From Shadows to Solutions: Leveraging Dark Data to Optimize Waqf Management in Malaysia

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DOI: https://doi.org/10.47772/IJRISS.2026.100601425

Received: 06 July 2026; Accepted: 11 July 2026; Published: 22 July 2026

ABSTRACT

Waqf, as a core instrument of Islamic social finance, holds significant potential to support sustainable socio-economic development in Malaysia (Ihsan & Ibrahim, 2011; Hossain, 2020). Despite this potential, many waqf assets remain underutilized due to governance challenges, managerial limitations, and critically, the presence of dark data, which refers to data collected but not systematically analyzed for decision-making (Ahmad Fuzi et al., 2022). Through a mixed-methods empirical approach encompassing case studies, surveys, and stakeholder interviews, this study identifies the extent and operational consequences of dark data within waqf institutions (Nurul Aien et al., 2025). To address these constraints, the study develops a practical data governance framework detailing actionable strategies for data collection, storage, analysis, sharing, and utilization (Noordin et al., 2017). Furthermore, it highlights the necessity of digital transformation, specifically advocating for integrated waqf information systems and analytics-based decision-making tools (Setiawan & Nurjaman, 2022). Ultimately, the study emphasizes that collaborative synergy between Islamic institutions, technology experts, policymakers, and researchers is essential to optimize waqf asset management and enhance the socio-economic status of the ummah (Zainal et al., 2025).

Keywords: Waqf, Dark Data, Social Entrepreneurship, Islamic Social Finance, Malaysia

INTRODUCTION

Waqf, a longstanding Islamic endowment institution, has historically financed education, healthcare, and poverty alleviation in Muslim societies (Ihsan & Ibrahim, 2011; Hossain, 2020). In contemporary settings, waqf has been positioned as a catalyst for social entrepreneurship, where commercial activities align with social objectives to generate sustainable impact (Iman & Mohammad, 2017; Ridwan, 2021). In Malaysia, waqf institutions managed by State Islamic Religious Councils (SIRCs) oversee substantial assets, yet a significant proportion remains idle or underperforming (Abas & Raji, 2018; Haniff et al., 2023).

Recent studies suggest that beyond financial and human capital constraints, ineffective data management practices—particularly the accumulation of dark data—constitute a structural barrier to optimal waqf utilization (Sulaiman et al., 2019; Ahmad Fuzi et al., 2022). Organizations typically analyze less than 20% of the data they collect, a trend likely mirrored in waqf institutions with limited digital maturity (Ahmad Fuzi et al., 2022). However, data governance remains underdeveloped in both academic discourse and institutional practice (Noordin et al., 2017).

In Malaysia, waqf governance faces persistent issues, including ambiguity in property information, non-uniform management practices across states, and quality deficiencies in reporting (Mohd Hadli Shah et al., 2024). These weaknesses create fertile ground for dark data accumulation, reinforcing institutional inertia and constraining innovation. Thematic reviews identify technology application as critical for addressing waqf inefficiencies, yet empirical research examining data governance impacts remains limited (Nurul Aien et al., 2025). This paper addresses: *How can leveraging dark data enhance waqf asset management and strengthen social entrepreneurship outcomes in Malaysia?* It responds to calls for rigorous research informing waqf governance and policy formulation (Mohd Hadli Shah et al., 2024). Malaysia's digital economy agenda provides impetus for waqf institutions to embrace data-driven governance, with initiatives like Wakaf MARA Madani demonstrating growing recognition of waqf's potential for community development (Zainal et al., 2025).

Table 1: Summary on Waqf Management in Malaysia

Category	Key Statistic / Finding	Source
Data Utilization	Less than **20%** of collected data is analyzed; the rest is "dark data"	Ahmad Fuzi et al., 2022
Dark Data in Waqf	Waqf institutions likely analyze even less than 20% due to limited digital maturity	Ahmad Fuzi et al., 2022
Governance Structure	14 State Islamic Religious Councils (SIRCs) operate as sole trustees with independent systems	Mahadi et al., 2018
Interoperability	Limited to no interoperability between SIRC record-keeping systems across states	Mahadi et al., 2018
Asset Status	A significant proportion of waqf assets remain idle or underperforming	Abas & Raji, 2018
Data Storage	Records in disparate formats — paper files, isolated spreadsheets, no centralized integration	Noordin et al., 2017
Governance Issues	3 persistent problems: (1) ambiguity in property info, (2) non-uniform practices, (3) reporting quality deficiencies	Mohd Hadli Shah et al., 2024
Managerial Capacity	Inadequate training + difficulty attracting qualified personnel with dual religious-business expertise	Nurul Aien et al., 2025
Vicious Cycle	Limited capacity → more dark data → obscured performance → harder to justify investment → limited capacity	Sulaiman & Zakari, 2019
Federal Oversight	JAWHAR identified as key agency for national waqf database & digital standards	Haniff et al., 2023
Policy Initiative	Wakaf MARA Madani — emerging initiative linking waqf to community development	Zainal et al., 2025

Conceptual Background

This study is anchored in three interrelated pillars: waqf as Islamic social finance, social entrepreneurship for sustainable value creation, and dark data as an institutional constraint affecting governance (Nicholls, 2010; Iman & Mohammad, 2017; Ahmad Fuzi et al., 2022).

Waqf as Islamic Social Finance

Waqf represents a distinctive institution characterised by perpetual dedication of assets for charitable and socio-economic purposes (Ihsan & Ibrahim, 2011). Historically, financing public goods, waqf functioned as a non-state welfare mechanism in Muslim societies (Hossain, 2020). Contemporary scholarship positions waqf as a productive economic instrument generating sustainable income when professionally managed (Farid, 2016; Sulaiman & Zakari, 2019). Within Islamic social finance, waqf complements zakat and sadaqah but differs in its long-term, asset-based nature (Ascarya, 2021). Productive waqf emphasizes asset development and income generation, aligning with maqasid al-shariah objectives of wealth circulation and social justice (Roshayani et al., 2018). However, institutional waqf assets remain underutilised due to governance weaknesses and inadequate performance measurement systems (Abas & Raji, 2018; Jalil, 2020). Recent thematic reviews reveal increasing emphasis on integrating waqf with sustainability and innovation agendas (Nurul Aien et al., 2025). Systematic literature reviews emphasize that integrating social business with waqf requires holistic approaches encompassing financial sustainability, social impact assessment, and stakeholder partnerships (Junarti et al., 2024).

Waqf Governance and Institutional Theory

From institutional theory perspective, waqf institutions operate within complex regulatory, normative, and cultural environments shaping managerial behaviour (Nicholls, 2010; Scott, 2014). In Malaysia, decentralized waqf governance with SIRCs as sole trustees ensures Shariah compliance but introduces administrative fragmentation and variability across states (Mahadi et al., 2018; Haniff et al., 2023). Effective governance encompassing accountability, transparency, compliance, and strategic oversight is central to productive waqf management (Noordin et al., 2017). Weak governance results in poor documentation, limited disclosure, and minimal stakeholder engagement, constraining innovation and partnerships (R. Hasan et al., 2020). Contemporary research identifies persistent challenges: ambiguity in waqf property information, non-uniform management practices, and quality problems in reporting (Mohd Hadli Shah et al., 2024). These governance weaknesses are intimately connected to information management practices, with information gaps constituting dark data that obscure asset visibility and impede strategic decision-making. The strategic asset governance framework emphasizes three pillars: governance as structural foundation, accountability building trust, and innovation driving sustainability (Zainal et al., 2025). Comparative evidence from multiple jurisdictions demonstrates that waqf institutions with stronger governance frameworks achieve superior socio-economic outcomes (Mohd Hadli Shah et al., 2024).

Dark Data in Waqf Management

Nature and Sources of Dark Data

Dark data refers to data generated through routine processes that remain unused, unanalysed, or inaccessible for strategic purposes (Ahmad Fuzi et al., 2022). Unlike data scarcity, dark data indicates latent informational resources systematically neglected due to governance, capacity, and structural limitations (Sulaiman et al., 2019). Waqf institutions accumulate substantial data across asset lifecycles including endowment deeds, land titles, valuation reports, rental contracts, and financial statements.

These data are frequently stored in disparate formats from paper-based files to isolated spreadsheets without centralized integration or standardized classification (Noordin et al., 2017; Abas & Raji, 2018). Decentralized Malaysian waqf governance exacerbates this problem as SIRCs maintain independent record-keeping systems with limited interoperability (Mahadi et al., 2018; Haniff et al., 2023). Consequently, data on land utilization, asset performance, and beneficiary outcomes are often incomplete, outdated, or inconsistent (Jalil, 2020). Organizations typically analyze less than 20% of collected data, with the remainder constituting dark data (Ahmad Fuzi et al., 2022). In waqf institutions with limited digital maturity, this proportion may be even higher as fragmented systems compound the problem (Nurul Aien et al., 2025).

Dark Data Management Capability

Dark data management capability refers to organizational capacity to identify, integrate, analyze, and utilize dormant data for strategic decision-making (Ahmad Fuzi et al., 2022). This capability encompasses technical infrastructure, analytical competencies, governance frameworks, and organizational culture. In waqf context, this capability has emerged as critical for institutional effectiveness (Setiawan & Nurjaman, 2022). Technology application in waqf emphasizes digitization, centralized databases, and standardized reporting for enhancing transparency (Triyatno & Julaihah, 2025). Developing this capability requires: technical infrastructure integrating disparate data sources through digitization and interoperable systems (Mahadi et al., 2018); analytical capacity through training and recruitment (Noordin et al., 2017); governance frameworks ensuring data quality and security (Mohd Hadli Shah et al., 2024); and organizational culture valuing evidence-based decision-making (Zainal et al., 2025). Recent bibliometric analyses reveal growing interest in technology-based waqf management including blockchain, crowdfunding, and fintech solutions (Triyatno & Julaihah, 2025; Setiawan & Nurjaman, 2022).

Dark Data and Governance Inefficiency

From governance perspective, dark data constitutes significant institutional weakness undermining accountability, transparency, and regulatory oversight (Mohd Hadli Shah et al., 2024). Effective waqf governance relies on reliable information flows between mutawalli, regulators, donors, and beneficiaries (Ihsan & Ibrahim, 2011). When critical data remain dark, information asymmetry emerges increasing moral hazard risk and resource misallocation (Mohsin, 2013). Absence of standardized performance measurement systems reflects deeper data governance failures (Noordin et al., 2017). Without accurate data, waqf authorities cannot evaluate asset productivity, monitor outcomes, or justify strategic decisions, weakening institutional legitimacy and public confidence (R. Hasan et al., 2020). Ambiguity in waqf property information creates legal uncertainties impeding asset development (Jalil, 2020). Non-uniform management practices across states prevent development of national benchmarks (Haniff et al., 2023). Quality issues in reporting undermine stakeholder trust and limit regulatory oversight (Mohd Hadli Shah et al., 2024). The strategic asset governance framework highlights accountability as key for building trust, which depends fundamentally on reliable information (Zainal et al., 2025).

Managerial Capacity and Dark Data

Managerial capacity critically determines ability to address dark data and leverage informational resources (Noordin et al., 2017). This encompasses technical competencies in data management and broader capabilities in strategic planning, stakeholder engagement, and entrepreneurial orientation. Professionalizing waqf management requires managers possessing both traditional religious knowledge and contemporary business and data management skills (Zainal et al., 2025). However, evidence suggests managerial capacity in many waqf institutions remains limited, with challenges including inadequate training opportunities and difficulties attracting qualified personnel (Nurul Aien et al., 2025). These capacity constraints directly affect data management practices. The relationship between managerial capacity and dark data is mutually reinforcing: limited capacity generates dark data obscuring performance information, while absence of clear performance data makes justifying capacity investments difficult (Sulaiman & Zakari, 2019). Emerging research emphasizes entrepreneurial orientation among waqf managers, requiring opportunity identification, resource mobilization, and service innovation (Iman & Mohammad, 2017; Ridwan, 2021). Data management capability supports this orientation by providing informational foundation for opportunity recognition and performance monitoring (Triyatno & Julaihah, 2025).

Socio-Economic Impact on Ummah

The ultimate objective of waqf management is to generate sustainable socio-economic benefits for the ummah aligned with the maqasid al-shariah (Roshayani et al., 2018). Benefits encompass poverty alleviation, employment creation, access to education and healthcare, and community empowerment (Hossain, 2020). Despite theoretical potential, empirical evidence suggests this potential remains substantially unrealized, with waqf underemphasized in economic development (Nurul Aien et al., 2025). Socio-economic impact is mediated through productive assets generating income for reinvestment, waqf-funded institutions providing essential services, and social enterprises creating employment (Iman & Mohammad, 2017). Dark data constrains impact by obscuring relationships between activities and outcomes (Noordin et al., 2017). Without reliable data on beneficiary needs, asset performance, and program effectiveness, institutions cannot optimize resource allocation or demonstrate value, limiting ability to attract partners and scale initiatives (Molderez & Fets, 2023). Integration with sustainable development goals requires frameworks for assessing contributions to poverty reduction, health improvement, and educational access (Junarti et al., 2024). Intergenerational justice embedded in waqf's perpetual nature requires preserving information about asset boundaries and performance history for future trustees and beneficiaries (Jalil, 2020).

Problem Statement and Research Objectives

Despite growing attention on waqf-based development, effective utilization of waqf assets in Malaysia remains persistently low (Abas & Raji, 2018; Hossain, 2020; Haniff et al., 2023). While literature emphasizes governance weaknesses and financing constraints, a critical underexplored issue lies in dark data prevalence within waqf institutions (Ahmad Fuzi et al., 2022; Sulaiman et al., 2019). Dark data significantly impedes strategic decision-making by obscuring asset visibility and performance (Noordin et al., 2017; R. Hasan et al., 2020). Malaysian institutions accumulate large volumes of unstructured data due to fragmented record-keeping and limited analytical capability (Ahmad Fuzi et al., 2022). In the waqf context, this manifests in incomplete asset registries, undocumented land titles, and unanalysed beneficiary data. Recent research provides compelling evidence: ambiguity in waqf property information, non-uniform management practices, and quality issues in reporting persist as problems undermining institutional effectiveness (Mohd Hadli Shah et al., 2024). These findings suggest that dark data are structural features perpetuating inefficiency.

From a regulatory perspective, unmanaged dark data heightens compliance and legal risks (Ihsan & Ibrahim, 2011). Weak performance measurement and inadequate disclosure reduce stakeholder confidence and discourage private-sector collaboration (Mohsin, 2013). This erosion of trust affects the sustainability of waqf-based social entrepreneurship initiatives that rely on community participation and investor confidence (Iman & Mohammad, 2017). Furthermore, dark data constrains socio-economic impact as institutions struggle to demonstrate measurable outcomes (Molderez & Fets, 2023). Inability to quantify social impact limits the legitimacy of waqf-driven social enterprises, undermining maqasid al-shariah objectives (Roshayani et al., 2018). Recent bibliometric analyses reveal growing interest in technology-based waqf management, yet without systematic attention to dark data, innovative approaches risk replicating historical information deficiencies (Triyatno & Julaihah, 2025).

Research Objective: This study examines how dark data affects waqf asset management in Malaysia, which will enhance the socio-economic impact on the Ummah.

METHODOLOGY

This study adopts a qualitative-dominant, exploratory research design supported by descriptive statistics from secondary sources, aligned with prior waqf studies emphasizing conceptual development and institutional analysis (Hossain, 2020; Noordin et al., 2017). The research is primarily conceptual and doctrinal, integrating content analysis with qualitative inquiry (Yaqin, 2007). A qualitative approach is appropriate given the institutional complexity of waqf governance and the exploratory nature of dark data in Islamic social finance. Recent methodological developments emphasize value of qualitative approaches for theory building in nascent research areas (Nurul Aien et al., 2025). The study is informed by Theory of Planned Behaviour (Ajzen, 1991), providing a lens to examine managerial attitudes, subjective norms, and behavioural intentions toward data utilization and social entrepreneurship practices.

To accurately identify the extent and consequences of dark data, this study expands beyond conceptual analysis to employ a robust empirical research design (Nurul Aien et al., 2025). First, in-depth case studies of selected State Islamic Religious Councils (SIRCs) will be conducted to observe localized data handling practices and the real-world impact of unanalyzed data on asset performance (Abas & Raji, 2018). Second, a structured survey distributed to waqf managers across Malaysia's 14 SIRCs, which operate as sole trustees with independent systems, will quantify the prevalence of dark data and assess current institutional digital maturity (Mahadi et al., 2018). Finally, semi-structured interviews will be conducted with key stakeholders, including Shariah advisors, waqf officers, mutawallis, and technology experts, to deeply explore the governance bottlenecks and capacity constraints that lead to data accumulation (Bogdan & Biklen, 2003).

Data Collection: Secondary data were collected through an extensive review of academic journals, policy reports, annual reports of SIRCs, and waqf authority publications (Sulaiman & Zakari, 2019; Haniff et al., 2023). The collection focused on literature published between 2019-2024, reflecting recent scholarly trends (Nurul Aien et al., 2025). Key databases included Scopus and Web of Science. Semi-structured interviews were conducted with selected experts including Shariah advisors, waqf officers, and practitioners involved in waqf asset development, enabling in-depth exploration of perceptions and practices (Bogdan & Biklen, 2003).

Data Analysis: Data analysis follows a thematic and interpretive analytical strategy supported by descriptive statistical evidence (Braun & Clarke, 2006). Interview data and documentary materials were analysed through thematic analysis involving systematic coding, categorization, and interpretation to identify recurring patterns. Analysis proceeded through familiarization, initial coding, theme development, and refinement. Analytical triangulation cross-validated interview insights with literature, policy documents, and institutional reports (Denzin, 2012). Descriptive statistics from secondary sources contextualised the magnitude of waqf underutilization (Abas & Raji, 2018; Sulaiman & Zakari, 2019; Ahmad Fuzi et al., 2022). Findings were interpreted through Theory of Planned Behaviour lens (Ajzen, 1991), linking managerial attitudes, institutional norms, and behavioural control to actual practices.

Development of Conceptual Framework

Building on literature review and qualitative insights, this section develops a conceptual framework explaining how dark data management capability influences waqf asset utilization and socio-economic outcomes.

Theoretical Underpinnings

The framework is theoretically anchored in Theory of Planned Behaviour (TPB) and Institutional Theory. TPB posits behavioural intentions shaped by attitudes toward behaviour, subjective norms, and perceived behavioural control (Ajzen, 1991). In waqf context, TPB explains why managers may adopt data-driven practices: positive attitudes, supportive norms, and adequate resources should increase likelihood of investing in dark data management. Institutional theory emphasizes how organizations are shaped by regulatory, normative, and cultural environments (Scott, 2014; Nicholls, 2010). Waqf institutions operate within complex institutional fields including Shariah requirements, state regulations, community expectations, and professional norms, influencing both persistence of dark data and potential for change (Zainal et al., 2025).

Proposed Conceptual Framework

The framework posits that **dark data management capability** serves as a foundational enabler influencing **waqf governance quality**, which affects **socio-economic impact on the ummah**. Three key constructions:

1. **Dark Data Management Capability:** Organizational capacity to identify, integrate, analyze, and utilize dormant data (Ahmad Fuzi et al., 2022). Encompasses technical infrastructure, analytical competencies, governance frameworks, and organizational culture.

2. **Waqf Governance Quality:** Effectiveness of governance mechanisms including accountability, transparency, compliance, and strategic oversight (Noordin et al., 2017; Mohd Hadli Shah et al., 2024).

3. **Socio-Economic Impact on Ummah:** Outcomes including asset utilization, income sustainability, employment creation, service provision, and community empowerment (Roshayani et al., 2018).

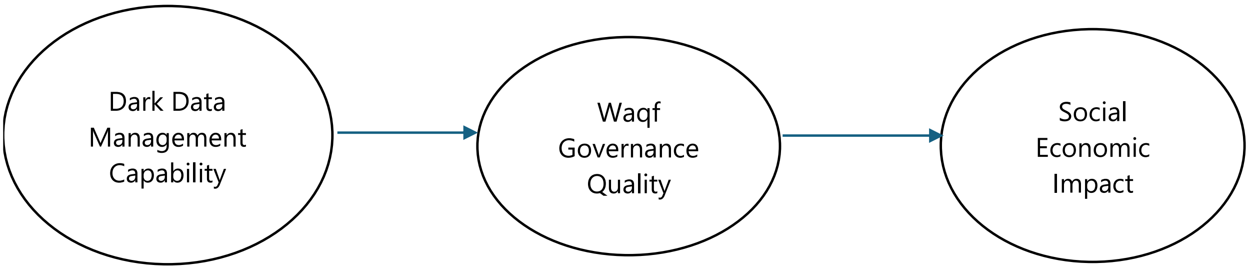

Figure 1: Conceptual Framework

Proposition Development

Data Management Capability role affects Waqf Governance Quality

The relationship between data management capability and governance quality is well-documented in waqf literature. Research by Noordin et al. (2017) emphasizes that developing performance measures for waqf institutions require systematic data collection and analysis capabilities. Their study demonstrates that without accurate and timely data, waqf authorities cannot evaluate asset productivity, monitor social outcomes, or justify strategic decisions to stakeholders, which directly undermines governance quality through weakened accountability and transparency.

A study on cash waqf decisions by Rohmana et al. (2024) provides empirical evidence that good governance mediates the relationship between institutional capabilities and waqf outcomes . The research, conducted among mosque congregations in Malang City, Indonesia, found that "good governance can mediate the influence of literacy and income on giving cash waqf," concluding that "implementation of institutional solid good governance can strengthen the trust of wakifs, thereby increasing cash waqf revenues" . This finding directly supports the notion that governance quality depends on underlying institutional capabilities, including data management.

The strategic asset governance framework proposed by Zainal et al. (2025) emphasizes that governance serves as the structural foundation for asset preservation, with accountability building trust and legitimacy. Within this framework, data management capability emerges as a critical enabler supporting all governance pillars. Effective governance requires reliable information flows; accountability depends on transparent reporting; and oversight necessitates analytical capacity to assess performance.

As a result, it is posited that:

Proposition 1 (P1): Dark data management capability has a positive effect on waqf governance quality

Waqf Governance Quality affects the Socio-economic impact on Ummah

Research indicates that enhanced governance quality, characterised by transparency, accountability, and structured management, directly fosters donor trust and ensures the efficient mobilisation of funds, thereby maximising the socio-economic potential of Waqf assets (Abd Razak, 2025). This is achieved by moving away from fragmented practices toward standardized reporting and Shariah-compliant investment mechanisms, which not only secure sustained contributions but also align Waqf operations with broader development goals such as poverty alleviation and the UN SDGs (Mohamad Yunus et al., 2024). Furthermore, collaborative and formalized governance frameworks, as seen in models like Malaysia's myWakaf initiative, facilitate financial innovations and operational efficiency, enabling Waqf institutions to channel resources effectively into education and healthcare (Mahmud & Noordin, 2024). Conversely, the literature provides compelling counterevidence by illustrating that the absence of such governance quality—through corruption, poor management, or weak regulatory oversight—leads directly to institutional dysfunction and the erosion of civic goods, squandering the very socio-economic benefits Waqf is intended to deliver (Kuran, 2023; Muhammad et al., 2024). Thus, the prevailing academic consensus confirms that high-quality governance is not merely an administrative ideal but a fundamental prerequisite for Waqf to generate a meaningful and sustainable socio-economic impact.

As a result, it is posited that

Waqf governance quality mediates the relationship between dark data management capability and socio-economic impact

Oladapo (2016), in his doctoral thesis on determinants of waqf sustainability in Nigeria, provides robust quantitative evidence for governance as a mediating mechanism. Using multiple regression analysis with data from 370 waqf officials, the study revealed "strong indirect relationships between accountability, transparency and beneficiary participation via governance on the sustainability of the Waqf institution in Zamfara state, Nigeria" . This finding directly supports Proposition 3a, demonstrating that governance transmits the effects of organisational capabilities to sustainability outcomes.

The same study further documented "a partial mediating effect" for beneficiary participation, which "recorded the strongest direct and indirect relationships compared to the other two variables (accountability and transparency) on sustainability of Waqf institution" . This nuanced finding supports Proposition 3b by identifying specific governance dimensions (accountability, transparency, and stakeholder participation) through which mediating effects operate.

Rohmana et al. (2024) similarly found that "good governance can mediate the influence of literacy and income on giving cash waqf" . Their research demonstrates that governance quality serves as an intervening mechanism through which individual-level factors (literacy, income) translate into institutional outcomes (cash waqf decisions). This finding has direct relevance for understanding how data management capability—as an organizational-level factor—may similarly operates through governance to affect socio-economic outcomes

Proposition 3 (P3): Waqf governance quality mediates the relationship between dark data management capability and socio-economic impact

Implications

Theoretical Implications

This study advances waqf and social entrepreneurship literature by explicitly positioning dark data as critical explanatory variable in waqf asset underutilization (Ahmad Fuzi et al., 2022). Prior studies focused on governance, financing, and human capital constraints while overlooking informational dimensions (Abas & Raji, 2018; Jalil, 2020). Integrating dark data discourse with Islamic social finance extends existing frameworks responding to calls for interdisciplinary approaches (Nicholls, 2010; Molderez & Fets, 2023). The framework introduces dark data management capability construct, integrates individual-level cognitive factors with macro-level institutional forces, and specifies mediating and moderating mechanisms linking data capability to outcomes. This responds to calls for rigorous theoretical frameworks guiding empirical research (Zainal et al., 2025) and contributes to emerging literature on technology application in waqf management (Triyatno & Julaihah, 2025; Setiawan & Nurjaman, 2022).

Practical Implications

Findings underscore urgency for waqf institutions to adopt standardized data governance frameworks (Noordin et al., 2017). Improved data integration enhances asset visibility, regulatory compliance, and performance measurement, strengthening stakeholder trust (Sulaiman et al., 2019). Recommendations include: conducting comprehensive data audits identifying dark data extent (Ahmad Fuzi et al., 2022); investing in digital infrastructure enabling integration (Setiawan & Nurjaman, 2022); developing standardized reporting frameworks (Mohd Hadli Shah et al., 2024); building data management competencies through training and recruitment (Noordin et al., 2017); fostering organizational culture valuing evidence-based decision-making (Zainal et al., 2025).

Policy Implications

Regulators and federal agencies like JAWHAR can promote national waqf databases, digital reporting standards, and incentive mechanisms for productive waqf development (Haniff et al., 2023). Recommendations include: establishing national waqf data infrastructure integrating information from all SIRCs (Mohd Hadli Shah et al., 2024); mandating minimum data standards for asset registration and performance reporting (Noordin et al., 2017); creating incentive mechanisms rewarding effective data management (Sulaiman & Zakari, 2019); reviewing regulatory frameworks to enable data-driven innovation; investing in research and development for waqf data management (Triyatno & Julaihah, 2025).

CONCLUSION

This study addressed critical underexplored challenge in Malaysian waqf management: dark data constraining asset utilization and limiting waqf-based social entrepreneurship sustainability (Ahmad Fuzi et al., 2022; Sulaiman et al., 2019). Findings demonstrate that dark data represent structural governance problem rather than technical deficiency. While Malaysian waqf institutions possess substantial assets, socio-economic impact remains suboptimal due to fragmented data systems, weak performance measurement, and limited analytical capability (Noordin et al., 2017; Haniff et al., 2023). These conditions hinder informed decision-making, reduce transparency, and erode stakeholder trust essential for social entrepreneurship success (Iman & Mohammad, 2017).

By proposing data-driven conceptual framework, this study integrates dark data discourse with waqf governance, clarifying mechanisms through which data management capability enhances governance quality and enables sustainable outcomes aligned with maqasid al-shariah (Roshayani et al., 2018). The study responds to calls for analytically grounded interdisciplinary approaches in waqf research (Mohd Hadli Shah et al., 2024; Nurul Aien et al., 2025) and contributes to technology application discussions (Triyatno & Julaihah, 2025). Practically, it underscores urgency for waqf authorities to prioritize digital transformation, standardized data governance, and capacity building (Zainal et al., 2025). Without systematic efforts to illuminate dark data, commercialization attempts remain fragmented and unsustainable.

The persistent ambiguity in waqf property information and reporting deficiencies necessitate an aggressive digital transformation agenda (Shah et al., 2024). Waqf institutions must move beyond basic digitization to implement fully integrated waqf information systems featuring analytics-based decision-making tools capable of tracking asset lifecycles, forecasting rental yields, and measuring social impact (Triyatno & Julaihah, 2025). Embracing advanced technologies, such as centralized databases and blockchain for transparent asset tracking, will mitigate the structural barriers causing dark data accumulation (Setiawan & Nurjaman, 2022).

However, addressing the vicious cycle of limited capacity and dark data accumulation requires a multidisciplinary collaborative ecosystem (Sulaiman & Zakari, 2019). This ecosystem must involve Islamic institutions, such as SIRCs and JAWHAR, to provide regulatory oversight and ensure that data standardization aligns with maqasid al-shariah objectives (Haniff et al., 2023). Additionally, it requires technology experts and fintech providers to design interoperable systems and train personnel, thereby closing the gap in managerial capacity and technical competency (Nurul Aien et al., 2025). Policymakers must also be engaged to mandate minimum data standards for asset registration and incentivize data-driven innovation (Noordin et al., 2017). Concurrently, academic researchers are essential to continuously monitor, evaluate, and provide empirical evidence on the effectiveness of these implemented data governance frameworks (Zainal et al., 2025).

Future research should empirically test the proposed framework using quantitative data across multiple states or through comparative cross-country analysis. Directions include quantitative testing of propositions using survey data and structural equation modeling; comparative case studies of institutions with varying data management capability; longitudinal research tracking data management interventions; cross-country comparative analysis with Indonesia, Singapore, or GCC countries (Triyatno & Julaihah, 2025); and action research collaborating with waqf institutions to develop interventions. Unlocking dark data potential offers a promising pathway for transforming waqf institutions into resilient engines of inclusive and sustainable development for the ummah (Hossain, 2020).

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