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Digitalizing Community Empowerment: A Digital Ethnography of Interaction and Transaction Cost Efficiency in Village-Owned Enterprises

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Abstract

Digital technologies are increasingly embedded in rural development, yet platform adoption alone does not explain how digitalization changes the everyday practice of community empowerment. This study examines how digitally mediated interaction reorganizes coordination and transaction-cost efficiency in Village-Owned Enterprises (Badan Usaha Milik Desa, or BUM Desa) in a predominantly Muslim rural setting. A six-month digital ethnography was conducted in Kediri Regency, Indonesia, from September 2025 to February 2026. Data combined participant observation in a district WhatsApp group with more than 850 members, a seven-day intensive window containing 225 messages, observation of Zoom and digital-reporting practices, 13 semi-structured interviews lasting 60–90 minutes, and documentary records. Analysis identified a layered interaction architecture: hierarchical-formal interaction through Zoom, network-organic interaction through WhatsApp groups, and personal-relational interaction through private messaging. Zoom reduced travel and scheduling costs; WhatsApp lowered information-search costs and accelerated collective problem-solving; and private communication supported lower-cost clarification, monitoring, and conflict management. Internal income statements from one focal enterprise recorded a 41.77% revenue increase and a decline in the operating-cost ratio from 62.10% to 35.24% between 2023 and 2025. These figures are treated as contextual, noncausal evidence. Digitalization also shifted temporal and cognitive burdens onto facilitators through uneven connectivity, digital-literacy support, availability pressure, and fatigue. The study explains digital empowerment as a fit among interaction mode, institutional task, and relational sensitivity.

Keywords: Community empowerment; digital ethnography; interaction architecture; transaction costs; Village-Owned Enterprises

Abstrak

Teknologi digital semakin melekat dalam pembangunan perdesaan, tetapi adopsi platform saja belum menjelaskan bagaimana digitalisasi mengubah praktik pemberdayaan masyarakat sehari-hari. Penelitian ini mengkaji bagaimana interaksi yang dimediasi secara digital menata ulang koordinasi dan efisiensi biaya transaksi pada Badan Usaha Milik Desa (BUM Desa) dalam konteks perdesaan yang mayoritas penduduknya Muslim. Etnografi digital selama enam bulan dilakukan di Kabupaten Kediri, Indonesia, sejak September 2025 hingga Februari 2026. Data menggabungkan observasi partisipan pada grup WhatsApp BUM Desa tingkat kabupaten dengan lebih dari 850 anggota, jendela observasi intensif selama tujuh hari yang memuat 225 pesan, pengamatan terhadap praktik Zoom dan pelaporan digital, 13 wawancara semi-terstruktur berdurasi 60–90 menit, serta dokumen penelitian. Analisis mengidentifikasi arsitektur interaksi berlapis: interaksi hierarkis-formal melalui Zoom, interaksi jejaring-organik melalui grup WhatsApp, dan interaksi personal-relasional melalui pesan pribadi. Zoom menekan biaya perjalanan dan penjadwalan; WhatsApp menurunkan biaya pencarian informasi serta mempercepat pemecahan masalah kolektif; sedangkan komunikasi pribadi mendukung klarifikasi, pemantauan, dan pengelolaan konflik dengan biaya yang lebih rendah. Laporan laba rugi internal dari satu BUM Desa fokus mencatat kenaikan pendapatan 41,77% dan penurunan rasio biaya operasional dari 62,10% menjadi 35,24% antara 2023 dan 2025; angka ini diperlakukan sebagai bukti kontekstual, bukan kausal. Digitalisasi juga mengalihkan beban waktu dan kognitif kepada para pendamping akibat konektivitas yang tidak merata, kebutuhan dukungan literasi digital, tekanan ketersediaan, dan kelelahan. Studi ini menjelaskan pemberdayaan digital sebagai kesesuaian antara mode interaksi, tugas kelembagaan, dan sensitivitas relasional.

Kata kunci: *pemberdayaan masyarakat; etnografi digital; arsitektur interaksi; biaya transaksi; Badan Usaha Milik Desa*

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I. INTRODUCTION

Digitalization has become a central strategy in rural development because it can compress distance, accelerate information flows and connect local organizations to wider administrative and market networks. The economic significance of these changes lies partly in cost reduction. Digital technologies can reduce search, transportation, tracking and verification costs, thereby altering how organizations coordinate and make decisions (Goldfarb & Tucker, 2019). In rural settings, however, these benefits are neither automatic nor evenly distributed. Connectivity, device access, digital skills and organizational routines shape who can participate, how quickly information circulates and whose labor absorbs the demands of constant connection (Salemink et al., 2017; van Dijk, 2020; World Bank, 2021). Indonesian evidence likewise shows that digitalization can expand rural capabilities without necessarily producing broad structural transformation (Fahmi & Mendrofa, 2024).

Indonesia provides a consequential setting in which to examine this relationship. The 2014 Village Law expanded village authority and resources while placing greater expectations on local participation, accountability and economic initiative (Antlov et al., 2016). Village-Owned Enterprises (*Badan Usaha Milik Desa*, hereafter BUM Desa) were strengthened as community-oriented economic institutions under this governance framework and subsequently given a more specific legal basis through Government Regulation No. 11 of 2021 (Government of Indonesia, 2021). Their mandate combines commercial activity with collective village benefit, making them hybrid organizations in which economic performance, public accountability and community participation must be pursued together.

Research has shown both the promise and fragility of this institutional model. BUM Desa can stimulate rural entrepreneurship, mobilize local resources and support village development (Kania et al., 2021; Hilmawan et al., 2023; Ultari & Khoirunurrofik, 2024). At the same time, expansion in the number of enterprises does not necessarily produce employment or sustained community value, and weak managerial capacity, accountability gaps and limited stakeholder coordination remain persistent concerns (Arifin et al., 2020; Fitriani et al., 2024). More recent work highlights open innovation, digital communication and literacy as potential pathways to stronger financial and social performance (Wulandari & Wardani, 2024; Harinurdin et al., 2025; Nugroho et al., 2025; Suhartanti & Sholikhah, 2026). Yet most studies continue to treat digitalization as an organizational capability, an adoption variable or a marketing instrument. Less is known about the interactional mechanisms through which ordinary platforms become part of community empowerment in practice.

This omission matters because empowerment is not reducible to the possession of technology. In a capability-oriented view, empowerment involves expanding the substantive capacity of people and institutions to access information, exercise judgment, coordinate action and pursue locally valued outcomes (Sen, 1999). A WhatsApp group, a Zoom meeting or a digital reporting system may expand those capabilities, but each platform organizes participation differently. A formal video meeting can preserve hierarchy while reducing travel; a group chat can widen peer-to-peer access while increasing message volume; and a private message can protect relational sensitivity while making monitoring less visible. The relevant analytical question is therefore not simply whether digital tools are used, but how distinct modes of interaction redistribute organizational frictions, voice and responsibility.

Transaction Cost Economics (TCE) offers a useful but incomplete starting point. Coase (1937) and Williamson (1985) conceptualize organizations as governance arrangements that economize on the costs of searching for information, negotiating, coordinating and monitoring. Digital technologies may lower these costs by enabling rapid communication and traceable records. Yet a narrow efficiency account can overlook the social organization of those savings. Reduced travel or administrative delay may coexist with availability pressure, cognitive overload and blurred work boundaries. Digitalization can thus lower visible organizational costs while shifting less visible costs to facilitators and other actors who must remain responsive across multiple channels.

Digital ethnography is well suited to examining this tension because it treats digital media as embedded in everyday social worlds rather than as separate technical environments (Hine, 2015; Pink et al., 2016). It follows routines, movements and relationships across online and offline settings, allowing analysis of how platforms acquire meaning through use (Postill & Pink, 2012). Applied to BUM Desa facilitation, this approach can reveal how formal authority, peer exchange and personal trust are differently enacted across platforms, and how these interactional arrangements shape the practical costs of empowerment.

Against this background, the study aims to explain how digitally mediated interaction structures the everyday facilitation of BUM Desa and how different interaction modes alter coordination, information, and monitoring costs. It addresses three questions: (1) What modes of digitally mediated interaction organize everyday BUM Desa facilitation? (2) How does each mode affect coordination, information, and monitoring costs? and (3) What enabling conditions and hidden burdens qualify these efficiencies?

The contribution lies in connecting the social organization of digital interaction with the distribution of transaction costs in community-based enterprises. Evidence from everyday facilitation shows that Zoom meetings, WhatsApp groups, and private messages do not simply offer different technical features; they carry different forms of authority, participation, and relational exposure. The article captures this arrangement as a layered interaction architecture, explaining why the value of a platform depends on the task, the actors involved, and the sensitivity of the exchange. It also adds a neglected labor dimension to Transaction Cost Economics: savings in travel, scheduling, and information search may be achieved by transferring work to facilitators who manage constant messages, provide digital support, and remain available beyond formal hours. Bringing these gains and burdens into the same account offers a more grounded explanation of when digitalization strengthens community empowerment and when it risks becoming unsustainable.

II. METHOD

1. Research design and setting

The study used a qualitative digital ethnography to investigate the everyday use of digital platforms in the facilitation of BUM Desa in Kediri Regency, East Java, Indonesia. Field engagement ran for approximately six months, from September 2025 to February 2026. The field was understood as an interconnected socio-technical setting rather than a single online community. WhatsApp groups, Zoom meetings, private chats, digital reporting applications and face-to-face village activities formed

one facilitation ecology. This design followed the digital-ethnographic principles of embeddedness, multiplicity and reflexivity (Hine, 2015; Pink et al., 2016).

Kediri was selected because digital applications had become routine in cross-village coordination, program reporting and enterprise support. The focal village and enterprise were Mejono Village and BUM Desa Hapsari Mejono, while district-level digital interaction connected actors from the wider BUM Desa facilitation ecosystem. The case therefore offered access to mature everyday use rather than a short-term technology pilot. The unit of analysis was the interactional practice through which facilitators, enterprise managers and village officials used digital channels to coordinate, exchange information, monitor activities and address operational problems.

Kediri Regency is a predominantly Muslim setting: official statistics report that 97.13% of its population is Muslim (BPS-Statistics of Kediri Regency, 2025). This demographic context locates the study within community development in a Muslim-majority rural society. BUM Desa is a public community-based enterprise rather than a faith-based organization, however, and the study did not treat religious identity or practice as an explanatory variable.

2. Participants

Purposive sampling identified participants who were directly involved in BUM Desa facilitation, had at least three years of relevant experience, and had used digital platforms during at least one program or budget cycle. Thirteen participants represented six institutional positions, allowing comparison among strategic supervision, field facilitation, enterprise management, village administration and district policy oversight. Recruitment stopped when later interviews repeated established patterns and no additional higher-order theme emerged.

Table 1. Participant composition

Participant group	n	Analytical relevance
Community Empowerment Experts (TAPM)	3	District-level supervision, coordination and capacity building
Village Facilitators (PD)	2	Cross-village implementation and technical facilitation
Local Village Facilitators (PLD)	2	Day-to-day village-level support and problem escalation
BUM Desa managers	3	Enterprise operations, marketing and reporting
Village officials	2	Village governance, oversight and institutional coordination
District community-empowerment official	1	Policy direction, program oversight and institutional verification
Total	13	Multiple perspectives across the facilitation ecosystem

3. Data generation

Data were generated through digital participant observation, semi-structured interviews and documentary analysis. Observation focused on one district BUM Desa WhatsApp coordination group with more than 850 members, scheduled Zoom activities, private follow-up practices and the Daily Report Pendamping (DRP) system. Within the six-month field engagement, a structured seven-day WhatsApp observation window captured 225 messages (8-64 per day; mean 32.1). Messages were classified by time of day, interaction form and function, including policy circulation, consultation, problem escalation, peer learning, documentation and activity reporting.

Broader field notes recorded how online exchanges connected with meetings, village visits and enterprise work.

The 13 semi-structured interviews lasted approximately 60-90 minutes each and were conducted face to face or through WhatsApp Call or Zoom. Questions covered platform use, interactional change, experienced efficiencies, operational consequences, constraints and perceived opportunities. Documentary material included observation notes, relevant screenshots, Zoom agendas and minutes, DRP activity records, policy documents, social-media posts, and internal income statements from BUM Desa Hapsari Mejono for the annual periods 2023 and 2025.

The two income statements covered the same focal enterprise and were supplied from its organizational archive; the study did not independently audit them or analyze comparable statements from other BUM Desa. They were therefore used only for contextual corroboration. Interview and observational evidence could identify plausible mechanisms linking digital practices to lower coordination costs, whereas the financial figures indicated organizational change during the same period and could not establish a counterfactual effect.

4. Analysis and trustworthiness

Analysis followed an iterative process of data condensation, display and conclusion verification (Miles et al., 2020). Interview accounts, observation notes and documents were coded for platform, interaction form, institutional purpose, transaction-cost mechanism, empowerment effect and digital burden. First-cycle descriptive codes were compared across participant groups and reorganized into three higher-order interaction modes: hierarchical-formal, network-organic and personal-relational. A cross-case matrix then mapped each mode to coordination, information and monitoring costs, while negative or qualifying evidence was retained, including connectivity failures, misunderstandings and fatigue (Saldana, 2021).

Credibility was supported through triangulation across participant roles and data sources. Interpretations were checked against observation and documents, and selected summaries were returned to key participants for member checking. One researcher occupied an insider position as a Community Empowerment Expert. This role enabled sustained access to routine digital practices but also created a risk of normalizing familiar behavior. Reflexive notes were therefore used to distinguish professional assumptions from evidence, and accounts were compared across facilitators, managers and village officials.

III. FINDINGS

1. A complementary digital work infrastructure

Digital facilitation was organized through a division of labor among platforms. WhatsApp served as the default channel for daily coordination, quick consultation, document exchange and photographic reporting. Zoom was used less frequently, typically for monthly or ad hoc meetings across subdistricts, but carried greater formal authority. Digital reporting applications connected field activity to district and national administrative systems by making records searchable and reviewable. Facebook and WhatsApp were also used by enterprise managers to circulate product information and communicate with customers.

The significance of this ecology lay in complementarity. Participants did not treat one platform as a replacement for all other forms of communication. Instead, they

selected channels according to the formality, urgency, sensitivity and evidentiary requirements of a task. The intensive WhatsApp window contained 225 messages across seven days, ranging from 8 to 64 messages per day. This variation reflected the rhythm of field problems and reporting demands rather than a fixed communication schedule.

For BUM Desa managers and village officials, the practical empowerment gain was quicker access to advice, policy information and shared solutions. They could consult facilitators about operational or administrative problems without waiting for a scheduled visit, retrieve prior documents, and observe how similar problems had been handled elsewhere. These data support a claim about strengthened access and response capacity within the empowerment process; they do not establish broader effects on household welfare or community-wide participation.

Table 2. Platform functions within the facilitation ecology

Digital channel	Primary use	Interaction pattern	Main cost mechanism
WhatsApp groups	Daily coordination, questions, documents, photos and policy updates	Asynchronous, multi-directional and rapid	Lower information-search and routine coordination costs
Zoom	Formal meetings, policy socialization, evaluation and capacity building	Synchronous, agenda-led and hierarchical	Lower travel, scheduling and meeting costs
Private messages/calls	Sensitive feedback, clarification, conflict management and individual follow-up	Dyadic, relational and discreet	Lower monitoring and conflict-resolution costs
Digital reporting system	Activity records, evidence submission and program monitoring	Standardized and traceable	Lower documentation, verification and monitoring costs
WhatsApp/Facebook marketing	Promotion, orders and customer communication	External and market-facing	Lower search and outreach costs

2. Hierarchical-formal interaction: Coordinating without travel

Zoom meetings reproduced the formal hierarchy of village-development administration. District officials or expert facilitators generally controlled the agenda and delivered initial information, while other participants responded during designated discussion periods. Digitalization therefore did not dissolve authority; it relocated formal coordination into a virtual setting. This arrangement was valued when policy interpretation, cross-subdistrict alignment or collective decisions required synchronous exchange.

> *"We use Zoom for large meetings involving several subdistricts. We do not need to leave the village; we can join from home or the village office. It saves time and transport costs." (PD-1)*

The principal efficiency was a reduction in coordination costs. Participants no longer had to assemble physically for every formal meeting, and one TAPM estimated that avoided travel could save approximately IDR 1.5 million per month. Because this estimate came from one participant rather than audited organizational accounts, it is interpreted as an experiential indicator. The stronger evidence is the consistent cross-

role account that Zoom reduced travel time, transport expenditure and scheduling delay while preserving a recognized forum for authoritative decisions.

3. Network-organic interaction: Distributed information and collective problem solving

WhatsApp groups generated a more networked mode of interaction. Members could report field problems, request clarification or share documents without waiting for a scheduled meeting. Information moved in several directions: TAPM circulated policy updates, village facilitators escalated implementation problems, managers reported enterprise needs and participants learned from responses to other villages. Although formal status remained visible, turn-taking was less controlled than in Zoom meetings and practical knowledge circulated laterally as well as vertically.

> *"Every morning I check the WhatsApp groups. There are usually reports from village facilitators. If a problem appears, I respond immediately. It is faster than gathering everyone at the office." (TAPM-1)*

This mode lowered information-search costs by placing current policy information, prior solutions and peer experience within a shared channel. It also shortened problem-resolution cycles. A question posed by one facilitator could produce a response useful to several others, making knowledge partially reusable across cases. Participants described this as a form of continuous collective learning. The network was therefore not merely faster; it broadened access to distributed expertise and allowed local problems to enter a shared problem-solving space.

The empowerment effect was conditional. Less confident users, older managers and those with limited devices did not participate on equal terms. Some required one-to-one assistance to upload documents or join virtual meetings. The group widened access to expertise, but digital capability affected whose questions were voiced and whose contributions were visible.

4. Personal-relational interaction: Monitoring with discretion

Private chats and calls were used when an issue was sensitive, potentially conflictual or closely tied to individual performance. TAPM avoided raising some concerns in group channels because public correction could produce defensiveness or damage working relationships. A personal channel made it possible to clarify expectations, request evidence, follow up delayed tasks and discuss interpersonal tensions without exposing the actor to the wider group.

> *"If there is a problem with a facilitator's performance, I message them privately first rather than posting it in the group. That is wiser." (TAPM-3)*

This mode reduced monitoring costs by replacing some site visits with direct clarification and digital evidence. Its contribution was also relational: discretion protected trust and made corrective communication more acceptable. Personal interaction did not replace formal accountability; it worked as a bridge between standardized reporting and the social realities of implementation. The finding indicates that transaction-cost efficiency in community-based organizations depends partly on relational sensitivity. Monitoring is less costly when the channel fits the social risk of the issue.

Table 3. Layered interaction architecture and transaction-cost effects

Interaction mode	Typical channel	Institutional task	Cost primarily reduced	Empowerment relevance
Hierarchical-formal	Zoom	Policy alignment, evaluation and collective decisions	Travel, scheduling and formal coordination	Connects dispersed actors to authoritative information
Network-organic	WhatsApp group	Daily consultation, peer learning and rapid problem solving	Information search and routine coordination	Widens access to shared expertise and response capacity
Personal-relational	Private chat/call	Sensitive feedback, clarification and follow-up	Monitoring and conflict resolution	Protects trust while enabling corrective action

5. Efficiency gains and displaced burdens

Taken together, the three modes formed a hybrid coordination system. Participants reported that routine coordination increased from approximately once to seven times per month after digital channels became embedded, without a proportional rise in travel or meeting expenditure. Reporting records became easier to retrieve, policy updates circulated more quickly and field problems could be identified before the next scheduled meeting. These were the central transaction-cost efficiencies observed in the study.

The same infrastructure created new frictions. Eleven of the 13 participants identified unstable connectivity, particularly during Zoom meetings and uploads, sometimes requiring repeated explanations or a return to telephone and face-to-face communication. Four mentioned device or battery constraints, while three reported that some older BUM Desa managers needed additional support to join meetings, upload records and navigate reporting systems. Uneven access and literacy therefore transferred troubleshooting and teaching work to facilitators.

WhatsApp's accessibility produced another burden: an always-on communication norm. Messages arrived at night, on weekends and outside formal hours, creating an expectation of rapid response.

> *"The work never stops. The WhatsApp groups keep sounding, even at night. Sometimes it feels as though there is no time to rest." (TAPM-3). "There is an expectation that we must reply quickly, even though we are in the field and do not always have the phone in our hands." (PD-1)*

Participants described fatigue from moving between multiple groups, attending virtual meetings and completing digital reports. Two participants also reported misunderstandings because short text messages removed tone and non-verbal context. In these cases, the speed gained in group communication was partly offset by the time required for telephone, private-message or face-to-face clarification. Digitalization therefore reduced some organizational costs while displacing temporal and cognitive costs onto facilitators.

6. Contextual organizational indicators

Internal income statements from the same focal enterprise, BUM Desa Hapsari Mejono, indicated substantial organizational change between the annual reporting periods 2023 and 2025. Total revenue rose from IDR 157,947,900 to IDR 223,928,000, while recorded operating expenditure fell from IDR 98,093,000 to IDR 78,912,000. The

operating-cost-to-revenue ratio consequently declined from 62.10% to 35.24%. Managers associated these changes with lower-cost promotion through WhatsApp and Facebook, reduced travel and meeting expenditure, quicker customer response and more timely operational decisions.

These internally prepared statements were not independently audited for this research and represent one enterprise rather than the district BUM Desa population. They do not establish that digitalization caused the financial change. Market conditions, product demand, managerial capacity, seasonality and government support may also have contributed. The figures are therefore treated as contextual corroboration of the efficiency mechanisms reported in interviews and observation, not as an impact estimate. This distinction is essential because the study was designed to explain interactional processes rather than identify a counterfactual effect.

Table 4. Internal documentary indicators from the focal BUM Desa

Indicator	2023	2025	Recorded change	Interpretive status
Total revenue	IDR 157,947,900	IDR 223,928,000	+41.77%	Contextual financial record
Operating expenditure	IDR 98,093,000	IDR 78,912,000	-19.55%	Contextual financial record
Operating-cost ratio	62.10%	35.24%	-26.86 percentage points	Derived from financial records
Coordination frequency	About 1/month	About 7/month	+600%	Participant and activity-report evidence

IV. DISCUSSION

1. From platform adoption to layered interaction architecture

The principal finding is that digital empowerment was produced by a layered interaction architecture rather than by any single platform. Zoom, WhatsApp groups and private messages organized different social relations and solved different coordination problems. Formal video meetings preserved authorized direction while reducing the cost of assembling dispersed actors. Group messaging enabled rapid, multi-directional exchange and reusable problem-solving knowledge. Private communication handled tasks for which discretion and trust were more important than visibility. The platforms became valuable through their institutional fit.

This finding develops digital-ethnographic accounts that treat online activity as embedded in wider social worlds (Hine, 2015; Pink et al., 2016). The BUM Desa field was neither purely virtual nor simply a digitized version of offline bureaucracy. Participants moved between formal meetings, group discussions, private clarification, reporting systems and village visits. The resulting arrangement was hybrid: digital channels reduced the need for some physical encounters but relied on offline relationships, authority and contextual knowledge to remain intelligible.

The concept of layered interaction architecture also refines existing research on BUM Desa digitalization. Studies have associated digital adoption and open innovation with organizational performance (Wulandari & Wardani, 2024; Suhartanti & Sholikhah, 2026), but adoption does not explain why one channel supports collective

learning while another is better suited to formal decisions or sensitive monitoring. Interaction mode provides the missing middle between technology availability and organizational outcome.

2. Recasting transaction-cost efficiency in community empowerment

The findings support the TCE proposition that communication technology can reduce the costs of organizing exchange (Coase, 1937; Williamson, 1985). They also show that the effect is differentiated. Coordination costs were lowered most clearly by formal synchronous meetings; information costs by networked asynchronous exchange; and monitoring or conflict-resolution costs by personal communication and traceable reporting. Digitalization did not produce one general efficiency effect. It created a portfolio of mode-specific efficiencies.

This portfolio matters for community empowerment. BUM Desa operate through public, commercial and relational logics. Efficient governance must therefore preserve participation and trust while improving speed and accountability. The network-organic mode expanded access to expertise and allowed field problems to be addressed collectively, which is consistent with empowerment as an expansion of practical capability (Sen, 1999). Hierarchical-formal interaction ensured that rapid exchange remained connected to legitimate decisions. Personal-relational interaction prevented accountability from becoming unnecessarily public or punitive. Efficiency and empowerment were mutually reinforcing when the channel matched the task and relational context.

The argument also qualifies optimistic assessments of BUM Desa. Prior evidence shows that formal expansion does not automatically produce employment or durable outcomes (Arifin et al., 2020), while accountability and managerial capability remain central challenges (Fitriani et al., 2024). The present case suggests that digital interaction can strengthen these organizational processes, but only when embedded in a functioning facilitation system. Platforms cannot compensate for weak trust, absent managerial capacity or exclusionary participation.

The Muslim-majority setting locates these findings within scholarship on socio-economic change and community development in Muslim rural society. The relevant contribution is institutional rather than theological: ordinary digital infrastructures reorganized access to public information, expertise and collective problem solving in a community whose social life is predominantly Muslim. Because religious practice, Islamic economic norms and faith-based organizations were not observed as analytic variables, the evidence does not support a claim that religion generated the three interaction modes. This boundary keeps the contextual relevance visible without attaching an unsupported religious mechanism to the findings.

3. The efficiency-burden paradox

A second theoretical implication is that visible transaction-cost reduction can coexist with hidden cost displacement. Travel, scheduling and information-search costs declined, but facilitators absorbed new demands associated with constant availability, message triage, user support and clarification. This efficiency-burden paradox is not an incidental side effect. It is produced by the same affordances that make digital coordination effective: immediacy, persistence and low-cost reach.

The finding connects rural digitalization with research on availability pressure and online vigilance. After-hours monitoring expectations can weaken work detachment and increase exhaustion (Belkin et al., 2020), while intensive vigilance is

associated with momentary and lagged mental fatigue (Van Gaeveren et al., 2026). In the present setting, such pressure had an institutional dimension because facilitators were responsible for keeping geographically distributed actors connected. Organizational efficiency was partly achieved through their willingness to extend responsiveness beyond formal work boundaries.

TCE should therefore be applied with a broader accounting of costs. If reduced travel expenditure is accompanied by escalating cognitive load or burnout risk, the governance arrangement may be efficient in the short term but unsustainable for the people maintaining it. A socially grounded account of transaction costs must include the distribution of temporal, emotional and cognitive burdens, not only monetary expenditure.

4. Practical and policy implications

For BUM Desa and facilitation teams, the findings suggest that channel governance should be designed around task fit. Formal cross-village decisions are best handled through scheduled synchronous meetings with clear agendas and archived outcomes. Routine consultation benefits from shared messaging groups, but searchable repositories or pinned guidance are needed to prevent repeated questions and information overload. Sensitive performance issues should be moved to private channels, with key decisions subsequently documented through accountable procedures.

Digital empowerment also requires inclusion measures. Training should address not only platform operation but also document management, digital communication norms and the interpretation of online information. Shared devices, connectivity support and low-bandwidth alternatives remain necessary where access is uneven. Group participation should be monitored to identify actors who receive information but rarely contribute because of age, confidence, literacy or device constraints. This emphasis is consistent with Indonesian research showing that digital communication and literacy must develop together if rural enterprise actors are to convert connectivity into socio-economic capability (Nugroho et al., 2025).

At policy level, technology should be designed as part of a collaborative rural-development system rather than as a stand-alone application. Smart-village planning is vulnerable when social and institutional capacity is treated as secondary to infrastructure (Muhtar et al., 2023), while collaborative frameworks emphasize actor alignment, resource integration and shared communication arrangements (Monda et al., 2023). District governments should therefore connect platform provision with facilitation roles, clear escalation routes and locally usable repositories of guidance.

Finally, efficiency policies should protect facilitator well-being. Teams can establish response windows, distinguish urgent from non-urgent channels, rotate monitoring responsibility and avoid treating after-hours availability as a default obligation. Such measures do not weaken digital responsiveness; they make it institutionally sustainable.

V. CONCLUSION

This digital ethnography shows that digitalizing community empowerment is an interactional and institutional process, not simply a matter of adopting applications. In the BUM Desa facilitation ecosystem studied in Kediri, three complementary modes organized digital work: hierarchical-formal interaction through Zoom, network-

organic interaction through WhatsApp groups, and personal-relational interaction through private messaging. Each mode reduced a different organizational friction. Formal meetings lowered travel and scheduling costs, group communication reduced information-search costs and accelerated collective problem solving, and private communication supported lower-cost monitoring and conflict management.

The study contributes the concept of a layered interaction architecture to explain how platform choice, institutional task and relational sensitivity combine to produce transaction-cost efficiency. It also identifies an efficiency-burden paradox. The same infrastructure that reduced visible organizational costs created availability pressure, digital-literacy work and fatigue for facilitators. Digital empowerment is therefore strongest when it expands access to information and coordinated action while distributing the labor of connectivity fairly.

The findings are bounded by a qualitative case in one regency, a small purposive participant group and one seven-day intensive observation window nested within six months of broader field engagement. The study centered on facilitators and institutional actors rather than community beneficiaries, so its empowerment claims concern access, coordination and organizational capability rather than household welfare. Internal financial records came from one focal BUM Desa at two time points, were not independently audited and cannot isolate the effect of digitalization from market, managerial or policy influences. Future research should compare interaction architectures across regions and enterprise types, combine digital trace data with audited longitudinal financial evidence, and examine whether inclusive channel governance moderates the relationship between digital adoption, transaction costs and community outcomes.

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Author Contributions
Supriyanto: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, and Writing – Original Draft. Sugeng Hariadi: Validation, Supervision, Writing – Review & Editing, and Project Administration. Both authors reviewed and approved the final version of the manuscript and take responsibility for the integrity of the work.

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The author used ChatGPT solely to assist with language editing, sentence-level clarity, and grammar checking. The tool was not used to generate, analyze, or interpret research data or to make research decisions. All AI-assisted language edits were reviewed, revised, and verified by the author, who takes full responsibility for the accuracy, originality, and integrity of the manuscript.

Conflict of Interest
The author declares no conflict of interest.

Data Availability

The data supporting the findings of this study are documented in the article and its supplementary materials in de-identified and aggregated form. Raw interview transcripts, private messages, screenshots, and other identifiable digital records are not publicly shared because of confidentiality, privacy, and participant-consent restrictions. Additional de-identified information may be made available by the author where ethically and legally permissible.

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