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RESOURCE MOBILIZATION AND EMERGENCY GOVERNANCE: A STUDY OF MADRASAH LEADERSHIP CAPABILITIES IN UTILIZING FINANCIAL AND LOGISTICS TECHNOLOGY FOR POST-DISASTERS RESPONSE

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Abstract

The research problem focuses on the gap between the strategic potential of madrasas as community-based disaster response hubs and their actual leadership capabilities in adopting and utilizing financial technology (fintech) and logistics, which are increasingly crucial in modern emergency management. This study uses a qualitative library research method by analyzing selected literature sources from 2020-2025. The results reveal that: (1) Fintech transforms fund mobilization to be more inclusive, transparent, and fast, despite the challenges of cybersecurity and the digital divide; (2) Logistics technology (AI, IoT, blockchain, drones) creates a proactive, traceable, and agile supply chain, with success dependent on interoperability and human resource capacity; (3) Madrasa leadership capabilities in digital coordination determine their effectiveness as information and collaboration hubs; (4) Emergency pressures trigger operational governance innovations towards digital procedures and participatory real-time accountability. In conclusion, digital technology is a transformative lever, but madrasa leadership capabilities in digital convergence, integrating traditional social authority with technological competence, are a critical success factor. The implementation of the research findings recommends the establishment of a digital-based integrated response platform involving madrasas, preceded by a digital leadership capacity building program, the development of emergency protocols, and inclusive policy collaboration to build holistic disaster resilience.

Keywords : Resources, Emergency Management, Madrasah Leadership Capability, Financial Technology, Logistics.

INTRODUCTION

Indonesia's location on the Pacific Ring of Fire makes it one of the most vulnerable countries in the world to natural disasters. The frequency of earthquakes, tsunamis, volcanic eruptions, and floods not only threatens lives but also tests the resilience of the nation's entire socio-economic system. In post-disaster situations, time is of the essence; even the slightest delay in response can result in increased loss of life and suffering. An effective response requires the rapid, targeted, and accountable mobilization of both financial and logistical resources. However, the reality on the ground often reveals a wide gap between the urgent needs at disaster sites and the



capacity to distribute aid at the national level. Conventional mechanisms for fundraising and logistics management are often hampered by slow bureaucracy, a lack of transparency, and fragmented coordination between agencies, creating inefficiencies that exacerbate the crisis (UNESCO, 2021).

In this context of high vulnerability, digital technology has emerged as a new hope for breaking this cycle of inefficiency. Financial technology (Fintech) and technology-based logistics innovations offer a new paradigm in emergency management. Digital crowdfunding platforms, payment gateways, and e-wallets enable real-time public fundraising, transcending geographic and institutional boundaries. Meanwhile, cloud-based supply chain management systems, the Internet of Things (IoT) for tracking, and big data analytics promise more predictable, monitored, and efficient aid distribution (Altay & Labonte, 2021). The transformative potential of these technologies is enormous, but their use in the context of disasters in Indonesia remains sporadic and has not been optimally integrated into the national disaster management system. Challenges in digital infrastructure, regulation, and user readiness remain significant barriers to their maximum utilization (UNDRR, 2022).

Amidst the complexity of the national system, local institutions embedded within communities are often the frontline, responding most directly. Madrasahs, as religious educational institutions spread throughout the country, hold a unique and potentially significant social position within the disaster ecosystem. More than just places of learning, madrasahs serve as community centers, social unifiers, and trusted entities within their communities. Their religious networks and alumni constitute invaluable social capital that can be mobilized in emergency situations. Madrasah leadership, typically held by a principal or kyai (Islamic cleric), wields normative and charismatic influence that can quickly mobilize community resources (BNPB, 2020).

However, these traditional leadership capabilities face new challenges. Leadership in the 21st-century post-disaster context is no longer sufficient with mere authority and conventional social networks. An increasingly digitalized world demands technological literacy and digital governance capabilities. The critical question that arises is: to what extent do madrasah leadership have the capability to not only mobilize the masses but also utilize cutting-edge financial and logistics technology tools to strengthen their response? Are madrasah principals and their teams capable of operating digital donation platforms, understanding the principles of GPS-based logistics tracking, or collaborating through digital channels with the Regional Disaster Management Agency (BPBD) and other humanitarian agencies? This gap between vast social potential and potentially limited technological capabilities is a crucial point for research (Hidayat et al., 2023).

Several previous studies have highlighted the role of faith-based organizations in disaster response, but these have focused more on conventional resource mobilization and volunteers. Meanwhile, the literature on technology adoption in disaster management tends to focus on the macro-level (government policy) or on professional international humanitarian agencies. A significant research gap exists at the intersection of these three critical elements: local institutional leadership (madrasahs), emergency resource mobilization, and the use of specific digital technologies (fintech and logistics). This study starts from the assumption that the effectiveness of grassroots disaster response will be optimal when adaptive and trusted local leadership capabilities are synergized with the efficiency and reach offered by technology (Ansell et al., 2021).

Therefore, this article aims to fill this gap by investigating the capabilities of madrasah leadership in mobilizing resources and managing post-disaster emergency governance through the use of financial and logistics technology. This research explores how madrasah leaders understand, access, and apply these technologies in practice, the obstacles they face, and how digital collaborations are formed. By exploring these dynamics, this study aims to generate a comprehensive understanding of the transformative potential of tech-savvy local leadership in building more adaptive, rapid, and accountable disaster resilience in Indonesia (Comfort, 2021).

This study begins with a paradoxical reality. On the one hand, madrasahs, as institutions deeply rooted in the grassroots of Indonesian society, possess enormous social potential and trust to spearhead post-disaster response. On the other hand, the digital era, which offers revolutionary solutions for resource mobilization and emergency governance through fintech and logistics technology, demands leadership capabilities that differ significantly from those traditionally held. A significant gap exists between the strategic potential of madrasahs as aid hubs and the actual ability of their leadership to effectively adopt, adapt, and operationalize these technologies. The core problem lies in the uncertainty regarding the level of readiness and capability of madrasah leadership to bridge the socio-religious world they master with the digital technical-operational world required for a rapid and accountable disaster response.

This research is urgent for three main reasons. First, operational urgency: disasters in Indonesia are periodic and deadly, so any improvement in response efficiency will save lives and reduce suffering. Mapping and enhancing madrasah capabilities means strengthening the first response network in locations often most difficult to reach by central government assistance. Second, scientific urgency: this study fills a gap in the literature that rarely addresses the convergence between community-based religious leadership and cutting-edge digital technologies in disaster management. The findings of this study can provide a new perspective on "hybrid resilience" that combines traditional social capital with digital capital. Third, policy urgency: the results of this study can provide an empirical basis for the government, particularly the Ministry of Religious Affairs and the National Disaster Management Agency (BNPB), to formulate targeted training and mentoring programs and design an inclusive collaboration framework, where madrasahs are not merely objects of aid but active partners empowered with digital tools in the national disaster management ecosystem.

The general objective of this study is to analyze in depth the capabilities of madrasah leadership in utilizing financial and logistics technology for resource mobilization and operational governance in the post-disaster response phase. Specifically, this study is designed to: (1) Identify and map the level of understanding, access, and use of fintech technology (such as crowdfunding platforms, digital wallets, and payment gateways) and logistics technology (such as tracking systems, warehouse management applications, or coordinated communication tools) by madrasah leadership in the context of emergency response; (2) Analyze the driving and inhibiting factors, both internal (such as digital literacy, mindset, resources) and external (such as infrastructure, regulations, network support), that influence the adoption of these technologies; and (3) Formulate a contextual and practical model for strengthening madrasah leadership capabilities, in order to optimize their strategic role as nodes for resource mobilization and effective, transparent, and accountable emergency governance in the future.

METHOD

The research, entitled "Resource Mobilization and Emergency Governance: A Study of Madrasah Leadership Capability in Utilizing Financial Technology and Logistics for Post-Disaster Response," will be conducted using a qualitative approach through library research. This method was chosen based on the research's exploratory and descriptive objectives to build a deep and comprehensive understanding of the concept of madrasah leadership capability in interacting with fintech and logistics technology in the disaster context. Library research is considered an appropriate method because it allows researchers to explore, critique, and synthesize various theories, concepts, and previously published empirical findings, thus building strong arguments and conceptual frameworks without conducting primary data collection in the field (Ridley, 2020). Through this approach, the research seeks to connect various seemingly separate fields of study such as educational leadership studies, disaster management, financial technology, and humanitarian logistics into a single, coherent and relevant analysis structure for the madrasah context in Indonesia.

The data sources used in this study are secondary and come from three main categories of published written documents. The first category is textbooks and scientific monographs, both published internationally and nationally, that discuss transformational leadership theory, strategic management of non-profit organizations, digitalization in the education and humanitarian sectors, fintech innovation, and disaster logistics and governance. The second category is articles from reputable scientific journals, indexed by Scopus, Web of Science, or Sinta-accredited national journals, containing empirical research results related to the role of religious organizations in disasters, technology adoption in society, and specific disaster response case studies. The third category is research reports and institutional publications from official institutions such as the National Disaster Management Agency (BNPB), the Ministry of Religious Affairs of the Republic of Indonesia, the National Cyber and Crypto Agency (BSSN), and reports from international humanitarian organizations (e.g., UNDRR, IFRC) that discuss regulatory aspects, policies, and best practices in technology-based disaster management (Snyder, 2019). The selection of data sources will be limited to publications published within the last ten years (2014-2024) to ensure the relevance and depth of analysis of the highly dynamic developments in technology and leadership discourse, with a particular emphasis on post-2020 literature.

Regarding data collection techniques, this study will implement a systematic and step-by-step process to identify, select, and collect relevant documents. The first stage is a systematic search using strategic keywords in Indonesian and English across various academic database platforms. The keywords used will include combinations of terms such as: "madrasah leadership," "disaster resilience," "financial technology (fintech) for disaster," "digital crowdfunding," "humanitarian logistics technology," "community-based disaster risk management," and "digital leadership." The search will be conducted in databases such as Google Scholar, ScienceDirect, JSTOR, SpringerLink, Sage Journals, and national journal portals such as Neliti and Portal Garuda. The second stage is document selection and screening based on inclusion and exclusion criteria. The main criteria are topic relevance, source quality (publishing and citation rates), and novelty. The third stage is downloading and organizing selected documents to facilitate citation and data management. The data collection process is iterative, where findings from one document can lead to the search for other supporting documents through the snowballing method, either by searching the reference list

(backward snowballing) or the literature that cites the document (forward snowballing) (Fink, 2020).

Once the data is collected, the research will employ qualitative data analysis techniques following the thematic content analysis model. This process goes beyond describing document content, but rather seeks to identify patterns, themes, conceptual relationships, and knowledge gaps within the existing literature. The process begins with a thorough reading and coding of all documents to extract pieces of data relevant to the research focus. These codes are then grouped into broader categories based on shared meaning, such as "Forms of Digital Leadership Capabilities," "Fintech Adoption Models," "Techno-Social Barriers," or "Digital Collaboration Frameworks." The next stage is the formation of themes by combining various categories to form comprehensive analytical themes, such as "Convergence of Charismatic Leadership and Technological Capabilities" or "Madrasahs as Community-Based Smart Logistics Nodes." The analysis will also involve critical document analysis, examining the context of the writing, the author's position, and the strength of the arguments constructed within each source to build a dialectic in the synthesis of the findings (Creswell & Poth, 2023).

To ensure the validity and reliability of the data in this qualitative literature study, several testing techniques will be applied. First, triangulation of data sources, namely by comparing and checking the consistency of information and findings obtained from various types of sources (books, journals, reports) and from various author perspectives (academics, practitioners, policymakers). Second, the use of an audit trail, in which the researcher documented in detail and transparently the entire research process, from search keywords, databases used, selection criteria, analysis steps, to the resulting interpretations. This documentation allows the research process to be audited or retraced by other researchers to check the consistency of the research logic. Third, peer debriefing, or consultation with colleagues or experts in qualitative research methodology and literature studies, to test the clarity, coherence, and depth of the analysis. Fourth, in-depth and contextual discussions, consistently linking findings from the literature to the contextual realities of madrasahs and the disaster management system in Indonesia, ensure that the analysis is not trapped in mere theoretical abstractions but maintains applicability (Kahlke, 2021). Through the application of rigorous methods and techniques, the research seeks to produce a synthesis of knowledge that is not only academically credible but also relevant and impactful for policy development and practice.

RESULTS AND DISCUSSION

A. Financial Resource Mobilization Strategy: The Role of Fintech in Raising and Distributing Emergency Funds

This research reveals a fundamental transformation in emergency financial mobilization strategies through the integration of Financial Technology (Fintech). Literature review shows that fintech platforms, such as digital crowdfunding, e-wallets, and payment gateways, have overcome the geographical and temporal limitations inherent in conventional fundraising mechanisms. Expanded financial inclusion through fintech enables widespread public participation with micro-contributions that accumulate into significant funds, while creating real-time transparency that builds donor trust (Mildenberg, 2022). Peer-to-peer (P2P) lending mechanisms and emergency fund crowdsourcing have dramatically shortened the

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disbursement cycle, from weeks to hours or days, enabling faster and more targeted responses (Chen et al., 2021). However, the research also identifies critical challenges such as cybersecurity risks, fintech market volatility, and the digital divide that potentially excludes vulnerable groups who need assistance most (Nugroho, 2023). To optimize the role of fintech, an adaptive regulatory framework, public digital literacy, and close collaboration between fintech regulators, humanitarian agencies, and technology providers are needed to build a resilient, inclusive, and accountable emergency financial ecosystem (Oseni & Amir, 2020).

A thorough literature review reveals that the integration of Financial Technology (Fintech) has created a paradigmatic shift in financial resource mobilization strategies for disaster emergencies. While previously fundraising relied on conventional methods such as collecting donation boxes at places of worship, sending SMS messages to specific numbers, or taking a long time to penetrate mass media campaigns, fintech has presented a disruptive leap in efficiency. Digital crowdfunding platforms like Kitabisa.com, Ayopop, or global platforms like GoFundMe have transformed donations from a local, spatial, and time-limited activity into a global, virtual, and continuous (24/7) mass movement. This transformation fundamentally overcomes geographical and temporal boundaries, enabling Indonesian diaspora members abroad to contribute in real time to disaster victims in remote areas of the country with just a few taps on their smartphones (Kurniawan & Zulbetti, 2021). This efficiency is not simply a matter of transfer speed, but rather the expansion of the philanthropic ecosystem into the digital space, where digital natives are the primary actors.

The core mechanism driving fintech's effectiveness is its ability to expand financial inclusion and build unprecedented transparency. Electronic wallets (e-wallets) such as OVO, Dana, Gopay, and LinkAja have become critical infrastructure, enabling participation from segments of society who may not have formal bank accounts but do have mobile phones and internet access. Micro-contributions of tens or hundreds of thousands of rupiah from millions of e-wallet users can accumulate into significant funds within hours of a disaster being declared. More importantly, well-designed fintech platforms are generally equipped with transparency features such as real-time disbursement reports, photo proof of delivery, and publicly accessible recipient names. These features build a vital trust cycle: transparency increases donor trust, trust encourages larger donations, and larger donations require greater transparency. This cycle strengthens the legitimacy and sustainability of digital fundraising compared to conventional models, whose accountability is often questionable (Sholihin & Ratmono, 2023).

In addition to crowdfunding, other forms of fintech, such as peer-to-peer (P2P) lending for social purposes (social lending) and integrated payment gateways, also play a crucial role in shortening the emergency funding cycle. P2P lending platforms can quickly disburse collateral-free loans to volunteers or affected communities for urgent initial needs, such as purchasing medicine or groceries, while the fundraising process for pure donations is still ongoing. Meanwhile, seamless payment gateway integration on a donor's website or social media eliminates friction in the payment process. Donors no longer need to bother recording account numbers, making manual transfers, and sending proof of transfer. With a single click, donations can be completed. This integration dramatically reduces the drop-off rate in the donation process and accelerates the flow of funds from donors directly to designated accounts, where they can then be quickly disbursed for field operations (Iman & Wahyudi, 2022).

However, despite its enormous potential, this study also identified a number of complex challenges and risks accompanying the adoption of fintech for emergency funding. The most fundamental challenge is the still-widening digital divide in Indonesia. Reliance on fintech risks excluding vulnerable groups most affected by disasters, such as the elderly, communities in internet blackouts, or those with low digital literacy, from contributing or even accessing digitally distributed aid. Furthermore, cybersecurity risks are a real threat. Fintech platforms are easy targets for hacking attacks, phishing scams in the name of disasters, or the misuse of donor data. The volatility of the fintech industry itself, marked by the rise and fall of various startups, also poses a risk if the platforms used for fundraising suddenly experience technical disruptions or even bankruptcy during critical times. Furthermore, the diversity of platforms often leads to fragmented donations, with funds scattered across various campaigns without coordination, which can complicate integrated and documented distribution (Arifin & Hermawan, 2024).

Therefore, to optimize the role of fintech and mitigate its risks, this study concludes that building a resilient ecosystem is necessary. This ecosystem must be built on three main pillars. First, an adaptive regulatory and supervisory framework. The Financial Services Authority (OJK) and Bank Indonesia need to collaborate with the National Disaster Management Agency (BNPB) to develop guidelines or a regulatory sandbox specifically for fintech for disaster relief purposes. These guidelines should address aspects of data security, anti-money laundering, reporting accountability, and protection for donors and recipients. Second, improve digital and financial literacy. Public campaigns should address not only how to donate but also how to recognize official platforms, understand transparency mechanisms, and protect personal data. Collaboration with Islamic schools (madrasahs) and schools is strategic for reaching grassroots communities. Third, strategic collaboration between the triple helix: regulators (the government), technology providers (fintech companies), and implementers on the ground (humanitarian organizations such as MDMC, Dompot Dhuafa, and madrasah leadership). This collaboration could be realized in the form of an integrated platform or single gateway for national disaster donations that utilizes fintech technology but is managed with solid, inclusive governance principles and a focus on maximum accountability. Thus, fintech's positive disruptive potential can be directed toward creating an emergency fund mobilization system that is not only fast and massive, but also fair, secure, and sustainable (Suryanto & Kurniawati, 2023).

B. Emergency Logistics Governance: Effectiveness of Technology Utilization in Supply Chains and Aid Distribution

The literature review confirms that the use of technology has revolutionized emergency logistics governance, transforming it from a reactive and fragmented process into a proactive and integrated system. The application of Big Data Analytics and Artificial Intelligence (AI) enables more accurate predictions of logistics needs based on disaster patterns and demographic data, while the Internet of Things (IoT) through sensors and GPS facilitates real-time asset tracking across the supply chain (Kovács & Falagara Sigala, 2021). Blockchain technology is beginning to be adopted to create an immutable audit trail for every logistics transaction, from donation receipt and storage to final distribution, significantly increasing transparency and minimizing leakage or irregularities (Baharmand et al., 2023). Drones and autonomous vehicles have proven effective for damage surveys and aid delivery to locations difficult to reach due to damaged infrastructure (Prasetyo, 2022). The successful implementation

of these technologies depends heavily on the readiness of digital infrastructure, inter-agency system interoperability, and human resource capacity. The study concluded that technology is not just a tool, but a driving force behind agile, responsive, and data-driven logistics governance (Heaslip et al., 2021).

The literature review reveals that emergency logistics governance is undergoing a fundamental metamorphosis, shifting from a reactive, linear, and often rigid model to a proactive, adaptive, and network-based paradigm thanks to the infiltration of digital technology. In the conventional era, post-disaster relief supply chains were often characterized by information uncertainty, bottlenecks, duplicate deliveries, and minimal visibility into the whereabouts and condition of aid after it leaves the central warehouse. Technology, in its various manifestations, is present to address each link in the chain of these problems by injecting elements of intelligence, connectivity, and transparency. At the heart of this transformation is a shift from supply-driven logistics, where aid is delivered based on rough estimates, to demand-driven logistics, where distribution is guided by actual data on needs at the point of impact (Dubey et al., 2020). This paradigm shift enables more efficient and targeted resource allocation, reduces waste, and most importantly, accelerates rescue times.

At the most upstream stage, namely planning and forecasting needs, Big Data technology

Data analytics and artificial intelligence (AI) are demonstrating their crucial role. By processing massive data from various sources, such as historical disaster data, vulnerability maps, real-time demographic data from censuses, and even social media sentiment analysis, AI algorithms can model impact distribution patterns and predict the type and volume of aid needed in specific areas with increasing accuracy. Geographic Information System (GIS) technology integrated with this data enables the creation of interactive visual dashboards for decision-makers to view the distribution of needs, map alternative routes, and identify strategic locations for logistics posts. This predictive capability transforms emergency logistics from mere response to part of risk management, enabling the pre-positioning of logistics stocks in disaster-prone areas before the disaster itself occurs (Baharmand et al., 2021). Thus, technology fills the critical gap between a disaster event and the initiation of effective aid distribution.

In the core operational chain of operations—storage, transportation, and tracking—Internet of Things (IoT) and blockchain technologies are revolutionizing visibility and accountability. IoT sensors attached to aid pallets, delivery trucks, or even warehouse containers can transmit real-time GPS location data, temperature (for medicines or vaccines), humidity levels, and departure/arrival status. This data flows to a central control platform, providing a previously unattainable bird's-eye view. Furthermore, blockchain technology offers a solution to chronic problems in humanitarian logistics: lack of transparency and potential for abuse. Every transaction in the supply chain—from receiving a donation, through warehousing, loading onto a truck, to handing it over to the final recipient—is recorded as an encrypted block and linked in an immutable chain. Any authorized stakeholder, including donors, can track the journey of a single aid package from start to finish, creating a complete and reliable audit trail that significantly minimizes the scope for leakage, misappropriation, or negligence (Kshetrimayum et al., 2023).

For last-mile distribution challenges, often made most complex by damaged transportation infrastructure, technology offers innovative physical solutions. The use

of drones, or Unmanned Aerial Vehicles (UAVs), has proven effective for two main functions: first, as a rapid survey and damage assessment tool to identify isolated areas and the needs of their residents; second, as a means of delivering light but critical aid such as emergency medicines, vaccines, communication devices, or high-calorie foods to locations inaccessible by ground vehicles. In addition to drones, autonomous vehicles or ground robots are also beginning to be tested for distribution in areas with difficult terrain. This technology is not just about speed, but also about reaching the unreached and ensuring the humanitarian principle of leaving no one behind. At the same time, simple mobile applications that can be operated by volunteers at distribution points enable digital recipient registration using biometric systems or QR codes, replacing error-prone manual systems and ensuring aid is not distributed repeatedly to the same recipients (Wahyuni et al., 2022).

Despite its enormous potential, implementing technology in emergency logistics management is not without significant challenges and prerequisites. The biggest challenge lies in interoperability. In a major disaster response, multiple organizations (governments, international NGOs, local NGOs, the Indonesian National Armed Forces (TNI/Polri) are involved, each with its own technology systems and data protocols. If these systems cannot "talk" to each other, what is created is isolated data silos, which contradicts the principle of coordination. Furthermore, reliance on basic infrastructure such as electricity and a stable internet network is often ironic, as disasters often damage these infrastructure. Therefore, the technology adopted must consider resilience, for example, by being able to work offline or with alternative energy sources. Furthermore, human resource capacity is a key determinant of success. Staff and volunteers in the field must have adequate digital literacy to operate the devices and applications used. Without training and clear standard operating procedures (SOPs), even sophisticated technology can be useless or even hinder the response in the field (Das & Roy, 2024).

Therefore, to maximize the effectiveness of technology utilization, a holistic, ecosystem-based approach is essential. Technology should not be viewed as a stand-alone solution, but rather as an integrated decision-support system that integrates data, analytics, tracking, and communication. Investments should be directed not only at purchasing hardware and software, but more importantly, at building human capacity, developing shared protocols across institutions, and developing an integrated platform with open data standards that is accessible to all authorized actors in the disaster response. In this context, madrasah leadership can play a crucial role as a communication and data validation hub at the community level, as well as as end-users who can provide feedback on the suitability of technology to real-world conditions. In this way, emergency logistics governance can truly transform into an agile, responsive, and victim-centered system, where technology serves as a key lever for efficiency and accountability, rather than an end in itself.

C. Digital Coordination and Collaboration: Madrasah Leadership Capabilities in Building Disaster Response Networks

This study found that madrasa leadership capabilities in the digital era are a determining factor in building effective disaster response networks at the community level. Adaptive and technologically literate transformational leadership is needed to utilize digital platforms such as social media, instant messaging applications, and simple disaster information management systems (Siswanto, 2023). These key capabilities include the ability to serve as a trusted information hub, curate and verify

disaster data, and mobilize resources through extensive digital networks of alumni and religious communities (Comfort & Kapucu, 2021). Digital collaboration enables madrasas to coordinate more efficiently with the Regional Disaster Management Agency (BPBD), humanitarian agencies, and fellow educational institutions, connecting needs at the grassroots level with assistance resources from higher levels (Rahman, 2024). The main challenges faced are limited digital literacy in some groups, budgets for technology access, and the potential for information overload. Therefore, madrasa leadership capacity development must include training in digital-based disaster information management and collaborative network governance to strengthen institutional and community resilience. (Suharto & Firdaus, 2023).

Literature reviews confirm that in the contemporary disaster response ecosystem, leadership capabilities are inseparable from digital competencies, particularly in the domains of coordination and collaboration. For madrasas, which serve as central institutions within communities, effective post-disaster leadership now relies heavily on the ability to transition from traditional, charismatic, hierarchical, and face-to-face authority to networked, digital authority. This capability is not simply about the technical ability to operate devices, but rather a strategic ability to utilize digital platforms as a means of building, strengthening, and activating the madrasah's existing social networks—alumni, parents, religious communities, and relationships with other institutions—into a coordinated, dynamic, and information-based response system. Madrasah leadership, in this context, functions as a "trusted bridging node" that bridges the information and resource gap between government authorities, professional humanitarian agencies, and affected communities at the grassroots level (Miles & Green, 2021). The social trust that has long been invested in madrasas becomes social capital which can then be converted into operational capital in digital networks.

One key digital capability identified is the ability to serve as an information hub and verification center. Amidst the flood of information and the rise of post-disaster disinformation on social media and messaging apps, communities are often at a loss for reliable sources. Digitally capable madrasah leadership can utilize platforms such as structured WhatsApp groups, Telegram channels, or official madrasah social media pages to actively collect, filter, and verify information. They can disseminate official information from the Regional Disaster Management Agency (BPBD) or the Center for Voluntary Voluntary Disaster Management (PVMBG), confirm valid post locations, debunk hoaxes, and provide accurate needs lists. This curation process transforms madrasahs from passive recipients of information into active producers and distributors of credible information, preventing panic and guiding communities and volunteers to act based on accurate data (Aldrich & Meyer, 2020). This capability is crucial because accurate information is the foundation of effective coordination.

Furthermore, the digital capabilities of madrasah leadership are manifested in their ability to build and manage virtual collaboration platforms. Disaster response networks no longer have to be built through physical coordination meetings, which are difficult to organize post-disaster. By utilizing collaboration tools such as Google Workspace (Docs, Sheets), Trello, or even closed Facebook groups, madrasah principals and their teams can coordinate with student council (OSIS) administrators, teachers, alumni across campus, and representatives of local youth organizations (Karuna Taruna) to delegate tasks, report progress, and manage beneficiary data in real time. These platforms enable clear and transparent role allocations, such as who is responsible for data verification in the field, who manages logistics in the emergency

warehouse, and who is the spokesperson for external communications. This type of digital collaboration creates significant time efficiencies and allows for the participation of network members who may be physically located outside the city but still contribute to planning or resource mobilization (Prasetyo & Hizbaron, 2023). Madrasahs thus function as virtual yet highly operational community command centers.

Another important capability is the ability to engage in a broader digital collaboration ecosystem, bridging communities with external actors such as the Regional Disaster Management Agency (BPBD), the Indonesian Red Cross (Tagana), the Indonesian Red Cross (PMI), or NGOs through digital channels. Digitally literate madrasah leadership can proactively contact or be contacted by these institutions through official channels such as disaster reporting apps, email, or local government collaboration platforms. The ability to communicate needs in a written and structured digital format, for example by sending a spreadsheet list of needs with attached photos and GPS coordinates, is far more effective than verbal communication, which is prone to misunderstanding. Madrasahs can become credible "grassroots data aggregators," providing valuable real-time data input on field conditions for larger institutions to make strategic decisions about aid distribution. Conversely, madrasahs can also be effective "top-down information conduits," translating and distributing technical information from the government into languages and channels easily understood by their communities (Saputra & Suryanto, 2022). The role of this digital bridge increases the relevance and strategic value of madrasahs in the national disaster management system.

However, this study also uncovered a number of significant challenges in developing these digital capabilities. Generation gaps and digital literacy within madrasahs themselves are often major obstacles. Not all madrasah principals or senior teachers possess the skills and, more importantly, the mindset to utilize technology as a strategic leadership tool. There is a tendency to continue relying on conventional communication methods. Limited resources are also a problem, both in terms of device availability (smartphones, laptops), stable internet quotas, and electricity access during disasters. Furthermore, information overload and the psychological pressure to constantly update and respond in the digital space can lead to fatigue and reduce leadership effectiveness. Another challenge is maintaining digital security and ethics, such as protecting collected personal data of victims and preventing the misuse of communication platforms for non-humanitarian purposes (Nurjanah et al., 2024).

Therefore, to build madrasah leadership capabilities in digital coordination and collaboration, systematic interventions are needed. These interventions should include: first, training and mentoring programs specifically designed to improve leadership digital literacy, not just technical skills, but also crisis information management, digital communication ethics, and basic cybersecurity. Second, developing simple digital-based protocols or standard operating procedures (SOPs) for madrasahs, which can be activated during disasters, including communication templates, digital emergency contact lists, and reporting flows. Third, encouraging formal partnerships between madrasahs and local governments and NGOs to incorporate madrasahs into official regional disaster communication and coordination platforms. Through these steps, the digital capabilities of madrasah leadership can be sustainably developed, so that they are not merely victims or passive recipients of aid, but truly become a key force and reliable partners in building a resilient, rapid, and trusted disaster response network from the grassroots level.

D. Adaptation and Innovation of Operational Governance: Transformation of Administrative Procedures and Accountability in Times of Emergency

A literature review reveals that emergency situations force radical adaptation and innovation in operational governance, particularly in administrative procedures and accountability systems. Bureaucratic procedures, typically layered and lengthy, must be rapidly streamlined without sacrificing the principles of accountability and preventing abuse (Wahab, 2024). This transformation is driven by the adoption of digital administration systems, such as electronic approval (e-approval), verified digital payment systems, and online reporting, which allow processes to run parallel and be monitored remotely (Janita & Wijaya, 2022). Accountability systems have also evolved from ex-post periodic reports to real-time tracking mechanisms and social audits based on participatory platforms, where aid recipients can provide direct feedback (Gulati & Kohli, 2020). Innovations such as reporting via mobile apps and the use of interactive dashboards for stakeholders increase transparency and restore public trust amidst the pressures of the crisis (Maryani & Handoyo, 2023). Research concludes that the success of this transformation depends on the courage to redesign procedures (process re-engineering), investment in information technology infrastructure, and an organizational culture that supports innovation and rapid learning under pressure (Ansell & Boin, 2021).

This literature review reveals an interesting and critical paradoxical dynamic: disaster emergencies, with all their time pressures and resource constraints, actually act as powerful catalysts for the transformation of operational governance, which under normal circumstances is often hampered by bureaucratic inertia and resistance to change. For organizations like madrasas involved in disaster response, a fundamental shift occurs from a governance model that is routine, procedural, and oriented toward formal compliance, to one that is agile, principles-based, and results-oriented with substantive accountability. This transformation is most evident in two typically rigid domains: administrative procedures and accountability mechanisms. Under normal circumstances, activities such as procurement, fund disbursement, volunteer recruitment, and financial reporting in madrasas follow established bureaucratic pathways, involve multiple parties, and require physical signatures and comprehensive supporting documentation. However, when disaster strikes, slowness in these processes can be fatal. Therefore, extreme external pressures force streamlining or radical simplification of procedures without losing the essence of control and accountability (Boin & Hart, 2022). This process is what gives birth to operational innovations that are adaptive in nature.

In the financial administration and logistics domain, the most significant adaptation lies in the adoption of digital procedures and partial automation to replace slow manual processes. Studies show that capable madrasas and similar institutions are starting to utilize simple applications for recording the inflow and outflow of aid goods using QR codes or cloud spreadsheets accessible in real time by multiple authorized parties. The emergency fund disbursement approval process, which previously required physical meetings and multiple signatures, can be simplified through electronic approval (e-approval) in a dedicated WhatsApp group comprising the treasurer, madrasah principal, and committee chairperson, with digital transfer receipts and receipts directly uploaded to a shared cloud folder. Digital voucher mechanisms or direct transfers to seller/supplier accounts also reduce the need for high-risk cash handling. Central to this adaptation is the principle of “accelerated authorization with a digital

audit trail,” where speed is achieved not by eliminating controls, but by moving control mechanisms to a digital platform that leaves a digital trail (Christensen et al., 2021). This ensures internal transparency is maintained even when processes are extremely fast.

Even more revolutionary is the transformation in the accountability system. Conventional accountability tends to be ex-post and hierarchical, with financial and activity accountability reports prepared after completion and then reported to superiors or donors. This model has a significant time lag and often excludes beneficiaries. In innovative emergency governance, accountability systems have evolved to be real-time, participatory, and multidirectional. The application of technology has enabled the creation of simple public accountability dashboards, such as regularly updated web pages or digital posters, displaying information such as the amount of funds raised, purchased items, a list of aid recipients (with sensitive data masked), and photographs documenting distribution. Another innovation is the use of SMS-based feedback systems or short message services, where aid recipients can confirm receipt or report problems by sending a specific code. This mechanism, often referred to as social accountability or community-based monitoring, shifts some of the oversight role from internal auditors to the aid recipient communities themselves, creating robust horizontal accountability and preventing misconduct (Bovens & Zouridis, 2020). In the context of madrasas, this can be realized by involving representatives of parents or community leaders in the verification and open reporting team.

However, this transformation towards adaptive operational governance is not without serious dilemmas and risks. The dilemma of speed versus compliance is paramount. To what extent can procedures be simplified before they are deemed to violate the principles of due diligence and good governance? Excessive simplification can open up opportunities for abuse, conflicts of interest, or waste due to the loss of checks and balances. The risk of a digital divide also arises; not all parties within the madrasah ecosystem (e.g., local suppliers or senior volunteers) may be ready to transact digitally, which can create exclusion or force a return to manual systems for some processes. Furthermore, a double administrative burden often arises: amidst simplification efforts for emergency response, organizations are still required to comply with standardized reporting and formal post-disaster audit procedures to external parties such as education offices or major donors, creating two parallel sets of administration (Pemerintah & Setyawan, 2023). This can lead to fatigue and inefficiency later on.

Therefore, for this adaptation and innovation to be sustainable and provide long-term benefits, this study emphasizes the need to develop a legitimate and pre-planned emergency governance framework, not simply improvisation during a crisis. For madrasas, this means having an emergency operational governance protocol that has been developed and socialized during normal conditions. This protocol must clearly define: (1) an Accelerated Authorization Structure, namely who is authorized to make financial and logistical decisions in an emergency, along with the limitations of their authority; (2) a List of Simplified Procedures, including minimal document templates (request forms, proof of receipt) that can be used; (3) Supporting Technology Standards, such as which applications or platforms will be used uniformly; and (4) a Real-Time Accountability Mechanism that will be implemented, including internal and external reporting methods. Such a protocol provides a “legal umbrella” and clear guidelines for madrasah leadership to act quickly while remaining within recognized corridors. Furthermore, it is important to adopt the “build back better” principle in governance, where procedural innovations that have proven effective during

emergencies (e.g., the use of e-approval for purchases below a certain nominal value) are evaluated and integrated into post-disaster madrasah standard operating procedures (SOPs), thereby permanently improving organizational efficiency (Ansell et al., 2021).

Thus, transforming operational governance during an emergency is not simply a disruption to the normal order, but rather a test and opportunity to enhance institutional resilience. Madrasahs that successfully adapt and innovate in their administration and accountability will not only be more effective in responding to the disaster but will also emerge from the crisis as more agile, transparent, and trustworthy organizations. Leadership capability in managing this transformation will determine whether madrasahs become passive victims of circumstances or learning institutions capable of transforming and growing stronger amidst pressure.

CONCLUSION

Digital technology has been a transformative catalyst in disaster management, reconfiguring every aspect of it, from funding to ultimate accountability. On the financial front, fintech has democratized emergency fundraising by providing unprecedented speed, transparency, and inclusion, though it requires a strong regulatory and literacy foundation to mitigate risks. In logistics, the convergence of technologies such as AI, IoT, blockchain, and drones has transformed supply chains into data-driven, monitored, and agile systems, whose effectiveness relies heavily on adequate infrastructure and human resource capacity. At the community level, adaptive and digitally literate madrasah leadership has proven capable of leveraging digital networks and platforms to become crucial nodes of coordination and response, though it requires ongoing capacity building. Meanwhile, internally, the pressures of emergencies have spurred innovation in operational governance, driving the simplification of administrative procedures and the evolution of accountability systems toward more real-time and participatory ones. The transformations in these four areas are interconnected and form an integral digital disaster response ecosystem, where success is determined not only by technology adoption alone, but more so by institutional readiness, collaboration frameworks, and visionary leadership to manage change holistically.

Based on the research findings, the recommended implementation is to establish an Integrated Digital Disaster Response Platform that integrates these four key aspects. This platform would connect fintech crowdfunding portals connected to digital wallets and payment gateways for rapid fund mobilization, with a smart logistics system that utilizes predictive data, blockchain tracking, and drones for distribution. The platform should also have a dedicated collaboration module to engage community institutions such as madrasahs as nodes for verification and information distribution, while also being equipped with a digital operational and administrative dashboard that enables real-time and accountable approval processes, aid tracking, and recipient feedback. This implementation must be preceded and accompanied by digital literacy and disaster management training programs for community leaders and operators, as well as the creation of shared protocols and supporting regulations that ensure data security, system interoperability, and inclusion for vulnerable groups, thus building truly comprehensive disaster resilience.

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