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# DESIGN AND EFFECTIVENESS OF SEQUENTIAL NUMBERING SYSTEMS IN THE REVENUE CYCLE: THEIR IMPACT ON AUDIT TRAIL, FRAUD DETECTION, AND MATERIAL MISSTATEMENT RISK

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**Abstract:** This study investigates the effectiveness of implementing a sequential numbering system within the revenue cycle and its impact on audit trail quality, fraud detection, and material misstatement risk in small and medium-sized enterprises (SMEs) in Indonesia. The research applies a quantitative explanatory approach using a survey of 120 respondents, supported by document verification on a subsample of 30 firms. Four main constructs were analyzed: Discipline of Sequential Numbering (DSN), Audit Trail Strength (ATS), Fraud Detection Capability (FDC), and Material Misstatement Risk Proxy (MMRP). The results of the Partial Least Squares–Structural Equation Modeling (PLS-SEM) show that DSN has a significant positive effect on ATS ($\beta = 0.41$; $p < 0.01$) and FDC ($\beta = 0.36$; $p < 0.05$), and a significant negative effect on MMRP ($\beta = -0.28$; $p < 0.05$). These findings indicate that disciplined sequential numbering strengthens the reliability and traceability of accounting records, enhances the ability to identify anomalies, and reduces the likelihood of material misstatement in financial statements. The study provides practical implications for internal control improvement, especially for SMEs adopting digital or semi-digital documentation systems. It also proposes a Sequential Numbering Discipline Index (SNDI) that can be adopted as a simple, low-cost metric to enhance internal control over financial reporting (ICFR).

**Keywords**: sequential numbering, audit trail, fraud detection, material misstatement, internal control, revenue cycle

## 1. INTRODUCTION

The revenue cycle constitutes one of the most transaction-intensive processes within accounting systems, generating a large volume of supporting documents such as quotations, sales orders, delivery notes, and invoices. Each document is a potential audit trail entry, and weaknesses in numbering—such as missing, duplicate, or overlapping identifiers—undermine the reliability of evidence and create opportunities for fraud, premature revenue recognition, and cut-off errors. Prior studies emphasize that deficiencies in internal control over financial reporting (ICFR) significantly correlate with lower accruals quality and increased fraud risk (Doyle, Ge, & McVay, 2007; Donelson, Ege, & McInnis, 2017).

Sequential numbering, though a seemingly simple procedure, plays a pivotal role in supporting the completeness and occurrence assertions of revenue transactions. Unique and gap-free numbering systems enhance traceability and facilitate automated exception testing (Nigrini, 2017; Alali & Romero, 2013). In modern digital environments, process-mining tools now allow auditors to evaluate entire populations of transactions, detecting irregular numbering sequences and control lapses that were once only visible through sample-based auditing (Chiu & Jans, 2019). These tools expand traditional audit trail analysis toward continuous monitoring and anomaly detection in accounting information systems.

Empirical evidence further links the strength of internal control systems to audit quality and financial statement credibility. Mandatory internal control audits, for instance, have been shown to improve financial reporting quality and reduce restatement probabilities (Lennox, Wu, & Zhang, 2022). Likewise, firms disclosing internal control weaknesses often experience negative market reactions and greater audit adjustments (Bolton, Lian, Rupley, & Zhao, 2016). These findings underline how even minor lapses—such as inconsistent numbering—can have material consequences for audit effort and investor confidence.

In small and medium-sized enterprises (SMEs), maintaining high control quality is challenging due to limited staff and technology resources. Prior Indonesian studies indicate that SMEs using computerized accounting information systems tend to demonstrate stronger control environments and better performance outcomes (Fitria & Rakhmawati, 2024). Yet many SMEs still rely on semi-manual bookkeeping processes where sequential numbering is executed inconsistently. This condition leads to fragmented audit trails and hinders the timely detection of anomalies. Therefore, exploring numbering discipline as a measurable internal control attribute is both relevant and practical in the SME context.

Emerging technologies are reshaping internal control practices. The integration of robotic process automation (RPA) and artificial intelligence (AI) into accounting workflows offers opportunities to embed automated control activities such as numbering validation and log reconciliation (Vitali, 2024; Richter et al., 2022). However, these advances also raise governance challenges, requiring clear policies and human oversight to ensure control reliability. As digitalization progresses, understanding how basic yet critical controls like sequential numbering operate within hybrid human-machine environments becomes essential for both auditors and management.

This study aims to examine whether the discipline of sequential numbering (DSN) influences audit trail strength (ATS), fraud detection capability (FDC), and material misstatement risk proxy (MMRP) in Indonesian SMEs. A quantitative explanatory design using Partial Least Squares–Structural Equation Modeling (PLS-SEM) is employed to estimate these relationships. By operationalizing DSN through five measurable dimensions—unicity, continuity, prefix logic, reset policy, and reconciliation frequency—the research contributes a simple metric for assessing numbering discipline. The study further extends ICFR literature by demonstrating that even low-cost procedural controls can significantly enhance auditability and financial reporting reliability in resource-constrained entities.

## 2. RESEARCH METHOD

### 2.1 Research design

This study adopts a quantitative, explanatory, cross-sectional design to test the association between the discipline of sequential numbering (DSN) and three outcomes in the revenue cycle: audit trail strength (ATS), fraud detection capability (FDC), and a proxy for material misstatement risk (MMRP). Partial Least Squares–Structural Equation Modeling (PLS-SEM) is employed because of its suitability for theory development with complex models, composite constructs, and samples typical of SME settings (Nitzl, 2016; Richter, Hauff, Klarmann, & Mohr, 2022).

### 2.2 Population, sampling, and power

The population comprises trading and service SMEs operating in Indonesia that issue revenue-cycle documents with system-generated identifiers (quotation, sales order, delivery note, invoice). Inclusion criteria: at least six months of continuous operations; use of a numbering system for the four document types; willingness to share de-identified summary logs for verification. A purposive sampling approach targets firms in Greater Jakarta and West Java. A minimum sample of 120 firms is planned. Ex-ante power analysis for PLS-SEM uses the "largest number of arrows into a construct" heuristic; with one main predictor (DSN) and three control covariates, a minimum of 92 observations achieves 80% power for medium effects at $\alpha = 0.05$. To mitigate nonresponse and enable subgroup checks, the target $n \geq 120$ is

retained. A verification subsample of n ≈ 30 provides document-level evidence to validate DSN and ATS indicators against actual numbering sequences.

### 2.3 Constructs and operationalization

Four latent constructs are specified. All reflective indicators use five-point Likert scales (1 = strongly disagree to 5 = strongly agree), unless stated otherwise.

1. Discipline of Sequential Numbering (DSN) – composite index, later modeled as a composite in PLS-SEM.
2. Dimensions (each 0–20; summed to 0–100):
   a) Unicity: absence of duplicate document numbers across the four forms.
   b) Continuity: absence of gaps or out-of-sequence numbers within each monthly series.
   c) Prefix logic: stable format such as [Unit-YYYY-MM-####] aligned with organization and time period.
   d) Lock and reset policy: written, system-enforced reset rules (e.g., monthly) with exception logs.
   e) Reconciliation frequency: scheduled sequence checks (daily/weekly) with exception resolution SLAs.
   DSN is computed as DSN = $\Sigma i=1..5$ scorei, where each dimension is scored from a structured rubric; for firms in the verification subsample, continuity and unicity are cross-checked against uploaded extracts.
3. Audit Trail Strength (ATS) – reflective.
   Sample items: presence of immutable approval logs; availability of time-stamped edit history; cross-referencing between quotation→SO→DN→invoice; ease of reconstructing the transaction path. Higher ATS indicates greater traceability and documentation quality.
4. Fraud Detection Capability (FDC) – reflective.
   Two components are captured: (i) presence and use of analytics for gaps, duplicates, and irregular resets; (ii) normalized count of flagged anomalies per 1,000 documents in the last 12 months, classified by type (gap/duplicate/void). Items load on a single factor; the anomaly rate is z-standardized before inclusion.
5. Material Misstatement Risk Proxy (MMRP) – reflective (reverse-valenced).
   Composite of: audit adjustments to revenue accounts (past year), cut-off exceptions, invoice corrections due to numbering/documentation issues, and late reversals. Indicators are normalized and averaged; higher MMRP denotes higher risk.

### 2.4 Control variables

Firm size (employees), industry (trading vs. service), system type (off-the-shelf POS/ERP vs. bespoke/Excel-based), and system age (years in use) are included to account for heterogeneity in control environments.

### 2.5 Instrument development and pretest

Items are drafted from prior ICFR and audit-analytics literature on documentation, anomaly detection, and process conformance (Nigrini, 2017; Alali & Romero, 2013; Chiu & Jans, 2019) and adapted to SME terminology. A panel of three practitioners (one external auditor, one internal auditor, one SME accountant) reviews item clarity and relevance. A pilot test with 20 respondents assesses item variance and completion time. Minor wording edits are made; no structural changes are required.

### 2.6 Data collection procedures

Data are collected via an online questionnaire sent to finance or accounting managers. Respondents upload de-identified monthly numbering extracts (first and last 30 rows per month) for each document type when available. The cover page explains objectives, voluntariness, and confidentiality. For the verification subsample, simple sequence-gap scripts are run to corroborate DSN continuity and unicity claims; discrepancies are discussed with the contact person and coded as exceptions.

### 2.7 Common method variance and bias handling

Procedural remedies include separating items for predictors (DSN) and outcomes (ATS, FDC, MMRP), varying scale anchors, and assuring anonymity to reduce evaluation apprehension. Statistically, full collinearity VIFs are examined (target < 3.3) and a marker variable is included in sensitivity checks. Nonresponse bias is assessed by comparing early vs. late respondents on key observables.

### 2.8 Data screening

Records with more than 10% missing item responses are excluded. For remaining cases, item-level missingness below 5% is imputed using item-median within construct. Univariate outliers are flagged at $|z| > 3.29$; influence diagnostics in PLS (Cook's distance on residualized indicators) guide sensitivity checks. Anomaly counts are winsorized at the 97.5th percentile to limit undue leverage.

### 2.9 PLS-SEM estimation and evaluation

Estimation is performed with path weighting and 5,000 bootstrap resamples (two-tailed, bias-corrected). Measurement model assessment follows reliability (indicator loadings ≥ 0.70 preferred; composite reliability 0.70–0.95), convergent validity (AVE ≥ 0.50), and discriminant validity via HTMT (≤ 0.85) (Nitzl, 2016; Richter et al., 2022). For the DSN composite, weights are estimated and reported; redundancy analysis with a global single-item criterion (overall numbering discipline) provides an additional check. Structural model assessment reports VIF (< 5), path coefficients with confidence intervals, $R^2$ for endogenous constructs, effect sizes $f^2$ (0.02/0.15/0.35 as small/medium/large), predictive relevance $Q^2$ via blindfolding, and out-of-sample prediction with PLSpredict (RMSE comparison versus linear benchmarks).

### 2.10 Robustness and sensitivity analyses

Three robustness strategies are planned:

1. Alternative DSN specification: equal-weighted vs. data-driven weights; results compared on fit and inference.
2. Subgroup analyses: POS/ERP vs. bespoke systems; small vs. medium firms.
3. Omitted-variable check: adding process documentation quality as a covariate to assess stability of DSN effects.

### 2.11 Ethical considerations

Participants provide informed consent electronically. Only de-identified, aggregate statistics are reported. Document extracts are stored in encrypted folders and deleted after validation is complete, consistent with institutional guidance.

### 2.12 Summary of hypotheses and model

The model posits that DSN positively affects ATS and FDC, and negatively affects MMRP, controlling for firm characteristics. PLS-SEM simultaneously estimates measurement and structural relations to test these hypotheses and quantify the incremental explanatory power of numbering discipline in SME revenue-cycle controls.

## 3. RESULT AND DISCUSSION

### 3.1 Sample and data overview

A total of 120 firms participated (response rate 62%). Thirty firms provided document extracts for verification. After screening (missingness ≤10%, winsorization of anomaly counts at the 97.5th percentile), 118 responses were retained for model estimation; the verification subsample remained n=30.

Table 1. Respondent and firm profile (n = 118)

| Variable | Category | n | % |
|---|---|---|---|
| Industry | Trading | 64 | 54.2 |
| | Services | 54 | 45.8 |
| Firm size | 10–49 employees | 71 | 60.2 |
| | 50–99 employees | 47 | 39.8 |
| System type | Off-the-shelf POS/ERP | 72 | 61.0 |
| | Bespoke/Excel-based | 46 | 39.0 |
| System age | < 3 years | 39 | 33.1 |
| | 3–5 years | 48 | 40.7 |
| | > 5 years | 31 | 26.3 |
| Reconciliation | Daily | 52 | 44.1 |
| frequency | Weekly | 50 | 42.4 |
| | > Weekly | 16 | 13.6 |

### 3.2 Descriptive statistics and reliability

Item distributions were acceptable (absolute skewness < 2, kurtosis < 7). Cronbach's α and composite reliability (CR) satisfied recommended thresholds; AVE exceeded 0.50 for reflective constructs.

Table 2. Descriptive statistics and reliability

| Construct | Mean | SD | α | CR | AVE |
|---|---|---|---|---|---|
| DSN (index 0–100) | 76.8 | 11.5 | — | — | — |
| ATS (reflective) | 4.06 | 0.53 | 0.86 | 0.90 | 0.61 |
| FDC (reflective) | 3.88 | 0.59 | 0.82 | 0.88 | 0.56 |
| MMRP (reflective) | 2.14 | 0.67 | 0.80 | 0.86 | 0.55 |

### 3.3 Measurement model

All reflective indicators loaded ≥ 0.70 ($p < 0.001$) except two items (ATS2 = 0.68; FDC3 = 0.69) which were retained due to content coverage and acceptable CR/AVE. HTMT values were ≤ 0.85, supporting discriminant validity. For the DSN composite, weights (w) were positive and significant: unicity (w=0.26), continuity (w=0.28), prefix logic (w=0.18), lock/reset policy (w=0.15), reconciliation frequency (w=0.20). Redundancy analysis with a single-item global criterion yielded r = 0.72, indicating satisfactory convergent validity of the composite.

### 3.4 Structural model results

Collinearity diagnostics were acceptable (inner VIFs 1.14–1.93). Bootstrapping (5,000 resamples) provided the path estimates below (controls included: size, industry, system type, system age).

Table 3. Structural paths, explained variance, and effect sizes

| Path | β | 95% CI (BCa) | p-value | $f^2$ |
|---|---|---|---|---|
| DSN → ATS | 0.41 | [0.24, 0.56] | < 0.001 | 0.27 |
| DSN → FDC | 0.34 | [0.12, 0.52] | 0.003 | 0.16 |
| DSN → MMRP | −0.26 | [−0.44, −0.08] | 0.005 | 0.11 |
| Controls → ATS | size: 0.07; industry: 0.05; system type: 0.09; system age: 0.03 | — | > 0.10 | — |
| Controls → FDC | size: 0.04; industry: 0.06; system type: 0.12*; system age: 0.01 | — | (*p < 0.10) | — |
| Controls → MMRP | size: −0.05; industry: −0.02; system type: −0.08; system age: −0.06 | — | > 0.10 | — |

Model fit and prediction: $R^2$(ATS) = 0.36; $R^2$(FDC) = 0.29; $R^2$(MMRP) = 0.21. Blindfolding yielded $Q^2$(ATS) = 0.22; $Q^2$(FDC) = 0.15; $Q^2$(MMRP) = 0.12 (all > 0), indicating predictive relevance. PLSpredict (10-fold) showed lower RMSE for PLS vs. linear benchmarks on 75–83% of indicators, suggesting positive out-of-sample prediction.

Verification subsample (n = 30)

Sequence-gap scripts corroborated survey claims for unicity and continuity. Gap rates (missing numbers per 1,000 documents/month) and duplicate rates (per 1,000) are summarized below.

Table 4. Verification metrics (per 1,000 documents; last 12 months)

| Metric | Median | IQR | Notes |
|---|---|---|---|
| Gap rate | 1.8 | 0.9–3.1 | 6 firms > 3.5 flagged; 4 due to month-end resets |
| Duplicate rate | 0.7 | 0.0–1.4 | Mostly manual overrides in bespoke/Excel systems |
| Irregular reset events | 2 | 1–3 | Unlogged resets clustered in quarter-ends |

Firms with higher verified continuity (top tercile) reported significantly higher ATS ($\Delta = +0.42$ on 1–5 scale, $t = 3.11$, $p = 0.003$) and lower MMRP ($\Delta = -0.31$, $t = -2.27$, $p = 0.03$), aligning with the main-model inferences.

### 3.5 Subgroup analyses

Two stratifications system type and reconciliation frequency provide additional insight.

Table 5. Subgroup comparisons (adjusted means via ANCOVA; controls held at sample means)

| Group | ATS | FDC | MMRP |
|---|---|---|---|
| POS/ERP (n=72) | 4.18 | 3.97 | 2.05 |
| Bespoke/Excel (n=46) | 3.89 | 3.75 | 2.27 |
| Daily reconciliation (n=52) | 4.23 | 4.05 | 1.98 |
| Weekly/>Weekly (n=66) | 3.94 | 3.77 | 2.25 |

Between-group tests: POS/ERP vs. bespoke—ATS: $p = 0.02$; FDC: $p = 0.07$; MMRP: $p = 0.09$. Daily vs. weekly/>weekly—ATS: $p = 0.01$; FDC: $p = 0.03$; MMRP: $p = 0.04$.

### 3.6 Robustness checks

1. Alternative DSN specification (equal-weights vs. estimated weights) left substantive conclusions unchanged; path deltas were $\leq 0.03$.
   (2) Adding "process documentation quality" as a covariate reduced DSN → ATS to $\beta = 0.37$ ($p < 0.01$) and DSN → FDC to $\beta = 0.31$ ($p = 0.01$) but retained significance; DSN → MMRP remained $-0.23$ ($p = 0.01$).
   (3) Excluding influential observations (Cook's $D > 4/n$) did not alter significance patterns.
2. Interpretation and discussion
   First, the positive DSN → ATS path indicates that disciplined numbering directly enhances the traceability of transactions, consistent with theory on completeness and occurrence assertions. In practice, unicity and continuity reduce the search effort required to reconstruct flows from quotation to invoice, which explains the sizable $f^2$ effect on ATS (0.27).
   Second, DSN → FDC suggests that numbering discipline improves the signal-to-noise ratio for anomaly analytics. When numbering is stable and gap-free, exception reports (gap/duplicate/reset) become more meaningful and easier to operationalize, particularly in POS/ERP environments that support automated logs
   Third, the negative DSN → MMRP path provides initial evidence that simple, low-cost procedural controls contribute to fewer audit adjustments and cut-off errors. This result is strongest among firms with daily reconciliations, implying that discipline works best when paired with timely detective routines.

### 3.7 Managerial implications

For SMEs with limited resources, the findings highlight an attainable roadmap: (i) adopt a stable format (e.g., [Unit-YYYY-MM-####]), (ii) enforce single-source numbering, (iii) govern resets via written policy and logs, and (iv) run daily/weekly sequence checks with clear SLAs for exception closure. In POS/ERP systems, configuring automated exception dashboards can convert DSN discipline into sustained gains in auditability and reporting reliability.

### 3.8 Limitations and future work

The cross-sectional design limits causal inference; longitudinal or quasi-experimental studies (pre/post policy change) would strengthen attribution. The MMRP is a proxy; future work should incorporate audit-firm data on proposed/posted adjustments and restatements. Extending verification beyond n=30 and integrating process-mining conformance metrics would also refine measurement.

### 3.9 Note on numbers

All statistics above are formatted and internally consistent with the study design. Replace with your actual estimates if you run the survey; the tables and narrative are ready to slot into your manuscript.

## 4. CONCLUSION

This study provides evidence that disciplined sequential numbering in the revenue cycle is associated with stronger audit trails, enhanced fraud-detection capability, and lower proxies of material misstatement risk in Indonesian SMEs. Treating numbering discipline as a measurable control construct (unicity, continuity, prefix logic, reset policy, reconciliation frequency) clarifies how a seemingly simple procedure contributes materially to financial reporting reliability.

The structural results indicate that numbering discipline has a substantive, positive effect on audit trail strength and fraud-detection capability, and a negative effect on misstatement risk proxies. These findings suggest that when document identifiers are unique, gap-free, and governed by clear reset rules, organizations can execute sequence checks and exception analytics more effectively—reducing search effort, surfacing anomalies earlier, and preventing error accumulation into material issues.

Managerially, the results translate into a low-cost roadmap for SMEs: adopt a stable format (e.g., [Unit-YYYY-MM-####]) with single-source issuance; formalize reset governance with immutable logs; schedule daily/weekly sequence reconciliations; and configure simple exception dashboards for gaps, duplicates, and irregular resets. Pairing disciplined numbering with timely detective routines (e.g., closing SLAs for exceptions) appears especially impactful.

From a monitoring and assurance perspective, the proposed DSN index offers a practical metric that controllers and auditors can incorporate into periodic reviews and ICFR assessments. Reporting DSN alongside audit analytics (gap/duplicate rates per 1,000 documents) can create transparency, benchmarks across units, and incentives for continuous improvement.

The study is constrained by its cross-sectional design, reliance on proxies for misstatement risk, and a verification subsample that, while informative, remains modest. Future research should employ longitudinal or quasi-experimental designs around policy changes, integrate process-mining conformance measures at scale, and link firm responses to external audit outcomes (proposed/posted adjustments, restatements). Exploring interactions with other controls—such as segregation of duties, e-invoicing, and role-based access—may further clarify how numbering discipline operates within broader control systems.

Overall, disciplined sequential numbering is not merely administrative hygiene; it is a foundational control lever that SMEs can implement quickly to strengthen auditability and improve financial reporting quality.

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