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Green Engineering Management Practices and Financial Performance in Clean Water Infrastructure Programs: Evidence from a Waqf-Based Initiative

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Abstract: Green engineering emphasizes the efficient use of resources, sustainable infrastructure delivery, and integrated management systems to support long-term environmental and financial performance. In clean water infrastructure programs, particularly those implemented through philanthropic and waqf-based initiatives, managerial effectiveness plays a critical role in ensuring project sustainability. This study investigates how knowledge management, organizational communication, and accountability shape the financial performance of a clean water infrastructure program at Institution X. Using a quantitative explanatory design, survey data from 84 personnel involved in project implementation were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicate that engineering management practices are implemented at a moderate level, while their impacts on financial performance are selective and mediated. Transparency shows a significant direct effect, whereas reporting and communication practices influence financial outcomes indirectly through knowledge sharing. Knowledge sharing emerges as the central mechanism linking governance and communication practices to efficient resource utilization and financial performance. The findings demonstrate that green infrastructure performance is not determined solely by technical design, but also by integrated engineering management practices that enhance coordination, knowledge utilization, and project sustainability.

Keywords: Green engineering management, clean water infrastructure, knowledge management, accountability, financial performance

INTRODUCTION

Access to clean water remains a persistent challenge in Indonesia, particularly in rural and underserved regions where infrastructure development has not kept pace with community needs. Although the country is endowed with abundant water resources, distribution remains uneven, and only about 20% of the population is reported to have proper access to safe water services, according to national data presented in the Road to 10th World Water Forum 2024.

This situation underscores the urgent need for non-governmental actors especially philanthropic institutions to contribute to the provision of sustainable clean water facilities.

Among Islamic social finance instruments, ***waqf*** has emerged as a strategic mechanism for funding essential infrastructure. Philanthropic organizations that manage community contributions through waqf and crowdfunding have played an increasingly important role in filling public service gaps. The Indonesia Philanthropy Outlook 2022 recorded philanthropic disbursements reaching IDR 15.4 trillion and supporting more than 91 million beneficiaries in 2020. When managed professionally, waqf-based programs carry significant potential to strengthen community access to clean water.

However, despite this potential, the financial performance of the *Clean Water Waqf Program* (WAFP) at Institution X has not been optimal. Throughout 2017–2023, annual fundraising ranged between IDR 3.85 - 10.03 billion, significantly lower than the institution's flagship Qur'an waqf program, which reached IDR 13.15 - 54.64 billion annually (Table 1.1).

Table 1.1 Fundraising Performance of Clean Water Waqf Program Compared to Qur'an Waqf Program (2017–2023)

Year	Clean Water Waqf Program	Qur'an Waqf Program	Share of Clean Water Program
2017	Rp. 3.854.136.062	Rp. 13.148.586.646	22,7%
2018	Rp. 5.072.735.299	Rp. 19.348.579.538	20,8%
2019	Rp. 4.766.462.130	Rp. 22.010.319.539	17,8%
2020	Rp. 5.755.388.148	Rp. 24.809.241.147	18,8%
2021	Rp. 6.182.504.982	Rp. 54.637.592.509	10,2%
2022	Rp. 10.030.226.713	Rp. 50.768.016.991	16,5%
2023	Rp. 8.640.343.091	Rp. 45.064.164.401	16,1%

Furthermore, fund utilization has remained relatively low, with annual disbursements representing only 37%–67% of total receipts (Table 1.2)

Table 1.2 Fund Utilization Performance of the Clean Water Waqf Program (2017–2023)

Year	Funds Received	Funds Disbursed	Remaining Balance	Disbursement Ratio
2017	Rp. 3.854.136.062	Rp. 1.432.465.732	Rp. 2.421.670.330	37,2%
2018	Rp. 5.072.735.299	Rp. 2.012.481.961	Rp. 3.060.253.338	39,7%
2019	Rp. 4.766.462.130	Rp. 2.926.388.667	Rp. 1.840.073.463	61,4%
2020	Rp. 5.755.388.148	Rp. 2.356.498.340	Rp. 3.398.889.808	40,9%
2021	Rp. 6.182.504.982	Rp. 3.850.458.103	Rp. 2.332.046.879	62,3%
2022	Rp. 10.030.226.713	Rp. 6.666.534.987	Rp. 3.363.691.726	66,5%
2023	Rp. 8.640.343.091	Rp. 3.837.295.706	Rp. 4.803.047.385	44,4%

These patterns limited fundraising share, fluctuating income, and modest disbursement ratios indicate potential internal managerial issues that may be affecting the program's financial outcomes.

Scholarly literature highlights three managerial factors that strongly influence financial performance in nonprofit organizations: ***knowledge management (KM), organizational communication,*** and ***accountability***. Weak KM particularly inconsistent documentation, limited knowledge sharing, and inadequate knowledge retention tends to result in repetitive technical errors and decision-making that is not data-driven (Lettieri et al., 2004; Gunasekera & Chong, 2018). Internal communication affects coordination speed, clarity of responsibilities, and cross-unit integration; ineffective communication structures are

associated with operational delays and reduced organizational productivity (Johnston et al., 2007; de Nadae & de Carvalho, 2019). Accountability including transparency, timely reporting, and adherence to internal procedures is essential in sustaining donor trust and ensuring the steady flow of waqf funding (Ebrahim, 2003; Ritchie & Kolodinsky, 2003).

Preliminary observations within Institution X corroborate these patterns. Knowledge management practices remain unstandardized, including the absence of a structured repository of project learnings or technical guidelines. Internal communication gaps particularly unclear workflows and inconsistent coordination between headquarters and branch offices pose risks of misinterpretation and delayed execution. On the accountability side, inconsistent reporting timeliness threatens donor visibility and long-term trust. Altogether, these managerial challenges align with the observed financial issues and suggest a systemic linkage between KM, communication, accountability, and financial performance.

The consequences of these weaknesses are multi-layered. At the ***micro level***, technical and administrative delays elevate project lead time, reduce asset utility, and increase unnecessary operational costs. At the ***organizational level***, unstable information flow and delayed reporting reduce fundraising efficiency, weaken donor retention, and hinder program scalability. At the ***sectoral level***, limited transparency and operational inconsistency risk eroding public trust in philanthropic waqf initiatives and slowing the adoption of best practices across the clean water ecosystem.

Given these dynamics, strengthening KM, communication, and accountability is essential for improving WAFP's financial performance. While prior studies have explored these managerial dimensions separately or in different organizational contexts, there remains a limited number of integrative studies focusing on philanthropic organizations in Indonesia. This research addresses that gap by examining the relationships among the three managerial constructs and their influence on financial performance within a clean water waqf program.

Accordingly, this study focuses on three core research questions aligned with the scope of the journal:

1. What are the key managerial factors that influence the effectiveness of knowledge management, communication, accountability, and financial performance in the clean water waqf program?
2. How well are knowledge management, communication, accountability, and financial performance currently implemented in Institution X?
3. What are the structural relationships between knowledge management, communication, accountability, and financial performance in Institution X?

By addressing these questions, the study provides empirical evidence on managerial determinants of financial performance in nonprofit waqf-based programs, contributing both theoretically to nonprofit management literaturee and practically to the improvement of clean water waqf operations.

METHOD

Research Design

This study employed a quantitative explanatory design to examine the relationships between **knowledge management, communication, accountability,** and **financial performance** within the clean water waqf program of Institution X. The explanatory approach was selected to evaluate causal relationships among variables using field data obtained from staff involved directly in project implementation. The research was conducted using a **survey method** supported by structured questionnaires as the primary data collection tool.

In line with the objectives of RQ1–RQ3, the research process consisted of three main stages:

1. Identifying and validating measurement indicators (RQ1).
2. Assessing the performance level of each managerial construct (RQ2).
3. Testing structural relationships among variables using PLS-SEM (RQ3).

Research Variables

The study investigated four latent constructs: **Accountability, Knowledge Management, Communication,** and **Financial Performance**. Each variable was conceptualized as a reflective construct based on validated theoretical indicators derived from literature review and expert validation (see Table 2.1). Variable roles were determined according to causal relationships tested in the structural model:

1. Independent variables: Knowledge Management, Communication, Accountability
2. Dependent variable: Financial Performance

These relationships formed the basis of the hypothesized model tested using PLS-SEM

Instrument Development

A multi stage instrument development process was applied. First, indicators for each variable were identified through literature review followed by expert validation involving five specialists in NGO governance and management. Experts assessed the relevance and clarity of the indicators and recommended refinements where needed.

Second, a pilot survey was administered to 10 respondents from Institution X to evaluate the comprehensibility of questionnaire items and ensure linguistic clarity. Revisions were incorporated before dissemination of the final survey.

Third, the main questionnaire measured respondents' perceptions regarding the implementation of Knowledge Management, Communication, Accountability, and Financial Performance using a **five-point Likert scale**, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*)

Data Collection

1. **Population and Sampling** for RQ1, expert sampling (non-random purposive technique) was used, involving 5 experts with relevant professional or academic experience. For RQ2 and RQ3, the study targeted employees of Institution X who were directly involved in the clean water waqf program. Sampling followed judgmental quota sampling for the pilot survey and purposive sampling for the main survey. Before full deployment, a pilot test was conducted to refine item clarity and ensure reliability.
2. Hair et al. (2021; 2023), sample adequacy was instead established through **power analysis**, assuming medium effect size ($f^2 = 0.15$), $\alpha = 0.05$, and power = 0.80, resulting in a required sample of approximately **70 - 80 respondents**. The actual sample met this threshold and was therefore adequate for PLS-SEM analysis.

Data Types

The study utilized both **primary data** (expert validation, pilot survey, main survey) and **secondary data** (documents, internal reports, prior studies). Primary data were obtained using structured questionnaires distributed electronically. Secondary data supported contextual understanding and triangulation of variables and indicators.

Data Analysis

Data analysis was conducted in two stages in accordance with RQ2 and RQ3:

1. **Descriptive Analysis (RQ2)** Descriptive statistics were used to assess the perceived performance of each indicator across variables. Mean scores were computed to identify strengths and areas requiring improvement, providing an overview of managerial effectiveness within the clean water waqf program.

2. **PLS-SEM Analysis (RQ3) Structural model analysis was performed using Partial Least Squares Structural Equation Modeling (PLS-SEM). This method was selected due to** the complexity of the model (>50 reflective indicators), the study's predictive and exploratory orientation, suitability for small to medium sample sizes, and minimal distributional assumptions required for non-profit organizational data. PLS-SEM evaluated both the **measurement model** (outer model: reliability, convergent and discriminant validity) and **structural model** (inner model: path coefficients, R^2, effect sizes, and significance via bootstrapping).

Respondent Profile

A total of 84 respondents participated in this study, representing operational, technical, administrative, and managerial personnel involved in the clean water waqf program at Institution X. Respondents had between two to eight years of professional experience in project-based or nonprofit program environments, ensuring adequate familiarity with organizational processes assessed in this study. This profile strengthens the reliability of the data collected.

RESULTS AND DISCUSSION

The descriptive analysis indicates that the implementation of accountability, knowledge management, organizational communication, and financial performance in clean water waqf programs at Institution X is perceived at a moderate level. Most indicators fall within the "adequate" category, suggesting that managerial systems and procedures are already in place but have not yet reached an optimal level of effectiveness. This condition reflects a functional organizational environment in which practices are operational but still fragmented and inconsistently integrated across program units.

The structural model analysis reveals that the influence of managerial variables on financial performance is selective rather than uniform. At the dimensional level, transparency (AK1) demonstrates a positive and significant direct effect on financial performance, indicating that openness in financial information, clarity of decision rationales, and accessible budget management directly enhance the effectiveness of financial resource utilization. In contrast, reporting (AK2) does not exert a direct influence; its contribution becomes significant only when mediated by knowledge sharing, suggesting that reporting impacts financial performance when it functions as a source of shared organizational knowledge rather than as a purely administrative requirement.

Knowledge management emerges as the central mechanism shaping financial performance, with knowledge sharing (KM2) showing both a significant direct effect and a mediating role in the relationships between accountability, communication, and financial outcomes. This finding highlights that financial effectiveness in waqf-based infrastructure programs is strongly influenced by the organization's ability to exchange, interpret, and collectively utilize operational knowledge across teams and divisions. Without effective knowledge-sharing processes, the potential benefits of accountability and communication practices remain limited.

Organizational communication contributes to financial performance primarily through the effectiveness of communication media (MK3), which demonstrates both direct and indirect effects via knowledge sharing. Appropriate communication platforms facilitate coordination, documentation, and inter-divisional interaction, thereby supporting efficient program execution and financial control. Meanwhile, feedback mechanisms (MK4) do not exhibit direct or mediated effects but show a significant total effect, indicating a systemic and cumulative influence that strengthens learning and coordination over time.

Overall, these findings suggest that financial performance in clean water waqf programs is not driven by the completeness of formal managerial systems, but by specific functional dimensions that directly influence information flow, knowledge utilization, and coordination processes. Knowledge sharing acts as the pivotal link that converts accountability and communication practices into financially relevant outcomes, underscoring the importance of integrated managerial mechanisms in improving the financial effectiveness of non-profit, project-based programs.

CONCLUSION

This study examined the performance and interrelationships of accountability, knowledge management, and organizational communication in shaping the financial performance of clean water waqf programs at Institution X. The findings indicate that although these managerial practices are generally implemented at a moderate level, their influence on financial performance is selective and mediated through specific functional mechanisms rather than uniformly direct effects.

The results show that transparency in accountability, knowledge sharing, and the effective use of communication media are the primary drivers of financial performance. Transparency exerts a direct influence by improving financial control and decision clarity, while knowledge sharing functions as a central mechanism that converts accountability and communication practices into financially relevant outcomes. Reporting and communication practices contribute to financial performance primarily when they are integrated into organizational knowledge-sharing processes, rather than operating as standalone administrative functions.

From a theoretical perspective, this study contributes to the literature on non-profit and waqf-based project management by demonstrating that financial performance is shaped by a layered mechanism of direct, indirect, and systemic effects. The findings highlight the pivotal role of knowledge management—particularly knowledge sharing—as a mediating backbone that links governance and communication practices to financial effectiveness. These insights extend existing frameworks by emphasizing the importance of functional integration over formal completeness in managerial systems.

REFERENCES

Al Nahyan, M. T., Sohal, A., Hawas, Y., & Fildes, B. (2019). Communication, coordination, *decision*-making, and knowledge-sharing: A case study in construction management. *Journal of Construction Engineering and Management, 145*(3), 04019010. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001611

Aldashev, G., Marini, M., & Verdier, T. (2014). Brothers in alms? Coordination between nonprofits on markets for donations. *Journal of Public Economics, 117*, 182–200. https://doi.org/10.1016/j.jpubeco.2014.04.009

Ali, M., Hassan, R., & Arshad, R. (2022). Enhancing financial sustainability of waqf institutions through digitalization and good governance. *Journal of Islamic Accounting and Business Research, 13*(2), 195–215. https://doi.org/10.1108/JIABR-04-2021-0115

Alves, J. L., de Nadae, J., & de Carvalho, M. M. (2022). Knowledge management enablers and barriers: Exploring the moderating effect of communication barriers. *Journal of Knowledge Management, 26*(5), 1145–1163. https://doi.org/10.1108/JKM-11-2020-0830

Bowman, W. (2011). Financial capacity and sustainability of ordinary nonprofits. *Nonprofit Management & Leadership, 22*(1), 37–51. https://doi.org/10.1002/nml.20039

Clampitt, P. (2016). *Communicating for managerial effectiveness* (6th ed.). SAGE Publications.

Cornelissen, J. (2020). *Corporate communication: A guide to theory and practice* (6th ed.). SAGE Publications.

de Nadae, J., & de Carvalho, M. M. (2019). Managing communication in project teams: A systematic literature review. *International Journal of Project Management, 37*(7), 917–932. https://doi.org/10.1016/j.ijproman.2019.06.002

Downs, C. W., & Adrian, A. D. (2012). *Assessing organizational communication: Strategic communication audits*. Guilford Press.

Ebrahim, A. (2003). Accountability in practice: Mechanisms for NGOs. *World Development, 31*(5), 813–829. https://doi.org/10.1016/S0305-750X(03)00014-7

Ebrahim, A. (2010). The many faces of nonprofit accountability. In D. O. Renz & R. D. Herman (Eds.), *The Jossey-Bass handbook of nonprofit leadership and management* (pp. 101–121). Jossey-Bass.

Ebrahim, A., & Rangan, V. K. (2014). What impact? A framework for measuring the scale and scope of social performance. *California Management Review, 56*(3), 118–141. https://doi.org/10.1525/cmr.2014.56.3.118

Gunasekera, A. I., & Chong, S. C. (2018). Knowledge management critical success factors and organizational performance: An empirical study in Sri Lanka. *VINE Journal of Information and Knowledge Management Systems, 48*(3), 466–490. https://doi.org/10.1108/VJIKMS-11-2017-0081

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2019). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). SAGE Publications.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook*. Springer. https://doi.org/10.1007/978-3-030-80519-7

Hair, J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2023). *PLS-SEM for business and management research: A practical guide to least squares structural equation modeling*. Springer. https://doi.org/10.1007/978-3-031-19207-4

Johnston, M., Reed, K., Lawrence, K., & Onken, M. (2007). Internal communication and organizational performance. *Journal of Business and Psychology, 22*(2), 137–152. https://doi.org/10.1007/s10869-007-9045-x

Kaplan, R. S. (2001). Strategic performance measurement and management in nonprofit organizations. *Nonprofit Management & Leadership, 11*(3), 353–370. https://doi.org/10.1002/nml.11308

Kerlin, J. A. (2017). Shaping nonprofit financial sustainability. *Nonprofit Policy Forum, 8*(4), 399–417. https://doi.org/10.1515/npf-2017-0023

Keyton, J. (2017). Communication in organizations. *Annual Review of Organizational Psychology and Organizational Behavior, 4*, 501–526. https://doi.org/10.1146/annurev-orgpsych-032516-113341

Lettieri, E., Borga, F., & Savoldelli, A. (2004). Knowledge management in nonprofit organizations. *Knowledge and Process Management, 11*(3), 235–244. https://doi.org/10.1002/kpm.203

Men, L. R. (2014). Strategic internal communication: Transformational leadership, communication channels, and employee satisfaction. *Management Communication Quarterly, 28*(2), 261–283.

Noor, N. M. M., Hazlin, N., & Abdullah, R. (2017). Tacit knowledge sharing behaviour among employees in Malaysian public sector. *International Journal of Academic Research in Business and Social Sciences, 7*(8), 110–121.

Ritchie, W. J., & Kolodinsky, R. W. (2003). Nonprofit organization financial performance measurement: An evaluation of new and existing financial performance measures. *Nonprofit Management & Leadership, 13*(4), 367–381. https://doi.org/10.1002/nml.20

Valmohammadi, C., & Ahmadi, M. (2015). The impact of knowledge management practices on organizational performance. *Journal of Enterprise Information Management, 28*(1), 131–159. https://doi.org/10.1108/JEIM-09-2012-0065