Initiatives of the Indonesian Government for Digital Transformation in Rural Areas

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Abstract. Indonesia is undergoing a digital transformation with a strong focus on building digital infrastructure and harnessing digital technologies to drive sustainable economic growth. Digital literacy and information and communication technology (ICT) infrastructures are important to this shift. The Indonesian government also encourages rural development by improving the connectivity and accessibility of rural people to ICT, giving them more power over their development. To achieve a beneficial influence on rural communities, rural peoples must treat the use of ICT in rural regions cautiously and strive to understand its socio-cultural effects. This article aims to study government activities in Indonesia for building ICT infrastructure in rural regions and to acquire a thorough understanding of ICT developments. The research objective is to comprehensively depict ICT development within Indonesia's rural regions and examine its potential implications for the indigenous population. The Indonesian government should increase competitiveness among its population in the public and private sectors. The government should actively oversee and enhance the digital skills of economic actors in rural areas, offer incentives for innovation, develop communication strategies, and close the digital divide for mountain communities.

1 Introduction

Many scholars have demonstrated that Information and communication technologies have transformed various aspects of life and changed thinking patterns, attitudes, and community actions toward accessing and sharing information [1–3]. Information and Communication Technology (ICT) development in Indonesian rural areas is important for several reasons. First, economic growth and competitiveness. Expanding ICT infrastructure and services can contribute to economic growth and enhance the country's competitiveness [4]. Indonesia is a promising ICT market, and the development of rural areas can unlock the country's potential in this sector [5]. Second, improved access to public services. ICT helps deliver public services more efficiently and effectively, benefiting the rural population. The Indonesia Broadband Plan aims to enhance the government's use of ICT for e-governance, e-education, e-health, e-procurement, and e-logistics, ultimately improving service delivery in under-served regions [5]. Third, education and knowledge sharing. ICT facilitates access to

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educational resources and promotes knowledge sharing in rural areas. It can help bridge the education gap between urban and rural areas and empower rural communities [6]. Fourth, reduced social inequality. ICT infrastructure development in rural areas bridges the digital divide and reduces social inequality. Access to information and communication technologies empower rural communities and provide them with more opportunities for social and economic development [6]. Fifth, achievement of development goals: ICT is expected to play a crucial role in achieving the United Nations Millennium Development Goals and the goals outlined by the Indonesian government for rural development [6].

Innovative digital technology platforms in Indonesia make accessing information through interactive communication easy. To achieve sustainable and low-carbon economic growth through balanced growth and development, Indonesia is implementing a digital transformation plan, which uses digital technology to modify business processes, culture, and customer experiences to meet changing market and business needs.

The pillars of this transformation are developing digital infrastructure, utilizing digital technology, and building enabling factors. Digital infrastructure involves expanding access and quality, establishing a national data center, broadcasting digitally, and setting frequencies. The utilization of digital technologies encompasses a wide array of sectors, spanning rural areas, healthcare, education, social services, industry, tourism, trade, cooperatives, micro, small, and medium-sized enterprises, agriculture and fisheries, as well as the development of smart cities, among other priority sectors. To fully realize the potential of digital transformation, a comprehensive and interconnected framework must be established that incorporates digital infrastructures to make social transformation [7,8].

Those components are big data analytics, Big Data Analytics, Artificial Intelligence, the Internet of Things (IoT), Digital Literacy, Fintech, Cybersecurity, ICT Human Resource Development, ICT Industry Development, and Research and Development. Organizations and governments can create a supportive ecosystem that enables digital transformation and drives economic growth by addressing these key components. In the context of ICT in rural and agricultural areas, it is acknowledged that these technologies offer numerous benefits to farmers and can contribute to sustainable agriculture and food security [9,10]. However, access to ICTs can be limited in rural areas, creating disparities for farmers. To address this issue, the Indonesian government is committed to promoting rural development and ensuring that all farmers, regardless of their location or socio-economic status, have access to and can benefit from ICTs. According to the Central Statistics Agency, in 2020, nearly 65% (54,297 out of 83,937) of villages in Indonesia were classified as rural. The Indonesian government has implemented various public policies to achieve sustainable national development, such as budget decentralization, government programs, and initiatives to develop rural areas.

The essence of development lies in implementing a process of social change and transformation, and technology plays a crucial role in determining the pace and extent of social change. The integration of technology often parallels the advancements in society. In Indonesia, the emphasis is placed on using Information and Communication Technology for rural development [11]. Rural communities have embraced and integrated this technology into various aspects of their lives. The government has taken initiatives to enhance the accessibility and connectivity of rural communities to ICT, including implementing the Base Transceiver Station Signal program in underprivileged areas. The COVID-19 pandemic has significantly impacted technology adoption, particularly in the context of health facilities and rural communities [12,13]. National policies aimed at mitigating the spread of the virus, such as remote education and work, have accelerated the adoption of ICT. The pandemic has driven a swift increase in the use of technology in rural areas, including in Indonesia. ICT empowers rural communities' development by enhancing the education system, governing community services, creating smart villages, promoting self-learning, and facilitating

collaboration in a connected society [14]. However, for a digital technology ecosystem to exist, stakeholders must make it available and understand its socio-cultural impacts.

The ICT ecosystem in rural areas encompasses innovative governance, electronic government services, technology convergence, information, and telecommunications applications [15,16]. Despite the potential benefits, stakeholders must approach the use of ICT in rural communities with caution, as it can disrupt social, economic, ethical, and cultural life and affect the health of rural communities [17]. This paper aims to analyze the Indonesian government's initiatives for constructing ICT infrastructure in rural areas and to gain an in-depth knowledge of ICT advancements in rural areas of Indonesia. Meanwhile, the ministry provides programs to enhance the digital skills and competitiveness of government and private sector leaders. These programs aim to increase their technical expertise and digital literacy, preventing the spread of negative content and optimizing the distribution of positive content. The ministry actively promotes digital literacy across Indonesia. They cover skill on digital, culture, ethics, and safety. Digital literacy empowers individuals to use hardware, software, and digital operating systems to improve productivity in everyday life while reflecting the national worldview (*Pancasila* or the official philosophical foundation of the Indonesian state) in the digital space and demonstrating Indonesian society's professionalism, integrity, and norms. Digital literacy increases individual awareness of personal data protection and digital security.

2 Method

This paper offers an exhaustive analysis of the Indonesian government's endeavors to establish ICT infrastructure in rural regions of Indonesia. An extensive examination of official Indonesian government documents was conducted to accumulate pertinent data, specifically focusing on the initiatives undertaken by the Telecommunication and Information Accessibility Agency and the Ministry of Information and Communication, Republic of Indonesia. Furthermore, this research engaged experts in the field of public policy, particularly those with expertise in rural development, to garner insights into the role of ICT in rural areas, thus enriching the depth of our understanding of this subject. By synthesizing insights from governmental sources and expert perspectives, our objective is to provide a comprehensive overview of the status of ICT development in rural areas of Indonesia and its potential ramifications for the local communities.

This paper presents a comprehensive analysis of the Indonesian government's initiatives to build ICT infrastructure in rural areas of Indonesia. To gather information, we thoroughly reviewed relevant Indonesian government documents detailing the efforts of the Telecommunication and Information Accessibility Agency and the Ministry of Information and Communication, Republic of Indonesia. Furthermore, we sought expert views on the role of ICT in rural areas to gain a more in-depth understanding of the subject. By combining these sources of information, we aim to provide a comprehensive overview of the status of ICT development in rural areas of Indonesia and its potential impact on the communities there.

3 Result and Discussion

Equations should be centered and numbered with the number on the right-hand side. Rural areas frequently need to catch up to urban areas regarding access to digital technology and infrastructure, a chronic problem in many countries. Governments worldwide have launched several projects to close the gap and encourage digital transformation in rural areas. The following suggestions can help the government's programs for digital transformation in rural areas: Invest more in digital infrastructure, train people in digital skills, support innovation

and entrepreneurship, encourage public-private collaborations, and promote community involvement. Information and Communication Technologies are crucial in empowering farmers and supporting sustainable agriculture. By providing access to information on best practices, market prices, weather forecasts, and other relevant data, ICTs can help farmers make better decisions.

In addition, ICTs facilitate communication between farmers, extension workers, and other relevant stakeholders, enabling sharing of knowledge and information. Furthermore, ICTs can help farmers connect with buyers and markets, giving them greater control over their product sales and potentially increasing their income. Using precision agriculture techniques, such as precision planting, irrigation, and soil management, farmers can manage their operations more efficiently with the help of ICTs. Finally, it can support the monitoring and managing of food supply chains, ensuring that food is produced and distributed sustainably, thus increasing food security.

Indonesia's digital economy has grown in double digits and positively contributed to the national economy. The E-commerce sector contributes the most to Indonesia's digital economy [18,19]. Southeast Asia Internet Economy, GMV in US$ Billions Economic Growth in Business Field [20]. The information and communication sector gained double-digit growth even during the pandemic [21]. The migration of physical activity to the digital space drives high demand for services and products from the sector.

The authors provide a summary of the presentation given by the President Director of the Telecommunication and Information Accessibility Agency at "*the 2nd ICT Rural Development Conference in 2021*" on 28th October 2021. His presentation focused on developing Indonesia's digital infrastructure in rural areas. To accelerate digital transformation in Indonesia, the Telecommunication and Information Accessibility Agency has identified five priorities. These include expanding high-speed internet access to all villages and sub-districts, developing a digital transformation roadmap for strategic sectors, establishing a National Data Center, preparing a digital talent pool, and consolidating the digital economy ecosystem to support online MSMEs. The agency has also defined four pillars to achieve digital transformation: digital infrastructure, digital government, digital economy, and digital citizen. To this end, Indonesia must build an inclusive digital infrastructure and connectivity with high-quality services, an open digital government to improve public services, and digital capabilities to enhance national competitiveness and economic growth.

The Telecommunication and Information Accessibility Agency is a Public Service Agency under Indonesia's Ministry of Information and Communication. Its main task is to provide ICT infrastructure and empower the ecosystem by managing the Universal Service Obligation fund collected from telecommunications networks and service operators. Starting in 2021, the Telecommunication and Information Accessibility Agency has also been entrusted with using state budget funds to build a digital culture that empowers, engages, and educates people in Indonesia. Broadband connectivity revolutionizes several crucial industries, including agriculture. It, in agriculture, enables efficient communication and access to information, resulting in higher productivity and profits.

The Digital Ecosystem Empowerment Program aims to provide digital facilitators and access to capital for small business owners, particularly in village mini markets or "*BUMDes-Mart*." The program also offers training for customer service, English language training for students and teachers, digital creativity training in graphic design and social media, and increasing human resources capacity for tourism business owners. Additionally, there is training for virtual tour guides, digital marketing for activity-based tourism, and farming digitization. Basic telecommunications network training is also provided for rural communities that run village mini markets as part of the "*Merajut Nusantara*" collaborative program with the Telecommunication and Information Accessibility Agency. "*Merajut*

Nusantara" is an Indonesian phrase that can be translated to "knitting the archipelago" in English. It often refers to efforts to connect and unite Indonesia's various islands and diverse cultures into a cohesive whole.

The Digital Connectivity Program by Telecommunication and Information Accessibility Agency-Ministry of Communication and Informatics) has four key initiatives aimed at improving connectivity in Indonesia. First, the Palapa Ring is a 12,229 KM backbone network connecting 90 remote regencies and cities using fiber-optic and microwave radio connections. Second, the digital ecosystem initiative seeks to increase productivity in remote areas by empowering and assisting communities utilizing the telecommunications infrastructure. Third, the Telecommunication and Information Accessibility Agency - Ministry of Communication and Informatics provides free internet access to public facilities across Indonesia, using various technologies such as fiber, radio link, VSAT, and Wi-Fi. As of quartile 2020, they have served 11,589 public facility locations. Finally, the Multifunction Satellite Satria project aims to provide broadband access to 150,000 locations not covered by terrestrial broadband services using High Throughput Satellite technology. The launch is scheduled for quartile 2023. Telecommunication and Information Accessibility Agency- The Ministry of Communication and Informatics has built an extensive digital infrastructure in Indonesia. The total length of the Palapa Ring and non-Palapa Ring networks is 458.941 km, with the Palapa Ring network spanning 12.229 km and the remaining 446.712 km belonging to various telecommunications operators. An additional 12.083 KM of Palapa Ring integration is planned for 2022-2023. Indonesia has a total of 83.218 villages, out of which 9.113 are in remote areas and 3.435 are in non-remote areas. 12.548 villages lack 4G coverage, while 70.670 villages have 4G coverage.

3.1 Discussion

Indonesia is undergoing a digital transformation and is developing an information society. Covid-19 pandemic is driving this digital transformation [21]. It means that the implementation of information society development has accelerated. The performance of this development is the commitment of the Indonesian government to the convention on the development of the Global Information Society in the WSIS Forum, Tunis, 2005 [22,23]. The government of Indonesia has made various efforts to build the Indonesian Information Society. One of the efforts is to change the institution of the State Ministry of Communication and Information (2001-2005), which was previously known as the Ministry of Information (1945-1999), to become the Ministry of Communication and Informatics (2005-2009). The Ministry of Communication and Information then changed its name to the State Ministry of Communication and Informatics (2009 to date). The ministry's tagline is: "*Towards the Indonesian Information Society*".

One of the essential functions of the Ministry of Communication and Informatics is to create open access to information and build and develop telecommunications infrastructure for the benefit of all citizens. The President of the Republic of Indonesia emphasized the Development of the Indonesian Information Society or "National Vision of Golden Indonesia 2045". It will be realized through the development of Industry 4.0. Industry 4.0 is a revolutionary concept that integrates digital and physical technologies seamlessly into all industrial operations. It includes using advanced technologies such as the Internet of Things (IoT), big data, robotics, artificial intelligence, cloud computing, and augmented reality. By leveraging these technologies, Industry 4.0 enables highly efficient, flexible, and responsive production to customer needs, with connected and integrated systems across supply and manufacturing chains. This concept also offers exciting possibilities for creating highly personalized products and new creative avenues in product design and production. In addition, Industry 4.0 presents an opportunity to create production systems that are more

sustainable and environmentally friendly, which is increasingly important in the face of climate change and other global challenges [24,25].

Developing Indonesian rural areas is vital to national development because most Indonesian regions are rural [26]. The problem of Developments in rural area development includes low population density, lack of adequate infrastructure, few job opportunities, and population movement to cities. One of the keys to digital transformation in rural areas is last-mile connectivity. Indonesia is already doing an excellent job of improving connectivity in rural areas. Second: Integrated Digital Services. Local governments provide government services through e-Government Facilities and Capacity Building. It is important because this technology allows the community to follow developments after delivering connectivity infrastructure and public services. Communities can follow developments at the same speed. Therefore, community development is key. The government must consider integrating various digital services, government services, e-health, etc., in one platform in addition to efficiency and reducing implementation costs. Various studies in the field of rural areas prove that the influence of mobile phones (access and connectivity) influences market integration. The government needs to concentrate resources on policymaking and reduce barriers to economic development.

4 Conclusion

The government must enhance the competitiveness of the Indonesian population in knowledge, technology, and digital expertise, necessitating the identification and cultivation of digital skills for both public and private sectors. Proficiency levels for each skill set need determination to effectively prepare the workforce for the digital age and empower them with the knowledge to navigate the digital landscape for economic progress. In rural development and digital transformation, human resource management in digital technology is essential, fostering collaboration between government and non-government entities. Economic actors in rural areas, such as Small and Medium Enterprises, farmers, and informal sector workers, require tailored skills development models. The government should incentivize civil society, including research centers and universities, to produce innovations benefiting rural communities, and local governments should formulate effective communication strategies for disseminating national priority programs. The Ministry of Communications and Informatics must address the digital divide in mountainous rural communities, as the higher digital index has disrupted traditional ways of life, necessitating inclusive digital development strategies. Establishing digital villages forms a solid foundation for successful village development. This paper conducts a comprehensive analysis of the Indonesian government's ICT infrastructure initiatives in rural areas, drawing from in-depth reviews of relevant government documents and expert perspectives to provide a holistic understanding of ICT development's status and potential impact on rural Indonesian communities.

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