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Implementation Strategy of Digital Visualization-Based Management System in Baitul Arqom Non-Formal Islamic Education

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ABSTRACT

This study aims to formulate a comprehensive implementation strategy for a digital visualization-based management system in the Baitul Arqom program as a core non-formal Islamic education initiative for cadre regeneration to improve data utilization and decision-making efficiency. This research employs a qualitative descriptive approach, with data collected through in-depth interviews with administrators of the Council for Cadre Education (Majelis Pendidikan Kader) and Focus Group Discussions (FGD), which were analyzed using SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats). The findings indicate that although Baitul Arqom has a strong organizational structure and ideological foundation, its management remains constrained by manual administrative processes, limited technological infrastructure, and low digital literacy among senior administrators. Based on the SWOT analysis, a three-phase implementation strategy was formulated, consisting of infrastructure modernization, human resource capacity building, and the development of a digital visualization dashboard for real-time monitoring and evaluation. This study implies that the successful implementation of a visualization-based management system requires a holistic approach that prioritizes organizational culture transformation, continuous capacity development, and phased system adoption to ensure sustainable and data-driven cadre management within the Baitul Arqom program.

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INTRODUCTION

The rapid advancement of information technology in the era of Society 5.0 has fundamentally reshaped how institutions manage information, make decisions, and ensure organizational sustainability. Education, as a key driver of social development, is expected to adapt to data-driven management practices to

remain relevant and effective. The increasing complexity of educational governance requires accurate, timely, and integrated data to support evidence-based decision-making (Afifah, 2025; Hikmah et al., 2025; Jamil & Sanusi, 2024; Setiawan et al., 2024; Wahyudi, 2025). Empirical evidence shows that institutions adopting digital management systems demonstrate higher efficiency, transparency, and adaptability compared to those relying on manual processes (Barokah, 2025; Hasani, 2025; Khotimah et al., 2024; Shofuro, 2025). In this context, the relevance of digital transformation extends beyond technical efficiency to broader societal benefits, such as accountability and inclusivity. However, digital transformation is unevenly distributed across educational sectors, creating disparities in organizational performance. Therefore, examining digital management implementation in underexplored educational settings is crucial to ensure that technological progress contributes equitably to societal development and institutional resilience in the Society 5.0 era.

Despite the growing importance of digital governance, many non-formal educational institutions remain marginalized in the digital transformation agenda. Unlike formal education sectors that have widely adopted Management Information Systems (MIS), non-formal Islamic education programs often operate with limited technological integration (Rahmat, 2021). This condition creates systemic problems, including inefficient data management, slow decision-making processes, and limited organizational learning. The lack of digital infrastructure exacerbates information asymmetry, making it difficult for stakeholders to monitor program outcomes and long-term impacts. Moreover, the absence of standardized data systems restricts institutional capacity to respond to social changes and generational shifts. As non-formal Islamic education plays a strategic role in shaping moral values, leadership character, and community resilience, these management challenges extend beyond organizational concerns and affect broader social development. Consequently, addressing digital management gaps in this sector is not merely a technical necessity but a societal imperative.

Baitul Arqom, as the standardized cadre training program of Muhammadiyah, holds a strategic position in ideological internalization and leadership regeneration within the organization (Fajariyah, 2025; Hadi & Masuwd, 2025; Hasanah et al., 2024; Jannah & Rizquha, 2025). However, field observations indicate that its management practices remain predominantly manual, characterized by paper-based reporting, fragmented documentation, and decentralized data storage. Participant records, competency development data, and alumni tracking are often scattered across physical archives or individual administrators' files. This phenomenon results in limited data accessibility and underutilization of valuable institutional knowledge.

Administrators face difficulties in synthesizing information for strategic planning, program evaluation, and policy formulation. Furthermore, the reliance on tabular data without analytical visualization limits the ability to identify trends, patterns, and anomalies efficiently. This gap between the strategic importance of Baitul Arqom and its management capacity highlights the urgency of developing an integrated digital management approach tailored to its organizational and cultural context.

Previous studies have extensively examined digital transformation and information system adoption in formal education and corporate organizations. Research by Westerman et al. (2014) emphasizes that successful digital transformation requires alignment between technology, organizational culture, and leadership commitment. In the educational context, MIS implementation has been shown to enhance administrative efficiency, data accuracy, and decision-making quality. Studies by Setiawan and Luthfi (2020) further highlight the risks of data silos in organizations lacking integrated information systems, resulting in fragmented knowledge and suboptimal performance. Meanwhile, data visualization has gained recognition as an effective tool for transforming complex datasets into intuitive insights, enabling faster and more informed decisions (Few, 2019). However, most of these studies focus on formal institutions or profit-oriented organizations, leaving non-formal and religious education contexts underrepresented in academic discourse.

Although existing literature provides valuable insights into digital management systems and data visualization, there remains a significant research gap regarding their implementation in non-formal Islamic education institutions (Fajariyah, 2025; Hadi & Masuwd, 2025; Hasanah et al., 2024; Jannah & Rizquha, 2025). Studies addressing Islamic education management often emphasize curriculum, ideology, and leadership values rather than technological governance. Conversely, digital transformation studies tend to overlook the unique cultural, structural, and resource constraints of religious non-profit organizations. Rahmat (2021) notes that digital adoption in non-formal Islamic education is hindered by limited digital literacy and resistance to change, yet strategic implementation frameworks remain underexplored. Moreover, prior research rarely integrates SWOT analysis as a strategic tool to bridge organizational readiness and technological innovation. This gap underscores the need for context-sensitive research that not only proposes technological solutions but also addresses organizational culture, human resource capacity, and sustainability considerations.

The novelty of this study lies in its strategic integration of data visualization, qualitative SWOT analysis, and non-formal Islamic education management. Unlike previous studies that focus on system development or

technical efficiency, this research emphasizes implementation strategy as a holistic process encompassing infrastructure, human resources, and cultural transformation. By positioning data visualization as a managerial tool rather than merely a technical feature, this study advances the state of the art in educational management research. The urgency of this research is reinforced by the increasing demand for accountability, transparency, and adaptability within religious organizations in the Society 5.0 era. Addressing this issue is essential to ensure that cadre training programs like Baitul Arqom remain relevant, effective, and sustainable amid rapid social and technological change.

Based on the identified gaps and field phenomena, this study addresses the research problem of how a visualization-based digital management system can be strategically implemented in the Baitul Arqom program. The central argument of this research is that technological adoption alone is insufficient without a structured implementation strategy that aligns organizational culture, human resource capacity, and infrastructural readiness. This study proposes that a phased strategy—comprising infrastructure modernization, capacity building, and visualization dashboard development—can mitigate resistance to change and enhance data-driven decision-making. The contribution of this research is twofold: theoretically, it enriches the discourse on digital transformation in non-formal Islamic education; practically, it provides a strategic framework that can be adapted by similar religious and non-profit educational institutions.

RESEACH METHOD

This study employs a qualitative descriptive research design with a case study approach. The qualitative case study design was selected to obtain an in-depth and contextual understanding of organizational readiness, managerial practices, and specific constraints faced in the management of the Baitul Arqom program (Abas & Kholidah, 2025; Khoiroh, 2025; Ma'isyah et al., 2024; Setiawan & Rizal, 2024). This approach allows the researcher to explore complex social and organizational phenomena that cannot be adequately captured through quantitative measurement alone. By focusing on a single case, the study seeks to uncover detailed insights into administrative processes, decision-making patterns, and challenges related to manual data management. The case study design is particularly suitable for examining digital transformation strategies within non-formal Islamic education institutions, where organizational culture, human resource capacity, and contextual factors play a critical role in shaping implementation outcomes.

The research was conducted within the Council for Cadre and Human Resource Development (Majelis Pembinaan Kader dan Sumber Daya Insani or MPKSDI) at the regional level, which is responsible for managing and

supervising the implementation of the Baitul Arqom program. This location was selected because MPKSDI serves as the central administrative body that coordinates cadre training activities, manages participant data, and oversees reporting mechanisms. The regional-level MPKSDI represents a strategic locus for examining management practices, as it directly interacts with program implementation while simultaneously responding to organizational policies from higher leadership structures. Furthermore, the selected location reflects typical administrative conditions of non-formal Islamic education institutions, making it a relevant and representative case for this study.

Data collection was conducted using multiple techniques to ensure depth and credibility of findings. First, in-depth interviews were carried out with five purposively selected key informants, consisting of the Head of MPKSDI, the Secretary, the Treasurer, and two IT staff members who possess a comprehensive understanding of the existing administrative workflow. These interviews aimed to identify key challenges, operational bottlenecks, and expectations related to the adoption of a digital visualization-based management system. Second, a Focus Group Discussion (FGD) was conducted to validate interview findings and facilitate collective reflection on potential strategic solutions. Third, direct observation was undertaken to examine the Baitul Arqom reporting process, document handling practices, and daily administrative routines in their natural setting.

Data analysis was conducted through an interactive process consisting of data condensation, data display, and data verification. Data condensation involved the processes of selecting, focusing, simplifying, and transforming raw data obtained from interviews, FGDs, and observations to identify relevant patterns and themes. The condensed data were then organized and presented through data displays in the form of matrices and thematic categorizations to facilitate interpretation. Subsequently, data verification was performed by continuously comparing emerging findings across data sources to ensure consistency and credibility. Based on this analytical process, a SWOT analysis was employed to map internal factors (strengths and weaknesses) and external factors (opportunities and threats). The results were then synthesized using a TOWS Matrix to formulate strategic recommendations for implementing a visualization-based management system in Baitul Arqom.

RESULT AND DISCUSSION

Result

The findings indicate that the current management system of Baitul Arqom remains heavily dependent on conventional spreadsheet-based tools, primarily Microsoft Excel, which are not integrated into a cloud-based

environment. Data storage and reporting processes are conducted offline and dispersed across individual administrators, resulting in limited data accessibility and high vulnerability to data loss. Reports generated from these spreadsheets are predominantly descriptive and narrative in nature, lacking quantitative indicators and visual performance metrics. Consequently, top-level decision makers experience difficulty in comprehending the overall condition of cadre regeneration, including trends in participant development, regional distribution, and program effectiveness. The absence of real-time data aggregation further restricts the ability of management to conduct timely evaluations and formulate responsive strategies, thereby weakening organizational agility and strategic oversight.

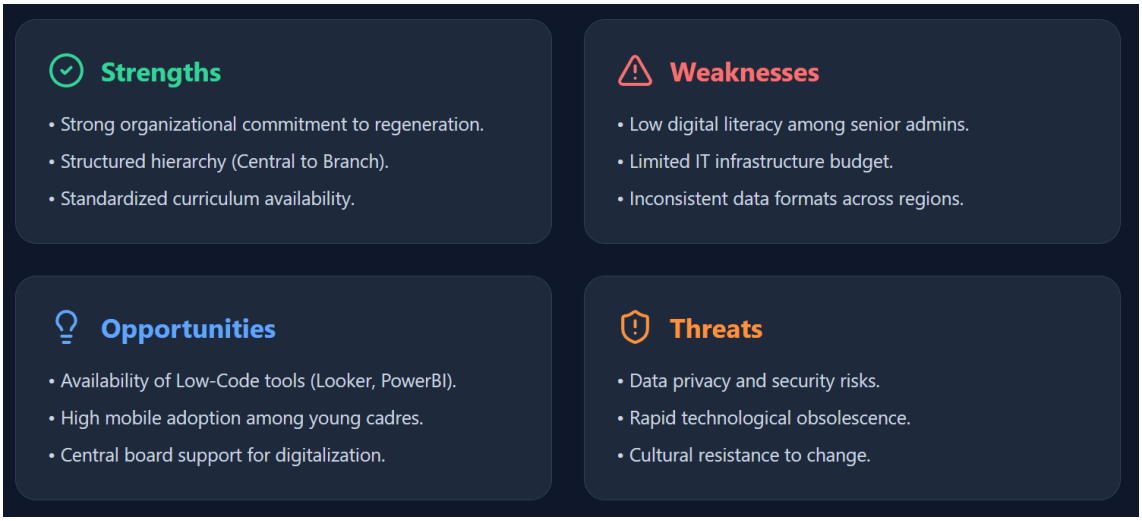

Figure 2. SWOT Analysis: Digital Readiness

Based on data collected through in-depth interviews and Focus Group Discussions (FGD), a SWOT analysis was conducted to assess the digital readiness of Baitul Arqom management (see Figure 2). The analysis identifies several internal strengths, including a strong organizational commitment to cadre regeneration, a clearly structured hierarchy from central to branch levels, and the availability of a standardized cadre training curriculum. However, these strengths are counterbalanced by notable weaknesses, such as low digital literacy among senior instructors, limited financial resources allocated for IT infrastructure, and inconsistencies in data formats across regional units. Externally, opportunities arise from the increasing availability of low-code and no-code data visualization tools such as Google Looker Studio and Power BI—the widespread use of mobile devices among younger cadres, and institutional support from the central board for digital transformation initiatives. Conversely, the organization faces threats related to data privacy and security risks, rapid

technological obsolescence, and resistance to cultural change within the institution.

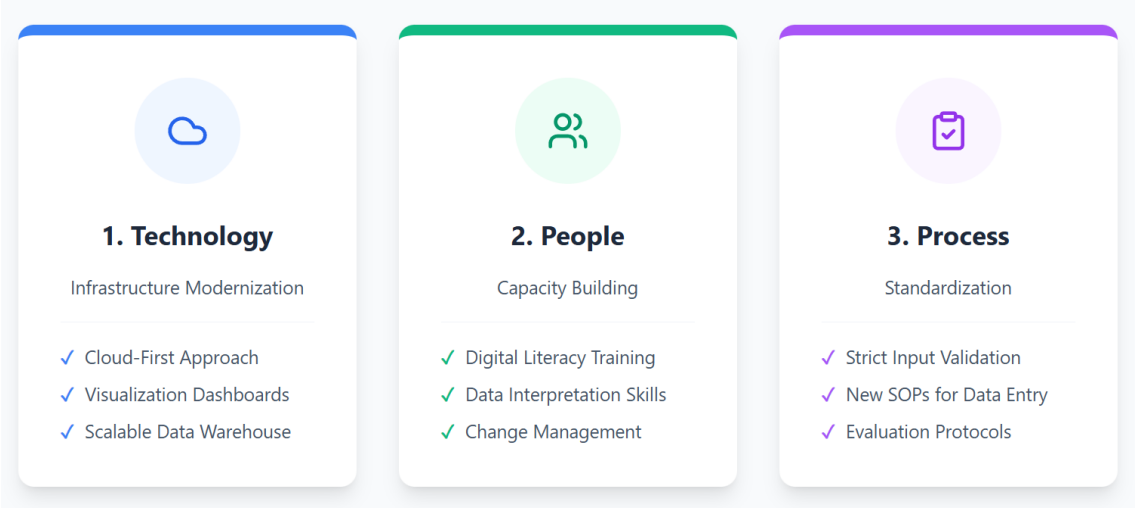

Figure 3. Three Strategic Pillars for Implementing Strategy Formulation

Implementation Strategy Formulation

Drawing on the SWOT analysis results, the implementation strategy is structured around three interrelated strategic pillars: People, Process, and Technology, as illustrated in Figure 3. This framework emphasizes that digital transformation is not solely a technological intervention but a systemic organizational change. Each pillar addresses a critical dimension of readiness and sustainability to ensure the effective implementation of a visualization-based management system.

Technology Strategy: Scalable Infrastructure

The technology strategy prioritizes the adoption of a scalable and cost-efficient infrastructure through a "cloud-first" approach. Rather than investing in expensive on-premise servers, Baitul Arqom is encouraged to utilize cloud-based data storage and processing services that enable centralized data access and real-time updates. The visualization layer should be designed to be user-friendly, presenting interactive dashboards that display Key Performance Indicators (KPIs) such as participant competence growth and the geographic distribution of alumni, thereby supporting data-driven decision-making.

People Strategy: Digital Capacity Building

The findings highlight that technological tools are ineffective without adequate human resource capacity. Therefore, a tiered digital capacity-building program is proposed. Administrative staff should receive training in standardized data entry procedures and basic system troubleshooting, while top-level management should be equipped with data literacy skills, particularly in

interpreting dashboards and leveraging visual insights for strategic decision-making.

Process Strategy: Standardization and SOPs

The most critical issue identified in this study is the absence of standardized data management processes. To address this, the system must incorporate strict data input validation mechanisms to ensure consistency and accuracy. Additionally, clear Standard Operating Procedures (SOPs) should be established to regulate data access, usage rights, and the integration of visualization reports into routine evaluation meetings, thereby institutionalizing data-driven practices.

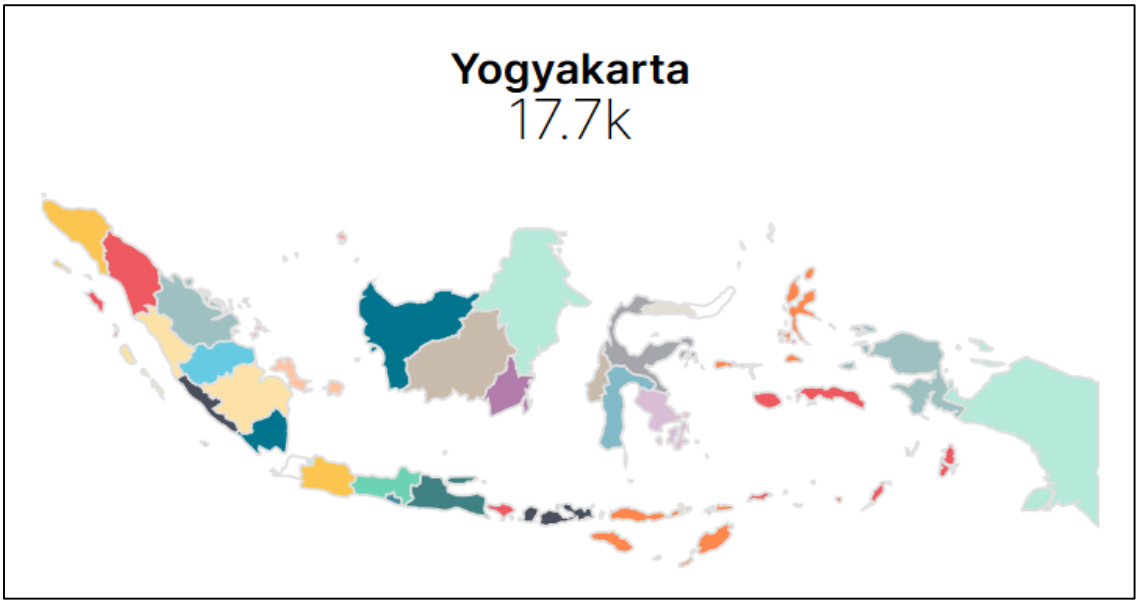

Figure 4. Visualization of the number of cadres distributed in the DIY Province

Figure 4 presents a visualization of the number of cadres distributed across the Special Region of Yogyakarta (DIY). The dashboard illustrates spatial distribution patterns that were previously difficult to identify using tabular or narrative reports alone. The visualization demonstrates the practical value of data dashboards in enhancing managerial insight. Through graphical representation, decision makers can quickly identify regions with high cadre concentration as well as areas with limited regeneration outcomes. This visual clarity enables more targeted policy interventions, such as prioritizing underrepresented regions for future cadre training programs. Moreover, the visualization supports longitudinal analysis by allowing comparisons across time periods, thereby facilitating evidence-based evaluation of program effectiveness. These findings reinforce the argument that visualization-based management systems not only improve data presentation but also transform

organizational decision-making processes into more strategic, responsive, and accountable practices.

DISCUSSION

Transformation toward Evidence-Based Management

The transition to a visualization-based management system marks a fundamental shift in the governance of Baitul Arqom, moving from intuition-driven decision-making toward an evidence-based management paradigm (Syafrudin et al., 2021). Through systematic data visualization, managerial judgments are no longer based solely on experience or subjective impressions but are supported by empirical evidence derived from structured data. For example, by visualizing pre-test and post-test assessment scores, MPKSDI can objectively measure learning gains and evaluate instructor effectiveness across different training cohorts. This approach enhances transparency in evaluation processes and strengthens institutional accountability. These findings are consistent with Rahman and Iryanti (2018), who demonstrated that web-based management systems significantly improve transparency, monitoring capacity, and accountability in educational organizations. In the context of cadre regeneration, such evidence-based practices are essential to ensure that leadership development aligns with organizational standards and ideological objectives.

Data Visualization Framework for the Management of Baitul Arqom

The proposed data visualization framework adopts a layered architectural model to ensure scalability, flexibility, and ease of implementation. This framework enables systematic data flow from data collection to strategic decision-making, ensuring that visualization outputs are reliable and meaningful.

The first layer is the Data Acquisition Layer, which focuses on digitizing data at the source. Effective visualization requires standardized and structured data input. In this study, three main data categories are identified: participant data (demographic information, educational background, and organizational experience), assessment data (pre-test scores, post-test scores, and psychomotor evaluations conducted during training), and feedback data (participant satisfaction surveys related to instructors, learning materials, and facilities). Digitization at this stage is critical to eliminate data fragmentation and ensure consistency across regions.

The second layer is the Data Processing Layer (ETL), which addresses data quality and comparability issues. Raw data collected from multiple training sessions and regions are often inconsistent and redundant. Therefore, this layer performs Extraction, Transformation, and Loading (ETL) processes. Data cleaning removes duplicate records, particularly for cadres who attend multiple

training sessions. Standardization processes normalize assessment metrics across different regions and training levels, such as regional and national programs, ensuring that performance comparisons are valid and equitable.

The third layer is the Visualization Layer (Dashboard), which functions as the user interface for Muhammadiyah leadership. This layer translates processed data into intuitive visual formats that support strategic analysis and decision-making. To operationalize this layer, four visualization modules are proposed, as presented in Table 1.

Module	Visualization Type	Metric / KPI
Demographic Overview	Geo-Map / Heatmap	Distribution of cadres across provinces/districts.
Academic Performance	Box Plot / Line Chart	Comparison of Pre-test vs. Post-test scores (Knowledge Gain).
Engagement Tracker	Bar Chart	Attendance rates and participation frequency in follow-up activities.
Resource Management	Pie Chart	Allocation of budget vs. number of cadres trained.

Table : 1 Table visualization modules

Visualizing the "Knowledge Gap"

One of the primary contributions of this visualization framework is its ability to explicitly display the "knowledge gap," defined as the delta between pre-test and post-test results. By employing paired bar charts or comparative line graphs, administrators can instantly identify whether specific cohorts of Baitul Arqom participants fail to adequately internalize core ideological concepts, particularly those related to Ideopolitor. This capability enables early detection of instructional weaknesses and supports immediate curriculum adjustments or instructor interventions. Unlike conventional tabular reports, which require manual interpretation, visual representations accelerate comprehension and reduce the risk of misinterpretation. Consequently, visualization serves not merely as a reporting tool but as an analytical instrument that enhances pedagogical quality control within cadre training programs.

Strategic Mapping of Cadres through Geospatial Analysis

Another significant strength of the proposed framework lies in its use of geospatial visualization to support strategic planning. By mapping the geographic distribution of Baitul Arqom alumni, the system can identify regions with high cadre concentration as well as "cadre deserts," defined as areas with minimal or no trained cadres. Figure 5 illustrates this phenomenon by showing

the absence of cadre distribution in Banten Province.

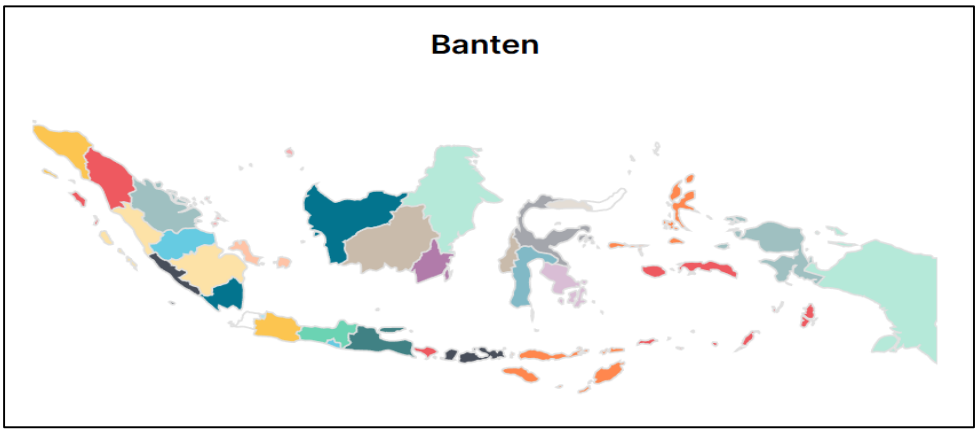

Figure 5. Geospatial visualization easily shows that there is no distribution of Cadres in Banten Province

This spatial insight provides a powerful basis for strategic intervention. The Central Board (Pimpinan Pusat) can use this information to prioritize funding allocations, schedule targeted training programs, and deploy instructors to underrepresented regions. Over time, such data-driven spatial planning supports a more equitable and balanced distribution of human resources across provinces, reinforcing Muhammadiyah's organizational sustainability and outreach capacity.

Implications for Management

The implementation of this visualization-based framework has significant managerial implications (Abas & Kholidah, 2025; Khoiroh, 2025; Ma'isyah et al., 2024; Setiawan & Rizal, 2024). Most notably, it necessitates a cultural shift from intuitive, experience-based management toward systematic, evidence-based governance. Leadership decisions—such as cadre promotion, instructor assignment, and program expansion—can be grounded in historical performance data, training consistency, and engagement indicators. This shift enhances organizational objectivity and reduces bias in decision-making processes. Furthermore, the integration of visualization into routine evaluation meetings institutionalizes data usage as a core managerial practice rather than an ad hoc activity. Ultimately, this framework positions Baitul Arqom management to become more transparent, accountable, and strategically responsive, ensuring that cadre regeneration processes are aligned with long-term organizational goals.

CONCLUSION

The most important finding of this study lies in the insight that the digital transformation of Baitul Arqom is fundamentally an organizational learning process rather than a purely technological intervention. The research demonstrates that the primary barriers to effective visualization-based management are not infrastructural constraints but gaps in human resource readiness and the absence of standardized data processes. This study highlights the critical lesson that successful implementation requires the coherent integration of the three strategic pillars People, Process, and Technology to dismantle data silos and institutionalize evidence-based decision-making. From a scholarly perspective, this research contributes to the field of educational management by extending digital transformation discourse into the underexplored domain of non-formal Islamic education. It offers a context-sensitive strategic framework that bridges data visualization theory with organizational change, thereby enriching the literature on management innovation in religious and non-profit educational institutions.

Despite its contributions, this study is subject to several limitations that open avenues for future research. The qualitative case study design, while providing rich contextual insights, limits the generalizability of findings across different regions or organizational settings within Muhammadiyah. In addition, the study focuses primarily on managerial and strategic dimensions, without quantitatively measuring user acceptance, system usability, or performance outcomes. Future research is therefore encouraged to adopt mixed-method or quantitative approaches to evaluate user satisfaction, system effectiveness, and the long-term impact of visualization-based management on organizational agility, leadership quality, and sustainability within broader Islamic educational ecosystems.

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