



Development of the “e-MusrenbangDes” Application as a Participatory Medium for Development Planning in Peatland Areas: A Case Study of Tumbang Nusa Village, Central Kalimantan

Gradila Apriani¹, Melia Sintha², Helmi³, Whilis Putri Pitaloka^{4,*}, Muhamad Risky Hidayat⁵, Tio Palentino⁶

Universitas Palangka Raya, Palangka Raya, Indonesia

whilis.pitaloka@fkip.upr.ac.id⁴

**Corresponding author*

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ABSTRACT

Community participation is a key element of democratic and inclusive village development planning. However, in areas with specific ecological characteristics such as peatland regions, community participation in the Village Development Planning Forum (MusrenbangDes) is often constrained by geographical barriers, limited mobility, and reliance on face-to-face deliberative mechanisms. These conditions restrict equal access to participation and limit the representation of community aspirations in development planning processes. This study aims to develop the e-MusrenbangDes application as a context-sensitive digital participatory medium to strengthen village development planning in peatland areas. The research was conducted in Tumbang Nusa Village, Central Kalimantan, using a Research and Development (R&D) method with a qualitative approach. The development stages included needs analysis, system design, prototype development, expert validation, and limited field testing. Data were collected through participatory observation, in-depth interviews with key village stakeholders, and document analysis, and were analysed using an interactive qualitative analysis model. The findings indicated that the e-MusrenbangDes application expands community access to the submission of development proposals without dependence on physical attendance at MusrenbangDes meetings. The application also supports more systematic and transparent management of village development planning administration. These findings suggest that contextually designed digital innovations can strengthen participatory village governance in ecologically constrained areas such as peatland regions.

INTRODUCTION

Community participation is a fundamental element of democratic village development planning, as it ensures that development policies are grounded in local needs and collective priorities. In the

Indonesian context, this participatory principle is formally institutionalised through the Village Development Planning Forum (MusrenbangDes), which serves as a deliberative mechanism for aligning community aspirations with village development agendas (Wibawa, 2022). Through the Village Development Planning Forum (MusrenbangDes), residents are provided a formal platform to voice their aspirations and oversee the direction of development (Pratama et al., 2023).

Although MusrenbangDes holds an important normative position in village development governance, its practical implementation often faces structural limitations. Participation is not evenly distributed, as geographical constraints, rigid deliberative arrangements, and reliance on in-person meetings continue to restrict access for certain community groups. These conditions ultimately weaken the inclusiveness of village-level development planning processes (Eprilianto et al., 2021).

Such challenges are particularly evident in villages located within peatland ecosystems. Peatland areas are commonly characterised by dispersed settlement patterns, limited transportation infrastructure, and strong exposure to seasonal environmental conditions. These factors significantly affect community mobility and participation opportunities, thereby influencing the effectiveness of participatory planning mechanisms. Tumbang Nusa Village in Central Kalimantan exemplifies this context, where geographical and ecological constraints shape the dynamics of community participation in development planning. Settlements dispersed along riverbanks, limited transportation infrastructure, and high vulnerability to forest and land fires, particularly during prolonged dry seasons, often restrict MusrenbangDes activities from reaching the entire population (MMC Kalteng, 2023). Such conditions risk creating an imbalance of representation, where development priorities are influenced disproportionately by those who are physically able to attend.

In response to these limitations, the adoption of digital governance has emerged as a strategic approach to expanding participatory spaces and improving administrative processes. Several studies indicate that mobile-based applications can improve government responsiveness and broaden channels for public participation (Fitriani & Rachmawati, 2021; Wibawa, 2022). Digital platforms have been shown to facilitate broader access to participation, enhance transparency, and strengthen interactions between citizens and local governments when designed appropriately (Mergel, 2021). However, digital initiatives in village governance often remain generic and insufficiently adapted to local socio-geographical conditions, resulting in limited sustainability, particularly in rural and ecologically constrained areas (Putra & Lestari, 2020).

Responding to this gap, the present study develops e-MusrenbangDes, a contextually designed mobile application aimed at resolving participation barriers in peatland-based villages. Rather than merely digitising the MusrenbangDes workflow, the development process applies a Research and Development (R&D) approach grounded in local needs. Stages of development include analysing geographical landscapes, digital literacy levels, infrastructure conditions, and coordination patterns among village officials. Technology is positioned as an adaptive innovation aligned with the socio-spatial ecosystem, not as a one-size-fits-all solution.

This application serves as a participatory mobile platform that enables citizens to submit development proposals, express concerns, and report village conditions quickly and systematically. Key features include geolocation-based reporting, a lightweight and simplified user interface suitable for low-connectivity environments, and design elements tailored to the digital literacy of rural populations (Hasanah & Umar, 2022; Suryanto, 2021; Fahmi & Setiawan, 2022). The study also emphasises the role of village officials as local enablers who are essential for the sustainability of digital innovations (Mergel, 2021).

Given the limited scholarly attention to digital participation in peatland villages, this study addresses an important research gap. Accordingly, this research aims to develop and examine the e-MusrenbangDes application as a context-sensitive digital participatory medium to strengthen village

development planning in peatland areas, with a case study of Tumbang Nusa Village, Central Kalimantan.

METHOD

This study employed a descriptive qualitative approach combined with a Research and Development (R&D) model. The qualitative approach was selected to gain an in-depth understanding of community participation phenomena, geographical barriers in peatland villages, and the socio-ecological dynamics within the MusrenbangDes process, emphasising meaning, context, and process rather than statistical generalisation (Creswell & Poth, 2020). The R&D model was utilised to ensure that the research not only captured existing conditions but also produced an innovative product, namely the e-MusrenbangDes application, that could be evaluated for its effectiveness and usability in the local context (McKenney & Reeves, 2020).

The research was conducted in Tumbang Nusa Village, Central Kalimantan, an area characterised by peatland landscapes and limited geographical accessibility. Participants were selected through purposive sampling, consisting of ten community members actively engaged in Musrenbang activities, five village officials (administration staff, secretariat, and planning personnel), one traditional leader, the village head, and one information technology expert as a technical validator. Purposive sampling was applied to ensure that the selected participants possessed relevant knowledge and experience aligned with the objectives of qualitative inquiry (Saldana, 2021).

Data were collected using triangulation of techniques, including participatory observation to examine socio-ecological conditions and community interaction with technology, in-depth interviews to explore user experiences, feature needs, and participation barriers, and document analysis of previous Musrenbang records, village maps, consultation reports, observational photos, and application design artefacts. The use of multiple data collection techniques was intended to enhance data credibility and depth through triangulation (Creswell & Poth, 2020).



Fig. 1 Research Procedure and Methodological Flow

Based on Fig. 1, the research followed a five-stage R&D process adapted to the local context: (1) needs analysis to identify constraints in citizen participation and administrative challenges in conventional Musrenbang processes; (2) design stage involving the development of user flows, mobile interface prototypes, and administrative dashboards with stakeholder involvement; (3) prototype development incorporating core application features and iterative refinement; (4) expert validation to assess technical feasibility, data security, and procedural alignment; and (5) limited field testing involving selected users to evaluate usability and functionality before broader implementation. This iterative development logic reflects contemporary R&D practices that emphasise continuous refinement based on empirical feedback (McKenney & Reeves, 2020).

Data analysis was conducted using an interactive qualitative analysis model involving systematic data reduction, data display, and conclusion drawing. Analytical rigour was maintained through coding, thematisation, and reflective interpretation of findings. Trustworthiness was ensured through source and technique triangulation, member checking, and peer debriefing to strengthen the credibility and dependability of the results (Saldana, 2021).

RESULTS AND DISCUSSION

Results

Barriers to Participation in Conventional Musrenbangdes

Findings from field observations and in-depth interviews indicate that community participation in conventional MusrenbangDes activities in Tumbang Nusa Village remains constrained by geographical and spatial factors. Residential areas are dispersed along riverbanks and peatland zones, making physical access to village meeting venues difficult for some residents, particularly during the rainy season when roads become flooded.

One community member stated: *“Jalan ke balai desa melewati rawa, apalagi saat musim hujan. Kadang kami tidak bisa hadir, dan usulan kami tidak tersampaikan.”* These findings suggested that conventional MusrenbangDes mechanisms have not fully accommodated the geographical realities of peatland villages. As a result, participation tends to favour residents with better physical access, potentially limiting the inclusiveness of development planning processes. This condition aligns with the argument that spatial and procedural barriers can reduce public participation in rural governance contexts (Nam, 2020; Huang et al., 2025).

The e-MusrenbangDes Development Process

In response to these challenges, this study developed the e-MusrenbangDes application through a context-sensitive Research and Development process. The needs analysis stage identified key participation barriers, administrative inefficiencies, and user requirements based on empirical data from community members and village officials. The design stage focused on developing a simple user interface and participation flow suitable for smartphone use in low-connectivity environments.

Subsequent stages involved prototype development, expert validation, and limited field testing to ensure technical feasibility and usability. The collaborative involvement of community members, village officials, and local experts ensured that the application reflected local practices and institutional workflows. This approach supports the view that public sector digital innovations must align with social and organisational contexts to be effective and sustainable (Bason, 2021).

Implementasi e-MusrenbangDes sebagai Media Partisipasi Digital

The implementation of e-MusrenbangDes demonstrates how smartphone-based technology can facilitate more accessible and flexible community participation. Through the application, residents are able to submit development proposals digitally, reducing dependence on physical attendance at MusrenbangDes meetings. Submitted proposals are processed through the system and verified by village officials using an administrative dashboard, enabling more systematic documentation and monitoring.



Fig. 2 Digital Participation Flow through e-MusrenbangDes

As illustrated in Fig. 2, the digital participation flow allows community members to engage continuously in development planning processes. This mechanism supports greater inclusivity by accommodating residents who face mobility constraints due to geographical distance, age, or physical limitations. From an administrative perspective, the application contributes to more orderly data management and enhances transparency in proposal verification and prioritisation processes. These findings reinforce the argument that digital participation functions as a complementary mechanism

that strengthens, rather than replaces, conventional participatory forums (Mergel, 2021).

The application enables community members to submit development proposals digitally, thereby reducing reliance on physical attendance at deliberative meetings. This finding indicates that participation can be maintained despite mobility limitations caused by geographical distance and environmental conditions. From an administrative perspective, e-MusrenbangDes supports more systematic documentation and organisation of development proposals, contributing to improved procedural order and transparency in village development planning.

The digital participation flow facilitated by e-MusrenbangDes demonstrates that participatory processes are no longer confined to time-bound and location-specific forums. Instead, participation becomes more flexible and continuous, allowing community aspirations to be conveyed without procedural barriers. This finding aligns with the argument that digital participation can function as a complementary mechanism that expands access rather than replacing conventional participatory forums (Nam, 2020).

In addition to functional aspects, the application design emphasises contextual suitability. The interface is intentionally simplified to accommodate varying levels of digital literacy and limited infrastructure conditions commonly found in peatland villages. This result highlights that the effectiveness of digital innovation in rural governance is closely linked to design approaches that prioritise usability and contextual relevance over technological complexity (Bason, 2021).

Institutional factors also play a critical role in the implementation of e-MusrenbangDes. The involvement of village officials as facilitators and mediators ensures that the application is integrated into existing planning processes rather than operating as a standalone technological tool. This finding reinforces the view that digital transformation in the public sector is not solely a technical endeavour, but a socio-institutional process that depends on organisational readiness and local leadership (Mergel, 2021).

Overall, the findings indicate that the success of e-MusrenbangDes lies in its ability to combine digital functionality with contextual sensitivity. By aligning technological design with geographical conditions, community capacities, and institutional practices, the application demonstrates potential as a sustainable participatory medium for village development planning in peatland areas.

Discussion

Digital Technology and Inclusive Participation

The results of this study confirm that digital technology plays a crucial role in broadening community participation in village development planning. Previous studies indicate that participatory digital infrastructures enable citizens to better understand how their contributions influence public decision-making processes (Hughes et al., 2025). In line with this perspective, e-MusrenbangDes provides a transparent interface that allows residents to follow the progress of their submitted proposals. This transparency enhances procedural legitimacy and strengthens public confidence in the MusrenbangDes mechanism.

In addition, participatory digital governance has been shown to improve both accountability and the quality of policy decisions at the local level (Wijiantoro, 2025). The findings of this research demonstrate that e-MusrenbangDes encourages a more active role for citizens, enabling them not only to submit proposals but also to continuously observe and assess the development planning process. This indicates a shift from conventional, one-way participation toward a more interactive and accountable form of village governance.

Administrative Performance and Governance Quality

The integration of digital systems into village planning processes also contributes significantly to

administrative effectiveness. Digital workflows simplify verification procedures, minimise documentation errors, and reduce the potential for data loss. Earlier research has shown that the Village Information System (SID) improves service delivery in rural administrations (Mardinata, Cahyono, & Rizqi, 2023). e-MusrenbangDes extends this function by embedding participatory features within administrative routines. Through this system, proposals can be submitted and reviewed more efficiently, allowing village officials to manage development planning in a timely and systematic manner.

Moreover, the perception of fairness and legitimacy is a key determinant of public trust in digital participation platforms (Yang et al., 2023). The structured verification and prioritisation process implemented in e-MusrenbangDes helps ensure that community members view decision-making outcomes as transparent and equitable. This perception is essential for sustaining long-term participation and reinforcing good governance practices at the village level.

Co-Creation as a Source of Public Value

The development of e-MusrenbangDes adopted a collaborative approach involving village officials, customary leaders, and community members. This approach supports the argument that co-creation processes enhance public value by aligning digital innovations with local needs and social contexts (Hajar & Arma, 2024). In this study, feedback from residents directly informed the design of the application's features and user flow, resulting in a system that is responsive to actual conditions in the village.

Such collaborative development processes foster a sense of shared ownership and responsibility among stakeholders. Consequently, e-MusrenbangDes functions not only as a technological instrument but also as a platform that strengthens collaboration between citizens and village authorities in development planning activities.

Implementation Challenges and Adaptive Measures

Despite the positive outcomes observed, several challenges remain in the implementation of e-MusrenbangDes. Limited digital literacy, particularly among elderly residents, continues to hinder full participation, confirming earlier findings that technological adoption alone does not automatically eliminate participation disparities (Eprilianto et al., 2021). In addition, unstable internet connectivity in certain areas necessitates the development of offline features or synchronisation mechanisms to maintain accessibility.

The long-term sustainability of the system also depends on continuous capacity-building efforts, including training programs and ongoing socialisation for both residents and village officials (Sadiqin, Prasetyo, & Komariyah, 2025). These challenges highlight the importance of combining technological solutions with adaptive and inclusive strategies to ensure broader and more equitable participation.

Policy Implications

The findings of this study underline the strategic role of village governments in promoting policies that support participatory digital governance. e-MusrenbangDes demonstrates strong potential for replication in other villages, provided that local geographical, infrastructural, and social characteristics are taken into account. Ensuring sustainability requires long-term commitments to digital literacy development and system maintenance.

Furthermore, the data generated through e-MusrenbangDes can serve as a valuable resource for evaluating participation patterns and improving the effectiveness and accountability of village development policies. Overall, the integration of participatory digital technology through e-MusrenbangDes enhances access to planning processes, improves administrative efficiency, and strengthens transparency and accountability. This model offers a practical reference for villages facing challenging geographical conditions, such as peatland areas, in their efforts to achieve more inclusive

and effective development outcomes.

CONCLUSIONS

This study demonstrated that the development of the e-MusrenbangDes application had opened a new and more inclusive space for citizen participation in village development planning in Tumbang Nusa Village, particularly for communities previously constrained by geographical and mobility limitations. The findings indicated that the application enables residents to engage more actively in the planning process through digital access, while supporting village officials in managing development proposals in a more transparent and systematic manner.

The integration of a context-sensitive Research and Development approach ensured that the application was aligned with local geographical conditions, community capacities, and existing institutional practices. As a result, e-MusrenbangDes functions not merely as a digital administrative tool, but as a participatory medium that strengthened transparency, accountability, and inclusiveness in village governance.

These findings suggested that digital participatory applications developed based on local needs and institutional readiness had the potential to enhance the effectiveness of village development planning in ecologically constrained areas such as peatland regions. The e-MusrenbangDes application therefore offered a practical and adaptable model for strengthening participatory governance in rural contexts with similar geographical characteristics.

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