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A CO-PRODUCTION MODEL OF DIGITAL VILLAGE TRANSFORMATION IN INDONESIA

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Abstract. *The Smart Village Nusantara project in Indonesia indicates the existence of digital transformation that includes the involvement of several stakeholders: the government, the private sector, and the community. However, there remain few comprehensive models that explain the bottom-up demand process and integrative approach, and few previous studies have produced evidence-based data on digital village transformation. The purpose of this study is to produce a co-production model of digital village transformation. In co-production, various stakeholders are involved in the transformative process. The concepts of co-production and community-based digital village development are elaborated in this study, which employs a grounded theory approach as a method, involving both citizen producers and users as participants. This study elucidates a co-production model for digital village transformation, with several aspects outlined: context, stakeholders, co-production process/activities, institutional design, output, and outcome. The development of local potential, in this case tourism, is one of the driving factors for digital village transformation. At the level of assistance from professional actors, co-production in the Smart Village Nusantara project in Indonesia has succeeded in providing the foundation for the early*

stages of digital transformation. Meanwhile, sustainability also remains a challenge for the purpose of achieving a higher stage of digital village transformation.

Keywords: *bottom-up and integrated model; co-production; digital village transformation; smart village.*

Reikšminiai žodžiai: *iš apačios į viršų ir integruotas modelis; koprodukcija; skaitmeninio kaimo transformacija; išmanusis kaimas.*

Introduction

The term *digital transformation* indicates change, modernization or innovation, which is also interpreted as an effort to revise processes, move through stages, or mature from the current situation to higher levels of digitalization (Barcevičius et al. 2019, 17; Mergel, Edelmann, and Haug 2019, 2). Likewise, in rural areas, digital support has a significant role for transformations that enable a better and more sustainable future (Rijswijk et al. 2021, 79; Beranič et al. 2019, 281). The smart village method is a holistic and inclusive approach, serving as an effective tool in the digital transformation of rural areas (Cāne 2021, 43; International Telecommunication Union 2020, 2). Smart villages can be illustrated by three issues: first, focusing on the village as an ecosystem, community, and people; second, the generation of additional value from the application of ICT that focuses on the needs and challenges faced by rural communities; and third, the creation and application of effective and targeted policies requires dialogue with policy makers (Visvizi, Lytras, and Mudri 2019, 3). Digital village transformation, along with the smart village concept, is designed to encourage rural areas to be more advanced, to overcome the digital divide, and to build partnerships with urban and rural communities (Cāne 2021, 48; European Network for Rural Development 2020, 2)

There are some challenges that occur during digital village transformation. With nearly 80 percent of the world's extreme poor living in rural areas, in order to achieve the SDGs through digital transformation, villages must be the main focus of intervention (International Telecommunication Union 2020, 1). Likewise in Indonesia, the challenges of rural development include the gap between rural areas and urban areas in terms of the percentage of their area marked by poverty (13.47% and 7.20%, respectively) (Cabinet Secretariat 2020). Additionally, there are disparities in infrastructure development and the digital divide. Based on the Information and Communication Technology Development Index 2021 (Central Bureau of Statistics, 2021), this disparity is seen in the percentage of household computer ownership in urban areas (25.4%), which is considerably higher than in rural areas (8.82%). In Indonesia, household internet usage in urban areas has reached up to 88.53%, while in rural areas it sits at only 73.57%; 71.81% of individuals access the internet in urban areas, and only 49.30% in rural areas; and 5,705 villages have not yet received cellular network connections. Other challenges in the digital transformation of Indonesia also include digital and literacy skills (Hadi 2018, 18) and the digital divide amongst generations in rural contexts (Onitsuka, Hidayat, and Huang 2018, 17).

There is a high proportion of older people in Indonesia living in rural areas, with mostly young people migrating to cities or rapidly developing areas (Utomo et al. 2019, 1).

Responding to various challenges in digital development in rural areas, the Indonesian Government launched the Smart Village Nusantara project for rural growth and digital inclusion. Smart Village Nusantara is an initiative project from the private sector (namely Telkom) that seeks to create an independent and productive village by connecting every entity in the village into a digital ecosystem community to improve the quality of government, services, and the village economy. The first phase of development of the Smart Village Nusantara pilot project was carried out in two villages: Kemuning and Pangandaran. The stages carried out included starting a digital village by providing internet access and ICT infrastructure, then moving to the smart village stage using digital tools in daily life through smart government, smart economy, and smart society. Smart Village Nusantara is carried out by involving various stakeholders, namely the government, the private sector (Telkom), and the village community. Thus, this phenomenon is a new framework in digital village transformation.

The shortage of data in the literature that specifically highlights the success of digital village transformation involving various stakeholders represents the theoretical gap of this study. The concept of digital village transformation and smart villages remains underdeveloped (Fennell et al. 2018, 1), as earlier research on digital development in rural areas focused more on one aspect of connectivity and inclusion (Salemink, Strijker, and Bosworth 2017, 9). Therefore, some recommendations emphasize a bottom-up approach, as well as an integrated approach in digital village development (van Gevelt et al. 2018, 139). Digital development in rural areas can be achieved by empowerment and participation through bottom-up demand processes (Fennell et al. 2018, 2). Furthermore, integrated development involves public and private cooperation and support, creating a supportive, coherent, and flexible policy framework at the national level, as well as thinking about financing mechanisms (van Gevelt et al. 2018, 140; Henderson 2020, 1). This integrative approach is in line with the "smart" element of smart villages, which is defined as the development of new forms of cooperation and building partnerships, including bottom-up and top-down cooperation (Cāne 2021, 43; European Network for Rural Development 2020, 1). There are few comprehensive studies and a lack of empirical evidence regarding the bottom-up and integrated approaches to digital village transformation. Further studies that empirically examine the concepts and roles of various stakeholders are needed for the success of this approach, so that the smart village support system can help rural communities to be involved in the digital transformation process. The findings of this study can help build the evidence base needed to advance villages in this way (Rijswijk et al. 2021, 87; Cāne 2021, 48; Hadi 2018, 31; van Gevelt et al. 2018, 142)

Hence, the problem statement of this study is that the Smart Village Nusantara program in Indonesia indicates a phenomenon of digital village transformation which involves various stakeholders. However, the concept of a bottom-up and integrated model of digital village transformation has not been extensively developed. Based on the limitations in the literature, to better understand bottom-up demand processes and an integrated approach to digital village development, the author uses a comprehensive co-

production concept. Therefore, the purpose of this study is to produce a co-production model of digital village transformation. This study also highlights the necessary conditions for successful digital village transformation through the involvement of various stakeholders.

Literature Review

Public administrations invest heavily in digital transformation – both citizen-oriented and regarding their internal administrative processes. They use a co-production approach and involve multiple stakeholders to improve service quality and generate public value (Scupola and Mergel 2021, 1). In the digital era, co-production has become one of the latest buzzwords in the literature related to how citizens contribute to the delivery of public services (Mergel et al. 2018, 2). Co-production is understood as an impact-oriented form of collaboration between public administrations, professionalized service providers and citizens (Jarke 2021, 24; Brandsen, Steen, and Verschuere 2018, 11), where there is direct input from citizens during the production phase that affects the service (Lember, Brandsen, and Tõnurist 2019, 1667; Brandsen, Steen, and Verschuere 2018,11).

Apart from co-production, there are various ways to involve the community, such as co-creation. Although the concepts of co-production and co-creation have different histories, it is generally agreed that both co-production and co-creation relate to the involvement of citizens (Lember, Brandsen, and Tõnurist 2019, 1667). These two concepts can be differentiated based on the type of input contributed by citizens. When citizens are involved in planning at a strategic level and starting the development of a digital platform, co-creation is observed. In co-production, citizens shape the service in the next phase of planning at the strategic level. Co-production is generally associated with services that citizens receive during the implementation phase of the production cycle, where citizens actively engage in the design and delivery of their personal services through a digital platform provided by the service organization (Brandsen and Honigh 2018, 13).

In the case of the Smart Village Nusantara project, we use the co-production concept because the Smart Village digital platform was provided by the service organization for the further development and implementation phase of the production cycle with the community. Based on a review of previous literature, dimensions of co-production are evidenced here, including: context, stakeholders, co-production process/activity, output, outcome, and value. The development of these co-production dimensions in the form of a co-production model in digital village transformation will be discussed in the findings and discussion section of this paper.

Research Methods

To achieve the research objectives, the grounded theory method was used, which is useful for developing the researcher's theoretical analysis. The grounded theory method helps to generate new concepts in scientific disciplines and the wider research literature (Charmaz and Thornberg 2021, 306). This research was conducted in Kemuning Village

and Pangandaran Village as a pilot project of the Smart Village Nusantara concept in Indonesia. Kemuning Village is in Central Java Province, while Pangandaran Village is in West Java Province. The list of participants is provided in Table 1.

Table 1. *List of participants*

Village	Code of participants	Role
Kemuning Village	1	Support team
	2, 3, 6	Village apparatus
	4	Village apparatus and admin
	5	Community
Pangandaran Village	7, 15	Village apparatus
	8, 11, 12, 13, 18, 19, 20	Community
	9, 10, 16	Village consultative board
	14	Village apparatus and admin
	17	Village assistant

In essence, there are two groups of actors involved in co-production: state actors or professional actors as regular producers (from outside the village); and citizens. There are two main roles of citizens: producers and users. In these groups, there are also drivers and supporters. Drivers are actors who initiate, operate, and manage innovation at every stage of the process, while supporters facilitate the diffusion of innovation, offering specific knowledge, funding, and connections to policy programs and service providers (Pestoff 2018, 30; Zerrer and Sept 2020, 83; Nabatchi, Sancino, and Sicilia 2017, 769). Based on this classification, Table 2 outlines the stakeholders involved in the Smart Village Nusantara project.

Table 2. *Stakeholders involved in the Smart Village Nusantara project*

Stakeholders	Positions	Roles
Telkom (as a state-owned enterprise)	Professional stakeholder – top-down drivers	– Provision and development of digital infrastructure and the Smart Village Nusantara application – Funding support in the form of grants – Training and mentoring
Central and regional government	State stakeholder – supporters	– Policy support – Providing support in accordance with the main tasks and functions – Disseminating information and outreach to various parties – Supervisor and companion
Village government	Citizen producers and bottom-up drivers	– Liaising with various stakeholders – Conducting socialization and training – Determining the administration of Smart Village Nusantara – Running and maintaining Smart Village Nusantara – Developing village innovation

Stakeholders	Positions	Roles
Admin (from village apparatus and community)	Citizen producers and supporters	– Operating the application – Maintaining Smart Village Nusantara
Support team (from the community)	Citizen producers and supporters	– Assisting the admin in operating the application – Providing creative ideas – Village assistants serving as liaisons between professional stakeholders and the community
Villagers	Users	– App users – Submitting ideas and suggestions

Source: result of the study

After obtaining 20 interview transcripts, data analysis was then carried out using the instrument created by Qureshi and Ünlü (2020). This instrument is an analytical tool for grounded theorists, consisting of four steps: code, concept, category, and theme. The stages of data analysis used in the study using the Qureshi and Ünlü instrument are depicted in Figure 1.

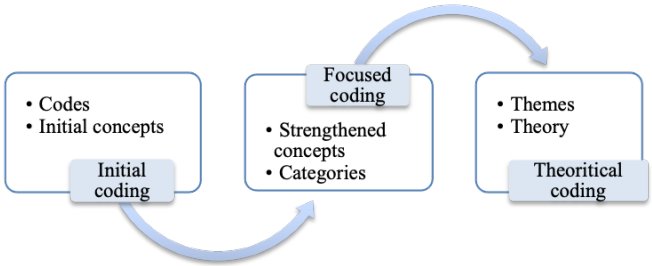

Figure 1. *Data analysis stages based on the Qureshi and Ünlü (2020, 7) instrument for grounded theory*

The first stage was initial coding, namely determining the code and concepts. The next stage, focused coding, involved determining categories. Next, at the theoretical coding stage, we determined themes and conceptualized how these themes relate to each other. The selected major themes were then obtained and explored further until saturation was achieved. Comparisons were also made with existing literature to produce new theories. Based on Charmaz and Thornberg (2020, 309), because researchers do not know in advance where the basic theory will take them, it was necessary to conduct a systematic literature search when completing this study.

Findings and Discussion

From the results of the interview, the initial coding and focused coding stages were then carried out to obtain codes, concepts and categories, as shown in Table 3.

Table 3. *An overview of the codes, concepts and categories determined in the study (initial coding and focused coding stages)*

Interview results	Codes	Concepts	Categories
P6: Telkom provided grants in the form of tools and applications for the smart village.	Grant support from Telkom (private sector) in the form of tools and applications	Grant support from the private sector	Professional support
P2: Telkom conducted a survey to study and observe the condition of the village. Our village met the criteria and had excellent value as a pilot project.	Activities carried out by Telkom (private sector) in implementing the pilot project	Support from the private sector	
P15: Digital village development is a national priority program, as well as a priority program for the use of village funds.	There is a national priority program that supports digital villages	Policy support	Policy, political and legislative support
P7: After the project started, there was a lot of support from the central government, local government, and legislature.	There is support from central government, local government, and legislature	Political/ legislative support	
P14: The central and local governments are incredibly supportive regarding the equipment needed in smart villages.	Equipment support from the government	Political/ government support	
P5: Applications are mostly used by the millennial group aged 15–50 years.	Application used by millennial groups	Skills	Social (characteristics of society, demographic diffusion, skills)
P18: There are obstacles, especially the elderly who have not mastered technology.	Limited skills of the elderly	Skills	
P10: We are used to using technology and the internet in everyday life.	Familiarity with using technology and the internet	Diffusion	
P20: The community can move in unison.	The characteristics of society are in unison	Social characteristics	
P9: Pangandaran Village has beautiful tourism and cultural potential, so this village was chosen to be a pilot village.	The village's potential advantages from tourism and culture	Potential in tourism and culture	Local potential
P5: Kemuning Village has lots of natural, artistic, cultural and tourism potential that can be developed.	The village's potential advantages from tourism and culture	Potential in tourism and culture	

The results of the complete focused coding stage were 28 categories. In the next stage, theoretical coding, these 28 categories were grouped to obtain 6 themes: context, stakeholders, institutional design, co-production processes/activities, outputs, and outcomes. Below, in Table 4, the 6 themes are outlined alongside their comparison with the literature review.

Table 4. *Dimensions or supporting factors for co-production from the literature and interview results (theoretical coding stage)*

Dimensions or supporting factors for co-production from the literature review	**Themes and categories generated from grounded theory**
I. Context	**I. Context**
Professional support (Steen 2021; Cepiku et al. 2020)	Supply side: Professional support Policy, political and legislative support Cost support Demand side: Social (characteristics of society, demographic diffusion, skills) Attitudes towards ICTs Technological factors Local potential
Policy, political and legislative support (Loeffler 2021; Salemink, Strijker, and Bosworth 2017)	
Economic and financial (costs and subsidies) (Loeffler 2021; Salemink, Strijker, and Bosworth 2017)	
Social (demography, community characteristics, diffusion, skills) (Loeffler 2021; Salemink, Strijker, and Bosworth 2017; Cepiku et al. 2020)	
Attitudes towards ICT (Salemink, Strijker, and Bosworth 2017)	
Technological factor, digital connectivity (Loeffler 2021; Salemink, Strijker, and Bosworth 2017)	
II. Stakeholders	**II. Stakeholders**
Motivation of stakeholders (Cepiku et al. 2020; Steen 2021; Benjamin and Brudney 2018)	Selection of stakeholders Producer motivation Knowledge, ability User motivation
Knowledge, ability (Cepiku et al. 2020; Steen 2021; Benjamin and Brudney 2018)	
III. Co-production process/activity	**III. Co-production process/activity**
Meetings, direct interaction (Loeffler 2021; Cepiku et al. 2020; Lember, Brandsen, and Tõnurist 2019)	Meetings, communication The collective learning processes Training and motivating Sharing decision-making Accountability and performance management Leadership Deliberative decision making
Collective learning processes (Loeffler 2021)	
Training and motivating staff (Loeffler 2021; Lember, Brandsen, and Tõnurist 2019; Cepiku et al. 2020; Tuurnas 2021)	
Sharing decision-making (Lember, Brandsen, and Tõnurist 2019)	
Accountability and performance management (Cepiku et al. 2020)	
Leadership (Loeffler and Bovaird 2021; Cepiku et al. 2020; Schlappa and Imani 2018)	
	IV. Institutional design Guide to using digital platforms Cooperative contract
IV. Output	**V. Output**
Improved service quality (Loeffler 2021)	Digital services Digital infrastructure
V. Outcome and value	**VI. Outcome**
Citizen-based, economic, administrative, and social public value (Cepiku et al. 2020; Scupola and Mergel 2021)	Increased participation, improved service quality, transparency, digital skill and literacy, increased welfare, and awards

In the context section, a comparison is also made with the concept of community-based digital village development from Salemink, Strijker, and Bosworth (2017). As a result of this comparison, findings were obtained in the form of new concepts that had not been discussed previously in the literature. In the context factor, the findings of this study suggest that local potential can be developed as a driving factor for digital village transformation. Regarding stakeholders, the findings of this study emphasize the selection of stakeholders and the motivation of users, where the latter desire convenience and that their needs be met. As for the co-production process/activity, the findings of the study suggest the existence of deliberative decision making. In accordance with the characteristics of rural communities, problems that have not been covered in institutional design can be solved through deliberative decision making. Another new aspect is institutional design: the rules that facilitate, guide, and limit the behavior of individuals and organizations (Ostrom 2011, 17). In the output aspect, this study finds that digital infrastructure is the result of the digital village transformation. They key outcomes of this are digital skills, digital literacy, and receiving awards. This is an important aspect as the first step in developing a digital village. In the early stages there is a stronger need to support physical investment to bring internet and digital infrastructure to rural areas, along with soft interventions for building digital skills capacity (European Network for Rural Development 2020, 7). Digital infrastructure is therefore the first stage of digital transformation (Janowski 2015, 226).

Thus, Figure 2 provides a visual representation of a co-production model for successful village digital transformation.

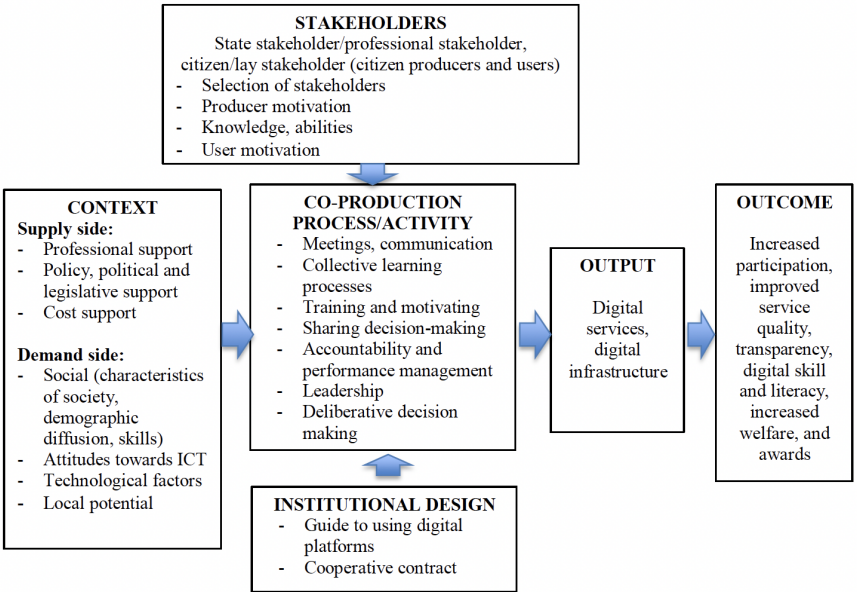

Figure 2. *A co-production model for successful digital village transformation*

Source: result of the study

This model has six variables, namely: context, stakeholders, institutional design, co-production processes/activities, outputs, and outcomes. The co-production process/activity variable is at the core of the model, with bottom-up (namely the active involvement of the community) and integrated approaches (in the form of cooperation between the community, the government, and the private sector) outlined. Meanwhile, the variables of context, stakeholders, and institutional design are factors that influence co-production processes/activities.

Context is defined by factors to support co-production. Context is a key factor at the macro level in the external environment, consisting of a supply side and a demand side. The supply side is determined by connectivity, namely the availability of telecommunications technology infrastructure and the supply mechanisms behind it. The supply side includes professional support, policy support, political and legislative support, and cost support. The demand side is a bottom-up element in the form of the conditions and needs of the local community. The demand side includes social attitudes (society characteristics, demographic diffusion, skills) towards ICT, technological factors, and local potential.

The next variable is stakeholders. The co-production process/activity involves various public and private stakeholders who demonstrate cooperation in an integrated approach. There are state stakeholder groups, professional stakeholders (private sector), and citizen groups. This group of citizens is also known as co-producers, citizen producers, or lay stakeholders, and involves citizens as users of public services. In terms of stakeholders, it is necessary to pay attention to the selection of stakeholders, producer motivations, knowledge, abilities, and user motivations. There is also institutional design in the form of guidelines for using digital platforms and cooperation contracts that regulate the behavior of stakeholders.

These three factors (context, stakeholders, and institutional design) contribute to the success of the co-production process/activity. Co-production processes/activities are collaborations between various public and private stakeholders (integrated) centered on empowerment and the active involvement of the community (bottom-up or demand side) in the transformation of digital services. Communities are actively and collaboratively involved in the planning, design, development and delivery of public services through platforms provided by professional stakeholders. There is therefore direct input from the community which will affect services. Co-production processes/activities include meetings, communication, collective learning processes, training and motivating staff, sharing decision-making, accountability and performance management, leadership, and deliberative decision making. Furthermore, co-production processes/activities produce outputs and outcomes. The output of this process is digital infrastructure and innovative digital services. Outcomes are in the form of increased participation, improved service quality, transparency, digital skills and literacy, increased welfare, and awards.

Conclusion

1. Digital village transformation requires support from parties outside the village and the involvement of the village community. This is a bottom-up demand process (citizen

centric) and an integrated approach that is carried out through co-production.
2. This study resulted in a co-production model for digital village transformation – a necessary condition for the success of digital village transformation through community involvement. This model has six variables: context, stakeholders, institutional design, co-production processes/activities, outputs, and outcomes.
3. Empirical evidence showed that at the stage of assistance from professional actors, the Smart Village Nusantara project in Indonesia has succeeded in providing the foundation for the early stages of digital transformation in the form of having built digital infrastructure and services. However, several obstacles remain, where not all people use and understand smart villages and the development of applications and other stages of smart villages are needed.
4. In order to gain support and participation from the community, it is recommended that digital village transformation is built according to local potential and designed according to users' desire to receive services that meet their needs.
5. The limitation of this study is that it has not yet assessed the further stages of digital village transformation. This study was carried out during the phase of mentoring by professional stakeholders. Thus, the next challenge is sustainability so that digital transformation in villages can reach a higher digital transformation stage. Furthermore, a wider chance to discuss sustainable digital transformation based on local capabilities in villages could also take place in future research. In addition, the co-production model of this research was formed from an Indonesian case; there are opportunities for future research to form co-production models within the contexts of different countries.

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KOPRODUKCIJOS MODELIS SKAITMENINIO KAIMO TRANSFORMACIJOS KONTEKSTE INDONEZIJOJE

Anotacija. *Pokyčiai išmaniajame kaime Nusantaroje (Indonezija) rodo, kad egzistuoja skaitmeninė transformacija, apimanti keletą suinteresuotų šalių: vyriausybę, privatų sektorių ir bendruomenes. Viena vertus, keli išsamūs modeliai paaiškina paklausos procesą iš apačios į viršų ir integracinį požiūrį. Kita vertus, nėra daug tyrimų ir įrodymais pagrįstų duomenų apie skaitmeninio kaimo transformacijas ir pokyčius. Šio tyrimo tikslas – sukurti skaitmeninio kaimo, kuris keičiasi, bendros įmonių produkcijos modelį. Bendroje įmonių produkcijoje į transformacijos procesą įtraukiamos įvairios tuo suinteresuotos šalys. Šiame tyrime buvo išplėtota koprodukcijos koncepcija ir bendruomeninio skaitmeninio kaimo plėtros koncepcija. Teorinis metodas pasitelktas siekiant išanalizuoti piliečių (vartotojų) ir gamintojų įsitraukimą į koprodukcijos ir skaitmeninio kaimo koncepcijos realizaciją. Šis tyrimas atskleidė įvairius skaitmeninio kaimo transformacijos koprodukcijos modelio aspektus, t. y. suinteresuotų šalių kontekstą, bendros gamybos procesą, veiklą, institucinį dizainą, produkciją ir rezultatus. Vietos potencialo, šiuo atveju turizmo, plėtra yra vienas iš skaitmeninio kaimo transformacijos varomųjų veiksnių. Nusantaros išmaniojo kaimo Indonezijoje pokyčių analizė padėjo sukurti pagrindą ankstyviesiems skaitmeninės transformacijos etapams. Tvarumas taip pat išlieka iššūkiu siekiant aukštesnio skaitmeninio kaimo transformacijos etapo.*

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