which are often set arbitrarily in practice, and allows the same design to be applied from small enterprises to large companies.

Regarding the third research question, the case demonstrates that bank reconciliation is not merely a bookkeeping exercise but a determinant of the reliability of decision information. Firms with internal control weaknesses tend to report lower-quality accruals (Ashbaugh-Skaife et al., 2008; Doyle et al., 2007), and the case illustrates the mechanism at a micro level: without reconciliation, cash and profit are misstated and the liquidity ratios are distorted. The corrected analysis also shows that profitability conclusions depend on separating sales revenue from other income, since interest income raised net profit margin while operating profit margin declined. A

methodological observation also emerged during design: single-column, running-balance reconciliation formats that mix bank-side and book-side items often fail to close and may mask errors, whereas the two-sided format forces each item to be classified correctly and makes the reconciliation self-verifying.

Implementation in spreadsheet-based and ERP environments

Table 14 shows how each component can be implemented in the two environments most common among Indonesian entities. Spreadsheet implementation is low-cost and accessible, but its controls are largely procedural: protection can be bypassed, formulas can be altered, and spreadsheets are known to contain errors at high rates (Panko, 1998). ERP implementation enforces controls through role-based access, configured workflows, and system logs, and enables continuous monitoring (Kuhn & Sutton, 2010), but it requires substantial investment and careful configuration (Grabski et al., 2011).

Table 14. Implementation of the framework in spreadsheet-based and ERP environments

Component	Spreadsheet-based implementation	ERP implementation
Document chain and three-way match	Separate PR, PO, RR, and invoice registers; lookup formulas flag mismatches in supplier, quantity, or price	Automated three-way match; invoice blocked for payment until tolerances are met
Pre-numbered vouchers	Sequential numbering formula; gap and duplicate checks with counting functions	System-generated numbering; duplicate-invoice check on supplier, number, and amount
Tiered authorization	Approval column with data validation by tier; signed printouts or e-mail approvals filed with voucher	Configurable release strategy by value and risk category; electronic approvals logged
Segregation of duties	Separate files or protected sheets per function; relies on staffing and supervision	Role-based access; periodic user-access and conflict reviews
Bank reconciliation	Two-sided template matching the bank statement export; reviewer sign-off	Electronic bank statement import with auto-matching; exceptions queue
Monitoring and audit trail	Change log maintained manually; file versioning and backups	Automatic system logs; continuous monitoring dashboards and exception reports

The practical limitations and cost drivers differ accordingly. For spreadsheets, the main costs are staff time for manual matching and review, and the main limitations are weak access control, vulnerability to formula error, and an audit trail that depends on discipline; these weaknesses can be partly mitigated by locking formulas, restricting file access, keeping dated versions, and assigning an independent reviewer. For ERP systems, the cost drivers are licensing or subscription fees, configuration and data migration, user training, and ongoing maintenance, while the limitations include dependence on accurate vendor master data, the risk of excessive user privileges that defeat segregation of duties, and the temptation to customize away standard controls. A staged path is therefore recommended for small entities: start with the spreadsheet design and the calibrated authorization matrix, and migrate to an ERP or cloud accounting module once transaction volume makes manual matching and monitoring uneconomical.

Practical implications

For managers of small and medium-sized entities, the blueprint offers a low-cost sequence of controls that can be implemented even with spreadsheet-based systems: pre-numbered vouchers, a written authorization matrix, a clear division of duties, and an independent monthly reconciliation. For system developers, the matrices translate directly into user roles, approval workflows, and exception reports. For educators, the integrated design

and the two-sided reconciliation case provide a coherent teaching sequence linking documents, journals, financial statements, ratio analysis, and managerial recommendations.

Limitations and future research

This study reports an ex ante, artificial evaluation; the artifact has not yet been implemented in a live organization or assessed by practitioners, and its practical effectiveness therefore remains to be demonstrated. The next evaluation episode recommended by FEDS (Venable et al., 2016) is an expert evaluation in which accountants, internal auditors, and prospective system users rate the completeness, understandability, feasibility, and expected effectiveness of each component, followed by a naturalistic field implementation that measures changes in control deficiencies, payment errors, reconciliation differences, or audit findings. Future research could also test the calibration rule against actual payment distributions, compare implementation costs across spreadsheet and ERP settings, and extend the design to public institutions and cooperatives.

CONCLUSION

This study designed an integrated purchasing and cash disbursement accounting information system that embeds internal control in interlocking components: a five-document chain with a three-way match, a tiered payment authorization matrix calibrated to materiality, transaction volume, and risk exposure, a segregation-of-duties matrix, recording rules for periodic and perpetual inventory systems, a two-sided bank reconciliation with adjusting entries, and a risk–control matrix. Evaluated ex ante against eight design requirements and seven fraud and error scenarios, the artifact addressed every requirement and prevented or detected six of the seven scenarios, with collusion and management override remaining as residual risks. The illustrative case showed that reconciliation corrects cash, receivables, and profit, and that ratio analysis must separate sales revenue from other income to avoid misleading conclusions about operating efficiency. The framework can be implemented in spreadsheet-based or ERP environments with different limitations and cost profiles. Internal control in the expenditure cycle is most effective when designed as an integrated, calibrated system grounded in the COSO framework and agency theory, and the blueprint provides a basis for subsequent expert and field evaluation.

ACKNOWLEDGEMENTS

The authors thank Universitas IBBI and Institut Modern Arsitektur dan Teknologi for academic support during the preparation of this article, and the reviewers and editor for their constructive comments.

ETHICAL STATEMENT

This study did not involve human participants or animals; therefore, ethical approval was not required. All case data are hypothetical and were constructed for illustrative purposes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

All data used in the illustrative case are presented in Tables 7 to 10 of this article. No additional datasets were generated or analyzed.

REFERENCES

1. Appelbaum, D., Kogan, A., & Vasarhelyi, M. A. (2017). Big data and analytics in the modern audit engagement: Research needs. Auditing: A Journal of Practice & Theory, 36(4), 1–27. https://doi.org/10.2308/ajpt-51684

2. Ashbaugh-Skaife, H., Collins, D. W., Kinney, W. R., Jr., & LaFond, R. (2008). The effect of SOX internal control deficiencies and their remediation on accrual quality. The Accounting Review, 83(1), 217–250. https://doi.org/10.2308/accr.2008.83.1.217
3. Committee of Sponsoring Organizations of the Treadway Commission [COSO]. (2013). Internal control—Integrated framework. AICPA. https://www.coso.org
4. Dai, J., & Vasarhelyi, M. A. (2017). Toward blockchain-based accounting and assurance. Journal of Information Systems, 31(3), 5–21. https://doi.org/10.2308/isys-51804
5. DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. Journal of Management Information Systems, 19(4), 9–30. https://doi.org/10.1080/07421222.2003.11045748
6. Didi, D., & Kusuma, I. C. (2018). Faktor-faktor yang berpengaruh terhadap kecenderungan kecurangan (fraud): Persepsi pegawai pemerintahan daerah Kota Bogor. Jurnal Akuntansi dan Keuangan Indonesia, 15(1), 1–20. https://doi.org/10.21002/jaki.2018.01
7. Doyle, J., Ge, W., & McVay, S. (2007). Determinants of weaknesses in internal control over financial reporting. Journal of Accounting and Economics, 44(1–2), 193–223. https://doi.org/10.1016/j.jacceco.2006.10.003
8. Fadilah, A., Sokarina, A., & Lenap, I. P. (2023). Revealing the effectiveness of government internal control systems in cash management for fraud prevention. ALEXANDRIA (Journal of Economics, Business, & Entrepreneurship), 4(2), 55–59. https://doi.org/10.29303/alexandria.v4i2.449
9. Government of the Republic of Indonesia. (2021). Government Regulation No. 7 of 2021 on the facilitation, protection, and empowerment of cooperatives and micro, small, and medium enterprises [Peraturan Pemerintah Nomor 7 Tahun 2021]. https://peraturan.bpk.go.id
10. Grabski, S. V., Leech, S. A., & Schmidt, P. J. (2011). A review of ERP research: A future agenda for accounting information systems. Journal of Information Systems, 25(1), 37–78. https://doi.org/10.2308/jis.2011.25.1.37
11. Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design science in information systems research. MIS Quarterly, 28(1), 75–105. https://doi.org/10.2307/25148625
12. International Auditing and Assurance Standards Board [IAASB]. (2009). International Standard on Auditing 320: Materiality in planning and performing an audit. International Federation of Accountants. https://www.iaasb.org
13. Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3(4), 305–360. https://doi.org/10.1016/0304-405X(76)90026-X
14. Kanellou, A., & Spathis, C. (2013). Accounting benefits and satisfaction in an ERP environment. International Journal of Accounting Information Systems, 14(3), 209–234. https://doi.org/10.1016/j.accinf.2012.12.002
15. Kieso, D. E., Weygandt, J. J., & Warfield, T. D. (2020). Intermediate accounting: IFRS edition (4th ed.). Wiley.
16. Kokina, J., & Davenport, T. H. (2017). The emergence of artificial intelligence: How automation is changing auditing. Journal of Emerging Technologies in Accounting, 14(1), 115–122. https://doi.org/10.2308/jeta-51730
17. Kuhn, J. R., Jr., & Sutton, S. G. (2010). Continuous auditing in ERP system environments: The current state and future directions. Journal of Information Systems, 24(1), 91–112. https://doi.org/10.2308/jis.2010.24.1.91
18. Moffitt, K. C., Rozario, A. M., & Vasarhelyi, M. A. (2018). Robotic process automation for auditing. Journal of Emerging Technologies in Accounting, 15(1), 1–10. https://doi.org/10.2308/jeta-10589
19. Panko, R. R. (1998). What we know about spreadsheet errors. Journal of End User Computing, 10(2), 15–21.
20. Parera, M. T., Kalangi, L., & Budiarso, N. S. (2019). Sistem pengendalian intern pengeluaran kas pada Sekretariat Daerah Kabupaten Kepulauan Sangihe. Indonesia Accounting Journal, 1(2), 129. https://doi.org/10.32400/iaj.26814
21. Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. Journal of Management Information Systems, 24(3), 45–77. https://doi.org/10.2753/MIS0742-1222240302

22. Penatari, R. I., Setiawan, D., & Suhardjanto, D. (2020). Dinamika penelitian sistem informasi akuntansi di Indonesia. Jurnal Akuntansi Multiparadigma, 11(1). https://doi.org/10.21776/ub.jamal.2020.11.1.10
23. Petraşcu, D., & Tieanu, A. (2014). The role of internal audit in fraud prevention and detection. Procedia Economics and Finance, 16, 489–497. https://doi.org/10.1016/S2212-5671(14)00829-6
24. Rachman, R., & Marselly, M. (2023). Dampak sistem informasi akuntansi penjualan dan pengeluaran kas terhadap pengendalian internal: Studi kasus pada PT Cahaya Buana Furindotama. Jurnal Ilmiah Akuntansi Kesatuan, 11(1), 187–198. https://doi.org/10.37641/jiakes.v11i1.1766
25. Rae, K., & Subramaniam, N. (2008). Quality of internal control procedures: Antecedents and moderating effect on organisational justice and employee fraud. Managerial Auditing Journal, 23(2), 104–124. https://doi.org/10.1108/02686900810839820
26. Rikhardsson, P., & Yigitbasioglu, O. (2018). Business intelligence & analytics in management accounting research: Status and future focus. International Journal of Accounting Information Systems, 29, 37–58. https://doi.org/10.1016/j.accinf.2018.03.001
27. Romney, M. B., Steinbart, P. J., Summers, S. L., & Wood, D. A. (2021). Accounting information systems (15th ed.). Pearson.
28. Venable, J., Pries-Heje, J., & Baskerville, R. (2016). FEDS: A framework for evaluation in design science research. European Journal of Information Systems, 25(1), 77–89. https://doi.org/10.1057/ejis.2014.36
29. Wijaya, D., & Kuang, T. M. (2023). Do intellectual capital and ESG mitigate accounting fraud? Jurnal Akuntansi Multiparadigma, 14(2). https://doi.org/10.21776/ub.jamal.2023.14.2.17