Contents lists available at GrowingScience

International Journal of Data and Network Science

homepage: www.GrowingScience.com/ijds

The effects of information and communication technology on village development performance

Andi Chairil Furqan[a,b*], Fikry Karim[a,b], Latifah Sukmawati Yuniar[a,b], Arif Gunarsa[a,b] and Erwinsyah[a,b]

[a]*Department of Accountancy, Faculty of Economics and Business, Universitas Tadulako, Palu, Indonesia*
[b]*Center for Sustainable Governance Studies, Faculty of Economics and Business, Universitas Tadulako, Palu, Indonesia*

C H R O N I C L E

Article history:
Received: February 20, 2023
Received in revised format: April 12, 2023
Accepted: June 25, 2023
Available online: June 25, 2023

Keywords:
Information Technology
Communication
Internet
Network
Village Development Performance

A B S T R A C T

The purpose of this study is to examine how Information and Communication Technology (ICT) affects village development performance, which is measured through the Developing Village Index (VDP). This index is made up of three dimensions: Social, Economic, and Environmental Resilience Indexes. By using quantitative methods and cross-sectional data from 1,842 villages in the Central Sulawesi Province in 2021, the study concludes that ICT has a positive impact on the development performance of villages overall. The study found that the quality of internet signals and the number of cell phone users, as well as the presence of technology devices and internet facilities in village offices, have a positive influence on village development performance. However, the existence of internet facilities for the public has no effect on village development performance, including economic, social, and environmental development in rural areas. By examining the effectiveness of both the community and the village government's utilization of ICT, this study contributes to understanding the impact of ICT in improving village development performance. To reduce the digital divide and continue to support rural development, it is important to enhance ICT facilities and infrastructure for rural communities and improve the quality of their implementation governance. Furthermore, to support the delivery of public services and the implementation of village development programs, both the government and Regional Government need to encourage the effectiveness of the use of ICT.

1. Introduction

The extent of the rural innovation system and the use of technology in rural areas can determine the achievement of village Sustainable Development Goals (SDGs) (According to Yin et al., 2019). The utilization of Information and Communication Technology (ICT) can also improve the economy, entrepreneurial activity, and welfare of rural communities, as noted by several studies such as Prieger (2013), Hübler and Hartje (2016), Barnett et al. (2019), Ma et al. (2020), Galperin et al. (2022), and Nguyen et al. (2022). Although previous studies, including Xia (2010), Zhang and Zhang (2020) as well as Adamowicz and Zwolińska-Ligaj (2020), have explored the role of ICT in sustainable village development, more investigation is needed to determine the existence and effectiveness of ICT facilities used by both community and village government in rural areas. Therefore, this study aimed to analyze the impact of ICT on village development performance and assess the efficiency of ICT facilities in rural areas.

Rural development is a complex phenomenon that faces a multitude of challenges, including issues related to local values, institutions, governance, innovation systems, communication information technology and digital divide (Douglas, 2005; Venkatesh & Sykes, 2013; Antlöv, 2016; Yin et al., 2019; Vasstrøm & Normann, 2019; Song et al., 2020; Ye et al., 2021;

* Corresponding author.
E-mail address: furqan.tadulako@gmail.com (A. C. Furqan)

ISSN 2561-8156 (Online) - ISSN 2561-8148 (Print)

doi: 10.5267/j.ijdns.2023.6.018

Harun et al., 2021). Therefore, to evaluate development in rural areas, it is important to consider multiple factors. In Indonesia, the Village Development Index (VDP) is used to assess village development performance, which consists of three dimensions: Social, Economic, and Environmental Resilience Indexes.

Accordingly, departing from prior research which linked ICT with rural development and the issues that occurred during BTS construction in Indonesia, this study used data from 1,842 villages in Central Sulawesi to demonstrate that ICT has a positive impact on enhancing village development performance. Factors such as internet signal quality, number of cell phone users, technology device presence, and internet facilities in village offices have contributed to this positive outcome. The aim of this research is to investigate the impact of ICT on the performance of village development, as determined by the VDP. The study presents new insights into the relationship between ICT and rural development, especially in developing countries. In addition, the study uses reliable data to demonstrate that ICT has a positive influence on village development performance as measured by a comprehensive index. The research also explores several factors that contribute to this relationship, including the number of cell phone users, the quality of internet signals, and the availability of technology devices and internet facilities within the village. The article is structured into four main sections, each discussing various aspects of the research: the second section covers theory and literature review of the hypotheses, the third section delves into the research methods, including the variables measured, the sample size, and analytical techniques, while the fourth section presents the findings of the research. Finally, the last section concludes the study, highlighting implications and limitations of the research while suggesting areas for future research.

2. Literature Review and Hypothesis

2.1 Internet and mobile phones on development performance

According to Song et al. (2020), the digital divide can be observed through access to ICT, ICT usage and benefits derived from ICT implementation. Venkatesh and Sykes (2013) highlight the significance of bridging this divide in rural areas, particularly in developing countries, as it is crucial for their socio-economic progress. Yin et al. (2019) suggest that rural innovation systems are essential for achieving rural revitalization and promoting growth, emphasizing that traditional labor-intensive methods with low technology are not sufficient. Instead, incorporating technological innovation into the rural development process is crucial. This aligns with previous research by Xia (2010), Zhang and Zhang (2020), and Adamowicz and Zwolińska-Ligaj (2020) which emphasize the significance of understanding and using ICT to support the success of village development. Although there remains a disparity between urban and rural areas in terms of broadband coverage (Prieger, 2013), various studies conducted by Barnett et al. (2019), Ma et al. (2020), Hübler and Hartje (2016), Nguyen et al. (2022), and Galperin et al. (2022) have demonstrated that the use of mobile phones and internet in rural areas can significantly increase agricultural and non-agricultural income as well as rural household income. Additionally, the use of the internet can boost household expenditure and encourage the development of the non-agricultural sector, leading to a reduction of natural resource extraction and dependence (Nguyen et al., 2022; Ma et al., 2020). With improved ICT facilities and utilization, employment opportunities can be created and the skills of the rural workforce can be improved, contributing to socio-economic development in rural areas (Prieger, 2013; Hübler & Hartje, 2016; Galperin et al., 2022). Therefore, the quality of internet signals, availability of internet infrastructure, and ownership of mobile phones among rural communities are crucial in improving rural development outcomes across economic, social, and environmental dimensions. In conclusion, it can be argued that the expansion and improvement of ICT facilities in rural areas can foster rural development and contribute to the reduction of regional disparities. Thus, the following hypotheses are proposed:

H_{1a}: *Internet quality has a positive effect on Village Development Performance.*
H_{1b}: *Internet facilities have a positive effect on Village Development Performance.*
H_{1c}: *Mobile phone ownership has a positive effect on Village Development performance*.

2.2 ICT Facilities on Village Development Performance

Making changes to internal processes within government organizations, including the use of ICT, can be challenging due to their strong attachment to their institutional environment, which includes regulations, norms, and customs. Institutional changes can only occur if there is support for them in terms of legitimacy and resources, and if actors are willing to initiate or advocate for these changes (Karim et al., 2020). Similarly, integrating ICT also requires full support and resources to adopt new practices based on this technology and mobilize human and financial resources to facilitate its implementation, as it has the potential to disrupt established habits.

According to Orlikowski (2000), the impact of ICT on organizational performance depends on its interaction with users in routine organizational practices. Therefore, the strategic role of ICT in an organization, such as automating routines, providing information for process improvement, or transforming routines, determines its benefits (Dehning et al., 2003). Kobelsky et al. (2014) found that the more strategic the routine use of ICT, the better the organizational performance. Devaraj and Kohli (2003) also found that the actual use of ICT is positively related to performance in hospitals. Similarly, Furqan et al. (2020) showed that increasing the use of the Regional Management Information System (SIMDA) application could improve the

quality of public services in local government, while Sofyani et al. (2020) found that compliance with information technology governance can affect service quality in local governments. Therefore, the availability of internet facilities and supporting ICT devices at village offices can enhance public service delivery and improve village development performance.

H_{2a}: *Internet facilities have a positive effect on Village Development performance.*
H_{2b}: *The availability of technological devices has a positive effect on Village Development performance.*

3. Research Method

The study was carried out in villages located in the Central Sulawesi Province of Indonesia. This province covers an area of approximately 61,841.29 square kilometers, making it the largest province on Sulawesi Island. The province comprises a city, 12 districts, 176 sub-districts, 2,020 villages, and 1,632 islands. Almost all districts have varied terrain, including mountains, coasts, and remote communities that have not received adequate assistance as per the Central Bureau of Statistics-Central Sulawesi (2022).

This study collects quantitative data from secondary sources for all 1,842 villages in 2021. The detailed information on the 2021 Village Development Program (VDP) for each village is obtained from documents released by the Ministry of Villages, Development of Disadvantaged Regions, and Transmigration of the Republic of Indonesia. The variables that depict the use of information and communication technologies (ICT) in each village are sourced from the Indonesian Village Potential document data for Central Sulawesi Province, published by the Central Bureau of Statistics for Central Sulawesi in 2022. As a result, the measurement of all variables in this study utilizes the same methodology as that used in the source documents. To address the research issue, the empirical framework for examining the research proposition is outlined as:

$$VDP_t = \beta_0 + \beta_1 S\text{-}Internet_t + \beta_2 F\text{-}internet_t + \beta_3 phones_t + B_4 network_t + \beta_5 technology_t + \varepsilon_t \quad (1)$$

VDP is a metric that evaluates Village Development Performance, ranging from 0.00-1.00, by means of a Developing Village Index. S-Internet refers to signal quality in villages, categorized into four categories= 4 for 4G/LTE; 3 for 3G/H/H+/EVDO; 2 for 2.5G/E/GPRS; and 1 for no signal.

The F-Internet variable refers to the availability of facilities or rooms that allow village communities to access the internet either for free or at a cost. This variable is measured using a dummy variable, where 1 denotes the presence of such facilities, and 0 denotes their absence. The variable of phone is concerned with ownership of mobile phones by the village residents, which is measured on a categorical scale. The scale ranges from 3 (corresponding to most residents owning mobile phones), through 2 (most residents do not own mobile phones), to 1 (none of the residents have mobile phones yet). The network variable measures the availability of an internet network in the village office. This variable is also measured categorically, with a range of scores from 4 (functioning) to 1 (no internet network in the village office). The technology variable is concerned with the availability of technological devices in village offices that enable residents to utilize the internet network. These devices, such as laptops or PC computers, are also measured on a categorical scale, with scores ranging from 4 (used) to 1 (no device technology in the village office).

4. Research Results

Table 1 displays that the Village Development Performance (VDP) variable has a mean of 0.67. This suggests that the average village in Central Sulawesi is considered as a developing village. However, there are still some villages that fall under the very underdeveloped category based on their lower value of 0.39. Although some villages may not have an internet signal, the mean value of S-Internet variable is 3.38, which indicates that most of the villages will have access to 3G/H/H+/EVDO and 4G/LTE internet networks. On the other hand, the mean value of the F-Internet variable is 0.25. This illustrates that most villages in Central Sulawesi will have special facilities for residents to use the internet, such as internet cafes or other amenities. This may be due to the increasing number of residents who already have cell phones or mobile phones shown by the mean value of phones variable at 2.87. Moreover, based on Table 1, the mean values of technology and network variables are 3.97 and 2.41, respectively. This indicates that most villages have technological devices like laptops and PC computers and displays a near-average number of internet facilities in the village office. However, most of these facilities are rarely used.

Table 1
Descriptive Statistics of Research Variables

Information	Means	Std. Deviation	Min	Max
VDP	0.67	0.07	0.39	0.90
S-internet	3.38	1.06	1	4
F-internet	0.25	0.43	0	1
Phones	2.87	0.35	1	3
Network	2.58	1.42	1	4
Technology	3.97	0.25	1	4
Observation (N)=1,842				

Table 2
Correlation Analysis

Variable	VDP	S-internet	F-internet	Phones	Network	Technology
VDP	1.000					
S-internet	0.407*** (0.000)	1.000				
F-internet	0.101*** (0.000)	0.072*** (0.001)	1.000			
Phones	0.335*** (0.000)	0.421*** (0.000)	0.137*** (0.000)	1.000		
Network	0.234*** (0.000)	0.129*** (0.000)	0.270*** (0.000)	0.157*** (0.000)	1.000	
Technology	0.107*** (0.000)	0.068*** (0.003)	0.043* (0.062)	0.119*** (0.000)	0.060*** (0.009)	1.000

Observation (N)=1,842
** **, *, = significant P-value 1%, 10%*

Table 2 shows that there is a significant positive correlation between Village Development Performance (VDP) and independent variables such as S-internet, F-internet, mobile phones, network, and technology. The data suggests that a higher quality of internet connection, designated internet rooms or spaces for village communities, mobile phone ownership within the village, along with the provision of internet facilities, and the availability of technological devices in village offices all serve as positive indicators of village development. The findings highlight that the better the resources and access to technology within a rural community, the higher the level of development of that specific village. Therefore, the introduction and expansion of such resources are necessary in order to prioritize the growth and development of these communities.

Table 3 presents the statistical analysis of the research hypothesis examination. The robust standard error model was utilized to test the research model, and it was discovered that by utilizing the village VDP score as a dependent variable, the research model's R-squared value equalled to 0.2289. This indicates that the research model can explain about 22.89% of the variations in the village development performance, which is statistically significant at a 1% level. Moreover, the VIF mean value of the researched model is 1.14, indicating that the model does not experience any multicollinearity problem and its outcomes can be comprehensively used to explain variations in village development performance. The findings suggest that the research model is a reliable technique for evaluating the variations in the village VDP score. It is believed that the research model will enhance understanding of the factors determining the village development performance.

Table 3
Hypothesis Testing Results

Variable	Expectaed Sign	Estimate	P-Value (Sig)
Cons.		0.403	0.000
S-internet	H1a (+)	0.021	0.000
F-internet	H1b (+)	0.001	0.688
Phones	H1c (+)	0.036	0.000
Network	H2a (+)	0.008	0.000
Technology	H2b (+)	0.016	0.007
Obs.	1.842		
Prob > F	0.0000		
R-squared	0.2289		
VIF means	1.14		

Observation (N)=1,842
** **, *, = significant P-value 1%, 10%*

Table 3 presents the findings of the H1a and H1b tests. As per the H1a test, the S-internet variable has a positive influence on VDP, with a coefficient of 0.021, indicating that good internet signal quality in villages leads to better village development performance. This outcome is statistically significant at a 1% level. Therefore, it can be concluded that H1a is supported. On the other hand, the H1b test results exhibit that the F-internet variable does not have a significant impact on VDP. Thus, H1b is not supported. Despite the lack of support for the H1b hypothesis, our study's results are consistent with prior research studies (Prieger, 2013; Barnett et al., 2019; Ma et al., 2020; Galperin et al., 2022; Nguyen et al., 2022), indicating that good internet signal quality can contribute to improving village development performance.

The results of testing the hypothesis H1c, which suggests that the usage of mobile phones has a positive impact on VDP, is demonstrated in Table 3. The coefficient value for this variable is found to be 0.036, which is statistically significant at the 1 percent level. This finding suggests that the hypothesis H1c is accepted. Accordingly, it can be inferred that when most of the village population uses mobile phones, it is seen to have a positive influence on the overall development performance of the village. This result corroborates with the findings of earlier studies on this topic conducted by Hübler and Hartje (2016), Barnett et al. (2019), and Ma et al. (2020). Therefore, it can be posited that the usage of mobile phones by the rural communities helps in enhancing the development performance of a village. As more and more people in villages begin using mobile phones for their daily activities, the performance of the village in terms of development is bound to improve.

Table 3 presents the results of the H2a test, indicating that the network variable has a positive influence on VDP. The coefficient of 0.008 is significant at the 1 percent level. The findings are like those of the H2b test which demonstrates that the technology variable also contributes positively to VDP, with a coefficient of 0.016 and significance at the 1 percent level. These results confirm that the H2a and H2b tests are reliable and suggest that the availability of internet facilities and technological devices in village offices can lead to better village development performance. The study's conclusions align with previous research studies conducted by Devaraj & Kohli (2003), Kobelsky et al. (2014), Furqan et al. (2020), and Sofyani et al. (2020). These studies suggest that ICT can enhance public services and development program implementation, resulting in higher performance levels of public sector organizations, particularly in rural areas.

The findings of this study have several important implications. Firstly, the results confirm the relevance of Xia's (2010) research, which emphasized the importance of promoting ICT use and its influence on rural development in China. Merely developing ICT infrastructure in rural areas is insufficient, and it is necessary to implement strategies that encourage the use of ICT, particularly in supporting public services and village development programs. Secondly, the study revealed that the benefits of ICT extend beyond community participation in village development. According to the users, including community members and Village Government officials, ICT continues to positively impact the performance of village development. These findings complement the research of Hübler & Hartje (2016), Ma et al. (2020), and Nguyen et al. (2022), which explored the impact of the internet and mobile phones on the welfare of rural communities, as well as the results of Devaraj & Kohli (2003), Kobelsky et al. (2014), and Furqan et al. (2020), which investigated the effect of using ICT on the performance of public organizations, including local government services. Consequently, it is necessary to enhance the effectiveness of ICT facilities and utilization in rural areas, including among village government officials, to support the improvement of public service quality and other rural development initiatives.

4.1 Analysis of VDP Components

To determine the variable measurement of village development performance, a composite index that combines the ECOR (Economic Resilience Index), SOCR (Social Resilience Index) and ENVR (Environmental Resilience Index) components is used. To further explore the impact of ICT on each component of the VDP, an additional test was conducted, and the results are presented in Table 4.

Table 4
Estimating Village Development Components

Variable	ECOR	SOCR	ENVR
Cons.	0.143*** (0.000)	0.499*** (0.000)	0.567*** (0.000)
S-internet	0.033*** (0.000)	0.019*** (0.000)	0.011*** (0.001)
F-internet	0.003 (0.576)	0.002 (0.386)	-0.002 (0.737)
Phones	0.065*** (0.000)	0.030*** (0.000)	0.013* (0.096)
Network	0.010*** (0.000)	0.011*** (0.000)	0.003* (0.097)
Technology	0.020**(0.034)	0.020*** (0.001)	0.007 (0.336)
Obs.	1.842	1.842	1.842
Prob > F	0.0000	0.0000	0.0000
R-squared	0.1825	0.2500	0.0220

Dependent Variable: Components of Village Development Variables. ECOR model measured by the Economic Resilience Index score; SOCR model: measured by the Social Resilience Index score; ENVR model: measured by the Environmental Resilience Index score.
***, **, * = significant P-value 1%, 5%, 10%.

Table 4 displays the outcomes of further examinations, where the VDP component acts as the subject to be analyzed. Among all test findings, the results from the SOCR and ECOR models are like those of the preceding tests when using VDP as the dependent variable. On the other hand, differences in test results are apparent in ENVR model tests, indicating that the impact of technological devices within villages on the performance of environmental village development is no longer significant. Additionally, the influence of cell phone and internet usage on environmental village development performance is weaker compared to their effects on social and economic fields. Nonetheless, the study's conclusions are consistent with those of Tim et al. (2018) in demonstrating the necessity of ICT presence in enhancing the quality of rural environments.

This study adds to the existing knowledge of the role of ICT in rural development and emphasizes the need for further focus on improving ICT facilities in rural areas. The study provides insights that can guide policy efforts to promote equitable and sustainable development in rural areas through the utilization of ICT. This study emphasizes that the impact of ICT on economic and social development in rural areas is more significant compared to its impact on environmental development. The results complement the previous research that explored the role of ICT in promoting development in rural areas, such as Venkatesh and Sykes (2013), Prieger (2013), Hübler and Hartje (2016), Tim et al. (2018), Aretaake, (2019), Barnett et al. (2019), Ma et al. (2020), Galperin et al. (2022) and Nguyen et al. (2022). Despite the limited contribution of ICT to sustainable environmental development in rural areas, improving ICT facilities and infrastructure in rural areas is necessary to ensure equitable and accelerated development while bridging the digital divide. To promote digital villages or smart villages, governments must prioritize the improvement of ICT facilities and their effective utilization in rural areas, especially in remote and disadvantaged regions. To minimize corrupt behavior in the implementation of these programs, governments must

strengthen governance mechanisms and engage village communities and non-governmental organizations in the oversight process. Citizen-led information systems are more effective than top-down approaches and can strengthen the role of ICT in village development.

5. Conclusion

Empirical evidence from this study reveals the contribution of ICT to village development performance in Indonesia's Central Sulawesi Province. The study collected data from 1,842 villages and established that ICT has a significant impact on improving economic, social, and environmental development in rural areas. The presence of technology devices, internet services, and an increase in cell phone users are all linked to the improved performance of village development. Additionally, the quality of the internet signal plays a vital role in the process. This shows that ICT can have a profound impact on rural areas, and policymakers must prioritize its integration to achieve sustainable development goals.

The study acknowledges certain shortcomings such as the absence of evaluating the features of villages and their communities, and lack of data concerning the broadband construction in certain selected villages. These limitations demand further investigations that consider the characteristics of villages and their communities for examining the impact of ICT on village development performance. Additionally, high-quality broadband's impact on village development performance can also be explored in more detail. Moreover, the study only focuses on the Central Sulawesi Province in Indonesia, which may limit the generalizability of the findings. Future studies should expand the scope of research to include other regions and countries to provide a more comprehensive understanding of the impact of ICT on village development performance. The study did not examine the underlying mechanisms that explain the relationship between ICT and village development performance. Future research should examine the mediating and moderating factors that affect the relationship between ICT and village development performance. The study also assumes that all villages have equal access to ICT facilities and infrastructure. However, this may not be the case, as some villages may have better access than others due to factors such as geographical location and socioeconomic status. Future studies need to consider the digital divide in rural areas and its impact on village development performance.

References

Adamowicz, M., & Zwolińska-Ligaj, M. (2020). The “Smart Village” as a way to achieve sustainable development in rural areas of Poland. *Sustainability*, *12*(16), 6503.

Antlöv, H., Wetterberg, A., & Dharmawan, L. (2016). Village governance, community life, and the 2014 village law in Indonesia. *Bulletin of Indonesian Economic Studies*, *52*(2), 161-183.

Aretaake, R. (2019). Traditional Kiribati beliefs about environmental issues and its impacts on rural and urban communities. *Disaster Prevention and Management: An International Journal*, *28*(1), 25-32.

Central Bureau of Statistics. (2022). *Provinsi Sulawesi Tengah Dalam Angka 2022.* Palu: Badan Pusat Statistik.

Barnett, W. A., Hu, M., & Wang, X. (2019). Does the utilization of information communication technology promote entrepreneurship: Evidence from rural China. *Technological Forecasting and Social Change*, *141*, 12-21.

Dehning, B., Richardson, V. J., & Zmud, R. W. (2003). The Value Relevance of Announcements of Transformational Information Technology Investments. *MIS Quarterly*, *27*(4), 637 - 656.

Devaraj, S., & Kohli, R. (2003). Performance Impacts of Information Technology: Is Actual Usage the Missing Link? *Management Science*, *49*(3), 273 - 289.

Douglas, D. J. (2005). The restructuring of local government in rural regions: A rural development perspective. *Journal of Rural Studies*, *21*(2), 231-246.

Furqan, A. C., Wardhani, R., Martani, D., & Setyaningrum, D. (2020). The effect of audit findings and audit recommendation follow-up on the financial report and public service quality in Indonesia. *International Journal of Public Sector Management*, *33*(5), 535-559.

Galperin, H., Katz, R., & Valencia, R. (2022). The impact of broadband on poverty reduction in rural Ecuador. *Telematics and Informatics*, *75*, 101905.

Harun, H., Graham, P., Kamase, H. P., & Mir, M. (2021). A critical analysis of the impacts of financial literacy and NPM on Village Funds Initiative in Indonesia. *International Journal of Public Administration*, *44*(4), 336-345.

Hübler, M., & Hartje, R. (2016). Are mobile phoness smart for economic development?. *Economics Letters*, *141*, 130-133.

Karim, F., Ghozali, I., Achmad, T., & Harto, P. (2020). The Interaction of Institutionalization of Information Technology & Institutional Entrepreneurship: An Idea of a Framework for the Application of Information Technology in Public Sector Financial Management, *International Journal of Management*, *11*(12),858-883.

Kobelsky, K., Larosiliere, G., & Plummer, E. (2014). The impact of information technology on performance in the not-for-profit sector. *International Journal of Accounting Information Systems*, *15* (1), 47-65.

Ma, W., Nie, P., Zhang, P., & Renwick, A. (2020). Impact of Internet use on economic well-being of rural households: Evidence from China. *Review of Development Economics*, *24*(2), 503-523.

Nguyen, T. T., Nguyen, T. T., & Grote, U. (2022). Internet use, natural resource extraction and poverty reduction in rural Thailand. *Ecological Economics*, *196*, 107417.

Orlikowski, W. J. (2000). Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations. *Organization Science*, *11*(4), 404 - 428.

Prieger, J. E. (2013). The broadband digital divide and the economic benefits of mobile broadband for rural areas. *Telecommunications Policy*, 37(6-7), 483-502.

Sofyani, H., Riyadh, H. A., & Fahlevi, H. (2020). Improving service quality, accountability and transparency of local government: The intervening role of information technology governance. *Cogent Business & Management*, *7*(1), 1735690.

Song, Z., Wang, C., & Bergmann, L. (2020). China's prefectural digital divide: Spatial analysis and multivariate determinants of ICT diffusion. *International journal of information management*, *52*, 102072.

Tim, Y., Pan, S. L., Bahri, S., & Fauzi, A. (2018). Digitally enabled affordances for community-driven environmental movement in rural Malaysia. *Information Systems Journal*, *28*(1), 48-75.

Vasstrøm, M., & Normann, R. (2019). The role of local government in rural communities: culture-based development strategies. *Local Government Studies*, *45*(6), 848-868.

Venkatesh, V., & Sykes, T. A. (2013). Digital divide initiative success in developing countries: A longitudinal field study in a village in India. *Information Systems Research*, 24(2), 239-260.

Xia, J. (2010). Linking ICTs to rural development: China's rural information policy. *Government Information Quarterly*, *27*(2), 187-195.

Ye, L., Pan, S. L., Li, M., Dai, Y., & Dong, X. (2021). The citizen-led information practices of ICT4D in rural communities of China: A mixed-method study. *International Journal of Information Management*, *56*, 102248.

Yin, X., Chen, J., & Li, J. (2022). Rural innovation system: Revitalize the countryside for a sustainable development. *Journal of Rural Studies*, *93*, 471-478.

Zhang, X., & Zhang, Z. (2020). How do smart villages become a way to achieve sustainable development in rural areas? Smart village planning and practices in China. *Sustainability*, *12*(24), 10510.