The Influence of Staff Participation, SOP Compliance, System Integration, and Management Commitment on the Data Quality of Telecommunication Tower Assets at XYZ Ltd

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ABSTRACT: This study aims to examine the influence of staff participation, compliance with standard operating procedures (SOPs), system integration, and management commitment on the quality of telecommunication tower asset data at XYZ Ltd. XYZ Ltd, a company engaged in the provision of telecommunications infrastructure, faces challenges in maintaining the quality of its tower asset data, particularly with respect to data validity and completeness. A quantitative approach with a cross-sectional design was employed, involving 231 respondents selected through purposive sampling from a total population of 537 employees. The results of multiple linear regression analysis indicate that staff participation, system integration, and management commitment have a positive and significant effect on the quality of telecommunication tower asset data at XYZ Ltd. In contrast, SOP compliance does not exhibit a statistically significant effect. Among the variables examined, management commitment exerts the most substantial influence on data quality. Future studies may consider incorporating additional variables such as organizational culture, human resource competence, or information system quality to achieve a more comprehensive understanding of the factors affecting data quality.

KEYWORDS: data quality, staff participation, SOP compliance, system integration, management commitment, telecommunications

INTRODUCTION

The Indonesian telecommunications industry has undergone a significant transformation in recent years, particularly in 2023, marked by rapid digitalization and a surge in data usage exceeding 12% from the previous year [1]. This expansion highlights the industry's strategic role in national economic development and in bridging the digital divide across regions. In alignment with government initiatives to promote digital equity, substantial investments have been directed toward telecommunication infrastructure, creating new opportunities for infrastructure providers, especially tower companies (TowerCos), to support network expansion in terms of both coverage and capacity.

However, this growth is not without challenges. The saturation of mobile subscribers—recorded at over 124 SIM cards per 100 inhabitants [2]—has slowed the expansion of the mobile internet market, prompting the adoption of fixed mobile convergence (FMC) strategies to sustain long-term industry growth. Concurrently, a shift in business models is observed, where mobile network operators divest infrastructure assets in favor of operational efficiency and customer experience optimization.

In this dynamic context, the accuracy and reliability of asset data have become critical, especially for firms such as XYZ Ltd, which specialize in providing telecom tower locations and space for tenants. Incomplete or invalid data can lead to opportunity losses, including lost revenue, uncontrolled operational costs, and service delivery delays. Current management reports indicate that tower data completeness remains deficient by 12.7%, while data validation gaps reach 34.6%, potentially undermining operational effectiveness and strategic decision-making.

To address these issues, XYZ Ltd launched the 'Aset Care Program', which aims to improve data quality and reduce data-related operational costs by fostering a culture of shared responsibility across the organization. This program emphasizes the role of internal stakeholders in ensuring data integrity through active engagement, adherence to operational standards, and better system utilization. For instance, Liu et al. [3] emphasize the importance of clinical staff participation and system integration in achieving data completeness within electronic medical records. Similarly, Eskandarzadeh et al. [4] demonstrate that adherence to SOPs significantly improves data quality by reducing errors and enhancing efficiency.

Furthermore, studies by Teklegiorgis et al. [5] highlight the influence of human and organizational factors—such as user competence, procedural clarity, and systemic alignment—on data quality in both health and resource-limited settings. These findings converge with the current challenges at XYZ Ltd, where unclear roles, lack of standardized data workflows, and fragmented system usage have hindered effective data governance. Management commitment also plays a crucial role, as evidenced by Zellal and Zaouia [6], who argue that strong managerial commitment is essential in mobilizing resources, enforcing accountability, and sustaining long-term improvements in data quality initiatives.

Therefore, this study seeks to analyze the extent to which staff participation, SOP compliance, system integration and management commitment influence the quality of telecommunications tower asset data, using XYZ Ltd as a case study. By integrating theoretical insights from existing empirical literature and organizational practices, this research contributes to a broader understanding of data governance mechanisms in the infrastructure-driven digital economy.

THEORETICAL REVIEW
IT-Business Strategic Alignment (BSA)

IT- Business Strategic Alignment (IT-BSA) refers to the strategic alignment between IT and business to create value and sustainably improve organizational performance. This alignment includes the integration of IT and business strategies in the planning process and operational execution [7]. Pesce and Neirotti [8] emphasize that IT's strategic role can change according to industry context-from mere automation to business transformation. These studies show that the success of organizations is greatly influenced by their ability to adaptively integrate IT roles with business strategies.

Resource-Based View (RBV)

The Resource-Based View (RBV) explains that competitive advantage stems from an organization's ability to manage internal resources that are rare and not easily imitated [9]. In the context of information systems, capabilities such as system integration, staff training, and data quality are strategic assets that support the achievement of operational efficiency. Grant [10] also emphasizes that organizations that are able to develop knowledge and technology-based capabilities will gain sustainable competitiveness.

Contingency Theory

Contingency theory states that there is no one universally applicable managerial approach; organizational effectiveness depends largely on the match between organizational structure and environmental conditions [11]. The contingency theory view considers that organizational effectiveness depends on how well they can adapt policies and procedures to the existing situation [12]. In this framework, management commitment becomes a determining element in adjusting data policies and SOPs to the complexity of information systems and organizational culture.

Theory of Planned Behavior (TPB)

TPB states that an individual's intention to act is influenced by attitudes towards behavior, subjective norms, and perceived behavioral control [13]. TPB is used to explain the relationship between attitudes and organizational behavior, including in the context of data management [14]. Management's positive attitude towards the importance of data quality plays a role in shaping policies that support SOP implementation and system integration. Staff perceptions of the control and value of quality data strongly influence their behavior in data collection and processing.

Total Quality Management (TQM) Theory

TQM emphasizes a holistic approach to quality improvement, which includes the involvement of all parties in the organization, including leaders and staff [15]. TQM principles such as continuous improvement and data-driven are particularly relevant in the context of information system integration and compliance with SOPs. Clancy et al. [16] point out that IT can accelerate the quality improvement process through automation, while management commitment plays a role in building a culture of quality [17].

Staff Participation

Staff participation is an important factor in ensuring the accuracy and consistency of data generated by information systems. Xiao et al. [18] showed that active involvement of staff in data collection and validation increases the reliability of the information produced. In addition, participation dimensions such as training, internal communication, and involvement in decision-making strengthen staff responsibility and work quality [19].

Compliance with Standard Operating Procedures (SOP)

Compliance with SOPs indicates the extent to which organizations follow standard procedures in data management. Al-Manghani [20] states that SOPs provide a systematic framework to ensure data integrity and accuracy. Pipino et al. [21] also found that consistent adherence to SOPs is positively correlated with improved data quality in a complex information systems environment.

System Integration

System integration plays an important role in creating efficient and consistent information flows between organizational units. Xiao et al. [18] explain that good integration allows smooth access to data across systems, thereby reducing redundancy and improving information accuracy. Tee et al. [22] also emphasize that high system interoperability contributes to managerial effectiveness through reliable data.

Management Commitment

Management commitment is key in supporting data quality improvement programs, both through resource allocation and supervision of information system implementation. Tee et al. [22] stated that supportive leadership will encourage staff to comply with SOPs and be active in data management. This commitment also reflects the strategic value of management in building a quality-oriented organizational culture.

Data Quality

Data quality reflects an organization's efforts to manage and maintain data that is accurate, complete, consistent, and valid. Strong et al. [23] identify key dimensions of data quality, including accuracy, completeness, consistency, and validity. Poor data quality, as emphasized by Kahn et al. [24], can lead to flawed decision-making and negatively impact overall organizational performance.

CONCEPTUAL FRAMEWORK AND HYPOTHESIS

Effect of Staff Participation on Data Quality

Active staff participation in data management plays an important role in ensuring data completeness, accuracy, and consistency. Liu et al. [25] showed that high staff participation has a positive impact on data completeness in electronic medical record systems. Research by Ahanhanzo et al. [26] also stated that staff training and empowerment in health information systems had an impact on improving understanding of data management processes and ultimately improving data quality.

Hypothesis 1 (H1): Staff participation has a positive effect on data quality.

The Effect of SOP Compliance on Data Quality

Compliance with standard operating procedures (SOPs) is a fundamental factor in ensuring consistent data management process standards. Eskandarzadeh et al. [4] found that compliance with SOPs can reduce errors in the data collection and processing process. In addition, Badaruddin et al. [27] confirmed a positive and significant influence between compliance with SOPs and improved data quality.

Hypothesis 2 (H2): Compliance with the SOP has a positive effect on data quality.

The Effect of System Integration on Data Quality

System integration refers to the interconnectedness of information systems within an organization, which enables automatic and error-free data exchange. Liu et al. [3] show that system integration has a positive impact on data completeness. The study by Hikmawati et al. [28] also shows that Master Data Management (MDM) as a form of system integration helps improve data validation. Meanwhile, Fraser et al. [29] found that integrated electronic systems strengthen data quality through better accessibility and management.

Hypothesis 3 (H3): System integration has a positive effect on data quality.

The Effect of Management Commitment on Data Quality

Management commitment reflects the support and involvement of organizational leaders in the implementation of effective data management policies. Somatunga et al. [30] state that the active involvement of management supports tighter supervision of data quality processes. Ibrahim et al. [31] emphasized that organizational commitment is key in maintaining consistent data quality. Zellal and Zaouia [6] also emphasize that top management commitment is the foundation for strengthening data governance.

Hypothesis 4 (H4): Management commitment has a positive effect on data quality.

Figure 1 presents the conceptual framework that illustrates the hypothesized relationships among the examined variables.
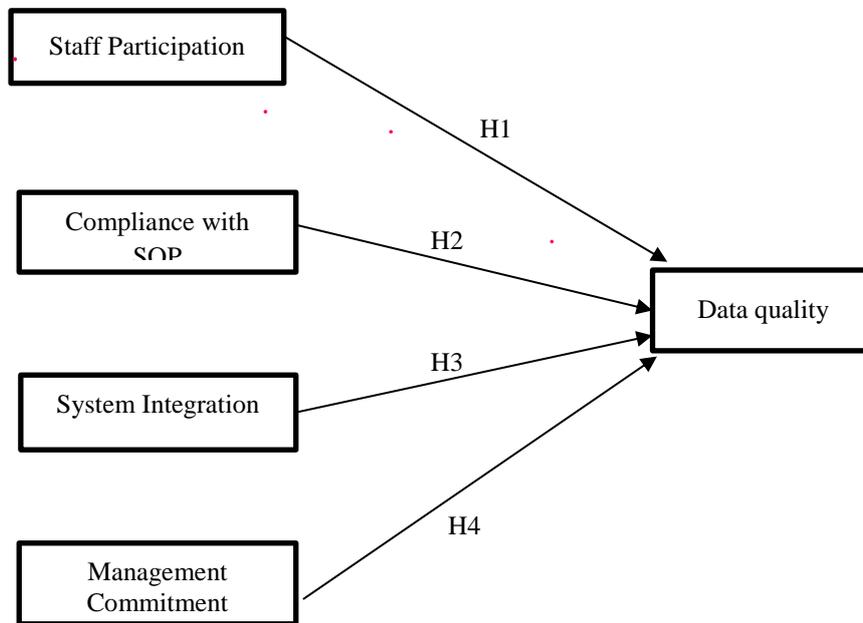

Figure 1. Conceptual Framework

RESEARCH METHODOLOGY

This research is an observational quantitative study with a causal analytic approach using a cross-sectional design, which aims to analyze the effect of several independent variables on data quality in an organization. The cross-sectional design was chosen because it allows simultaneous measurement of research variables at one point in time, and is suitable for testing causal relationships between variables [32]. Data collection was carried out once at a time through a Google Form-based questionnaire survey.

The unit of analysis in this study is an individual, namely all permanent employees of XYZ Ltd who work in divisions directly related to the management and maintenance of tower asset data, including the operational, information technology, and asset management divisions. The population in this study amounted to 550 permanent employees spread across various working areas of XYZ Ltd in Indonesia. The determination of the sample size was carried out using the Slovin formula with an error rate of 5%, resulting in a total of 231 respondents selected through purposive quota sampling technique. This technique is used to ensure proportional representation of each position level and work area [33].

The measurement instrument was prepared based on the theoretical indicators of each research construct and measured using a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree" [33]. The independent variables in this study include staff participation, compliance with standard operating procedures (SOPs), system integration, and management commitment, while the dependent variable is data quality.

The statistical analysis techniques used include descriptive analysis to describe the characteristics of respondents and the distribution of research variables, as well as inferential analysis with a multiple linear regression approach to test the simultaneous and partial effects of independent variables on the dependent variable [34]. The classical assumption test is conducted to ensure the validity of the regression model, which includes tests of normality, multicollinearity, heteroscedasticity, and autocorrelation. All tests were conducted with a significance level of 5% using SPSS statistical software version 25. The results of the analysis are expected to provide an empirical understanding of the factors that influence data quality in the context of the organizations studied.

RESULTS

To provide contextual information for interpreting the main results, Table 1 presents the demographic profile of the respondents involved in the study. This includes their gender, age group, educational background, and length of time worked. Understanding these characteristics is essential for assessing the generalizability and relevance of the findings to the target population.

Table 1. Demographic Characteristics of Respondents

Demographics	Category	Frequency	Percentage (%)
Gender	Male	181	78.4
	Female	50	21.6
	Total	**231**	**100.0**
Sex	< 25 years	2	0.9
	25-34 years	70	30.3
	35-44 years	109	47.2
	45-54 years	48	20.8
	> 54 years	2	0.9
	Total	**231**	**100.0**
Education	Diploma (D1/D2/D3)	4	1.7
	Bachelor (S1)	194	84.0
	Postgraduate (S2/S3)	33	14.4
	Total	**231**	**100.0**
Length of time worked	< 1 years	4	1.7
	1 - 3 years	21	9.1
	4 - 5 years	21	9.1
	> 5 years	185	80.1
	Total	**231**	**100.0**

Source: research data (processed)

The demographic data in Table 1 indicates that the majority of respondents are male (78.4%), aged between 35–44 years (47.2%), with a bachelor's degree (84.0%), and over five years of work experience (80.1%). These characteristics suggest a mature, educated, and experienced workforce, which may contribute to more informed and reliable responses, especially on topics concerning organizational systems and data quality.

Table 2 displays the descriptive statistics of the main variables examined in this study, offering an overview of respondents' perceptions before proceeding to further analysis.

Table 2. Statistics Descriptive

Variable	Indicator	Frequency of Answer					Total	Mean	Std. Dev	Score	Description
		1	2	3	4	5					
Staff participation	PS1	1		5	33	192	231	4.80	0.51	221.60	High
	PS2	1		23	70	137	231	4.48	0.71	207.00	High
	PS3		2	10	67	152	231	4.60	0.62	212.40	High
	PS4		2	19	53	157	231	4.58	0.68	211.60	High
	PS5	1	2	25	86	117	231	4.37	0.75	201.80	High
	PS6	5	16	35	66	109	231	4.12	1.04	190.20	High
	PS7		3	13	75	140	231	4.52	0.66	209.00	High
	PS8	7	7	32	74	111	231	4.19	0.99	193.60	High
	Average									205,90	High
Compliance with SOP	KS1	1	1	4	45	180	231	4.74	0.55	219.00	High
	KS2	1	2	9	56	163	231	4.64	0.64	214.20	High

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Variable	Indicator	Frequency of Answer					Total	Mean	Std. Dev	Score	Description
		1	2	3	4	5					
	KS3	1	4	17	66	143	231	4.50	0.75	207.80	High
	KS4	5	6	35	75	110	231	4.21	0.94	194.40	High
	KS5	1	6	22	84	118	231	4.35	0.79	201.00	High
	KS6		1	12	78	140	231	4.55	0.62	210.00	High
	Average									207,73	High
System Integration	IS1		11	23	77	120	231	4.32	0.84	199.80	High
	IS2	2	5	27	88	109	231	4.29	0.82	198.00	High
	IS3	1	1	8	71	150	231	4.59	0.62	212.20	High
	IS4		1	5	77	148	231	4.61	0.56	213.00	High
	IS5	1	2	18	72	138	231	4.49	0.72	207.40	High
	IS6		4	22	90	115	231	4.37	0.73	201.80	High
	Average									205,37	High
Management Commitment	KM1	2	2	12	71	144	231	4.53	0.71	209.20	High
	KM2	2	1	6	58	164	231	4.65	0.64	214.80	High
	KM3	6	8	15	81	121	231	4.31	0.93	199.20	High
	KM4	3	6	40	81	101	231	4.17	0.90	192.80	High
	KM5	4	3	30	88	106	231	4.25	0.86	196.40	High
	KM6	6	10	33	77	105	231	4.15	0.99	191.60	High
	KM7	1	1	14	72	143	231	4.54	0.67	209.60	High
	KM8	2		6	69	154	231	4.61	0.63	213.20	High
	KM9	3	5	14	82	127	231	4.41	0.81	203.60	High
	KM10	2	6	25	95	103	231	4.26	0.82	196.80	High
	KM11	1		5	70	155	231	4.64	0.57	214.20	High
	KM12	2	4	11	94	120	231	4.41	0.74	203.80	High
	Average									203,77	High
Data quality	KD1	3	4	19	86	119	231	4.36	0.81	201.40	High
	KD2	2	5	15	96	113	231	4.35	0.77	201.20	High
	KD3	2	2	17	89	121	231	4.41	0.74	203.60	High
	KD4	3	7	23	99	99	231	4.23	0.85	195.40	High
	KD5	4	8	42	87	90	231	4.09	0.93	188.80	High
	KD6	9	11	38	89	84	231	3.99	1.04	184.20	High
	KD7	3	11	29	92	96	231	4.16	0.91	192.00	High
	KD8	3	5	18	100	105	231	4.29	0.81	198.40	High
	Average									195,63	High

Source: research data (processed)

Table 2 show that all variables—staff participation, compliance with SOPs, system integration, management commitment, and data quality—achieved high average scores, with means exceeding 4.00 on a 5-point Likert scale. This reflects a generally favorable perception among respondents regarding organizational practices and data quality.

Before proceeding to the regression analysis, classical assumption tests were conducted to ensure that the model satisfies the conditions required for the Ordinary Least Squares (OLS) estimator to be Best Linear Unbiased Estimator (BLUE). Table 3 summarizes the results of the normality, heteroscedasticity, autocorrelation, and multicollinearity tests applied to the model.

Table 3. Classical assumption test results

Assumptions	Test results		Description
Normality	p-value KS = 0,000		Not compliant
Heteroscedasticity	Independent	p-value	Compliant
	Staff participation	0.991	
	Compliance with SOP	0.310	
	System integration	0.959	
	Management commitment	0.410	
Autocorrelation	DW=1,808		Compliant
Multicollinearity	Independent	VIF	Compliant
	Staff participation	2.776	
	Compliance with SOP	3.067	
	System integration	5.125	
	Management commitment	2.947	

Source: SPSS ouput

Based on Table 3, it can be concluded that in general the regression model fulfills the classical assumptions, except for the assumption of residual normality. The Kolmogorov-Smirnov test shows a p-value of 0.001 (<0.05), which means that the residuals are not normally distributed. However, since the sample size is quite large (n > 200), this violation can be ignored by referring to the Central Limit Theorem, so the estimation results remain valid.

The heteroscedasticity assumption is fulfilled based on Park's test, which shows that no independent variable is significant to the absolute residual. The autocorrelation test with Durbin-Watson yields a value of 1.808, close to 2, indicating no autocorrelation. In addition, the VIF values of all variables are below 10, so there is no multicollinearity. Thus, the model is considered feasible and the regression estimate can be considered BLUE (Best Linear Unbiased Estimator).

Table 4. Estimation results

Variable	Coefficient	SE	t-stat	Prob.
Constant	-5.481	1.607	-3.411	0.001
Staff participation	0.132	0.066	1.992	0.048
Compliance with SOP	0.036	0.097	0.370	0.712
System integration	0.398	0.068	5.821	0.000
Management commitment	0.455	0.063	7.194	0.000
F-stat	187.803		p-value F	0.000
R-squared	0.769		Adj.R-squared	0.765

Source: SPSS ouput

Table 4 displays the results of the multiple linear regression analysis assessing the influence of staff participation, compliance with SOP, system integration, and management commitment on data quality. The model is statistically significant overall, as indicated by the F-statistic value of 187.803 and a p-value of 0.000, suggesting that the independent variables collectively explain a significant proportion of the variance in data quality. The adjusted R-squared value of 0.765 indicates that approximately 76.5% of the variability in data quality can be explained by the four independent variables included in the model.

Among the predictors, management commitment ($\beta = 0.455$, $p < 0.001$) and system integration ($\beta = 0.398$, $p < 0.001$) have the strongest and statistically significant positive effects on data quality, implying that increased levels of managerial support and integrated systems substantially enhance data quality. Staff participation also demonstrates a positive and statistically significant influence ($\beta = 0.132$, $p = 0.048$), although the magnitude of its effect is smaller. In contrast, compliance with SOP ($\beta = 0.036$, $p = 0.712$) does not exhibit a statistically significant relationship with data quality, indicating that adherence to standard procedures alone may not directly enhance data quality in the presence of other organizational factors.

These findings highlight the critical role of managerial commitment and integrated systems in ensuring high-quality data within organizational settings, while also underscoring the importance of participatory involvement of staff in supporting data-driven outcomes.

DISCUSSION

The results of the multiple linear regression analysis in this study show that there are different levels of significance of the influence between the independent variables on the data quality of telecommunication assets. The findings provide important theoretical and practical implications in the context of data management in the digital infrastructure sector.

First, staff participation was found to have a positive and significant effect on data quality ($\beta = 0.132$; $p = 0.048$), indicating that the active involvement of staff in the data collection, verification and management process can improve data accuracy and completeness. This is in line with the findings of Liu et al. [3] who assert that end-user participation in information systems directly impacts on improving data integrity and reliability. In addition, a study by Ahanhanzo et al. (2014) emphasized that staff training and involvement in health information systems improves process understanding, which in turn strengthens the sense of ownership of data quality. In the context of telecommunication asset management, this means that the creation of a participatory work environment can be a key strategy to improve sustainable data quality.

Second, compliance with standard operating procedures (SOPs) did not show a significant effect on data quality ($\beta = 0.036$; $p = 0.712$). This result does not support the initial hypothesis and even contradicts some literature that states that compliance with SOPs is a prerequisite for data consistency and accuracy [27]. This discrepancy may be due to the weak implementation of SOPs in the field, which is often only administrative without internalizing the values of the importance of procedures. Eskandarzadeh et al. [4] also emphasized that organizational factors such as workload, operational fatigue, and low perceived value-added of data recording activities can reduce compliance even when SOPs are in place. Therefore, a more comprehensive approach in strengthening compliance is needed, such as empowerment, technology-based monitoring, and raising awareness of the impact of data quality on organizational performance.

Third, system integration contributes significantly and substantially to data quality ($\beta = 0.398$; $p = 0.000$). This finding confirms that integrated information systems not only facilitate interoperability between divisions, but also enable early detection of data anomalies, automatic validation, and elimination of redundancies. Consistent with the findings of Liu et al. [3], an integrated system plays an important role in supporting data completeness. The studies of Hikmawati et al. [28] and Fraser et al. [29] add that systems such as Master Data Management (MDM) are a strong technological foundation in creating a single source of truth. The practical implications of these findings point to the urgency of system integration as part of an organization's digital transformation strategy, particularly in the telecommunications sector which relies heavily on the accuracy of spatial information and asset inventories.

Fourth, management commitment emerged as the most dominant predictor of data quality ($\beta = 0.455$; $p = 0.000$). This suggests that data quality is not solely a technical issue, but depends on the direction of the organization's strategic policies and priorities determined by top management. This finding is in line with the study of Somatunga et al. [30] and Ibrahim et al. [31], which state that managerial commitment in the form of budget support, supervision, and the formation of a quality culture greatly affects the success of data governance programs. Zellal and Zaouia [6] also emphasize that without top-level support, data quality improvement initiatives

tend to be ad-hoc and unsustainable. Therefore, this result reinforces the urgency of the need for top management commitment as an enabler in efforts to systematically improve data quality.

The results of this study show that the quality of telecommunications asset data of XYZ Ltd is not only influenced by technical aspects such as system integration, but is also highly dependent on human and organizational factors, particularly staff participation and management commitment. Meanwhile, compliance with SOPs needs to be reviewed for the effectiveness of its implementation in the field. This research provides a practical contribution for policy makers in the telecommunications sector in designing a more comprehensive and evidence-based data quality improvement strategy.

CONCLUSION

This study examined the effects of staff participation, SOP compliance, system integration, and management commitment on the quality of telecommunication asset data of XYZ Ltd. The findings indicate that staff participation, system integration, and management commitment significantly and positively influence data quality. Notably, management commitment emerged as the most influential factor, highlighting the importance of leadership in fostering data governance.

In contrast, compliance with SOPs showed no significant effect, suggesting that procedural adherence alone is insufficient without meaningful engagement and contextual implementation. These results emphasize that improving data quality requires not only robust systems and formal procedures but also strong managerial support and active staff involvement. Future research may further explore the interaction among organizational, technical, and behavioral factors in shaping data quality outcomes.

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