HOW PEOPLE AND CULTURE DRIVE DIGITAL TRANSFORMATION: LESSONS FROM PUNGGUL DIGITAL VILLAGE, BALI

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Abstract

Digital transformation in rural governance often focuses on technology implementation, yet many initiatives fail because they neglect human and cultural factors. Punggul Village, Bali, provides a unique case where local human capital and culture are systematically leveraged to ensure a successful and sustainable digital transformation. This study aims to analyze how leadership, capacity building, cultural intermediaries, and collaboration collectively shape the adoption and institutionalization of digital services in a rural context. A qualitative case study approach was used. Data were collected through in-depth interviews with village leaders, IT staff, local system developers, and residents, complemented by participant observation and document review. Data were analyzed through data reduction, visualization, and inference following Miles & Huberman, using Rogers' Diffusion of Innovation framework as an analytical lens. The results indicate that Punggul's transformation is rooted in a deliberate socio-organizational strategy rather than simply a technology project. Visionary leadership introduced mandatory digital training and an integrity pact linked to performance; capacity building was task-specific and ongoing; cultural intermediaries (kelian) acted as mediators to maintain inclusivity; and collaboration between the village government, developers, and residents created a responsive digital ecosystem. These elements enable villages to progress from awareness to confirmation, integrating digital practices into routine governance. This study introduces the "Digital Village Model," which emphasizes that sustainable rural digital transformation must be people-centered, culturally grounded, and institutionally adaptive. This model provides actionable insights for policymakers seeking to bridge the rural digital divide and implement inclusive e-government initiatives.

Keywords: Cultural Brokerage, Digital Transformation, Human Capital, Rural Governance

INTRODUCTION

Rural digital transformation has become a strategic agenda in Indonesia's national development. This priority is reinforced by Presidential Regulation No. 82 of 2023 on the Acceleration of Digital Transformation and the Integration of National Digital Services. The regulation underscores the need for an integrated Electronic-Based Government System (SPBE), the establishment of comprehensive national digital services, the strengthening of Indonesia's One Data governance, and the enhancement of bureaucratic quality and reliable public services. With this regulation, the government's focus has shifted beyond infrastructure provision toward the integration of cross-sectoral digital public services, inter-agency coordination, and the support of local governments in accelerating digital transformation. In line with this policy, the *Indonesia Digital Roadmap 2021–2024*, launched by the Ministry of Communication and Information Technology, identifies digital villages as a priority in extending technology access to the grassroots level. Programs such as Public Service Automation and the Palapa Ring project were designed to promote innovation and strengthen technology-based public services, particularly in remote and rural areas (Kementerian Komunikasi dan Informatika Republik Indonesia, 2021). However, policy implementation has not always been seamless. The 2023 Indonesian Digital Society Index (IMDI) shows that digital transformation in Indonesia, especially in rural areas, faces multidimensional challenges. A significant gap exists between progress in infrastructure (57.09) and digital skills (56.59) compared with empowerment (26.19) and employment (32.14). This disparity suggests that digital initiatives often fall short of their core objective—improving social welfare (Koswara, 2024, pp. 183-184). These findings highlight that digital transformation is far more complex than the mere provision of technology.

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Previous studies emphasize that the main obstacles to rural digitalization are not rooted in hardware limitations but in techno-centric approaches that overlook human resources and local culture. Agusta (2023, p. 7) argues that digital village projects focusing narrowly on technical aspects often fail to sustain. Similarly, Susilowati, Rachmawati, & Rijanta (2024, p. 362) highlight that uniform, top-down digitalization policies are unable to accommodate the diverse socio-cultural contexts of rural communities. Amid these dynamics, Punggul Village in Badung Regency, Bali, offers a compelling case that contrasts with prevailing trends. Since 2014, the village has consistently developed its digital ecosystem and has received multiple awards, including recognition as a model Digital Village in Badung Regency (bali.antaranews.com, 2022). Unlike other digitalization projects that are primarily top-down, Punggul's initiatives have emerged organically from community awareness and agency, reflecting cultural readiness to embrace innovation. This orientation has enabled digital public service programs to grow sustainably without heavy reliance on external interventions.

The human factor has been central to the village's digital transformation. Capacity-building programs through structured training have significantly improved the performance of village officials, with digitalization serving as a mediator (Prihartono, Wijaya, Wicaksana, & Amelia, 2023). Visionary leadership by the village head—such as implementing an integrity pact requiring officials to master digital technologies—has also been a key driver of change. Moreover, the local cultural structure, particularly the role of the *kelian* (community leaders), functions as a cultural broker bridging technological adoption with traditional norms. Through this mechanism, even community members unfamiliar with applications are able to benefit from digitalization. Against this backdrop, this study seeks to analyze the human resource capacity development strategies employed to advance digital transformation in Punggul Village, examine the roles of local leadership and cultural structures in facilitating or constraining technology adoption, and formulate a contextually grounded HR empowerment model for accelerating rural digital transformation. Theoretically, this study contributes to the field of Public Administration, particularly in the areas of village governance, bureaucratic capacity building, and the interplay between leadership, local culture, and public service innovation. It also reinforces the importance of a human-centered approach in public administration, where policy success is determined not merely by technological instruments but by the quality of officials, citizen participation, and cultural value integration. Practically, this study provides evaluative insights and policy recommendations for rural digitalization in Indonesia. For local governments, the findings can serve as a reference for designing more sustainable digital transformation programs. For village governments, the proposed model may serve as a blueprint for strengthening HR capacity and leveraging socio-cultural structures. For rural communities, the study highlights the importance of digital literacy and active participation in supporting technology-based public service delivery.

LITERATURE REVIEW
Digital Transformation in the Public Administration Perspective
Digital transformation in public administration is not merely understood as the adoption of technology, but also as a fundamental shift in governance, bureaucratic processes, and patterns of social interaction between government and society. It is not only about adopting new technologies, but also about reshaping organizational culture, processes, and structures to maximize the benefits of these technologies (Subekti, et al., 2024). This framework is also reflected in Presidential Regulation No. 82 of 2023 on the Acceleration of Digital Transformation and the Integration of National Digital Services, which emphasizes the acceleration of digital transformation through cross-sectoral service integration and the strengthening of human capacity as primary users. However, the literature indicates that top-down and uniform approaches often encounter failure. Susilowati, Rachmawati, & Rijanta (2024, p. 362) found that the implementation of smart cities in Indonesia has frequently been trapped in the construction of digital infrastructure and applications, while paying insufficient attention to citizen participation, resulting in low levels of utilization. The success of digital transformation in rural areas is highly dependent on the alignment of strategies with local contexts. Pinuji, Lestari, & Yudistira (2024, p. 335) demonstrated that geographic, social, and economic conditions of villages vary significantly, thus requiring differentiated modules and smart village application designs—indicating that a standardized approach is not relevant for all rural communities.

Human Capital and Technology Adaptation Theory
The human factor is a key element in the success of digital transformation. The Technology Adaptation Theory, or *Diffusion of Innovations*, introduced by Everett Rogers (1962), explains that the diffusion of technology or innovation occurs through six stages: awareness, interest, evaluation, trial, adoption, and confirmation. In the initial stage, individuals or organizations become aware of a new innovation, then weigh its benefits and risks, experiment with it in practice, and finally decide whether to adopt it on a sustainable basis. The confirmation stage is marked by

the integration of technology into daily routines, making it an inseparable part of organizational or community culture (Rantung, 2024, pp. 17-18). This theory is highly relevant for explaining the dynamics of digital adaptation at the village level. Prihartono, Wijaya, Wicaksana, & Amelia (2023, pp. 548-550) demonstrate that information system–based training in villages accelerates the shift of village officials from the trial to adoption stage through continuous mentoring. Lestari, Saputri, Arief, Sultrayansa, and Tund (2023, p. 235) further argue that digital literacy among village officials not only enhances awareness but also strengthens consistency in using technology for public service delivery. In the context of Punggul Village, this theory illustrates how visionary leadership—through tiered training programs and the signing of a digital integrity pact—encouraged village officials to progress from awareness to confirmation. This process demonstrates that investment in human capital is not merely a supporting factor but the very foundation of sustainable rural digital transformation.

Local Culture and the Role of Social Brokerage

Beyond the human factor, local culture serves as both a filter and an accelerator in the digital adoption process. Agusta (2023, p. 7) observes that digital village projects that concentrate solely on technical aspects frequently fail to sustain, as they are often incompatible with the prevailing norms and values of the community. Embedding digital initiatives within local cultural structures does not merely enhance acceptance but also fosters a sense of ownership among citizens, thereby improving the long-term viability of digital transformation programs. International literature further supports this argument. A study in China published in *Nature* highlights that citizens' digital literacy, when reinforced by collective norms, significantly strengthens their commitment to using digital services even when state financial support diminishes (Ji, Dong, Pan, & Yu, 2024, p. 15). This finding underscores the importance of aligning technological innovation with the social fabric of the community. In the Balinese context, customary structures such as the *kelian* function as cultural brokers—actors who mediate between digital innovation and traditional norms, translating the benefits of technology into culturally acceptable practices. These brokers do not simply disseminate information but also legitimize digital initiatives, making them socially palatable. This mediation process enables groups reluctant to adopt digital applications directly—such as older residents or those with low digital literacy—to continue accessing public services through trusted intermediaries. In this way, local culture acts as a social infrastructure that amplifies digital inclusion and prevents the deepening of technological divides.

Punggul Village as a Case Study

Punggul Village in Badung Regency, Bali, offers a concrete example of how human capital and local culture underpin the success of rural digitalization. Unlike many top-down digital village projects, Punggul's digital initiatives have emerged from community participation and visionary local leadership. Since 2014, the village has consistently developed its digital ecosystem, ranging from application-based administrative services to public information transparency (Sari, Supriliyani, & Yudharta, 2022, pp. 3-5). ANTARA News Bali (2022) reported that Punggul Village was designated as a role model for digital village applications in the development of Badung Smart City. This success has been supported by three factors: first, the capacity building of village officials through structured training; second, the leadership of the village head, which emphasizes integrity and digital readiness; and third, the utilization of local culture as a mechanism for socialization and technological acceptance. These factors collectively illustrate that sustainable rural digital transformation cannot be separated from human resource development and the strengthening of local cultural contexts.

METHOD

This study employed a qualitative approach with a case study strategy to gain an in-depth understanding of how human resource development (HRD) and the utilization of local culture contribute to the success of digital transformation in Punggul Village, Badung Regency, Bali. The case study approach was selected because it allows researchers to explain phenomena contextually and comprehensively, aligning with the village's unique characteristics as a distinct social unit (Yin, 2003). The research site was Punggul Village, located in Abiansemal District, Badung Regency, which has been designated since 2014 as one of the pioneering Digital Villages and recognized as a role model for digital transformation at the regency level. Research informants were determined using purposive sampling, with participants deliberately selected based on their direct involvement in the village's digital initiatives. The primary informants included village officials, private sector actors, and community members. The data used in this study comprised both primary and secondary sources. Primary data were collected through in-depth interviews, participant observation, and documentation of activities, while secondary data were obtained from official village documents and academic literature related to rural digital transformation.

Data collection techniques consisted of semi-structured interviews guided by the framework of Rogers' Technology Adaptation Theory (2024, pp. 17–18), participant observation of village activities and digital service operations, and document analysis of regulations, village reports, media coverage, and records of Punggul's digitization programs. Data analysis followed the steps of data reduction, data display, and conclusion drawing as developed by Miles and Huberman. Field data were categorized according to the research dimensions and interpreted using Rogers' Technology Adaptation Theory. To ensure the validity of findings, triangulation was performed by cross-checking data from interviews, observations, and documents. Through this methodological approach, the study aims to produce a holistic, in-depth, and contextually grounded understanding of the dynamics of digital transformation in Punggul Village.

RESULTS AND DISCUSSION
Human Capital and Digital Adaptation

The primary factor underpinning the success of Punggul Village's digital transformation lies in its long-term investment in human capital and the deliberate adaptation mechanisms designed by village leadership. Rogers' Diffusion of Innovations framework offers a sequential lens for interpreting this process, which unfolds across the stages of awareness, interest, evaluation, trial, adoption, and confirmation.
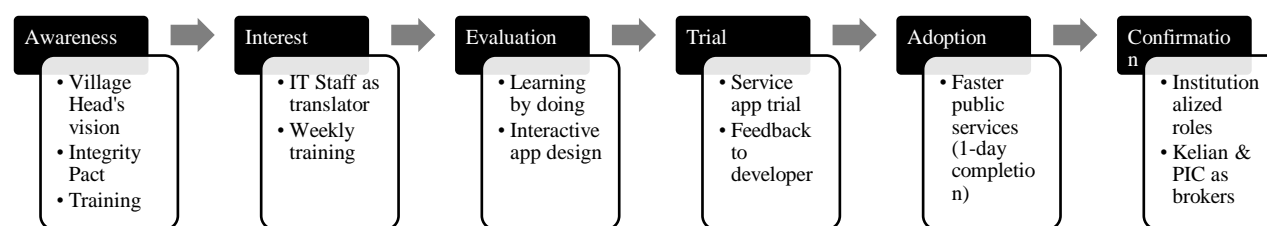

Figure 1. Digital Adaptation Flow in Punggul Village
(Based on Rogers' Theory of Innovation Diffusion)
Source: Data processed by the authors (2025)

During the awareness and interest phases, the Village Head explicitly articulated the vision of delivering "the best public service" as early as 2014, positioning human resource development as the first step prior to technological deployment. To ensure that this vision did not remain mere rhetoric, the village institutionalized weekly computer training sessions (every Thursday), provided work devices, and introduced a "integrity pact" as a commitment device. This mechanism mitigated moral hazard and compelled village officials to progress from trial to adoption. Officials unable to operate computers within one year were asked to step down, a policy design that created learning discipline and normalized digital literacy as a bureaucratic prerequisite rather than an optional skill. In the evaluation and trial phases, training was deliberately linked to real tasks, fostering a learning-by-doing environment. The village IT staff acted as a "translator," converting user needs (from community leaders or village staff) into system specifications before they were implemented by the local developer. This relational architecture minimized the distance between service policy formulation and application design, while accelerating the feedback loop: idea → process translation → code modification → testing → refinement. This collaborative model was repeatedly emphasized in interviews with IT staff ("like a translator") and the local developer, who highlighted system–operation fit as their primary design principle.

The adoption phase was marked by the mainstreaming of digital applications in core public services—particularly population administration and correspondence—resulting in visible service-level outcomes, such as same-day completion of requests. This outcome strengthened perceived usefulness, a key variable in technology adoption literature, and served as a social incentive for officials to sustain digital practices. Informants consistently emphasized that the ability to provide services "on the same day" and the orderly management of records reinforced the tangible and measurable benefits of digitalization at the frontline. The confirmation phase—when technology becomes fully embedded into organizational routines—was indicated by two factors: (i) the institutionalization of roles and processes (IT staff serving as the bridge, local developers remaining on call for server maintenance and migration, and the Punggul Information Centre (PIC) maintaining public communication), and (ii) the cultivation of transparency through online communication channels. Together, these elements created a "stable" and path-dependent digital practice—difficult to abandon because it had become ingrained in bureaucratic work routines and in citizens' expectations of service delivery.

From a public administration perspective, Punggul's internal policy design proved effective for three reasons. First, capacity building was task-specific, tiered, and norm-driven (through the integrity pact), thereby linking training to service performance rather than pursuing training for its own sake. Second, the structural coupling between policy domains, work processes, and application development (through the "translator" role and local developer engagement) minimized the implementation gap that often occurs when digital solutions are externally packaged in a one-size-fits-all model. Third, adaptive governance—allowing rapid iteration and contextual problem-solving—ensured that the burden of change was not placed solely on citizens but was distributed through cultural intermediaries. Cultural dimensions became a key differentiator for Punggul. Rather than enforcing digital channels as the sole option, the village leveraged its network of kelian (traditional neighborhood leaders) as cultural brokers to maintain inclusivity. Public communication flows—official letters, neighborhood or youth organization group chats, and educational video content—accommodated citizens' preference for face-to-face interaction. This choice did not represent a regression to analog systems but rather a hybrid strategy that reduced adoption costs for vulnerable groups (e.g., the elderly) without halting digital progress. Informants confirmed that the kelian functioned as an information hub, and citizens reported feeling more comfortable approaching them, indicating that cultural pathways acted as a "safety rail" during the digital transition.

The Punggul Information Centre (PIC) closed the loop of public sense-making. Despite limited resources, PIC consistently produced and disseminated content across multiple channels (website, Facebook, Instagram, YouTube), thereby reinforcing transparency and accountability. Even under budget and equipment constraints, the consistency of content production enhanced the legitimacy of digital services and fostered a digital civic habit—citizens grew accustomed to monitoring the village website for updates and accountability reporting. This underscores the importance of non-technical capacity—narrative curation and public communication literacy—in sustaining transformation. Two critical policy notes emerge. First, an internal digital divide remains, as some citizens still prefer to seek services through the kelian rather than digital applications. This signals the need for last-mile enablement: citizen assistance programs, interface simplification, cross-platform support (Android/iOS), and behavioral nudges to make digital channels the default option without negating cultural channels. Second, reliance on key individuals (the village head, IT staff, and PIC manager) must be mitigated through succession planning and knowledge codification to prevent capacity from becoming person-dependent. Process documentation, training playbooks, and clearly defined developer service contracts would further strengthen institutional resilience.

Overall, the case of Punggul provides an important contribution to both public administration literature and practice: technology proves most effective when it is built upon a foundation of strategically managed human capital—normatively anchored and performance-oriented—and is reinforced by cultural brokerage that respects local social structures. In Rogers' terms, Punggul has not merely achieved adoption but has successfully consolidated the confirmation phase through a combination of leadership (a clear vision and strong commitment that compelled bureaucratic behavioral change), capacity building (tiered training, translator roles, and the involvement of local developers), and cultural mediation (*kelian* and community-based channels acting as inclusive bridges). This triad helps explain why Punggul's digital transformation appears sustainable: it is not simply a technology deployment but an organizational and cultural reengineering effort that enables technology to become part of the village's institutional fabric.

Leadership and Cultural Brokerage in Governance

One of the key factors behind the success of digital transformation in Punggul Village is the visionary leadership of the Village Head, who acts as a *policy entrepreneur*. In public administration literature, local leadership has a strategic role in initiating adaptive policy change (Sari, Pinatih, Juniarta, & Supriliyani, 2022, pp. 59-61). The Village Head of Punggul demonstrated a clear vision by requiring village officials to undergo digital training, introducing an integrity pact, and ensuring that all staff possessed basic digital literacy. This reflects a shift from traditional administrative leadership toward *transformational leadership* that proactively drives innovation (Bass & Riggio, 2006).
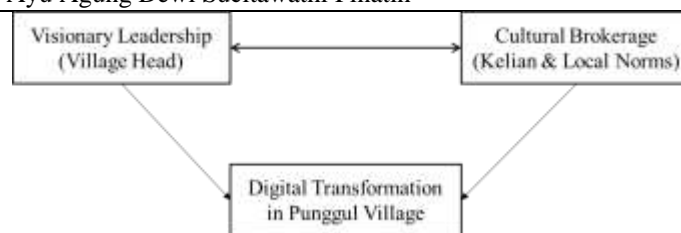
Figure 2. Synergy of Visionary Leadership and Cultural Brokage in Driving Digital Tranformation in Punggul Village
Source: Data processed by the authors (2025)

However, the village's success was not solely based on bureaucratic instruction but also embedded within Bali's strong socio-cultural fabric. Here, the role of the *kelian*—a customary leader with significant social authority—proved crucial. The *kelian* acted as a *cultural broker*, bridging digital innovation with deeply rooted traditional norms. Through their authority and proximity to villagers, they reduced resistance—especially among older generations—by translating the benefits of digitalization into cultural and local frames of meaning. This aligns with cultural brokerage theory, which emphasizes the importance of local actors in reinterpreting global innovations into contextually relevant forms (Jang, 2017, p. 1007) The synergy of visionary leadership and cultural brokerage ensured that digital transformation in Punggul was not just a technical project but a socially grounded process. In the lens of public administration, this case underlines that digital governance at the village level cannot be detached from local leadership and social structures. Thus, digital policy design must consider not only the *hard dimensions* of infrastructure but also the *soft dimensions* of culture and leadership. Punggul therefore offers an important lesson: rural digital governance cannot succeed solely through top-down interventions but must combine local leadership agency with cultural structures. This hybrid governance model—merging technological innovation with entrenched social values—represents a sustainable pathway for digital transformation in rural areas.

Towards a Human-Centered Model of Rural Digital Transformation

Findings from Punggul Village demonstrate that the success of rural digital transformation is not determined solely by technical infrastructure, but rather by the interplay of visionary leadership, the strengthening of bureaucratic capacity, the mobilization of local culture, and cross-sector collaboration. These four elements can be synthesized into what may be referred to as the "Punggul Model," grounded in Leadership–Capacity–Culture–Collaboration. This model underscores that rural digital transformation must be rooted in human dimensions rather than relying exclusively on infrastructure provision.

Component	Before (Pre-Transformation)	After (Post-Transformation)
Leadership	Traditional administrative leadership; focus on routine tasks.	Visionary and proactive leadership; Village Head as a *policy entrepreneur* with a digital vision.
Capacity	Limited digital literacy among apparatus; services mostly manual.	Apparatus trained through tiered programs; public services delivered via digital applications.
Culture	Resistance from certain community groups (e.g., elderly).	*Kelian* as cultural brokers bridging local norms with digital innovations.
Collaboration	Relatively individual; sporadic programs.	Strong collaboration among village government, private developers, and community in building a digital ecosystem.

**Table 1. Analytical Comparison of Punggul Village Digital Transformation
Source: Data processed by the authors (2025)**

First, leadership constitutes the primary foundation, as exemplified by the Village Head acting as a policy entrepreneur who mandated digital training, introduced a digital integrity pact, and internalized digital values into village bureaucracy. Second, the continuous enhancement of village officials' capacity through tiered training ensured that technology adoption did not stall at the trial phase but was fully integrated into routine service delivery. Third, local culture—particularly through the role of kelian as cultural brokers—facilitated social acceptance by aligning digital innovations with traditional norms. Fourth, collaboration between village government, private system

developers, and local residents strengthened the sustainability of the digital ecosystem. When compared to the national policy framework—particularly Presidential Regulation No. 82 of 2023 on Accelerating Digital Transformation and Integrating National Digital Services—it is evident that Punggul complements the government's predominantly top-down approach. While the regulation emphasizes cross-sector service integration, data interoperability, and a unified Electronic-Based Government System (SPBE), implementation at the village level reveals that without attention to human and cultural contexts, such policies risk facing gaps in execution. In this respect, Punggul offers a best practice that operationalizes national policy objectives through a bottom-up approach. The key contribution of the Punggul Model lies in its assertion that rural digital transformation cannot be uniform or standardized. Each village possesses distinct social and cultural configurations, rendering one-size-fits-all solutions insufficient. Punggul demonstrates that successful digitalization is born out of a synthesis between formal policy instruments and local socio-cultural dynamics. This model therefore provides a valuable reference for designing rural digital policies that are more adaptive, human-centered, and sensitive to Indonesia's local diversity.

CONCLUSION

This study demonstrates that the success of digital transformation in Punggul Village is not merely the result of technological availability, but rather of sustained investment in human capital development and the intelligent use of local culture. The village's digitalization process illustrates the relevance of Rogers' Technology Adaptation Theory, where village officials and community members gradually move from awareness to confirmation of technology use. The visionary leadership of the village head, reinforced by the *cultural brokerage* role of the *kelian*, has acted as a catalyst that enables digital innovations to be socially accepted and integrated into long-standing traditional norms. Critically, these findings reveal a fundamental weakness of homogenized and top-down rural digitalization policies. Projects that focus solely on technical aspects often struggle to be sustainable because they overlook contextual factors such as human capacity and cultural structures. Punggul offers an alternative model, showing that rural digital transformation must be grounded in *human-centered* and *culturally-sensitive governance*.

The practical implications of this study suggest the need for a policy reorientation. First, central government policies should adopt a more flexible approach, moving away from standardized frameworks and allowing space for locally rooted innovations. Second, local governments should shift budget priorities from merely providing technological infrastructure toward sustained training programs and capacity building for village officials, ensuring digital literacy becomes an embedded competency. Third, village governments should maximize transformational leadership while leveraging the role of cultural actors as intermediaries to broaden community participation. Thus, Punggul Village not only presents a case of local success but also offers a conceptual model that can be adaptively replicated in other rural contexts. This model underlines that sustainable rural digital transformation can only be achieved through a combination of visionary leadership, strengthened human capacity, and respect for existing cultural structures.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH
Research Limitations

This study provides valuable insights into the role of human capital and local culture in shaping digital transformation at the village level in Indonesia. However, several methodological and empirical limitations require further consideration.

1. As a single case study focusing exclusively on Punggul Village, the findings cannot be generalized to all Indonesian villages. Each community has distinct socio-cultural dynamics, leadership styles, and levels of digital readiness, which may lead to different trajectories of digital transformation. As Yin (2003). emphasizes, case studies provide deep contextual understanding but are limited in external generalizability.
2. Most of the data were collected through interviews with village apparatus, private sector partners, and community representatives. While these sources provide rich qualitative insights, they may not fully represent marginalized groups, such as digitally illiterate elderly villagers or women in remote households. This limitation echoes observation that representation remains a common challenge in qualitative research (Semiawan, 2010, pp. 139-140).
3. The temporal scope of the study is restricted to the period up to early 2025. Digital innovation is an ongoing and dynamic process, so the findings capture more of a *snapshot* than a longitudinal progression.
4. The study relies heavily on self-reported accounts and official village documents, which may be subject to bias and selective reporting (Semiawan, 2010, pp. 140-141).

Future Research Directions

While this study offers important insights, further research is needed to deepen and broaden understanding of rural digital transformation in Indonesia.

1. Comparative studies across multiple digital villages in different regions of Indonesia would help identify both commonalities and divergences in digital adaptation. Such an approach would strengthen the empirical base and inform more context-sensitive policy design.

2. Quantitative surveys could complement qualitative insights by measuring digital literacy levels, service efficiency, and community satisfaction. A mixed-methods approach is recommended for capturing a more holistic picture.

3. Longitudinal research is needed to assess the sustainability of digital transformation, particularly regarding whether innovations remain effective after leadership changes.

4. Further inquiry could explore the intersection between gender, digital literacy, and participation in rural governance. Previous studies indicate that women often face additional barriers in accessing technology.

5. Future research should investigate inter-village collaboration and the formation of regional digital ecosystems, especially in replicating the "Punggul Model" in other rural contexts. This would offer valuable policy insights for both national and local governments in accelerating rural digital transformation.

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