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Accounting Controls and Financial Data Quality in Credit Unions

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ABSTRACT

This study investigates the influence of accounting control elements on the qualitative attributes of financial information inside credit unions in Northeastern Thailand. The research employed a sequential mixed-methods approach and multiple regression analysis to investigate the effects of five control types: Preventative, detective, corrective, directive, and compensating, utilizing data from 181 CU executives. Findings indicate a multifaceted relationship between controls and data quality. Detective and compensating controls, bolstered by standardized accounting software, were the most robust and consistent positive indicators of data quality, relevance, and completeness. While preventative controls are a robust indicator of reliability, they had a negative correlation with timeliness ($\beta = -0.576$). Excessive preventive measures hinder operations by obstructing bureaucracy. The study concluded that effective financial governance requires credit unions to transition from rigid control frameworks to a strategic integration that prioritizes detection and technological compensation to enhance data quality while maintaining efficiency. The results guide regional collaborative resource distribution and policy enhancement.

Keywords: Accounting Controls, Financial Data Integrity, Credit Unions, Preventive, Detective, Timeliness
JEL Classifications: M41, G21, D23

1. INTRODUCTION

Credit Unions (CUs) in Thailand serve a significant socio-economic function, especially in regional hubs such as the Northeastern Region (Isaan), by functioning as essential financial intermediaries that aggregate members' savings and offer accessible credit (Chaiyapong et al., 2023). Considering public confidence and their responsibility in managing communal resources, the accuracy and dependability of their financial reporting are essential. Member confidence and regulatory stability depend fully on financial statements that accurately represent the credit union's operational realities (Ajao and Oluwadamilola, 2020; Harjanto, 2023).

A solid system of accounting controls is fundamental to ensuring this integrity (Krishnan et al., 2020). These controls are the principal safeguard against inaccuracies, fraud, and mismanagement, directly influencing the quality of the resultant financial data (Gotelaere and Paoli, 2022; Jannah et al., 2024). A deficient control environment eventually results in compromised data quality, undermining member trust and threatening the credit union's long-term viability (Abdullah, 2024; Hamed, 2023).

Although the prevailing academic literature robustly substantiates the positive correlation between internal controls and financial reporting quality (Dominic, 2024; Sakinah et al., 2024), a thorough examination of this relationship within the distinct operational and regulatory framework of Thai credit unions is still insufficiently investigated. Existing research frequently regards controls as a singular variable (Lartey et al., 2020), neglecting to examine the distinct effects of individual control dimensions—such as preventive, detective, and compensatory controls—on the specified attributes of data quality (e.g., reliability, timeliness, and relevance).

This study aims to furnish empirical evidence that transcends generic correlations to pinpoint the specific control characteristics that exert the most substantial predictive impact on improving financial data quality in the Thai CU industry. The results will

endorse optimal practice recommendations for enhancing financial governance and accountability in this economically vital industry.

Section 2 (Literature Review) identifies the empirical gap in existing literature, establishes the necessity for the study, and synthesizes established Internal Control Theory with the Qualitative Characteristics of Financial Data to theoretically underpin the research and emphasize the distinct predictive relationships this study aims to examine.

2. LITERATURE REVIEW

This research is based on two principal theoretical frameworks: Internal Control Theory, namely the COSO Framework (COSO, 2013), and the recognized Qualitative Characteristics of Financial Information. The connection between these two domains is frequently examined via agency theory (Jensen and Meckling, 1976), which asserts that robust controls are essential to harmonize the interests of management (agents) with those of the stakeholders (principals) by guaranteeing transparent and dependable reporting (Koolma, 2024; Madhavan et al., 2023).

2.1. Accounting Controls and Internal Control Theory

Accounting controls constitute the operational elements of an organization's extensive internal control framework (Shareef et al., 2023). Literature classifies these controls into three primary categories: Preventive (preventing errors prior to their occurrence, e.g., segregation of duties) (Naboth-Odums et al., 2022), detective (detecting errors post-occurrence, e.g., reconciliations), and corrective (rectifying identified errors, e.g., procedural modifications) (Lartey et al., 2020).

A recent study underscores the imperative for a more comprehensive and nuanced approach, broadening the framework to encompass directive/promotional and compensatory regulations (Lartey et al., 2020). Directive controls aim to direct employee conduct towards objectives (e.g., training, codes of conduct), whereas compensatory controls serve as supplementary measures designed to mitigate risk when primary controls are impractical (e.g., data backups, robust corporate governance) (Manginte, 2024).

Empirical evidence increasingly indicates that the efficacy of controls transcends simple prevention. Research conducted by Olumoh (2024) and Ngari (2017) indicates that detective and compensatory controls frequently have a more robust positive link with financial reporting quality compared to sole preventive measures. This indicates that the capacity to efficiently monitor and rectify errors, or to alleviate systemic vulnerabilities, is often more essential for output quality than depending exclusively on initial safeguards. This intricacy highlights the necessity to analyze the distinct prediction capability of each dimension (Maarouf et al., 2024).

2.2. Financial Data Quality

Financial data quality pertains to the utility of accounting information for decision-making and is characterized by certain qualitative attributes (Mahdi et al., 2022). These generally encompass:

- Reliability: The information is comprehensive, impartial, and devoid of significant errors, hence cultivating confidence (Zakariyau and Mustapha, 2021; Salehi et al., 2023).
- Relevance: The knowledge holds predictive and confirmatory significance, capable of impacting economic decisions (Pangaribuan et al., 2023).
- Timeliness: The information is accessible to decision-makers promptly, enabling it to impact their decisions (Antwi et al., 2024).
- Understandability: The material is articulated in a clear and succinct manner (Dulanee et al., 2024).

High-quality data is crucial for informed management decisions (Al-Okaily et al., 2023; Tran Thanh Thuy, 2025), ensuring regulatory compliance (Hu et al., 2021; Nurunnabi, 2021), and sustaining stakeholder confidence. Dulanee et al. (2024) assert that the efficacy of financial reporting is contingent upon the integrity of the quality attributes in the underlying data, irrespective of the enterprise's size or sector (Gyamera et al., 2023).

2.3. Relationship between Accounting Controls and Data Quality

The fundamental theoretical relationship is causal: the implementation of stringent accounting controls aims to result in, and forecast, enhanced qualitative attributes of financial data.

- Preventive controls, such as the segregation of jobs, should primarily augment reliability by diminishing the potential for error or fraud (Idowu et al., 2019).
- Detective controls, like reconciliations, should improve completeness and reliability by identifying and rectifying missing or erroneous transactions (Alastal et al., 2024).
- Directive controls, such as training and explicit policies, ought to improve understandability and relevance by standardizing output and directing workers towards the provision of valuable information (Adib et al., 2021).
- Compensatory controls, such as technology and system backups, are intended to enhance timeliness and overall reliability by ensuring continuous and efficient processing (Monteiro et al., 2023; Ryanto and Tundjungsari, 2024).

Although the current literature generally endorses this positive link (Nguyen et al., 2023; Salameh, 2019), it frequently neglects to consider potential trade-offs or varying effects. Some studies indicate that excessive preventive controls may create bureaucratic bottlenecks that adversely affect timeliness, despite enhancing reliability—a complex dynamic that can only be revealed through a disaggregated analysis of control dimensions (Umar et al., 2024; Lartey et al., 2023).

2.4. Research Gaps

This study seeks to address the empirical gap by explicitly examining the predictive efficacy of the five control dimensions (preventive, detective, corrective, directive, and compensatory) on the distinct attributes of financial data quality in Thai credit unions. Building on the theoretical framework established in the literature review, which highlighted the empirical gap concerning the varying effects of control dimensions, the subsequent section delineates the specific research objectives, questions, and hypotheses required

to bridge this gap and evaluate the relationships inferred from established theory.

2.5. Research Objectives, Questions, Hypotheses

2.5.1. Research objectives

This study seeks to accomplish the following objectives:

1. To evaluate the perception of accounting controls (by dimension) and the quality of financial data (by characteristic) among executives in credit unions.
2. To investigate if substantial disparities exist in the perception of accounting controls and the quality of financial data among credit unions, categorized by essential organizational features (e.g., type, size, and financial performance).
3. To examine the correlation and predictive impact of accounting control aspects (including detective and compensatory controls) on the overall quality of financial data in credit unions.

The following are the three primary research questions (RQs), accompanied by sub- questions for a comprehensive examination.

2.5.2. Research questions

The research aims to address the following fundamental inquiries:

(1) Research Question 1: Level of Perception
What is the perception of accounting controls (categorized as preventive, detective, corrective, directive, and compensatory) and the quality of financial data (characterized by relevance, reliability, completeness, decision-relevance, and timeliness) among credit union executives in the Northeastern Region of Thailand?

(2) RQ2: Variations Based on Attributes
Do substantial disparities exist in the perception of accounting controls and the quality of financial data when credit unions are categorized by organizational criteria such as kind, location, years of operation, membership size, and average annual operational results?

(3) RQ3: Correlation and Predictive Impact
What is the correlation between accounting controls (by dimension) and the quality of financial data, and which specific control dimensions significantly predict the overall and dimensional quality of financial data in these credit unions?

(4) Sub-Questions

To guarantee that all facets of your statistical analysis are addressed by the research questions:

- Sub-Q 3.1: What is the precise association between each dimension of accounting controls and the overall quality of financial data?
- Sub-Q 3.2: Which aspects of accounting controls are important predictors of financial data quality when analyzed for each specific attribute (e.g., dependability, timeliness)?

The hypotheses under examination pertain to the correlation between the five dimensions of accounting controls (preventive (PR), detective (DE), corrective (CO), directive (DI), and compensatory (CO)) and the six dimensions of financial data quality (overall, understandability, reliability, completeness, relevance, and timeliness) as elaborated in the subsequent section.

2.5.3. Hypotheses

1. Hypotheses for descriptive level (RQ1)
   - Hypothesis 1 (H_1): The general perception of accounting controls and financial data quality among credit union executives is high.
2. Hypotheses regarding variations based on organizational attributes (RQ2)
   - Hypothesis 2 (H_2): A statistically significant disparity exists in the general assessment of accounting controls when credit unions are categorized by organizational criteria (type, location, years of operation, number of members, and operating results).
   - Hypothesis 3 (H_3): A statistically significant difference exists in the overall assessment of financial data quality when credit unions are categorized by organizational criteria (type, location, years of operation, number of members, and operating results).
3. Hypotheses for Relationship and Predictive Influence (RQ3)
   - Hypothesis 4 (H_4): The five elements of accounting controls (preventive, detective, corrective, directive, and compensatory) combined exhibit strong positive correlation and impact on overall financial data quality (QAI).
   - Hypothesis 5 (H_5): The aspects of accounting control jointly exhibit a substantial positive correlation and impact on understandability (UN).
   - Hypothesis 6 (H_6): The aspects of accounting control jointly have a substantial positive correlation and impact on reliability (RE).
   - Hypothesis 7 (H_7): The aspects of accounting control jointly exhibit a substantial positive correlation and impact on Completeness (CP).
   - Hypothesis 8 (H_8): The aspects of accounting control jointly exhibit a strong positive correlation and impact on Relevance for Decision Making (RE).
   - Hypothesis 9 (H_9): The aspects of accounting control jointly exhibit a substantial positive correlation and impact on timeliness (TI).

This section outlines the design, sampling, data collecting, and analysis necessary to rigorously evaluate the correlations established in the hypotheses.

3. METHODOLOGY

3.1. Research Design

This study utilized sequential explanatory mixed-methods research methodology (QUAN → QUAL). This methodology emphasized the quantitative (QUAN) phase to collect generalizable statistical data from an extensive sample. The ensuing qualitative phase aimed to evaluate, contextualize, and elucidate the principal findings and unforeseen discoveries obtained from the original statistical study.

3.2. Population, Sample, and Sampling Selection

3.2.1. Population

The study's population consisted of all executives and board members of credit unions operating in the Northeastern Region

(Isaan) of Thailand. These individuals were selected due to their major role in executing internal controls and supervising financial reporting, rendering them the best qualified source for evaluating control efficacy and data quality perception.

3.2.2. Samples

The sample comprised 181 executives and board members from credit unions. The final sample for the quantitative phase comprised 181 participants, with each sample unit representing an individual executive or board member selected from each participating credit union (CU). The participants were selected from CUs that displayed various organizational characteristics throughout the Northeastern Region of Thailand. The sample comprised various forms of CU, including Teacher CUs (21.55%), Public Health CUs (19.34%), and Military CUs (15.47%). The sample geographically included all 20 provinces, with notable concentrations in regional centers such as Khon Kaen (14.92%) and Nakhon Ratchasima/Udon Thani (9.39% each). The experience profile of the sample credit unions was advanced, with the majority functioning within the 10- to 40-year-old range (73.48%).

3.2.3. Sampling selection

The sample selection comprised two phases:

3.2.3.1. Phase 1: Selection of samples for the quantitative phase

The quantitative phase utilized a dual stage sampling procedure, incorporating a census for organization selection and purposive sampling for the selection of individual key informants.

- Census (Comprehensive Enumeration) for Organizational Selection
  The principal method for selecting the Credit Unions (CUs) was a census (or total enumeration). The aggregate population of all registered credit unions across the 20 provinces of Thailand's Northeastern Region was 181, and the study effectively gathered data from an executive representing all 181 CUs. This method eradicates sampling errors, guaranteeing that the results are entirely representative and highly generalizable to the entire CU population within the specified geographic area.
- Purposive Sampling for Respondent Selection
  In each of the 181 CUs, the individual respondent was chosen by purposive sampling. Data was gathered exclusively from one executive or board member of each credit union. These individuals were deliberately selected due to their roles necessitating expert knowledge and organizational oversight to effectively evaluate internal controls and the accuracy of financial data, rendering them the most competent key informants for the research inquiries. This approach guarantees data validity by selecting respondents whose professional expertise directly corresponds with the constructs under examination.

The quantitative phase employed a census of all 181 credit unions in the Northeastern Region, utilizing purposive sampling to guarantee that the primary informant in each organization was an executive or board member possessing the necessary knowledge for the study.

3.2.3.2. Phase 2: Sampling selection for the qualitative phase

The qualitative phase employed Purposeful sampling to identify a focused group of significant informants for semi-structured interviews. This technique, executed following the quantitative analysis, aimed to furnish comprehensive, contextual data to elucidate the statistical results.

The objective of this sampling was to identify participants whose experiences might most effectively elucidate the rationale underlying the quantitative findings. Approximately six credit union executives or managers were chosen based on criteria derived from quantitative data, employing maximum variation or critical case sampling methods.

Participants were chosen according to the criteria established from the quantitative findings:

- Explanatory cases: Executives from credit unions that demonstrated significantly elevated or diminished expected Financial Data Quality scores according to the regression model, enabling the researcher to discern best practices or substantial obstacles in control implementation.
- Divergent cases: Executives from credit unions representing various organizational kinds (e.g., a teacher's credit union versus a military credit union) elucidated the conclusion that no substantial statistical difference in control perception existed among these groups.
- Critical cases: Executives capable of providing specific, thorough explanations of the operational trade-offs associated with the most nuanced quantitative findings, such as the adverse impact of preventive controls on timeliness.

This method guaranteed that the qualitative data collected was pertinent to evaluating and contextualizing the statistical correlations identified in the preliminary phase.

3.3. Data Collection and Instruments

Data collection was conducted in two consecutive phases in accordance with the research design.

3.3.1. Phase 1: Quantitative data collection

Table 1 below provides a summary of Phase 1.

The quantitative instrument was a self-administered questionnaire divided into three sections (Table 2).

Table 1: Summary of phase 1: Quantitative data collection and analysis

Component	Description
Purpose	The aim is to quantitatively ascertain the levels, disparities, and prediction correlations between accounting controls and financial data quality (RQ1, RQ2, RQ3).
Sample	The complete sample comprises 181 credit union executives.
Instrument	Questionnaire
Data analysis	The course covers descriptive statistics such as mean and standard deviation, one-way analysis of variance (ANOVA), multiple correlation, and multiple regression analysis.

Table 2: Structure and measurement of the quantitative research instrument

Section	Content focus	Measurement scale	Source/Adaptation
1. Demographics	CU and executive profile (kind, location, role)	Nominal/Ratio	Researcher-developed
2. Accounting Controls (Independent Variables)	Perception of five dimensions: Preventive (PR), Detective (DE), Corrective (CO), Directive (DI), and Compensatory (CC).	5-point Likert Scale (1 = Strongly Disagree; 5 = Strongly Agree)	The model is based on the COSO Framework (2013) and relevant control literature.
3. Quality of Financial Data (Dependent Variables)	Evaluation of six characteristics: QAI (Overall Quality), UN (Understandability), RE (Reliability), CP (Completeness), TI (Timeliness), and Relevance	5-point Likert Scale (1 = Extremely Low; 5 = Very High)	The framework is based on the IFRS/FASB Conceptual Framework for financial reporting.

3.3.2. Phase 2: Qualitative data collection

Table 3 below provides a summary of Phase 2.

The semi-structured interview approach was designed to address statistical results directly from the QUAN phase (Table 4):

3.4. Data Analysis

3.4.1. Quantitative data analysis

The analysis was organized to carefully address each research topic (Table 5).

3.4.2. Integration and interpretation

The research utilized a linking technique in which the qualitative phase was specifically leveraged to elucidate and corroborate the quantitative results. The regression results indicating the substantial predictive value of compensatory controls were elucidated through detailed, real-world accounts from executive interviews concerning the efficacy of standardized cooperative accounting software and obligatory monthly reconciliations.

3.5. Reliability and Validity Checks

3.5.1. Internal consistency reliability

A pilot test was conducted on a sample of 30 executives (excluded from the final study) to calculate the Alpha values for all constructs. The resulting overall Alpha value of 0.77 indicates satisfactory internal consistency reliability and exceeds the minimum acceptable threshold of 0.70.

3.5.2. Validity checks

Content validity was established through an expert panel review (five subject matter experts). The review results were quantified using the Index of Item-Objective Congruence (IOC). The average IOC score of 0.65 confirms adequate content validity, as all retained items exceeded the acceptable minimum criterion of 0.50. Construct validity was assessed by verifying discriminant validity using a correlation matrix. This examination ensured that theoretically distinct constructs (e.g., preventive control vs. detective control) were empirically separate. The observed correlation was 0.65 (significantly less than 1.0), confirming that the constructs are empirically distinct and are not measuring the same underlying concept.

The next section provides the data and statistical outcomes necessary to address the study's research questions.

Table 3: Summary of phase 2: Qualitative data collection and analysis

Component	Description
Purpose	To elucidate the rationale underlying the statistical outcomes, this task encompasses elucidating the efficacy of compensatory and detective controls, as well as the uniformity of perceptions across various credit union sizes.
Sampling Strategy	Intentional sample methods, such as maximum variation or critical case sampling, were utilized, leading to the selection of a restricted group of 6–10 senior executives for interviews. These individuals were selected based on their prior performance, such as executives from credit unions with the best projected data quality scores or representatives from many types of credit unions.
Instrument	Semi-Structured Interview Protocol
Data Analysis	We used thematic analysis (transcription, coding, and identification of reoccurring themes) to correlate practice with statistical outcomes.

Table 4: Structure and focus areas of the semi-structured interview protocol

Focus area	Key guiding question examples
Explaining high perception	The research indicated that compensatory controls, such as customized software, are exceptionally successful. Could you elucidate how your credit union employs these controls and the rationale behind their effectiveness?
Explaining uniformity	Our research indicated no substantial variation in control perception among various CU types and sizes. Could you elucidate the reasons for this consistency, potentially attributable to regulatory mandates or common best practices?
Explaining divergent effects	Investigating the adverse relationship between PR and timeliness Our investigation indicated that stringent preventive controls adversely affected timeliness. Could you provide an example of a control that induces delays in your daily reporting procedure?

4. RESULTS

4.1. Perception Level

The evaluation for Research Question 1 (RQ1) examined the perception of accounting controls and the quality of financial data among credit union executives in Thailand's Northeastern Region. The results demonstrate that the perceived level for both constructs is elevated across all assessed parameters.

Table 5: Alignment of research questions with data and quantitative analysis methods

Research question (RQ)	Data required	Analysis method
RQ1: Perception level	Opinion on controls and quality	We used descriptive statistics (mean and standard deviation) to establish the level of perception
RQ2: Differences based on characteristics	General CU info (type, location, etc.) versus overall mean scores	We used one-way analysis of variance (ANOVA) to compare means across different organizational groups.
RQ3: Relationship and predictive influence	Control dimensions versus quality characteristics	We used multiple correlation and multiple regression analysis to determine the strength of the relationship and identify significant predictive dimensions.

Table 6: Ranking of accounting control dimensions

Control dimension	Mean ($\bar{x}$)	Rank	Level of opinion
Compensatory	4.05	1	High
Detective	4.01	2	High
Directive/Promotional	3.92	3	High
Preventive	3.78	4 (Tied)	High
Corrective	3.78	4 (Tied)	High
Overall	3.91		High

Table 7: Ranking of financial data quality characteristics

Data quality characteristic	Mean ($\bar{x}$)	Rank	Level of opinion
Relevance for Decision Making	4.20	1	High
Timeliness	4.10	2	High
Completeness	4.04	3	High
Reliability	3.87	4	High
Understandability	3.80	5	High
Overall	4.00		High

Table 8: Summary of ANOVA results for differences in accounting control perception by organizational characteristics

Organizational characteristic	Statistical test	P-value	Finding (at α=0.05)
Type	ANOVA (Table B1)	0.698	No significant difference (P>0.05)
Location	ANOVA (Table B2)	0.347	No significant difference (P>0.05)
Years of Operation	ANOVA (Table B3)	0.522	No significant difference (P>0.05)
Number of Members	ANOVA (Table B4)	0.059	No significant difference (P>0.05)
Average Annual Operating Results	ANOVA (Table B5)	0.933	No significant difference (P>0.05)

4.1.1. Accounting controls

The general assessment of accounting controls was graded as high (mean = 3.91, standard deviation = 0.87). An in-depth examination of the individual aspects (Table 6 in the main text) disclosed a distinct hierarchy in perceived efficacy (also see Table A1 in Appendix A for comprehensive descriptive data).

Table 9: Summary of ANOVA results for differences in financial data quality perception by organizational characteristics

Organizational characteristic	Statistical test	P-value (initial)	Finding (final conclusion)
Type	ANOVA (Table C1)	0.839	No significant difference (P>0.05)
Location	ANOVA (Table C2)	0.003*	No significant difference after post-hoc analysis
Years of Operation	ANOVA (Table C3)	0.749	No significant difference (P>0.05)
Number of Members	ANOVA (Table C4)	0.085	No significant difference (P>0.05)
Average Annual Operating Results	ANOVA (Table C5)	0.053	No significant difference (P>0.05 at α=0.05)

The assessment of Accounting Control effectiveness revealed a distinct hierarchy in perceived strength among Credit Union executives. Compensatory Controls ($\bar{x}$ = 4.05) and Detective Controls ($\bar{x}$ = 4.01) were rated as the strongest dimensions, with specific practices like data backup and accurate asset registration receiving the highest individual scores ($\bar{x}$ = 4.19), signifying core operational strengths in safeguarding and verifying financial information. Conversely, although all dimensions maintained an overall "high" rating, Preventive Controls and Corrective Controls were perceived as the least effective ($\bar{x}$ = 3.78 for both), suggesting these specific areas require targeted reinforcement to achieve optimal control quality. Qualitative Context on Compensatory Control Effectiveness:

Qualitative data supported the high ranking of compensatory controls, attributing their perceived effectiveness directly to the mandatory use of standardized, specialized accounting software. Executives noted that the software forces compliance and provides an automated safeguard. For instance, one manager stated: "The system [software] forces compliance. It handles things like cross-checking and automatic balancing, which is much more reliable than relying on staff to manually check everything. It's our main safeguard." Another executive emphasized the efficiency gain: "Our CU uses cross-checking protocols heavily... because the software makes it easy. This works so well because it reduces human error at the point of data entry." This suggests that technological integration is the primary driver of perceived control strength.

The evaluation of accounting control efficacy disclosed a clear hierarchy in perceived strength among credit union executives. Compensatory Controls ($\bar{x}$ = 4.05) and Detective Controls ($\bar{x}$ = 4.01) were evaluated as the most robust dimensions, with practices such as data backup and precise asset registration attaining the highest individual ratings ($\bar{x}$ = 4.19), indicating fundamental operational strengths in the protection and verification of financial information. Conversely, while all dimensions retained an overall "high" grade, preventive controls and corrective controls were regarded as the least effective ($\bar{x}$ = 3.78 for both), indicating that these areas necessitate focused enhancement to attain ideal control quality.

Table 10: Summary of predictive findings and hypothesis testing

Dependent variable (financial data quality)	Significant predictive dimensions (β/P-value)	Adjusted R^2	Key Finding	Hypothesis result
Overall (QAI) (H4)	Detective (DE) (β=0.600, P<0.001), Compensatory (CC) (β=0.253, P=0.004)	0.461	DE and CC exert a considerable favorable impact.	Partially Supported
Understandability (UN) (H5)	Compensatory (CC) (β=0.409, P<0.001), Detective (DE) (β=0.216, P=0.014)	0.216	CC and DE exert a substantial favorable impact.	Partially Supported
Reliability (RE) (H6)	Preventive (PR) (β=0.689, P<0.001)	0.559	PR is the single, strong positive predictor (Highest R^2).	Partially Supported
Completeness (CP) (H7)	Detective (DE) (β=0.592, P<0.001), Corrective (CO) (β=0.161, P=0.008), Preventive (PR) (β=−0.129, P=0.008)	0.310	DE and CO exhibit positivity; PR demonstrates negativity.	Partially Supported
Relevance (RE) (H8)	Directive (DI) (β=0.235, P=0.022), Detective (DE) (β=0.197, P=0.029)	0.215	DI and DE exert a significant positive impact.	Partially Supported
Timeliness (TI) (H9)	Detective (DE) (β=0.681, P<0.001), Directive (DI) (β=0.441, P=0.005), Compensatory (CC) (β=0.181, P=0.009), Preventive (PR) (β=−0.576, P<0.001)	0.469	DE, DI, and CC exhibit positive values; PR is strongly negative.	Partially Supported

Qualitative findings corroborated the elevated rating of compensatory controls, linking their perceived efficacy directly to the obligatory utilization of standardized, specialist accounting software. Executives observed that the software enforces compliance and offers automated protection. For example, one manager remarked, "The system [software] mandates compliance." It manages tasks like cross-verification and automated reconciliation, which is significantly more dependable than depending on personnel for manual verification. It serves as our primary safeguard. Another executive highlighted the efficiency improvement: "Our CU extensively employs cross-checking protocols... due to the software's user-friendliness." This is effective, as it minimizes human error during data entry. This indicates that technology integration is the principal factor influencing perceived control strength.

4.1.2. Financial data quality

The executives' general assessment of financial data quality was scored as high ($\bar{x}$ = 4.00, S.D. = 0.87). The rating of individual qualitative features delineates the best and weakest components of the reported data (Table 7).

The data's foremost strength is its relevance for decision-making ($\bar{x}$ =4.20), which received the highest ranking and is corroborated by its perceived worth in "forecasting future status" ($\bar{x}$ = 4.41). This suggests that CEOs consider the financial data exceedingly valuable for strategic objectives. Conversely, despite all characteristics receiving high ratings, Understandability ($\bar{x}$ =3.80) was rated lowest, indicating that, in comparison to other attributes, the clarity, accessibility, and ease of comprehension of the data are the most deficient aspects of the financial reporting output.

Hypothesis 1 is fully supported, as the mean scores for Accounting Controls ($\bar{x}$ = 3.91) and Financial Data Quality ($\bar{x}$ = 4.00) both reside within the 'High' perception range (≥3.50 on a 5-point scale), indicating a high overall perception level among credit union executives.

4.2. Analysis of Differences Based on Organizational Characteristics

Research Question 2 (RQ2) examined whether organizational features resulted in substantial variations in the perception of accounting controls and the quality of financial data. The analysis has consistently shown statistically insignificant variation in the overall impression of each construct across organizational groupings, leading to the rejection of all hypotheses suggesting such differences.

4.2.1. Perception of accounting controls

A one-way analysis of variance (ANOVA) was employed to examine if the elevated overall assessment of Accounting Controls ($\bar{x}$ = 3.91) differed across five organizational features.

Formal Reply to H_2: The ANOVA results indicate no statistically significant difference in the overall perception of accounting controls among credit unions categorized by any of the five examined characteristics ($P > 0.05$ for all comparisons). Consequently, hypothesis 2 is rejected (Table 8).

The ANOVA results indicate that the executives' elevated assessment of accounting controls is consistent throughout the Northeastern Region, irrespective of the credit union's organizational characteristics. This conclusion is ascribed to the impact of the legislative framework and standardized practices, which effectively establish a uniform perceived norm for accounting controls throughout the diverse credit union sector. Refer to Tables B1-B5 in Appendix B for comprehensive statistical results of all comparisons. CU executives consistently attributed stability to the regulatory framework and standardized procedures when asked to elucidate this consistency. According to one executive:

The Cooperative Promotion Department (CPD) establishes the criteria for financial reporting and internal control. All entities must adhere to a uniform baseline, including identical charts of accounts, the same audit criteria, and the utilization of the same vendor's accounting software by many. The distinction between a small and large credit union is solely in the number of transactions, rather than the governance framework.

This indicates that external mandates and tool standardization effectively establish a uniform perceived standard for accounting controls throughout the diverse credit union industry.

4.2.2. Perception of financial data quality

ANOVA was employed to determine if organizational characteristics resulted in significant variations in the elevated overall assessment of financial data quality ($\bar{x}$ = 4.00). The analysis revealed no statistically significant difference in the overall assessment of financial data quality ($\bar{x}$ = 4.00) when credit unions were categorized by any of the five examined organizational features (P > 0.05 for all final results). Consequently, Hypothesis 3 is rejected (Table 9).

The assessment of financial data quality remained consistent across various organizational attributes. The sole exception was the first ANOVA for location, which revealed a statistically significant difference (P = 0.003). Nevertheless, a comprehensive analysis (Tables C1-C6 in Appendix C, including the MANOVA results) did not identify specific location groups responsible for this effect. Consequently, the definitive and cautious conclusion is that the elevated perceived quality of financial data ($\bar{x}$ = 4.00) is consistent and unaffected by the credit union's kind, size, or operational history. This discovery reflects the consistency noted in perceptions of accounting control, underscoring the impact of system-wide issues, such as legislation, over internal organizational variations.

4.3. Relationship and Predictive Influence

Research Question 3 (RQ3) examined the predictive impact of the five aspects of accounting control on the overall quality and specific attributes of financial data through multiple regression analysis. The investigation verified that the aspects of accounting control jointly exert a statistically significant impact on the quality of financial data. The influence is complex and varied, resulting in all examined hypotheses being partially supported.

All prediction models demonstrated statistical significance (P < 0.05), with the control dimensions collectively accounting for 21.5% (relevance) to 55.9% (reliability) of the variance in financial data quality (adjusted R^2) (Table 10).

The analysis uncovers a significant and intricate variation in the functions of several control types:

1. Dominance of Detective Controls (DE): Detective controls were the most prevalent and influential positive predictors, significantly affecting five of the six data quality attributes. The standardized coefficient (β) was consistently high, particularly for timeliness (β = 0.681), highlighting the essential role of monitoring and error-correction mechanisms in attaining superior reporting quality.
2. The Divergent Role of Preventive Controls (PR): This dimension had the most intricate and subtle impact.
    - Significant Positive Influence of PR on Reliability: PR emerged as the foremost predictor of reliability (β = 0.689), accounting for more than fifty percent of its variance. This reinforces the theoretical notion that strong initial controls, such as segregation of duties, are essential for data integrity.
    - Timeliness and Completeness Exhibit Significant Negative Impact: Paradoxically, PR demonstrated a substantial negative effect on both completeness (β = −0.129) and, more prominently, timeliness (β = −0.576). This significant discovery indicates that the existing use of preventative measures (e.g., excessive permission layers or inflexible pre-checks) creates bureaucratic impediments that impede transaction processing, consequently obstructing the comprehensive and prompt dissemination of financial information.
3. Supportive Roles of Other Controls:
    - Compensatory Controls (CC) served as a substantial positive predictor for overall quality, understandability, and timeliness, signifying that methods such as data backup and system-based cross-checking are essential for enhancing data accessibility and usability.
    - Directive Controls (DI) were significant positive predictors for relevance and timeliness, emphasizing the value of explicit policy and training in directing data production and prioritizing expediency.
    - Corrective Controls (CO) had a limited yet beneficial impact, just forecasting completeness.

In conclusion, obtaining high-quality financial data necessitates a complex integration of controls, predominantly dependent on detective procedures for widespread impact. It is imperative to optimize preventive controls, as they are vital for reliability, but, in their present condition, they seem to significantly hinder timeliness and completeness.

5. DISCUSSION

This study aimed to examine the link empirically and predict the influence of various dimensions of accounting controls on the qualitative characteristics of financial data in Thai credit unions (CUs). The regression study pertaining to RQ3 produced various nuanced and noteworthy findings that both corroborate established Internal control theory and provide, actionable insights pertinent to the Thai CU setting.

5.1. Interpretation of Differential Control Impact (RQ3)

The primary conclusion from the regression models (summarized in Tables D1-D6 in Appendix D) is that accounting controls serve as a robust, albeit variable, predictor of financial data quality. The impact is not uniform; instead, certain control aspects distinctly influence specific quality features, underscoring the need for a disaggregated examination.

5.2. The Dominance of Detective and Compensatory Controls

In alignment with current research, Detective (DE) and Compensatory (CO) controls consistently appeared as the most substantial positive predictors of data quality metrics (e.g., QAI, UN, CP, Relevance, and TI).

- Impact on Quality and Understandability (QAI & UN): The significant positive coefficients for detective controls (DE) correspond with the assertions of Olumoh (2024) and Ngari (2017), who contended that the capacity to monitor, identify, and rectify errors frequently exerts a greater influence on the ultimate quality of reporting than preventive measures alone. In the resource-limited context of regional credit unions, depending on ex-post verification (detection) may be more pragmatic and efficient.

- Role of Compensation (CO): Compensatory controls (CO), frequently encompassing technological implementations and meticulous procedures to mitigate intrinsic vulnerabilities, were a favorable predictor of completeness (CP). This substantiates the assertion that technology and comprehensive systematic processes serve as essential "gap fillers," enhancing data integrity and processing efficiency, therefore fostering reliability and completeness (Monteiro et al., 2023; Ryanto and Tundjungsari, 2024).

5.3. Nuanced and Divergent Role of Preventive Controls

Although academic literature frequently advocates preventive controls (PR) as the cornerstone of internal control, their function in this study was ambiguous and, moreover, at times counterintuitive.

- Strong Positive Role for Reliability (RE): PR was established as the foremost predictor of reliability ($\beta = 0.689$), indicating that precisely documenting initial transactions is essential for data integrity.
- Significant Negative Impact on Timeliness and Completeness: The substantial negative coefficient for preventive controls (PR) on both completeness (CP) and timeliness (TI) represents a crucial discovery. This outcome indicates that stringent compliance with preventive protocols (such as onerous authorizations and multi-tiered approvals) may generate bureaucratic impediments, resulting in delays in transaction documentation and reconciliation. This reflects the apprehensions expressed by Lartey et al. (2023) and Umar et al. (2024) concerning potential trade-offs and bottlenecks linked to stringent 'hard regulations,' suggesting a necessity for optimization rather than maximal implementation.

5.4. Alignment with Strategic Focus

- Directive Controls (DI): Directive controls, emphasizing training and policy clarity, were identified as strong positive predictors of Relevance (RE) and Timeliness (TI). This suggests that when CU staff comprehend the necessity of the information (relevance) and the timing of its requirement (timeliness), as conveyed through policies and training (Adib et al., 2021), the quality of output enhances. This supports the notion that the 'soft side' of internal control is crucial for operational emphasis.
- Consistency with Theoretical Frameworks: These findings bolster the foundational Agency Theory (Jensen and Meckling, 1976), wherein controls serve to align interests and guarantee accountability. The significant predictive capability of controls regarding data attributes, particularly Reliability and Relevance, substantiates that strong internal frameworks are the most effective means for management (agents) to transparently communicate their stewardship to CU members (principals) (Koolma, 2024). Moreover, the differential impact reinforces the COSO Framework's comprehensive perspective, highlighting that control operations should be regarded dynamically, with detection and monitoring being as essential as prevention (COSO, 2013).

5.5. Implications for Financial Governance in Thai Credit Unions

The empirical evidence translates into specific, actionable implications for financial governance in the Thai CU sector:

- Shift Focus to Detection and Training: Thai credit unions should prioritize investments in detective controls, such as automated reconciliation software and periodic comprehensive internal audits, as well as directive controls, including mandated, high-quality staff training on data needs. These factors provide the most robust predictive correlation with overall data quality, relevance, and manageability.
- Optimize, Not Maximize, Prevention: Credit unions must evaluate existing preventive controls to pinpoint bureaucratic redundancy. Although the segregation of roles is crucial (Idowu et al., 2019), any preventive control that impedes transaction flow must be reassessed to guarantee it does not undermine timeliness, which is critical for successful decision-making (Antwi et al., 2024).
- Harness Technology for Compensation: The beneficial function of compensatory controls highlights the importance of utilizing accounting information systems (AIS) to guarantee completeness and timeliness (Jannah et al., 2024). Credit unions should implement digital solutions for automated data capture, processing, and system backup to improve the technical dimensions of data reliability, thus offsetting deficiencies in manpower or resources (Al-Okaily et al., 2023).

5.6. Conclusion of Discussion

This study confirms that strong accounting controls are essential for obtaining high-quality financial data, with the important qualification that not all control dimensions are equally effective or advantageous in every setting. For Thai credit unions, enhancing the quality of financial reporting, as characterized by its qualitative attributes, depends more on targeted detection, training, and compensation mechanisms than on stringent prevention measures. These findings offer the essential empirical foundation to transcend conventional best practices and execute focused, high-impact governance measures within the regional financial cooperative context.

6. CONCLUSION AND RECOMMENDATIONS

This study effectively examined the correlation between the five dimensions of accounting controls and the qualitative attributes of financial data in Thai credit unions (CUs). The research utilized multivariate regression analysis to furnish empirical evidence that endorses strategic, targeted enhancements in financial governance inside the regional cooperative sector.

6.1. Key Findings

The analysis of the predictive influence of control dimensions (RQ3) revealed that while accounting control significantly impacts data quality, the effects are differential and non-uniform:

- Detective and Compensatory Controls are Key Predictors: Detective Controls (DE) and Compensatory Controls (CO) proved to be the most robust and reliable positive predictors for various data quality attributes, such as the Quality of Accounting Information (QAI), Understandability (UN), and Completeness (CP). This underscores the capacity to monitor,

identify problems, and address control deficiencies (typically through technology) is essential for ensuring data integrity and reliability.

- Preventive Controls Show Nuanced Negative Impact: Preventive Controls (PR) demonstrated a substantial negative correlation with Timeliness (TI) and Completeness (CP). This paradoxical discovery indicates that too rigid or intricate preventive measures may generate bureaucratic obstacles that hinder the speed and completeness of transaction processing, therefore impeding operational efficiency.
- Directive Controls Enhance Strategic Value: Directive Controls (DI) were identified as a substantial positive predictor of Relevance (RE) and Timeliness (TI). This signifies that explicit policies and comprehensive staff training are essential for guaranteeing that data production is targeted, beneficial, and readily accessible for management and member decision-making.

6.2. Implications for Practice and Policy

These differential findings carry direct and practical implications for CU management, regulators, and stakeholders seeking to optimize financial reporting quality:

- Strategic Resource Allocation: CUs should strategically shift resources from merely emphasizing extensive, paper-based preventive measures toward investing in Detective tools (e.g., automated reconciliations, frequent internal reviews) and Compensatory systems (e.g., robust accounting software, system backups). These are the most efficient and statistically proven drivers of reliable and complete data.
- Policy and Process Optimization: Management must urgently review existing control procedures to streamline processes. Policies should be simplified to mitigate the negative impact of rigid Preventive controls on operational efficiency, ensuring essential security is maintained without compromising Timeliness, which is vital for effective governance (Antwi et al., 2024).
- Focus on Training and Purpose: The positive link with Directive Controls underscores the need for continuous training that not only instructs staff on *how* to process transactions but also clearly explains the purpose (Relevance) and urgency (Timeliness) of the resulting financial data for management and member decision-making.

6.3. Limitations and Directions for Future Study

The study presents strong empirical evidence for distinguishing the effects of accounting controls; nonetheless, it has shortcomings that present opportunities for further research.

1. Methodological Limitation (Perception vs. Reality): Surveys often collect perception-based data, which is susceptible to technique bias. Subsequent research should incorporate objective, historical data (e.g., external audit reports, frequency of financial statement restatements, or quantifiable transaction cycle durations) to corroborate the perceived control effectiveness identified in this study.
2. Contextual Limitation (Scope and Generalizability): The scope was limited exclusively to credit unions in the northeastern region of Thailand. It is essential to replicate this study across credit unions in other Thai regions or comparable financial cooperatives (e.g., agricultural cooperatives) to evaluate the external validity and generalizability of the models.
3. Causality and Mechanism: While the analysis identified substantial predictive associations (RQ3), the precise causal mechanism underlying the key negative correlation between preventive controls and timeliness/completeness remained unexamined. Subsequent study ought to utilize sophisticated statistical methodologies, including mediation or moderation analysis, to ascertain whether variables such as organizational size, staff capabilities, or digital infrastructure mediate or mitigate this adverse effect.
4. Emerging Control Types: The research concentrated on five conventional control dimensions. Considering the swift digital transition within the financial industry, future studies ought to investigate the impact of novel control types, including IT General Controls (ITGCs) and specialized Fraud Risk Controls, on data quality results.

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APPENDIXES

Appendix A: Opinion Levels Regarding Accounting Controls

Table A1: Opinion levels regarding accounting controls, overall and by dimension, of credit unions in the northeastern region (Thailand)

Accounting control dimension	Mean ($\bar{x}$)	Standard deviation (S.D.)	Level of opinion
Preventive Control	3.78	0.91	High
Detective Control	4.01	0.85	High
Corrective Control	3.78	0.88	High
Directive/Promotional Control	3.92	0.88	High
Compensatory Control	4.05	0.85	High
Overall	3.91	0.87	High

Appendix B: Detailed ANOVA Results for Accounting Controls

Table B1: Comparative analysis of overall accounting controls by credit union type

Source of variation	Sum of squares (SS)	df	Mean square (MS)	F	P-value
Between Groups	1.956	6	0.326	0.641	0.698
Within Groups	88.539	174	0.509		
Total	90.494	180			

Finding: No significant difference in the perception of overall accounting controls by type (P>0.05).

Table B2: Comparative analysis of overall accounting controls by credit union location

Organizational characteristic	Statistical test	P-value	Finding (at α=0.05)
Location	ANOVA	0.347	No significant difference (P>0.05)

Table B3: Comparative analysis of overall accounting controls by years of operation

Organizational characteristic	Statistical test	P-value	Finding (at α=0.05)
Years of operation	ANOVA	0.522	No significant difference (P>0.05)

Table B4: Comparative analysis of overall accounting controls by number of members

Organizational characteristic	Statistical test	P-value	Finding (at α=0.05)
Number of Members	ANOVA	0.059	No significant difference (P>0.05)

Table B5: Comparative analysis of overall accounting controls by average annual operating results

Organizational characteristic	Statistical test	P-value	Finding (at α=0.05)
Average annual operating results	ANOVA	0.933	No significant difference (P>0.05)

Appendix C: Detailed ANOVA and MANOVA Results for Financial Data Quality

Table C1: Comparative analysis of overall financial data quality by credit union type

Source of variation	SS	df	MS	F	P-value
Between Groups	1.332	6	0.222	0.457	0.839
Within Groups	84.571	174	0.486		
Total	85.903	180			

Finding: No significant difference in the perception of overall financial data quality by type (P>0.05)

Table C2: Comparative analysis of overall financial data quality by credit union location

Source of variation	SS	df	MS	F	P-value
Between Groups	18.225	19	0.959	2.282	0.003*
Within Groups	67.678	161	0.420		
Total	85.903	180			

Initial ANOVA showed a significant difference, requiring post-hoc analysis

Table C3: Comparative analysis of overall financial data quality by credit union by years of operation

Source of variation	SS	df	MS	F	P-value
Between groups	0.588	3	0.196	0.406	0.749
Within groups	85.316	177	0.482		
Total	85.903	180			

Finding: No significant difference in the perception of overall financial data quality by years of operation (P>0.05)

Table C4: Comparative analysis of overall financial data quality by credit union by number of members

Source of variation	SS	df	MS	F	P-value
Between groups	3.142	3	1.047	2.240	0.085
Within groups	82.761	177	0.468		
Total	85.903	180			

Finding: No significant difference in the perception of overall financial data quality by number of members (P>0.05)

Table C5: Comparative analysis of overall financial data quality by average annual operating results

Source of variation	SS	Df	MS	F	P-value
Between Groups	3.630	3	1.210	2.604	0.053
Within Groups	82.273	177	0.465		
Total	85.903	180			

Finding: No significant difference in the perception of overall financial data quality by average annual operating results (P>0.05 at α=0.05)

Table C6: Comparative analysis of financial data quality by dimension by credit union location (MANOVA)

Statistical test	Financial data quality	Hypothesis df	Error df	F	P-value
Wilk's Lambda	5 Dimensions	95.000	768.541	1.118	0.072

Finding: No significant difference in the perception of individual data quality dimensions by location (P>0.05)

Appendix D: Detailed Predictive Regression Models

Table D1: Predictive model for overall financial data quality (QAI)

Predictor	β (Standardized)	t	P-value
Constant (α)			
Detective Controls (DE)	0.600		<0.001
Compensatory Controls (CC)	0.253		0.004
Model Summary	Adj. R^2=0.461	F=77.26	<0.001
Predictive Equation	QAI=0.665+0.600(DE)+0.253(CC)		

Table D2: Predictive model for understandability (UN)

Predictor	β (Standardized)	t	P-value
Constant (α)			
Compensatory Controls (CC)	0.409		<0.001
Detective Controls (DE)	0.216		0.014
Model Summary	Adj. R^2=0.216	F=25.41	<0.001
Predictive Equation	UN=1.385+0.216(DE)+0.409(CC)		

Table D3: Predictive model for reliability (RE)

Predictor	β (Standardized)	t	P-value
Constant (α)			
Preventive Controls (PR)	0.689		<0.001
Model Summary	Adj. R^2=0.559	F=227.16	<0.001
Predictive Equation	RE=1.228+0.689(PR)		

Table D4: Predictive model for completeness (CP)

Predictor	β (Standardized)	t	P-value
Constant (α)			
Detective Controls (DE)	0.592		<0.001
Corrective Controls (CO)	0.161		0.008
Preventive Controls (PR)	−0.129		0.008
Model Summary	Adj. R^2=0.310	F=27.60	<0.001
Predictive Equation	CP=1.586–0.129(PR)+0.592(DE)+0.161(CO)		

Table D5: Predictive model for relevance for decision making (RE)

Predictor	β (Standardized)	t	P-value
Constant (α)			
Directive Controls (DI)	0.235		0.022
Detective Controls (DE)	0.197		0.029
Model Summary	Adj. R^2=0.215	F=25.29	<0.001
Predictive Equation	RE=2.311+0.197(DE)+0.235(DI)		

Table D6: Predictive model for timeliness (TI)

Predictor	β (Standardized)	t	P-value
Constant (α)			
Detective Controls (DE)	0.681		<0.001
Directive Controls (DI)	0.441		0.005
Compensatory Controls (CC)	0.181		0.009
Preventive Controls (PR)	−0.576		<0.001
Model Summary	Adj. R^2=0.469	F=35.80	<0.001
Predictive Equation	TI=1.215–0.576(PR)+0.681(DE)+0.441(DI)+0.181(CC)		