The Digital Village: A New Era of Culture-Based Digital Transformation in Rural Areas

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Abstract. At the village level, digital transformation is seen as an important attempt to improve public services and strengthen governance. Punggul village is an intriguing case as there has been a gradual development and appropriate attention for digital activities. This research is conducted to find out the process of digital transformation in Punggul Village. A snowball sampling technique was used to identify informants. The data were acquired by means of in-depth interviews, observations and document studies, and evaluated by means of the Miles and Huberman model. Seventeen digital advances have been deployed. The achievement is attributed to the active engagement of village leadership, backing from traditional and young leaders and an integrated data system. This study proposes to combine several service applications into a single app platform for enhanced convenience and uptake. The findings also show the role of leadership, digital culture and collaboration in developing digital village.

Keywords: digital village, digital transformation, digital culture, rural development

1 Introduction

Digital inequality remains a significant challenge for inclusive and sustainable development in Indonesia, especially in its large rural areas. The villages are the closest government units to the community and play an important role in determining the degree to which digital transformation can be successfully implemented in an equitable manner. With almost 91 percent of Indonesia's territory being rural [1], building the digital capacity of village governments is not just a policy agenda but a fundamental need. This condition is also in line with the direction of national policy through Presidential Regulation Number 82 of 2023 concerning the acceleration of digital transformation and the integration of national digital services, which emphasizes the importance of the implementation of more responsive and technology-based public administration at all levels of government, including in the regions.

But despite this national direction, the various studies show that digital transformation is challenged in rural areas. The problems faced are also generally more complex than in the urban context, involving structural, technical and cultural aspects. However, limited internet infrastructure, low digital literacy of village officials, and absence of organizational culture that

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supports innovation still remain inhibiting factors [2]. Subekti et al. [3] similarly emphasize that digital transformation cannot be seen merely as a technical issue, but also as a form of institutional change that requires adjustments to values, work routines, and decision-making patterns. Therefore, the challenge of digitalization in rural areas is not only about technological preparedness but also about organizational capacity, the role of leadership and wider institutional adaptability.

In this context, Punggul Village in Badung Regency can be understood as an example of how a village government is dealing with the complexity of the digital transformation. Before the introduction of the digital system, the village had typical problems, including slow administrative processes, sub-optimal performance of staff, and lack of clear service standards [4]. This situation became the beginning of subsequent improvement efforts. Gradual innovations have happened since 2019. These include not only the provision of public Wi-Fi and CCTV but also the development of web-based services and mobile applications, and community empowerment programmes utilising digital technology [5].

The efforts resulted in the Punggul Village being declared as the first "Digital Village" in Badung Regency [6]. Interestingly, this was not done in isolation, but was associated with the commitment of village leadership, an organizational culture that was increasingly open to change, and strong cross-sectoral collaboration. In the academic literature, digital transformation in the public sector is not often thought of as an immediate process. It is a gradual process and is often driven by demands for more responsive governance oriented to public needs [7]. From an e-governance perspective, digital systems can improve transparency, efficiency and quality of service, but only if the institutions implementing them are well prepared [7].

On the other hand, several studies warn that technology alone is not enough to produce meaningful change. Equally important for sustainable transformation is to strengthen a digital culture – values, norms and daily work habits [3]. In a rural setting, this cannot be divorced from the role of digital leadership, i.e., the ability of the leader to mobilize different parties, set a clear direction, and engage officials and the community in the process of change [8]

Moreover, the degree of collaboration that can be established largely affects the digital development in the villages. The government, the private sector and the community are vital in generating more adaptive solutions especially when confronted with various limitations [9]. In line with the Rogers diffusion of innovation theory [10], it is obvious that the success of digitalization depends not only on the availability of technology but also on social processes, actors roles and the networks which influence the acceptance of innovation. Thus, the village level digital transformation is fundamentally shaped by the interplay among technology, culture, leadership and collaboration.

Although the research on digital villages in Indonesia has been continuously growing, most studies still tend to focus on the technical and infrastructural aspect of digitalization [11] [12]. Studies that perceive digital transformation as a process that involves culture and leadership are still somewhat scarce, especially those that integrate the perspectives of e-governance, digital culture and collaborative governance in a single analytical framework. Moreover, the role of leadership in developing a digital culture in terms of developing values, norms, and work practices has not been widely discussed, especially in the context of village governance. Thus, it is important to look at village digital transformation as an effort to adopt technology as well as an effort to form and strengthen the organizational culture of a collaborative ecosystem.

From this perspective, this study investigates digital transformation in Punggul Village by exploring the interplay of digital culture, digital leadership, and collaborative governance in shaping the innovation ecosystem at the village level. The analysis was conducted in depth, with the aim of making both conceptual and empirical contributions to the study of rural digitalization. In addition, the results of this study are also expected to be used as a reference for other villages to develop more sustainable digital transformation initiatives.

2 Methods

This research used a qualitative case study design to understand the dynamics of digital transformation in Punggul Village. The reasoning behind such an approach is that it gives researchers the chance to observe the phenomenon directly in a real world setting, when the boundaries between the phenomenon and its environment are not always clear [13]. With this analysis, we can have a more holistic understanding of the interactions between technology, organizational culture and leadership in the village government.

Data collection was through semi-structured interviews, observations, and document analysis. The main source was interviews, because they offered an insight into the experiences and perspectives of the actors involved. The method of sampling is snowball, where the informants have direct links in the social network [14]. The informants include village officials, traditional leaders, technology partners, and community users of digital services. Observations were made at the village office and service areas to directly observe the implementation of the system. Field data were supported by documents development plans, program reports, and regulations [15].

The analysis of data was done by using the interactive model of Miles and Huberman in an iterative process of data condensation, presentation and drawing conclusions [16]. Data from interviews and observations were coded and patterns related to digital culture, leadership and collaboration were identified. To supplement this process, constant comparison techniques were used to ensure analytical consistency [15]. Data sources were triangulated and informants were checked to enhance the findings and ensure appropriate interpretations.

The research was conducted upholding research ethics throughout. The objectives of the research were explained to the informants, confidentiality was assured and participation was voluntary. The report does not disclose their identities. This approach allowed us to trace digital transformation as a process embedded not only in technical aspects, but also in social and institutional dimensions at the village level.

3 Results and Discussion

3.1 Punggul Village's Digital Turning Point

Punggul Village was a milestone in the transformation of its government. The general objective of the Indonesian Digital Village Program was to improve the quality of public services and to increase community participation [17]. However, there are a number of studies that suggest that the success of the transformation is influenced not only by technology, but also by its compliance with local demands, adaptive leadership and the social readiness of the community

[18]. This can be seen in Punggul where the process of change was quite slow and steered. The transformation process is summarized in Fig. 1.

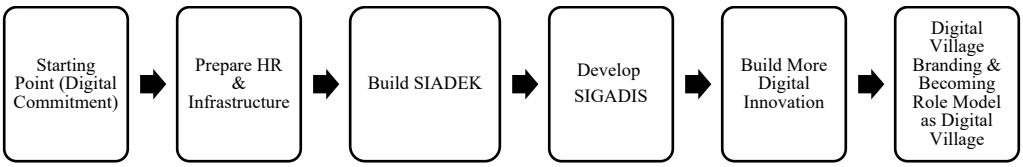


Fig. 1. Process of Village Flow Digitalization.
Source: Punggul Village Goverment [19]

Punggul Village Government The digitalization of the village began with the realization of the local leadership that the limited tourism potential and natural resources had to be balanced with other tactics, i.e. digital empowerment. From this point on, digitalization became increasingly defined as the key vector of village development Then the village authority prepared the basic in the form of human resource and infrastructure. An internet network, CCTV and an integrated service portal are provided, showing the desire to integrate technology into administrative procedures right from the beginning [20]. The service system increases its structure and sustainability.

With the foundation, Punggul then proceeded to develop essential administrative applications beginning with the Village Administrative Service Information System (named SIADEK). This stage was a transition from various manual processes to more structured and efficient digital service delivery. The development of the Integrated Village Geo-Administrative Information System (named SIGADIS) further improved the approach by improving interoperability and increasing the village's capacity for data-driven governance.

Later, the development of programs like SIADEK began to replace unintegrated manual processes previously used. SIGADIS upgraded its systems to enhance data-driven governance. The major change was the outcome of the success of the integrated data system in the community. In the past, data was copied and the validation process was long. The introduction of a unified data system has allowed for faster and more accurate services that meet the interoperability criteria of the UN DESA framework [21].

Digital innovation in Punggul also grew with collaboration with diverse parties. The partnership between the Badung Regency Government, ICON+ and CV Immortal Solutions shows the importance of the role of several actors in digital transformation [22] [23]. Thanks to these achievements, Punggul has gradually become a point of reference in the development of digital villages. We demonstrate that the process of digital transformation in villages is not only about the deployment of technology but also about the changes that co-occur in social, institutional and leadership dimensions.

3.2 The Foundations of Digital Transformation in Punggul Village

Mergel, Edelmann and Haug [24] state that the digital transformation in Punggul Village is based on institutional readiness such as human resource capacity, technological capability, and system governance. These three aspects have been developed step-by-step since 2014 and are the basis for various digital innovations in villages. This has caused Punggul to not only adopt technology but also to begin restructuring its public administration practices in a more focused and sustainable way.

1. **Digital People**

   Personnel Regarding human resources, the village government prioritizes increasing the capacity of officials through basic computer training, improving digital literacy, and providing adequate work facilities. This effort is also linked to the implementation of an integrity pact that fosters discipline and accountability. These steps are in line with the view that the success of digital transformation depends greatly on the competence of the officials not only as the users of the system, but also as the drivers of change [25] [26].

2. **Digital Infrastructure**

   Digital Infrastructure The key issue is the development of digital infrastructure. The provision of village internet networks through public Wi-Fi and installation of CCTV supports not only administrative services but access to information and environmental security as well. This is in line with the view that infrastructure is an important prerequisite for inclusive digital services [21]. Collaboration with the private sector, such as ICON+, also improves system sustainability by providing adequate technical support [27].

3. **Digital Systems**

   Digital system integration is made possible through an integrated service portal that links village administrative, financial and asset data onto a single platform. This integration allows for more accurate use of data and accelerates service delivery processes. This is in line with the principle of interoperability in the OECD digital government framework [28] [29] which stresses the significance of data connectivity in decision making.

These three pillars are connected and strengthened by collaboration between the government, the private sector and the community. This pattern is characteristic of collaborative governance practices where innovation is generated through cross-actor collaboration [30]. This foundation has enabled the Punggul Village to build a digital ecosystem that not only improves the quality of services but also strengthens the accountability and adaptability of the village government.

3.3 Multi-Actor Collaboration in the Digital Transformation Ecosystem

The digital transformation in Punggul Village is unavoidable from the involvement of various actors who jointly form an innovation ecosystem. Collaborative governance literature points out that success of public sector innovation is critically influenced by continuous coordination, clear role allocation and interactions that enable actors to work effectively [30]. This pattern is evident in Punggul, where the village government has established networks with the local government, the private sector, community groups and traditional institutions.

The role of the Badung Regency Government is one of the initial bases. Support from the Population and Civil Registration Office (known as Disdukcapil), the Communication and Information Office (known as Diskominfo), and the Regional Representative Council (known as DPMD) in data integration, infrastructure, and technical assistance shows that institutions above the village level act as liaisons and strengthen digital systems. This is consistent with the idea of interoperability, which emphasizes the importance of alignment between levels of government [31].

Also the private sector is there to deal with the technical limitations at village level. ICON+ offers a stable internet network, and CV Immortal Solutions is working on applications including SIGADIS and the village service portal. This collaboration is an example of a cross-sectoral model, where the private sector is not only a provider but also a partner in developing innovations [32]. Community engagement is also key to strengthening innovations. The Punggul Information Center (PIC), the *banjar* (village community association) and the *Sekaa Teruna Teruni* (Youth Group) show residents are not just service users, but also play a role in spreading information and making use of digital systems. This is in line with the concept of co-production, whereby communities are involved in development of services [33]. Table 1 summarizes the roles and forms of collaboration among the actors involved.

Table 1. Collaboration of Multi-Actors in Digital Transformation of Punggul Village.

Actor	Primary Role	Form of Collaboration
Regency Government	Data integration, network provision, technical assistance	Population data synchronization; internet network facilitation; digital system support
Private Sector (ICON+, CV Immortal Solutions)	Infrastructure provider and system developer	Provision of internet network; development of applications
Community, PIC, traditional community unit (*Banjar*), Youth Groups (*Sekaa Teruna Teruni*)	Dissemination, needs validation, social acceptance	Information center management; public outreach; input for system development
Traditional Institutions & Community Leaders	Social legitimacy and cultural endorsement	Support for digital initiatives; culturally grounded dissemination

Source: Data processed by the author from interviews with the head of Punggul Village (2022).

This multi-actor configuration shows that the digitalization in Punggul Village is not only due to the implementation of technology but also the result of effective collaborative governance. The village government serves as the main link, balancing local needs with technical and institutional support from different actors. This role follows the idea of network governance, where a central actor coordinates various interests to achieve common goals [34].

This synergy creates a digital ecosystem which is not only technically but also socially acceptable. This enables Punggul to kick start their digital initiatives, and at the same time enhance their impact on village governance, community empowerment, and the quality of public services.

3.4 The Impact of Digital Transformation on Village Governance and Socio-Economic Life

The digital transformation of Punggul Village has changed a lot of things, from the governance of the government to the socio-economic life of the community. These changes are not only the result of the use of technology but also of the integration of systems, of the collaboration between actors and of the strengthening of institutional capacity. In studies of digital governance these conditions are often linked to the increased efficiency, accountability and inclusiveness of public services [7]. Punggul has four major impacts that are visible: public services, internal governance, local economy and environmental management.

Digitalization has changed how public services do business. Manual, time-consuming processes have been replaced with faster, more accessible alternatives. Residents can also do administrative work online through an integrated service portal, eliminating repetitive processes at multiple counters. This change is reflective of a more citizen-centric service delivery approach where technology is used as an enabler to increase access and improve the quality of the services [35].

In terms of internal governance, the use of digital systems can enable village governments to manage data in a more systematic way, and enable informed decision-making. Previously, data was often fragmented and delayed, but now information can be accessed more quickly and used directly in the planning process. This is in line with the e-government framework that highlights the importance of data integration to enhance institutional performance [21].

Digitalization in the economic sector opens new opportunities for communities to participate in market activities based on digitalization. People have started to get more economically involved through training, help for small businesses and using marketing platforms. This illustrates that technology can aid economic empowerment and diversify livelihood choices at the village level.

Meanwhile, the use of technologies such as trash bin sensors, CCTV and digital mapping within the environmental sector enables more monitored and responsive management. These systems help villagers keep track of field conditions and resolve issues faster. Table 2 summarizes the impacts on these four sectors to compare the conditions before and after digitalization.

Table 2. Impacts of Digital Transformation in Punggul Village.

Sector	Before Digitalization	After Digitalization	Key Impacts
Public Services	Manual processes; long queues; repeated validation	Online services; faster processing; self-service features	Greater speed, transparency, and public trust
Internal Governance	Fragmented data; delayed reporting; non-evidence-based decisions	Real-time data; integrated systems; data-driven decisions	Improved accountability and faster responses
Local Economy	Limited market access; low digital literacy	IT training; village marketplace; digital promotion channels	Higher incomes, increased MSME participation, more job opportunities
Environment	Manual waste management; limited security	Waste sensors; CCTV; digital monitoring	Cleaner, safer environment and more efficient monitoring

Source: Data processed by the author from interviews with the head of Punggul Village (2022).

This quarter of the sectors shows that digitalization in Punggul Village not only affected one sector, but it also created a more adaptive village ecosystem that is open to innovation.

Technology helps to strengthen governance and improve the quality of community life in practice, especially if it is supported by collaboration between actors, capacity building and leadership able to drive change. This development also implies a shift to the idea of a digital ecosystem [36], where innovation is no longer seen as a self-contained activity, but as an interconnected process that impacts several aspects of village life, whether administrative, social or economic.

3.5 Organizational Culture as Drivers of Transformation

the effort to build a digital culture is also done gradually. Values such as discipline, integrity and openness to technology are reinforced through training, the use of applications in daily services and the application of an integrity pact. This is how the change in organizational culture can lead to readiness of apparatus for digital transformation [37]

It is important to strengthen networks. The village government has collaborated with CV Immortal Solutions in system development, with the district government in data integration, and with traditional institutions and youth groups. The role of the Punggul Information Center (PIC) also shows that the community is involved in disseminating and bridging digital information in the village.

However, community participation in planning is still less than optimal. This agrees with the results of Cho and Yi [38] who found that the development of technology often precedes social readiness. This is why it is so important to increase digital literacy, especially among vulnerable groups, so that the advantages of transformation are more evenly distributed. Adaptive organizational culture are the main drivers of the success of the transformation in Punggul Village in general. Organizational culture who build by leadership not only supply technology but also foster an environment in which innovation can thrive and flourish.

3.6 Research Limitations

Limitations of the study The research has a number of limitations, mostly related to the scope and generalizability of the findings. This study is a single case study so the results cannot be generalized to all villages in Indonesia, which have different characteristics. The case study approach gives analytical depth, but the contextual nature of the method limits its application on a larger scale [13]. In addition, some of the digital innovations in Punggul Village are still in an early stage of development and their longterm impacts are not fully assessable.

Another limitation is the lack of quantitative data for comparison. There are no quantifiable measures such as economic performance or social change, etc. This means the analysis must rely heavily on qualitative findings. But the results are stronger when supported by more extensive numerical data, although they still give a meaningful picture. For more comprehensive research results, use of mixed methods is suggested for in the future. Also, comparative studies across villages with varying degrees of digital readiness are required to draw out more general patterns. This approach can help to understand how the digital village model can be applied in different rural contexts.

4 Conclusion

The results of this study indicate that the role of local leadership in developing a digital-based working culture is heavily influenced by the digital transformation in Punggul Village. The village head has an important role in driving change, from capacity building of civil servants to infrastructure improvement and service system design that meets the needs of the community. These findings confirm that digital transformation is connected not only to technology, but also to changes in the values and work practices of the organization.

This transformation is also being supported by the local social structures. The traditional village head has a position of legitimacy and the youth group (*Sekaa Teruna Teruni*) helps to disseminate information and digital literacy. Community acceptance is quite good, but active participation is still constrained by the disparity of digital skills and access to devices. Thus the need for more inclusive strategies such as targeted training, mentoring and streamlining service systems.

Seventeen digital innovations were implemented in various fields ranging from public services to environmental management at the time of this study. These impacts are observable in the community through faster services, more accurate data and increased access to information and economic opportunities. This implies that the village is gradually improving its digital transformation by improving its capacity, infrastructure, and system integration.

In the future it may be worth thinking about merging different applications into one integrated platform. This approach can overcome user device limitations and streamline access to services. In addition, the system integration may potentially enhance the efficiency and sustainability of digital innovation in villages. Although contextual, the study adds to the explanation of the relationship between digital culture and collaboration in village transformation. From the practical point of view, the results of this study can also serve as a reference for other villages that want to develop more modern and inclusive public services.

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