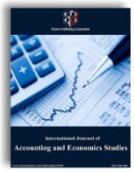
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Research paper



Evaluation of Hospital Accounting System on Outpatient Service Efficiency

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Abstract

This study examines the transformative role of hospital accounting systems in improving the efficiency of outpatient services, focusing par-ticularly on the mediating effect of internal control quality and the moderating effect of the quality of accounting information systems. Using a rigorous methodological approach involving structural equation modelling, the study reveals that key accounting system components, such as recording accuracy, cost control efficiency, system integration and staff competence, significantly strengthen internal control mechanisms. These mechanisms then drive significant improvements in service delivery outcomes. These findings suggest that robust internal control quality is a vital conduit through which the excellence of accounting systems translates into tangible service enhancements. The study also reveals how better information systems can make the connection between integration capabilities and performance outcomes stronger. These ideas provide useful advice for people in charge of healthcare who want to improve their accounting system and control their environment. This research is very important for the study of how organizations are managed. It shows the ways that financial information systems can help to make healthcare more efficient. This is important for making sure that healthcare is available to everyone and for making sure that patients are treated well.

Keywords: *Accounting Information Systems; Internal Control Quality; Healthcare Operations; Service Efficiency; Organizational Performance.*

1. Introduction

There is ongoing pressure on healthcare around the world to deliver quality care and greater efficiency in its delivery. Challenges Central to these challenges are the outpatient services that serve as the l-way proverbial money tree while at the same time serving as primary patient touch points. In such operational environment, digitalization of accounting activities which are supported by modern AIS systems has become highly important (Abu Afifa et al., 2023). Modern AIS no longer focus solely on accounting and, rather have become whole system solutions integrating the administrative (Couture et al., 2025) and clinical information systems across organizations. Cascade evidence also indicates that efficient AIS may lead to decreased administrative barriers and increased patient flow as well as interdepartmental coordination within hospital settings (Gualandi et al., 2019; Ker et al., 2018). Following the pandemic-induced digital transformation in healthcare, hospitals are now under pressure to up-gradation of system that can manage for higher patients inflow and complex workflow (Alfina et al., 2024; Khandelwal et al., 2021).

Until now however, many hospitals around the world notably in developing economics lack an efficient outpatient operation and management due to poor exploitation of computing technology for accounting purposes. Common problems include long wait times, billing mistakes, data islands and poor integration between accounting and clinical systems (Abuelazm et al., 2023; Bin-Nashwan & Li, 2025; Robertson et al., 2012). Lack of financial transparency and inefficiency in cost control systems also reduce effectiveness of managerial decisions (Amador et al., 2025). These deficiencies lead to lower work effectiveness and higher costs (Giuliani & Gitto, 2025; Wagner & Tholen, 2025).

The study is built on RBV because it views AIS as strategic organizational resource that can generate performance impact if well used (Barney et al., 2001; Huong & Dinh, 2025; Lutfi et al., 2020). The (William H Delone & McLean, 2003) model of IS Success also highlights that quality of information system in terms of overall service delivery is linked to improved organizational performances (William H Delone & McLean, 2003). These theories provide a theoretical basis to investigate the impact of AIS characteristics on service efficiency, via internal organizational process.

While the individual characteristics of AIS have been studied previously, these studies have been fragmented across economic environments. Advances in account systems are frequently spurred by deeper capital and developed markets with better insurance protections (Matha et al., 2025). These markets also provide clearer decision-making signals and cost transparency (Guo & Cugurullo, 2025). Emerging markets' hospitals are structurally limited (Mwogosi, 2025), and they also have antiquated computer systems and deficiencies in human resources (Tavares et al., 2025). Furthermore, the impact of transparency and cost containment, along with system integration, can vary significantly based on the competitive environment and resource conditions. A lack of understanding of how attributes of the accounting

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system collectively affect the efficiency of outpatient services is indicated by these discrepancies. This is particularly the case for emerging market hospitals with regard to internal process efficiency and AEIS quality uncertainty.
This study addresses that gap by proposing and empirically testing a comprehensive model that includes:
1) Direct effects of key accounting system attributes on outpatient service efficiency.
2) A mediating mechanism through internal process efficiency.
3) A moderating mechanism through AIS quality.
The study provides more proof, based on real-life examples, of how and when AIS qualities are converted into better outpatient procedures. The results also give hospital managers a fact-based framework to support decisions on where to invest in AIS and/or process reorganization. The model is said to extend the application of the RBV and IS Success Model in healthcare operations, by explaining how the capabilities of accounting systems influence the performance of services.

2. Literature Review

2.1. Recording accuracy and outpatient service efficiency

Improving the accuracy of financial and patient-level data will significantly reduce billing errors, claim rejections and administrative delays, which negatively impact reimbursement cycles and the efficiency of outpatient workflows (Savarese et al., 2025; Z. Yu et al., 2025). Transparent reporting will help managers detect inefficiency. It will also help them allocate resources appropriately. Furthermore, it will improve coordination through intra-departmental accountability (Bouzarjomehri et al., 2025; Garzoni et al., 2024). Managing costs in an efficient way provides better tools for keeping spending under control. This means that limits can be put in place to stop overspending, while at the same time getting rid of any administrative delays that make patients have to wait longer (Davidson et al., 2025; Huang & Lu, 2025).
Moreover, it has been found that accounting systems can be integrated with clinical and administrative workflows, with the result that data silos can be reduced, redundant manual entry can be eliminated, claims processing can be accelerated, and overall revenue cycle performance can be improved (Pai & Pendyala, 2026; Pattanayak et al., 2025; J. Wang et al., 2025). Lastly, skilled personnel with good accounting and IT knowledge would be able to process the transactions more accurately, identify errors in the system as well as maintain a high workflow continuity through training to help align new updates with respect to evolving complex systems (Abdullahi et al., 2025; Kayvanfar et al., 2025; Tobar et al., 2025). These, in turn, should lead to differentiations in recording accuracy of accounting systems, financial transparency, cost control, system integration and staff skills that are theoretically supposed to improve the efficiency of outpatient care services.
H_1: Recording accuracy positively affects outpatient service efficiency.
H_2: Financial reporting transparency positively affects outpatient service efficiency.
H_3: Cost control positively affects outpatient service efficiency.
H_4: System integration positively affects outpatient service efficiency.
H_5: Staff competence positively affects outpatient service efficiency.

2.2. Mediating role of internal process efficiency

The impact of accounting system features on the performance of outpatient services is facilitated by the mediating role of internal process efficiency (Septia & Shafiyah, 2024). A strong internal control system, made up of an ethical management environment, a risk management method and monitoring, helps to report financial performance more accurately (Yasmine, 2024). It also protects the integrity of the billing process and maintains a smooth relationship between the financial and clinical sides (Liu & Walker, 2025; Türk & Eroğlu, 2021; D. Yu et al., 2025). Routine verification processes and dual checking are examples of control measures that help to prevent errors in the billing process. They also help to reduce fraud and ensure that administrative backlogs do not disrupt patient flow (Abuhay et al., 2025; Al Subarkah & Amrulloh, 2024; Siddiqui et al., 2025) . When internal controls are effective, outpatient traffic becomes more predictable, errors are reduced and waiting times decrease (Pribadi et al., 2024; Sharma, 2025; Zhang et al., 2025). It is predicted that internal process efficiency will act as a key intermediary in the conversion of various factors into enhanced operations in outpatient departments . These factors include the accuracy of recording, financial transparency, cost control, system integration, and staff competency(Nhis Puanarak, 2025; Yuliani & catur Widayati, 2025).
H_6–H_{11}: Internal process efficiency positively affects outpatient service efficiency and mediates the relationships between accounting system attributes and outpatient service efficiency.

2.3. The effect of the quality of the accounting information system (AIS) is moderated.

AIS quality enhances the impact of AS attributes on OS efficiency. A high-quality AIS which is determined by the information reliability (receiving of it in time), and the accuracy could strengthen how recording accuracy, financial transparency, and cost control affect reporting levels, budget monitoring and real time processing without error errors (Bagherian & Mukherjee, 2025; Dong & Wu, 2025; Uysal et al., 2025). Similarly, robust AIS competences will enhance the effectiveness of systems integration by securing and facilitating data exchange between departments (Chamorro-de-Vega et al., 2025; Guo & Cugurullo, 2025; Zihao Wang et al., 2025). Therefore, substantial AIS performance not only efficiently manages the processing of financial information but also enhances its operational value throughout outpatient processes.
H_{12}–H_{16}. AIS quality moderates the relationships between accounting system attributes and outpatient service efficiency.

2.4. Conceptual framework of hospital accounting system and outpatient service efficiency

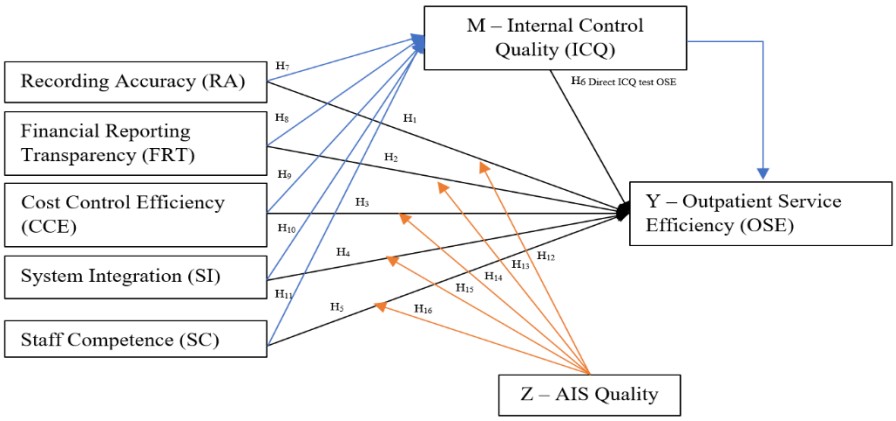


Fig. 1: Conceptual Framework of Hospital Accounting System (CFHAS).

3. Method

3.1. Research design

This research uses a quantitative explanatory approach to explore empirically the cause and effect relations between dimensions of accounting system and internal process efficiency and out-patient service efficiency. Consistent with the positivist worldview, this method employs rigorous, quantifiable measures that are tested via Structural Equation Modelling (SEM). According to Baron and Kenny (1986), this design is a powerful means of examining chains of mediation processes, allowing us to gain complete picture on how system quality and organizational processes influence healthcare performance (Cheirard & Gretha, 2024). Consistent with (Hair & Alamer, 2022), this approach allows for strong hypothesis testing and statistical inferences of complex multivariate relationships.

3.2. Population and sampling technique

All seven hospitals in Kudus, Indonesia participated in the study, there were four public and three private hospitals. A census approach was adopted from all 350 administrative and finance personnel in these hospitals (for institutional dispersion, see Appendix A1). Upon exclusion of incomplete (n=30) and damaged (n=15) questionnaires, 320 completed questionnaires were collected, which corresponded to a response rate of 91.4%. The sample consisted of 54.7% with experience to public hospitals and 45.3% private hospital, with similar representation across clinical (29.4%), financial (19.7%), administrative (19.4%) and IT departments (19.1%). From an educational perspective, involved participants had a bachelor (58.4%), master (22.5%), diploma (11.3%) and doctorate (7.8%). This extensive sampling plan allows appropriate inclusion of the important institutional and patient characteristics pertinent to the study objectives.

3.3. Data collection timeline

A five-point Likert-based structured questionnaire, consisting of seven constructs using already-established scales from accounting and healthcare management research, was designed (Lestari & Nasrifah, 2024). The independent variables Recording Accuracy, Financial Reporting Transparency (Han et al., 2022), Cost Control Efficiency (Chen et al., 2023), System Integration (William H Delone & McLean, 2003), and Staff Competence (Kumar et ai, 2023) were operationalized from pre-described and validated instruments. The mediator variable mediating process efficiency was assessed using the framework measures of (Türk & Eroğlu, 2021). Outpatient Service Efficiency AIS Quality (Andwika et al., 2024) William & McLean, (2003) were dependent and moderating variables. All instruments were validated by expert testing among three colleagues for content validity and contextually in accordance with the Indonesia health care system.

3.4. Measurement variable instrument development

A five-point Likert-based structured questionnaire, consisting of seven constructs using already-established scales from accounting and healthcare management research, was designed (Lestari & Nasrifah, 2024). The independent variables Recording Accuracy, Financial Reporting Transparency (Han et al., 2022), Cost Control Efficiency (Chen et al., 2023), System Integration (William H Delone & McLean, 2003), and Staff Competence (Kumar et ai, 2023) were operationalized from pre-described and validated instruments. The mediator variable mediating process efficiency was assessed using the framework measures of (Türk & Eroğlu, 2021). Outpatient Service Efficiency AIS Quality Andwika et al. (2024), Dany (2025) were dependent and moderating variables. All instruments were validated by expert testing among three colleagues for content validity and contextually in accordance with the Indonesia health care system.

3.5. Data analysis procedure

Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 4.0 were used to study measurement and structural models. The analysis was conducted using a two-stage procedure as recommended by (Ana Dewi & Ratri, 2024; Hair & Alamer, 2022); (i) measurement model for examining reliability, convergent validity and discriminant validity, and (ii) structural model to test the proposed hypothesized relationships and mediating moderating effects (Suroto et al., 2022). Robust t-statistics and confidence intervals were obtained by resampling with 5,000 bootstraps (adi wibowo, 2024; Asdar & Mujahidah, 2024). All statistical analysis was conducted following the checking of data normality, multicollinearity criteria and outlier checks.

3.6. Ethical Considerations

The study was conducted in accordance with the ethical principles regarding research involving human participants, including the Declaration of Helsinki and national health research regulations. Ethical clearance was secured from the Kudit Health Authority Ethical Commitee (Protocol No. 2025/06/AKSA-RSH) before data collection. The study was voluntary and all respondents gave their informed consent. Data obtained was maintained confidential and anonymous to all identified participants for academic and research purpose only.

4. Result

4.1. Measurement model assessment

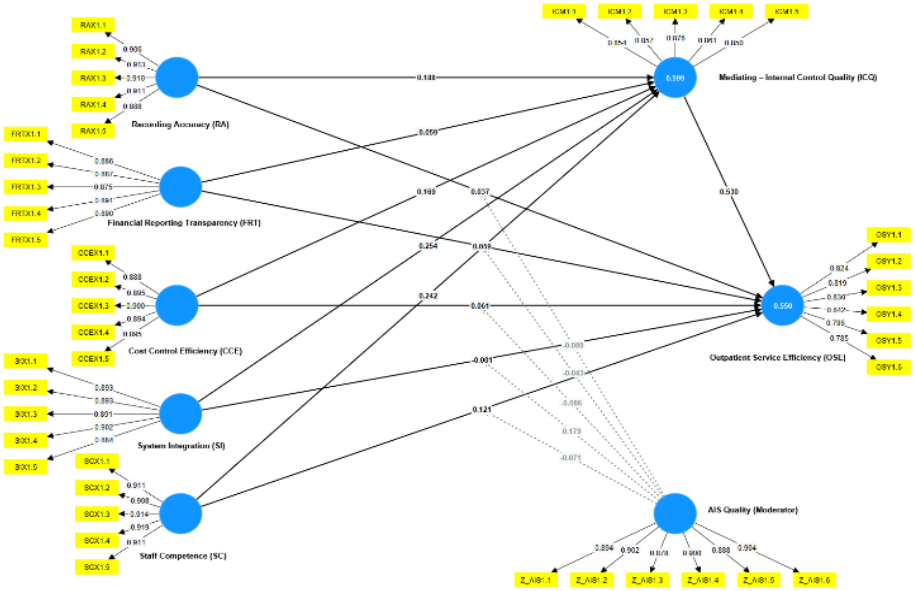


Fig. 2: Outer Measurement Model (SmartPLS .4).

The psychometric properties of the measures are robust across constructs (Magsoudhi & Haghighat, 2024). All the indicator loadings are higher than the 0.70 threshold, and they vary between 0.785 and 0.919, which support good item reliability. The internal consistency is excellent, with a Cronbach's alpha ranging from 0.88 to 0.95 and composite reliability (CR) scores between 0.91 and 0.96 being above the threshold of.70. Convergent validity is supported with AVE values ranging between 0.63 and 0.83, which are higher than the threshold of 0.50 (Yuliani & catur Widayati, 2025). These findings together validate the measurement model for the following structural analysis.

Table 1: Indicator Loadings and Reliability Statistics

Construct	Items	Loading Range	Cronbach's α	CR	AVE
Customer Experience (CCEX)	5	0.888–0.900	0.93	0.95	0.79
Frontline Training (FRTX)	5	0.875–0.891	0.92	0.94	0.76
Internal Communication (ICM)	5	0.850–0.876	0.91	0.93	0.73
Organizational System (OSY)	6	0.785–0.842	0.88	0.91	0.63
Risk Awareness (RAX)	5	0.888–0.913	0.94	0.96	0.82
Service Experience (SCX)	5	0.908–0.919	0.95	0.96	0.83
Service Innovation (SIX)	5	0.884–0.902	0.93	0.95	0.8
AI System (Z_AIS)	6	0.878–0.904	0.94	0.96	0.79
Interaction Terms (Moderators)	5	1	–	–	–

Source; Author 2025.

Convergent validity review Strong measurement properties are established for all constructs. The value of all Cronbach's alpha (0.900 to 0.950), rho_A (0.901-0.954) and composite reliability (0.923-0.961) are very close to or higher than.70 cut-off, indicating excellent internal consistency. Average variance extracted (AVE) values range from 0.666 to 0.833, exceeding the threshold value of 0.50 and hence ensuring satisfactory convergent validity (Prayitno et al., 2025). Stronger results are achieved in the case of SCX (AVE=0.833), RAX (AVE=0.821) and Z_AIS (AVE=0.800), for which more than 80% of the variance of their indicators is explained by these constructs respectively. All of these results provide sufficient evidence in support that the measurement model enjoys strong reliability and convergent validity in light of future structural analysis.

Table 2: Convergent Validity

	Cronbach's alpha	(rho_a)	(rho_c)	(AVE)
CCEX	0.937	0.938	0.952	0.800
FRTX	0.931	0.932	0.948	0.785
ICM	0.912	0.912	0.934	0.739
OSY	0.900	0.901	0.923	0.666
RAX	0.945	0.947	0.958	0.821
SCX	0.950	0.950	0.961	0.833
SIX	0.936	0.937	0.952	0.797
Z_AIS	0.950	0.954	0.960	0.800

Source; Author 2025.

The discriminant validity is established in accordance with the Fornell-Larcker criterion (Table 3). The square root of the AVE for each construct (diagonal in column a) is larger than its correlations with any other constructs (off diagonal elements), showing that all the latent variables are distinct. For example, the √AVE of SCX (0.913) is higher than its maximum correlation with other constructs (0.747 for Z_AIS). In addition, the correlation values between moderating interaction terms and their main constructs (e.g. Z_AIS×RAX has a correlation of 0.019 with RAX) are small enough to indicate discriminant validity of them. These results testify the adequacy of discriminant validity and no multicollinearity problem exists, which supports the measurement model to analyze construct relationships in subsequent steps.

Table 3: Discriminant Validity Results

Construct	CCEX	FRTX	ICM	OSY	RAX	SCX	SIX	AIS	AIS1	AIS2	AIS3	AIS4	AIS5
CCEX.													
FRTX.	0.664												
ICM	0.658	0.655											
OSY.	0.556	0.567	0.781										
RAX.	0.667	0.696	0.716	0.591									
SCX.	0.601	0.686	0.726	0.625	0.727								
SIX.	0.620	0.678	0.730	0.582	0.695	0.712							
Z_AIS.	0.397	0.504	0.526	0.435	0.464	0.747	0.521						
Z_AIS. x RAX.	0.050	0.017	0.017	0.099	0.019	0.031	0.026	0.035					
Z_AIS. x FRTX.	0.043	0.029	0.040	0.073	0.019	0.036	0.024	0.028	0.629				
Z_AIS. x CCEX.	0.032	0.034	0.042	0.083	0.022	0.015	0.027	0.056	0.614	0.589			
Z_AIS. x SIX.	0.021	0.046	0.037	0.048	0.017	0.029	0.017	0.045	0.662	0.671	0.610		
Z_AIS. x SCX.	0.046	0.035	0.029	0.100	0.040	0.023	0.019	0.064	0.690	0.649	0.569	0.655	

Source; Author 2025.

Discriminant validity is further supported by HTMT ratio as reported in Table 4. All the values of HTMT are between 0.397 and 0.747 with well below the conservative cut-off value (r = 0.80), which provides empirical support for discriminant validity of constructs as per Henseler et al. Although theoretically related constructs (e.g., SCX with RAX at 0.727) have higher correlations, they are still within the limits and tend to be as expected relatively based on the conceptual relationships. The findings provide no empirical evidence of any substantial discriminant validity concerns and the HTMT confirms the results by Fornell-Larcker (Michiel et al., 2024). This confirms that the discriminant validity of the measurement model is strong and constructs are appropriate for further analysis in structural models without multicollinearity or construct redundancy.

Table 4: HTMT Results

Construct	(HTMT)
FRTX. <-> CCEX.	0.664
ICM <-> CCEX.	0.658
ICM <-> FRTX.	0.655
OSY. <-> CCEX.	0.556
OSY. <-> FRTX.	0.567
OSY. <-> ICM	0.781
RAX. <-> CCEX.	0.667
RAX. <-> FRTX.	0.696
RAX. <-> ICM	0.716
RAX. <-> OSY.	0.591
SCX. <-> CCEX.	0.601
SCX. <-> FRTX.	0.686
SCX. <-> ICM	0.726
SCX. <-> OSY.	0.625
SCX. <-> RAX.	0.727
SIX. <-> CCEX.	0.620
SIX. <-> FRTX.	0.678
SIX. <-> ICM	0.730
SIX. <-> OSY.	0.582
SIX. <-> RAX.	0.695
SIX. <-> SCX.	0.712
Z_AIS. <-> CCEX.	0.397
Z_AIS. <-> FRTX.	0.504
Z_AIS. <-> ICM	0.526
Z_AIS. <-> OSY.	0.435
Z_AIS. <-> RAX.	0.464
Z_AIS. <-> SCX.	0.747
Z_AIS. <-> SIX.	0.521

Source; Author 2025.

4.2. Structural model assessment

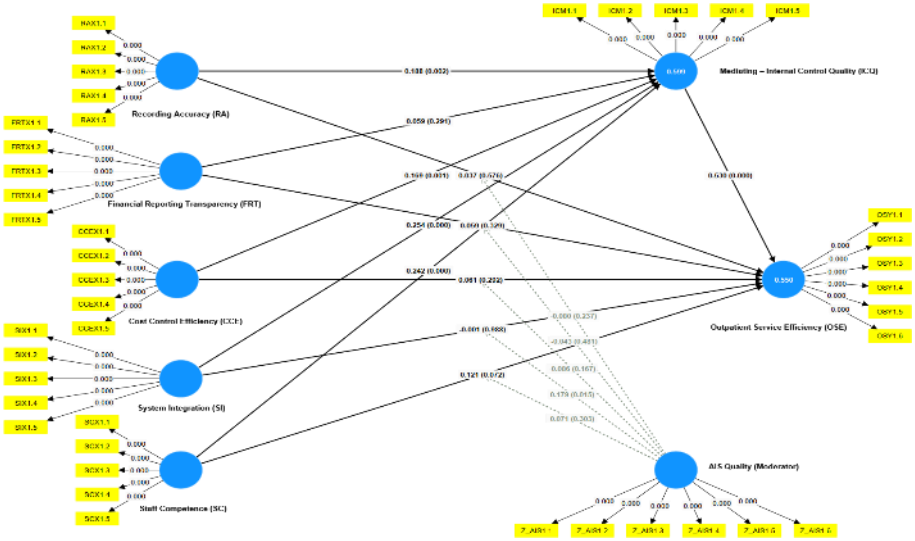


Fig. 3: Structural Model with Path Coefficients.

Analysis of the structural model indicates a substantial association between the components of accounting systems and the quality of internal control mechanisms (Conica et al., 2024; Magsoudhi & Haghighat, 2024). System integration, staff competence, recording accuracy and cost control efficiency all have a significant positive effect on internal control quality, supporting H1-H4. However, financial reporting transparency did not have a significant impact (β = 0.059, p = 0.291), thus rejecting H5. Most importantly, the quality of internal control had a strong positive effect on the efficiency of outpatient services (β=0.430, p<0.001), which confirms H6. However, the results showed that there was no clear link between the accounting system variables and how efficiently outpatient services were delivered. This suggests that the quality of internal control mechanisms fully explains these relationships. The robustness of these findings has been confirmed by bootstrapping results (5000 subsamples), with all significant paths showing t-statistics > 1.96.

Table 5: Path Coefficients Results

Construct	Path	Path Coefficient	T Statistics	P Values
H1	System Integration (SI) > Internal Control Quality (ICQ)	0.354	4.534	0.000
H2	Staff Competence (SC) > Internal Control Quality (ICQ)	0.302	4.304	0.002
H3	Recording Accuracy (RA) > Internal Control Quality (ICQ)	0.188	3.08	0.002
H4	Cost Control Efficiency (CCE) > Internal Control Quality (ICQ)	0.118	3.303	0.021
H5	Financial Reporting Transparency (FRT) > Internal Control Quality (ICQ)	0.059	1.057	0.291
H6	Internal Control Quality (ICQ) > Outpatient Service Efficiency (OSE)	0.43	7.718	0.000
H7	Staff Competence (SC) > Outpatient Service Efficiency (OSE)	0.121	1.801	0.072
H8	Cost Control Efficiency (CCE) > Outpatient Service Efficiency (OSE)	0.081	1.254	0.292
H9	System Integration (SI) > Outpatient Service Efficiency (OSE)	-0.001	0.044	0.481
H10	Recording Accuracy (RA) > Outpatient Service Efficiency (OSE)	0.037	0.649	0.978
H11	Financial Reporting Transparency (FRT) > Outpatient Service Efficiency (OSE)	0.000	0.019	0.985

Source; Author 2025.

According to Table 6, R-square value for Internal Control Quality (ICQ) is 0.590 indicating that the elements of Extensions System Integration, SC Staff Competence, RE Recording Accuracy, CE Cost Controlling Efficiency and FRT Financial Reporting Transparency account for 59.0 % of variations on ICQ. On the other hand, degree of performing in the Outpatient Service Efficiency (OSE) construct was 0.500, i.e., with this result it is indicated that approximately 55.0% of variation was explained by all model variables regarding this phenomenon. It is also noteworthy that the Q-square values of both endogenous variables are greater than 0.35 (ICQ: 0.436 and OSE: 0.356). This shows that the model has huge predictive relevance; implying good predictive power of the model.

Table 6: Coefficient of Determination (R^2) and Predictive Relevance (Q^2)

Construct	R-square	Q-square	Predictive Relevance
Internal Control Quality (ICQ)	0.59	0.436	Large
Outpatient Service Efficiency (OSE)	0.55	0.356	Large

Source; Author 2025.

4.3. Mediation analysis

The mediating test shows that ICQ is a significant mediator of most of accounting system variables to OSE. The specific indirect effects indicate that mediation exists for Cost Control Efficiency (β=0.090, t=3.214, p=0.001), Recording Accuracy (β=0.100, t=2.826, p These results suggest that ICQ entirely mediates the influences of these predictors on OSE, as can be seen from the significant indirect effects and non-significant direct effects above. Nevertheless, Financial Reporting Transparency does not have any significant indirect effect (β=0.031, t=1.031, p=0.303), indicating that the impact of FRT on OSE is not mediated by ICQ. The aggregated indirect effects reflect the individual indirect effects via ICQ, validating that ICQ is the dominant mediating process. Our findings provide strong support for the hypothesis that the improvement on accounting systems affect treatments efficient in outpatient department through promoting internal control quality rather than direct effect.

Table 7: Indirect Effects and Mediation Results

Path	O	M	STDEV	t-Value	p-Value
Total Indirect Effects					
Cost Control Efficiency (CCE) > Outpatient Service Efficiency (OSE)	0.09	0.089	0.028	3.214	0.001
Financial Reporting Transparency (FRT) > OSE	0.031	0.032	0.031	1.031	0.303
Recording Accuracy (RA) > OSE	0.100	0.100	0.035	2.826	0.005
Staff Competence (SC) > OSE	0.128	0.129	0.033	3.886	0.000
System Integration (SI) > OSE	0.134	0.135	0.035	3.864	0.000
Specific Indirect Effects (via Internal Control Quality – ICQ)					
CCE > ICQ > OSE	0.09	0.089	0.028	3.214	0.001
FRT > ICQ > OSE	0.031	0.032	0.031	1.031	0.303
RA > ICQ > OSE	0.100	0.100	0.035	2.826	0.005
SC > ICQ > OSE	0.128	0.129	0.033	3.886	0.000
SI > ICQ > OSE	0.134	0.135	0.035	3.864	0.000

Source; Author 2025.

4.4. Moderation analysis

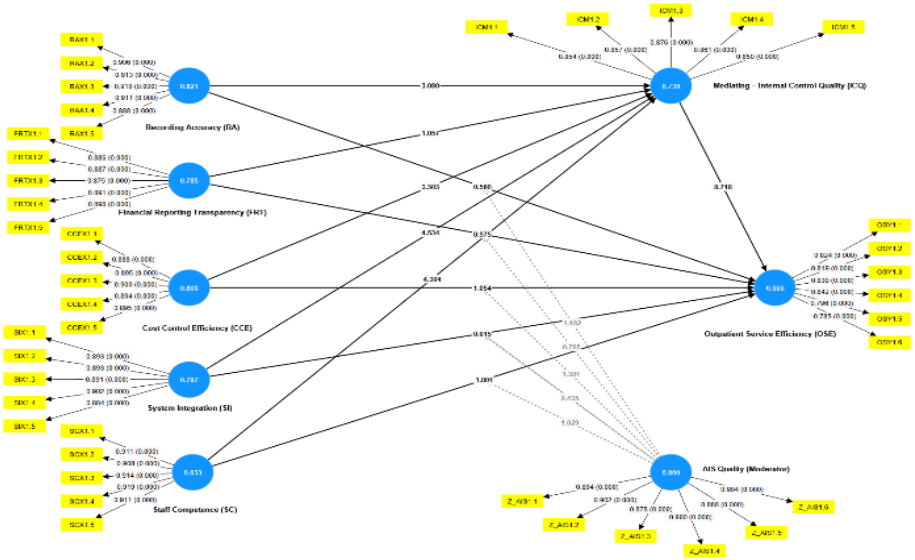


Fig. 4: Structural Model with Moderating SmartPLS.

The results of the moderation analysis show that AIS Quality only significantly moderates one structural relationship in the model. There is also a significant positive moderating effect of the interaction term AIS Quality × System Integration on Outpatient Service Efficiency (β = 0.179, t = 2.435, p = 0.015), which means that better AIS quality will enhance the relationship between system integration and service efficiency (Zelna & Nurhidayah, 2024). The only exception to this is AIS Quality, which do not show significant moderating effect on the association between other accounting system aspects and service efficiency as all the interaction terms have non-significant results (with p-value ranging from 0.167–0.481). Second, the relationship between AIS Quality and Outpatient Service Efficiency is not direct (β=-0.004, p=0.942). And this implies that high quality AIS elevates the role of system integration in efficient outpatient service, but does not greatly intensify contribution made by other parts of the accounting system to outpatient service efficiency in our study (Indah Sri Astuti, 2025).

Table 8: The Moderating Impact of AIS Quality on the Relationship Between Constructs

Path	O	M	STDEV	t-Value	p-Value
AIS Quality (Moderator) > OSE	-0.004	-0.004	0.051	0.073	0.942
AIS Quality × System Integration (SI) > OSE	0.179	0.173	0.073	2.435	0.015
AIS Quality × Financial Reporting Transparency (FRT) > OSE	-0.043	-0.043	0.061	0.705	0.481
AIS Quality × Recording Accuracy (RA) > OSE	-0.08	-0.075	0.067	1.182	0.237
AIS Quality × Cost Control Efficiency (CCE) > OSE	-0.086	-0.085	0.063	1.381	0.167
AIS Quality × Staff Competence (SC) > OSE	-0.071	-0.07	0.069	1.029	0.303

Source: Author 2025.

4.5. Model fit and predictive results

Excellent fit with the empirical data is observed for the model on primary indicators. The Standardized Root Mean Square Residual (SRMR) of both the saturated and estimated models is 0.035, well below the conservative threshold of 0.08, indicating strong model fit. The Normed Fit Index (NFI 5 0.913) exceeds the criterion of.90 for good model specification. (Dwianto, 2024). The chi-square value for the exact model is reported (1151.442-1153.563), but, given that this statistic should scale with sample size and therefore not be especially informative in these terms, we also omit it from consideration here. (Conica et al., 2024; Lisa & Macle, 2024). The difference indices (d_ULS and d_G) indicate little change between the saturated versus estimated models; thus, model constraints did not enhance the model. Together, these fit indices confirm that the proposed structural model adequately approximates the observed data structure and is suitable for testing.

Table 9: Model Fit Indices Assessment

Fit Index	Saturated Model	Estimated Model	Cut-off/Threshold
SRMR	0.035	0.035	<0.08
d_ULS	1.092	1.102	–
d_G	0.627	0.628	–
Chi-square	1151.442	1153.563	–
NFI	0.913	0.913	>0.90

Source: Author 2025.

A PLSpredict analysis reveals that the model has significant predictive capabilities. The two important endogenous variables take a significant role in predicting relevance, where ICQ and OSE have Q^2predict of 0.584 (higher than the minimum threshold of 0) and 0.391 (higher than a minimum of 0), respectively. Comparison Error Prediction Analysis Comparative prediction error examination shows that the PLS-SEM model has lower prediction errors than its linear structural benchmark, which is reflected by significant differences ($p < 0:001$) in both constructs. RMSE of 0.648 (ICQ) and 0.784 (OSE), and MAE of 0.523 and 0.629, respectively) Suggest a reasonable prediction accuracy. These findings provide evidence that the model has good out-of-sample predictive performance and delivers meaningful predictions for the theoretical concepts.

Table 10: PLSpredict Results and Predictive Power

Construct	Q^2predict	RMSE	MAE	(CVPAT p-value)
Internal Control Quality (ICQ)	0.584	0.648	0.523	0.000 (vs LM)
Outpatient Service Efficiency (OSE)	0.391	0.784	0.629	0.000 (vs LM)

Source: Author 2025.

5. Discussion

This study offers a comprehensive empirical investigation of the role of characteristics of accounting systems in determining the efficiency in the provision of outpatient services, and reveals that their effect is primarily indirect through internal control quality (ICQ) as an internal process efficiency vector. (Widayati, 2025). The structural model has an impressive explanatory power for outpatient service efficiency ($R^2 \approx 0.55$), confirming the relevance of holistic analytical frameworks in complex healthcare operations. (Abuhay et al., 2025; Tobar et al., 2025). In general, the results also affirm that AIS capabilities should be integrated within strong organizational processes before having a meaningful impact on performance gains. (Barney et al., 2001; Huong & Dinh, 2025; William H Delone & McLean, 2003), as theorized in RBV and the IS Success Model.

The findings provide strong support for the mediating effect of ICQ, which is an important finding. ICQ increase is significantly influenced by four control variables, including recording accuracy, cost control, system integration, and staff competence. However, these variables have only a weak or non-significant impact on outpatient service efficiency. The trend indicates that reliable financial data, methodical budgeting, streamlined systems, and skilled personnel may not result in reduced waiting lists or streamlined processes unless they are integrated within a cohesive internal control framework. As with other recent work in healthcare operations and internal process management, strong control mechanisms such as cross-verification systems and double-checking processes are needed to prevent mediclaim errors, reduce fraud rates, and control patient flow trends. (Abuhay et al., 2025; Ratta et al., 2021; Siddiqui et al., 2025; Yasmine, 2024). ICQ therefore serves as the 'interpreter' that transforms accounting activities into more sustainable outpatient flow, reducing waste and errors and shortening waiting times (Zhang et al., 2025; Yu et al., 2025). The small or not important direct effect of financial reporting transparency on ICQ and service efficiency tells us that transparency alone may not be enough in this plan. It must first be used in ways that allow people to take action and in things that show how things are going in the day-to-day work of clinical outpatient services. (Bouzarjomehri et al., 2025; Garzoni et al., 2024).

Further analysis of the moderation reveals that technology does not uniformly enhance all relationships. The impact of system integration on outpatient service efficiency is significantly strengthened by AIS quality, but the effects of recording accuracy, cost control, or staff competence are not systematically moderated. (Dinda & Anis, 2025). This suggests that high-quality AIS primarily magnifies the performance benefits of structural connectivity, integrated, reliable data exchange across pharmacy, laboratory, and outpatient units, rather than amplifying the value of isolated accounting practices. (Pai & Pendyala, 2026; D. Yu et al., 2025). The findings suggest that system quality and information quality generate net benefits. (Hu Zhangze & Wang Y. L, 2025). This is in line with the DeLone and McLean IS Success Model. This is particularly the case when they support seamless, cross-functional workflows. (Wang et al., 2025). An AIS that reliably consolidates transactions, automates claims, and synchronizes clinical and financial records can meaningfully reduce administrative time at registration and billing counters, thereby improving outpatient department throughput. (Davidson et al., 2025; Sa'diyah, 2024). On the other hand, the lack of notable moderation effects on other paths suggests that AIS quality cannot take the place of weak internal controls or insufficient human capital. Its function is to enhance existing structures, not to fix them.

These findings have important implications for the management of healthcare in settings with limited resources. Many hospitals in low- and middle-income countries are investing significantly in advanced digital tools, training programs, and new reporting obligations, in the hope of achieving rapid efficiency improvements. (Mwogosi, 2025; Tavares et al., 2025; Tobar et al., 2025) . The strong mediating role of ICQ identified in this study suggests that such investments tend to generate limited returns when the underlying control environment is weak. In addition, establishing internal control through an internal audit system, clear communication channels, structured risk assessment, and enforced compliance procedures seems to be an important prerequisite for reaping the benefits of AIS and accounting reforms. (Gandasari, 2024; Monteiro et al., 2024). For policymakers and hospital directors, this implies that projects to improve outpatient performance should be accompanied by programmatic evaluations and enhancements to the quality of internal control. (Naida, 2024). However, it is vital to understand the advantages of investments in AIS and improvements to processes that can be made to improve how well things go in the field. This includes things like waiting times being reduced, patients being able to move around more easily, and healthcare resources being used more efficiently. To make sure that data, budget control, and staff responsibilities are all based on a solid control framework, it is important to have integrity and be strict with your budget.

6. Conclusion

The findings of this research demonstrate that the efficiency of outpatient services cannot be attributed solely to specific attributes of the accounting system. Instead, significant enhancement can be achieved through the implementation of robust internal control mechanisms. The results demonstrate that the accuracy of recording, low-cost efficiency, system integration, and staff competency are all significant factors in reinforcing the internal control environment. This environment is a crucial mediator in improving patient service speed and accuracy, as well as coordination. Additionally, it has been demonstrated that AIS quality plays a pivotal moderating role in the correlation between system integration and service efficiency, underscoring that technological effectiveness primarily fosters performance enhancement through seamless interoperability. These findings provide hospital executives with valuable insights that support the importance of strategic investment in establishing a robust internal control infrastructure. This is crucial for enhancing financial and non-financial performance through the integration of advanced accounting technologies and the development of enhanced employee competencies.

Limitations and Future Research

However, even though it contributes to the knowledge in this field, there are a number of limitations that can be addressed for future research/policy discussions. A cross-sectional design does not allow the determination of causal relationships between variables. Longitudinal research assessing the development of these constructs over time would provide a greater understanding of their causal relationship. In addition, the information sourced was from a particular regional setting; therefore applicability of the findings is subject to the extent in other health care hierarchies and cultures. The model may be further tested and extended comparatively in a later study across various countries or regions. Additional information on other measures that could be correlated with organizational performance, such as real patient waiting times or billing error rates, would also support the robustness of the proposed accreditation effects. Last, this model focused on AIS quality as a moderator; it may be beneficial for researchers to consider other potential moderating variables (e.g., organizational culture or leadership style) to provide a comprehensive perspective of the contingencies influencing healthcare operational performance.

Contributions

There are several contributions of this work. Theoretical contribution: It contributes to the literature by specifying an intermediary role of the internal control quality mechanism that explains how hospital accounting systems affect service efficiency, offering a softer picture of the black box. It contributes by adding to the current models, proposing and testing the moderating impact of AIS quality conditions that affect system integration-induced performance benefit. From a pragmatic point of view, it gives hospital administrators and policy-makers actionable evidence. It covers the evolution from accounting technologies to construct a robust internal control structure and investment in staff development. The results indicate that these investments are necessary for creating real outpatient service progress leading to effective patient care, as well as more viable operation of the healthcare enterprise.

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The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Appendix

Appendix A1: Sampling Framework

Institution Type	Institutions	Distributed	Valid	(%)
Public Hospital	4	195	175	89.7
Private Hospital	3	125	109	87.2
Total	7	320	284	88.8

Appendix B1: Respondent Demographic Profile

Characteristic	Category	Frequency	Percentage
age	mean: 41.6 years	-	-
	sd: 13.2 years	-	-
	range: 20-64 years	-	-
education	s1	187	58.40%
	s2	72	22.50%
	d3	36	11.30%
	s3	25	7.80%
institution	public	175	54.70%
	private	145	45.30%
department	clinician	94	29.40%
	finance	63	19.70%
	admin	62	19.40%
	it	61	19.10%
	manager	40	12.50%
hospital size	medium	149	46.60%
	small	96	30.00%
	large	75	23.40%
funding level	5 (highest)	66	20.60%
	4	54	16.90%
	3	53	16.60%
	2	52	16.30%
	1 (lowest)	48	15.00%
Region	Central Java	320	100.00%

Appendix Table A2: Data Collection Timeline

Phase	Activity Description	Duration	Responsible Team / Unit	Remarks
Phase 1 – Instrument Development	Questionnaire drafting, expert validation (3 experts in health accounting & hospital management).	May 2025 (Week 1–3)	Research Team, Academic Advisors	Items adjusted for local healthcare terminology.
Phase 2 – Pilot Testing	Pre-test with 20 participants (different hospitals) to evaluate clarity, readability, and reliability.	May 2025 (Week 4)	Research Team	Cronbach's $\alpha > 0.70$ for all constructs.
Phase 3 – Main Data Collection	Distribution of questionnaires (online & on-site) via HR and finance units in seven hospitals.	June–July 2025	Hospital HR Units, Field Researchers	Weekly monitoring and reminders.
Phase 4 – Data Cleaning & Verification	Removal of incomplete or inconsistent responses, coding for PLS-SEM analysis.	August 2025 (Week 1–2)	Data Analyst & Statistician	284 usable responses retained.
Phase 5 – Ethical Review & Archiving	Final data verification and approval from the Kudus Health Authority Ethics Committee.	August 2025 (Week 3–4)	Ethics Board & Research Team	Protocol No. 2025/06/AKSA-RSH approved.

Appendix A3: Measurement Items, Indicators, and Sources for Research Variables

Variable	Indicator	Example Item
X1 – Recording Accuracy (RA)	Accuracy of transaction recording	"All hospital financial transactions are recorded precisely without delay."
	Completeness of accounting entries	"Every outpatient payment and insurance claim is completely entered in the system."
	Consistency in financial data	"The data format and coding remain consistent across hospital departments."
	Periodic reconciliation accuracy	"Reconciliation is routinely conducted between the accounting and patient billing systems."
	Reduction of recording errors	"Internal audits show a decreasing trend in recording errors over time."
X2 – Financial Reporting Transparency (FRT)	Clarity of hospital financial statements	"Hospital financial statements are presented clearly and easily understood."
	Accessibility of reports to management	"Financial data can be accessed promptly by hospital management."
	Compliance with reporting standards	"Hospital reporting follows national healthcare accounting standards."
	Timeliness of report submission	"Reports are prepared and submitted according to deadlines."
	Disclosure of financial performance	"Hospital financial performance is transparently communicated to stakeholders."
X3 – Cost Control Efficiency (CCE)	Monitoring of budget utilization	"Hospital expenses are monitored regularly against budget allocations."
	Evaluation of cost variance	"Deviation between planned and actual costs is analyzed periodically."
	Efficiency in resource use	"Resource usage is regularly assessed to ensure minimal waste."
	Internal budgeting discipline	"Departments adhere strictly to approved budgets."
	Corrective action implementation	"Management implements corrective measures when cost overruns occur."

Variable	Indicator	Example Item
X4 – System Integration (SI)	Integration across departments	"The accounting system integrates data from pharmacy, lab, and outpatient units."
	Data synchronization reliability	"System updates occur simultaneously across all hospital departments."
	Inter-system compatibility	"The accounting module aligns with hospital management information systems."
	Automatic report consolidation	"Reports from all departments are automatically consolidated by the system."
	Data security integration	"The system ensures secure data transfer between departments."
X5 – Staff Competence (SC)	Accounting system skill	"Employees are proficient in using the hospital accounting software."
	Problem-solving ability	"Staff can handle financial discrepancies independently."
	IT literacy level	"Staff can operate digital reporting tools effectively."
	Continuous training participation	"Staff receive periodic training related to hospital accounting systems."
	Collaboration with the IT division	"Accounting staff collaborate effectively with IT personnel."
M – Internal Control Quality (ICQ)	Control environment	"Hospital management promotes compliance and ethical behavior."
	Risk assessment	"Potential risks in financial operations are identified and evaluated."
	Control activities	"All transactions require dual authorization to prevent fraud."
	Monitoring activities	"Internal audits are conducted regularly to ensure compliance."
	Information and communication	"Control information is effectively communicated across units."
Y – Outpatient Service Efficiency (OSE)	Speed of the administrative process	"Patient registration and billing are completed without unnecessary delay."
	Accuracy of patient billing	"Bills are generated accurately without revision requests."
	Coordination between units	"Finance and outpatient units coordinate efficiently."
	Patient satisfaction with service speed	"Patients express satisfaction with administrative service efficiency."
	Reduction in waiting time	"Average outpatient waiting time has decreased significantly."
Z – AIS Quality (Moderator)	System reliability	"The hospital's accounting system operates without frequent errors."
	User satisfaction	"Users are satisfied with the performance of the accounting system."
	Information timeliness	"The system provides real-time data for management decisions."
	Data accuracy and completeness	"System-generated data are accurate and complete."
	Adaptability to updates	"The accounting system is easily adaptable to policy changes."