American Journal of Humanities and Social Sciences Research (AJHSSR)
e-ISSN : 2378-703X
Volume-09, Issue-08, pp-83-90
www.ajhssr.com
Research Paper Open Access

Adaptive Model of Empowering Traditional Communities in The Digital Era: A Conceptual Acceleration of the Welfare of Traditional Farmers and Livestock Farmers

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ABSTRACT: The global wave of digital transformation presents both opportunities and challenges for traditional communities, particularly farmers and livestock keepers, who continue to face barriers in access, digital literacy, and social inclusion. This study aims to develop an adaptive model for empowering traditional communities in the digital era as a conceptual effort to accelerate their welfare improvement. The model integrates five key dimensions: access to digital infrastructure, digital literacy, community participation, cultural sensitivity, and policy and institutional support. The research employs a qualitative approach using a systematic literature review method, drawing from high-impact scholarly publications, international policy reports, and prior empirical studies. This approach enables the construction of a conceptual framework that explains the direct and indirect relationships between these key variables and the adoption of digital technology, which in turn contributes to the empowerment of traditional communities. The resulting model is adaptive, participatory, and context-sensitive, offering both theoretical contributions and practical implications for inclusive development strategies and future empirical research.

KEYWORDS: *community empowerment, digital transformation, traditional communities, digital literacy, local wisdom.*

I. INTRODUCTION

Digital transformation has become the main force in shaping the social, economic, and cultural order of global society. However, the wave of digitalization does not always have an even impact. Traditional communities, which are generally in rural or structurally marginalized areas, often face challenges in accessing, understanding, and utilizing digital technology. In the midst of the acceleration of the 4.0 and 5.0 industrial revolutions, the digital divide between urban and traditional communities is increasingly evident. This phenomenon shows the need for an empowerment strategy that is not only technical, but also contextual and adaptive to the cultural characteristics, local values, and social structures of traditional communities.

Data from the World Bank (2023) shows that more than 30% of people in rural areas of Southeast Asia still do not have adequate digital access, both in the form of network infrastructure and technological literacy. This inequality not only impacts access to information, but also narrows economic opportunities, education, and participation in technology-based development processes. In the midst of massive digital transformation, this condition places rural and traditional communities in a position that is vulnerable to social and economic exclusion. The widening digital divide can even exacerbate long-standing structural inequalities, especially when national digital development policies tend to be oriented towards urban areas and large businesses. Thus, the issue of digitalization in traditional areas is not merely a technical problem, but touches on the dimensions of social justice and the right to inclusive development.

Indonesia such as Papua, Maluku, and Nusa Tenggara, which experience multiple forms of marginalization: geographical and digital. In addition to limited physical infrastructure and internet

access, these communities also face challenges in maintaining their cultural values and social structures when dealing with global and uniform technology. The absence of a contextual and adaptive empowerment model can lead to cultural alienation and the failure of digitization programs. Therefore, serious efforts are needed to formulate an empowerment model that not only brings technology closer to indigenous peoples, but also builds a participatory ecosystem that values local wisdom. This research is crucial to develop an adaptive model of digital empowerment that is socially relevant, culturally sensitive, and sustainable for traditional communities in Indonesia.

Various recent studies have highlighted the urgency of developing innovative approaches to empowering marginalized communities through digital technology. In this context, an approach based on participatory and inclusive values that are sensitive to local culture is crucial. Gao (2016) in the MDPI (Q1) emphasized that the development of digital platforms for indigenous communities in Asia should not be carried out in a top-down manner, but rather through participatory mechanisms that involve the community from the planning stage. This study shows that the active involvement of the community in the technology design and implementation process results in solutions that are more sustainable and socially accepted. In other words, technology is only effective when it is co-created, not imposed from the outside.

The novelty of this research lies in the development of an adaptive model of digital empowerment that is locality-based and integrates the principles of participation, inclusivity, and sociocultural sustainability. This model not only focuses on providing digital access, but also builds the community's ability to develop empowerment strategies independently with the support of technology. In addition, this model is designed as a conceptual and practical prototype that can be tested in the context of traditional communities in various regions of Indonesia, as a real contribution in bridging the digital divide and strengthening the resilience of local communities in the digital era.

II. LITERATURE REVIEW

In facing the challenges and opportunities of the digital era, accelerating the empowerment of traditional communities is an important agenda that demands a multidimensional approach. Empowerment does not only depend on the availability of technology, but also on the social, cultural, economic, and policy readiness that supports inclusive digital transformation. Various recent studies show that this acceleration is influenced by a number of important factors, such as the availability of digital infrastructure, the level of digital literacy, the active participation of the community in the design and implementation of programs, sensitivity to local cultural values, and responsive policy and institutional support. By understanding and managing these factors in an integrated manner, digitization programs can truly promote the independence and welfare of traditional communities, instead of widening the gap of social and digital inequality. Factors Affecting the Acceleration of Traditional Community Empowerment in the Digital Age.

2.1. Digital Access and Infrastructure

Digital infrastructure plays a crucial role in empowering traditional communities, particularly in rural and remote areas. Access to digital platforms can enhance engagement between researchers and Indigenous communities, promoting self-governance and data sovereignty (Bhawra et al., 2022). Digital infrastructure also acts as an external enabler for entrepreneurial action, influencing the relationship between socio-cognitive traits and new venture creation (Schade & Schuhmacher, 2022). For coastal fishing communities, IoT-enabled digital ecosystems can bridge the digital divide, improving access to vital information, e-commerce opportunities, and disaster resilience (Anand et al., 2024). In rural tourism development, digital transformation empowers local communities across individual, gender, political, and social dimensions, enhancing technical capabilities, promoting gender equality, boosting influence in decision-making, and building industry networks (Lapuz, 2023). These studies collectively demonstrate that access to digital infrastructure is essential for the socio-economic development and empowerment of traditional communities.

The adoption of technology in traditional communities is influenced by various social and cultural factors. Successful integration often relies on local individuals who understand the cultural context and can bridge the gap between new technologies and traditional practices (Curry et al., 2021; Irwansyah, 2020). Community-driven efforts play a crucial role in promoting technology

adoption, outweighing initiatives by public and private sectors (Díaz-Arancibia et al., 2024). Factors such as relative advantages, top management support, culture, regulatory environment, and owner/manager innovativeness significantly influence ICT adoption in rural SMEs (Albar & Hoque, 2019). The integration of togetherness, agreement, interest, and need within the community is essential for successful technology implementation (Irwansyah, 2020) (Irwansyah, 2020). However, socio-cultural barriers can hinder adoption, as seen in the case of cocoa pod borer control technologies in Papua New Guinea (Curry et al., 2021) (Curry et al., 2021). Understanding these factors is crucial for developing tailored technological adoption models that address the unique challenges of traditional communities and SMEs in developing countries.

Furthermore, a report from the World Bank (2023) highlights that around one-third of the global population, or 2.6 billion people, will still be offline in 2023, with the majority in low-income countries and rural communities. This digital divide widens the poverty and productivity gap between developed and developing countries. Therefore, investment in inclusive and sustainable digital infrastructure is crucial to ensure that traditional communities are not left behind in the era of digital transformation.

Information and Communication Technology (ICT) plays a crucial role in empowering remote communities and supporting economic development. ICT enables social connectedness, new livelihood strategies, and maintenance of social networks in rural areas (Horn & Gifford, 2022). During the COVID-19 pandemic, ICT has been essential in sustaining various sectors, including health, education, and entertainment (Casetti, 2021). In China, e-commerce powered by ICT has revitalized remote villages, offering new economic opportunities and development paths (Wu et al., 2020). Furthermore, ICT adoption in developing countries has shown potential for improving environmental quality by reducing emissions, although factors such as education, income growth, and financial development may counteract these benefits (Zhang et al., 2022). Overall, ICT serves as a powerful tool for bridging the digital divide, enhancing access to information and services, and fostering economic growth in remote and underserved areas.

2.2. Digital Literacy

Digital literacy is a concept that includes the ability to find, evaluate, use, and create information responsibly using digital technology (Reddy et al., 2022). Digital literacy is increasingly recognized as important for personal and professional development, especially in developing regions such as the South Pacific (Reddy et al., 2022). However, this concept is still difficult to understand, with little consensus on definition or measurement (Guess & Munger, 2020).

A study conducted by Liu & Zhou (2023) shows that digital literacy contributes positively to income growth among rural populations, especially in the wage and agricultural sectors. However, this can also widen the income gap in rural areas. To address this, digital tools that create synergies between local governments, researchers, and the private sector can promote sustainable rural development by identifying and meeting specific local needs (Dumitru et al., 2021).

2.3. Community Participation and Involvement

Community participation and empowerment are critical for effective digital transformation and sustainable development. A study by Lapuz (2023) shows that local community involvement in rural digitization leads to individual, gender, political, and social empowerment. Successful community empowerment programs focus on increasing capacity, independence, participation, and integration of local knowledge, tailored to the needs of specific communities (Dushkova & Ivlieva, 2024). Digital Citizen Empowerment Strategies include digital activism, multi-channel service delivery, participatory budgeting, and deliberative governance (Sharma et al., 2022). However, challenges such as the digital divide and difficulties in interpreting data that is only written remain.

Digital agriculture offers numerous benefits for smallholder farmers in developing countries, including access to real-time information, improved yields, and financial transactions (Kudama et al., 2021). However, participation in digital services is influenced by factors such as gender, farmer group affiliations, and access to digital resources (Abdulai et al., 2023). Smallholders can engage with digital agriculture through cooperatives or outsourcing services, shifting from land-scale to service-scale operations (Xie et al., 2021). Challenges to digital adoption include affordability, digital

illiteracy, and low participation of women and older farmers (Kudama et al., 2021). The interaction between digitalization and ecologisation in agriculture reveals that while both conventional and organic actors are interested in digital development, they perceive different benefits and risks (Schnebelin et al., 2021). To ensure inclusive digital agriculture, policymakers should consider these diverse perspectives and address barriers to participation (Abdulai et al., 2023; Xie et al., 2021).

2.4. Cultural Sensitivity and Local Wisdom

Community empowerment initiatives should focus on increasing capacity, self-reliance, participation, and integration of local knowledge (Dushkova & Ivlieva, 2024). The digitization of intangible cultural heritage can strengthen community identity and support sustainable local development (Csesznek et al., 2024). Digital transformation empowers local communities through individual, gender, political, and social aspects (Lapuz, 2023).

In addition, research by Shiri et al. (2022) highlights the importance of participatory design in the development of a digital storytelling system for the Inuvialuit community in the Canadian Western Arctic. This approach ensures that the developed system not only meets technical needs, but is also aligned with the community's cultural practices and oral traditions. Thus, the integration of local culture into technological design strengthens the relevance and effectiveness of digital solutions in the context of indigenous communities.

Recent research highlights the potential of 3D technology and virtual environments in preserving and disseminating archaeological heritage, especially for indigenous peoples. 3D photogrammetry has been used to visualize and analyze cave art sites and burial chambers, improving spatial analysis and data protection (González-Quevedo et al., 2021). Various 3D technologies, including visualization, modeling, augmented reality, and virtual reality, are increasingly being applied to preserve intangible cultural heritage (Skublewska-Paszkowska et al., 2022).

2.5. Policy and Institutional Support

Government policy and institutional support play an important role in encouraging the digital empowerment of traditional communities. The implementation of a digital roadmap in rural Indonesia has encouraged enthusiasm for the adoption of technology among forest communities, which requires complex coordination between digital leadership and institutional networks (Mazya et al., 2023). Governments around the world are investing in digital initiatives to develop an information society with engaged citizens, using strategies such as digital activism, multi-channel service delivery, participatory budgeting, and deliberative governance to promote digital citizen empowerment (Sharma et al., 2022).

Policy interventions targeting rural communities are essential. Policy interventions targeting rural communities are essential, including investing in broadband infrastructure, developing digital skills training programs, and promoting digital inclusion (Esteban-Navarro et al., 2020; Tiwasing et al., 2022). Innovative solutions such as the AURORAL ecosystem aim to bridge the urban-rural digital divide by providing digital services that can be operated and tailored to rural needs (Gómez-Carmona et al., 2023).

2.6. Empowerment of Traditional Communities

Community empowerment is essential for sustainable development in rural and traditional environments. This involves empowering communities to increase control over their lives and environment (Kemper-Koebrugge, 2023). Successful empowerment programs focus on increasing capacity, self-reliance, participation, and integration of local knowledge (Dushkova & Ivlieva, 2024).

However, challenges remain, as exemplified by trophy hunting tourism in Namibia, where economic benefits coexist with cultural impacts and governance issues (Thomsen et al., 2022). Effective empowerment strategies must consider community capital, including natural, built, financial, social, human, political, and cultural resources (Kemper-Koebrugge, 2023). Overall, empowerment programs must be tailored to local contexts and needs in order to effectively support sustainability and resilience in traditional communities.

III. RESEARCH METHODS

A well-designed digital empowerment model is expected to have a positive impact on the resilience and welfare of traditional communities and encourage inclusive development. The implementation of digital transformation programs in rural areas and traditional communities depends heavily on the integration of several important factors, including digital access, digital literacy, cultural sensitivity, community participation, and institutional support. These factors interact with each other to accelerate the adoption of digital technology and increase the capacity of traditional communities to participate in economic, educational, and sociopolitical processes.

This study is built on various theoretical frameworks and empirical findings that highlight the importance of specific contextual factors in digital empowerment. For example, Bhawra et al. (2022) emphasize that digital infrastructure can improve governance and the socioeconomic development of traditional communities, while Schade & Schuhmacher (2022) argue that access to digital platforms can encourage entrepreneurial action in underserved areas. In line with Curry et al. (2021 and Irwansyah (2020), this study also recognizes the importance of community-driven efforts and the integration of local knowledge to ensure the adoption of technology in harmony with cultural and social contexts. In addition, Díaz-Arancibia et al. (2024) emphasize that grassroots initiatives often result in more sustainable digital transformations than top-down approaches. Therefore, the framework developed in this study combines the following key insights to explore the interaction between digital access, literacy, community participation, and policy support in empowering traditional communities in the digital age.

The conceptual model proposed in this study focuses on five independent variables—Digital Infrastructure Access, Digital Literacy, Community Participation, Cultural Sensitivity, and Policy and Institutional Support—which are assumed to influence the Adoption of Digital Technology (as a mediating variable), and ultimately have an impact on the Empowerment of Traditional Communities (as a dependent variable). This model is built on the understanding that community empowerment in the digital era is not simply a direct result of the availability of technology, but rather a multidimensional process that requires social inclusion, local cultural relevance, and a supportive environment. Based on this framework, a number of hypotheses were developed to test the direct and indirect effects of each factor on the digital empowerment of traditional communities. The following is a picture of the adaptive model of traditional community empowerment in the digital era.

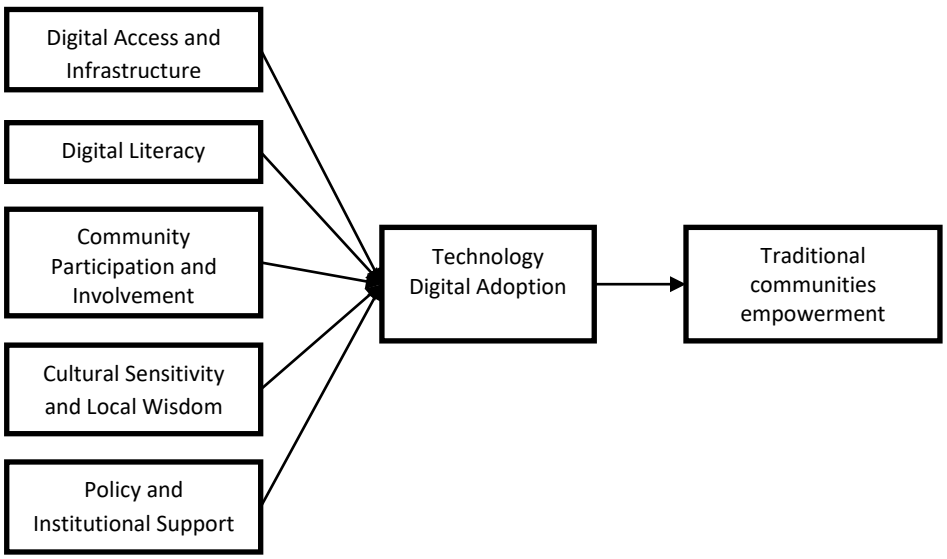

Figure 1 Adaptive Model of Empowering Traditional Communities in the Digital Age
Source: Authors, 2025.

Based on the conceptual model that has been explained, the hypothesis developed in this study is as follows:

- H1: Based on the conceptual model that has been explained, the hypothesis developed in this study is as follows.
- H2: Digital literacy has a positive effect on the adoption of digital technology by traditional communities.
- H3: The active participation of the community in digitalization programs has a positive effect on the adoption of digital technology.
- H4: Sensitivity to local culture in digital program design has a positive effect on the adoption of digital technology.
- H5: Policy and institutional support has a positive effect on the adoption of digital technology by traditional communities.
- H6: The adoption of digital technology has a positive effect on the level of empowerment of traditional communities.
- H7: Access to digital infrastructure, digital literacy, community participation, cultural sensitivity, and policy support indirectly influence community empowerment through the mediation of digital technology adoption.

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