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DIGITAL LITERACY INNOVATION FOR PUBLIC SERVICE PROVIDERS IN REMOTE, FRONTIER, AND OUTERMOST (3T) REGIONS

Rilit[1], Eny Haryati[2], Widyawati[3]
[1] Faculty of Administrative Sciences, Dr. Soetomo University, Surabaya
[2] Faculty of Administrative Sciences, Dr. Soetomo University, Surabaya
[3] Faculty of Administrative Sciences, Dr. Soetomo University, Surabaya
Email : rilit259@gmail.com [1], eny.haryati@unitomo.ac.id [2], widyawati@unitomo.ac.id[3]

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Abstract :

This study aims to analyze the factors influencing digital literacy among public service providers in underdeveloped, frontier, and outermost (3T) areas, particularly in Lumbis District, Nunukan Regency, North Kalimantan. The method used is a qualitative approach with a case study design, where data is collected through in-depth interviews, observations, and documentation from public service providers directly involved in the use of digital technology in the area. The results show that public service providers in Lumbis District face significant challenges in terms of low digital literacy and limited technological infrastructure, which hinder the implementation of e-government and digital-based public service applications. The main factors identified are the mismatch between human resource competencies and the tasks they carry, as well as limited internet access that hinders the digitalization process. The contribution of this study is to provide insight into the need for technology-based training relevant to local needs and the importance of improving infrastructure to support the successful digitalization of public services in 3T areas. This study also suggests the importance of collaboration between the government, universities, and the private sector to accelerate digital transformation in underdeveloped areas.

Keywords *: Digital Literacy; Public Services; 3T Regions; E-Government; Technology Infrastructure*

INTRODUCTION

With the rapid development of technology, the digital world has become an integral part of human life. The increasingly widespread digitalization process has brought significant changes to various sectors, including the public service sector..Fast, efficient and quality public services are now the hope and demand of the community, especially in areas that are trying to catch up in terms of infrastructure and technology.(Rizal et al., 2022)One of the government's efforts to respond to this is by encouraging the digitalization of public services throughout Indonesia..However, in underdeveloped, frontier, and outermost (3T) regions, the implementation of digitalization of public services still faces significant challenges, both in terms of human resources (HR), technological infrastructure, and access to adequate internet networks.(B & Anirwan, 2023) .Lumbis District, located in Nunukan Regency, North Kalimantan Province, is one of the areas facing various challenges in the development and implementation of technology-based public services. As part of the 3T (disadvantaged, frontier, and outermost) region, Lumbis District faces complex challenges in its efforts to improve the quality of public services,

particularly those related to digitalization.(Antika et al., 2025)Although Indonesia has entered the digitalization era in various sectors, the implementation of technology in 3T regions, including Lumbis, still faces many obstacles that hinder the digital transformation process in public services.(Arifin et al., 2025).

The first underlying issue is the mismatch between human resource competencies and the core duties and functions (tupoksi) they perform. In many regions, particularly in the 3T (frontier and remote) regions, public service providers often lack the skills to utilize digital technology in carrying out their duties.(Septian et al., 2022). Human resources in the 3T region still have difficulty operating various digital applications and systems that are expected to improve service quality. In addition, an analysis of ASN technical training needs revealed that approximately 35% or 1,365,000 of the 3.9 million civil servants working in the government showed poor competency and performance, which indicates that the competency of every ASN in Indonesia still does not meet expectations.(Azmi et al., 2025)Meanwhile, government digitalization supports Asta Cita by providing fast, efficient, high-quality, and equitable public services, as well as increasing public participation and secure data management, to create a more transparent and inclusive government.(Wahyuni et al., 2024).The second problem faced by public service providers in the 3T (frontier and remote) regions is the low level of human resource capacity in utilizing digital technology. Although technological devices such as computers, smartphones, and digital applications are readily available, not all public service providers have the necessary skills to utilize them.(Sebayang et al., 2024)This contributes to the slow adaptation process to introduced digital systems, such as e-government or digital-based public service applications. However, adequate digital literacy is crucial to ensuring that implementers can provide services that meet public expectations.(Siboro et al., 2025). In digital literacy theory, it is stated that an individual's ability to access, evaluate, and use information through digital technology effectively and ethically is very important in facing the information challenges in today's digital era.(Suwardhani, 2025).

As a concrete illustration, this research will focus on Lumbis District, Nunukan Regency, which is one of the areas in North Kalimantan that falls into the 3T category. This district faces various challenges related to the digitalization of public services. Therefore, this study aims to delve deeper into the factors influencing digital literacy among public service providers in the 3T region, particularly in Lumbis District. This research will also identify various innovations that can be implemented to improve digital literacy among public service providers in the region, so they can utilize technology to improve the quality and efficiency of public services.(Pitrianti et al., 2023).By understanding and addressing these problems, it is hoped that effective solutions can be found to improve the digital literacy of public service providers in the 3T region. The innovations that will be tested in this research are expected to not only help accelerate the digitalization process of public services in the 3T region but also help accelerate the digitalization process of public services in the 3T region.(Tombili et al., 2024). but can also reduce reliance on time-consuming

and costly manual systems. Furthermore, this research is also expected to make a positive contribution to the government's efforts to reduce the digital divide between developed and underdeveloped regions, as well as encourage the achievement of more efficient, transparent, and high-quality public services throughout Indonesia, particularly in the 3T regions.(Hasyyati et al., 2025).

RESEARCH METHOD

This research uses a qualitative approach with an in-depth case study design. This approach was chosen based on the need to explore the problem in detail and understand the specific local context, as well as to identify factors influencing digital literacy among public service providers in the 3T region.(Alaslan, 2023).The population in this study was all public service implementers working in Lumbis District, Nunukan Regency, who are involved in various types of public services implemented with digital technology. The research sample was selected using a purposive sampling technique, taking into account certain criteria, namely public service implementers who have been directly involved in the implementation of digital systems in the region. This sample consisted of government officials, administrative staff, and other public service officers who have experience or involvement in the use of digital technology in public services.Data collection was conducted through three main techniques: in-depth interviews, observation, and documentation. In-depth interviews were conducted with public service providers directly involved in the implementation of digital technology in Lumbis District. These interviews aimed to explore their experiences, challenges, and expectations regarding digital literacy in carrying out public service duties. Furthermore, observations were conducted to obtain firsthand information regarding the use of digital technology in public services and the daily work processes of public service providers in the field. Documentation in the form of reports, archives, and other documents related to the digitalization of public services in Lumbis District was also collected as additional reference material.(Vera Nurfajriani et al., 2024).

The research instruments used in this study were semi-structured interview guidelines, field notes for observations, and relevant documentation. The interview guidelines were developed based on the variables to be studied, namely the level of digital literacy of public service implementers, obstacles faced in using digital technology, and innovations and solutions that can be implemented to improve digital literacy. Field notes were used to record findings during observations, while documentation was used to obtain data related to digitalization policies and practices implemented by local governments.This research will be conducted in several stages. First, the preparation stage, which includes determining the research location, selecting samples, and developing research instruments. Second, the data collection stage, which includes in-depth interviews with public service implementers in Lumbis District, observations of the use of digital technology in public services, and the collection of documentation related to digitalization policies and implementation. Third, the data analysis stage, which will be conducted using thematic analysis techniques to identify key themes emerging from the

interview and observation data. The data obtained will be analyzed inductively to identify patterns related to the digital literacy of public service implementers and the factors that influence it.Data collected from interviews, observations, and documentation will be analyzed using thematic analysis techniques. This technique allows researchers to identify key themes related to the digital literacy of public service providers in Lumbis District. This thematic analysis process is carried out by categorizing data based on relevant topics, such as human resource competency levels, barriers to digital technology use, and potential innovations that can improve digital literacy. The results of this thematic analysis will be used to answer the research questions and provide recommendations regarding innovations that can be implemented to improve digital literacy among public service providers in the 3T (frontier and outermost) areas.To ensure the validity and reliability of this research, the researcher will use data triangulation, which includes triangulation of sources, techniques, and theories. Source triangulation is carried out by collecting data from various sources, namely interviews with public service implementers, field observations, and documentation related to digitalization policies. Technical triangulation is carried out using various data collection techniques, namely interviews, observations, and documentation. Theoretical triangulation is carried out by connecting the findings in this research with relevant theories, such as digital literacy theory and technology theory in public services.

FINDINGS AND DISCUSSION

This study aims to explore the factors that influence the digital literacy of public service providers in underdeveloped, frontier, and outermost (3T) areas, with a case study in Lumbis District, Nunukan Regency, North Kalimantan. The results of this study reveal significant challenges faced by public service providers in 3T areas, particularly in Lumbis District, in dealing with the mismatch between human resource competencies and the tasks they carry out in the digital era. The main findings indicate that low digital literacy, coupled with limited technological infrastructure, hinders the implementation of fast, efficient, and transparent digitalization of public services, despite government efforts to adopt technology.(Fachrudin, 2025).

Mismatch of HR Competencies with Duties and Functions

One of the main challenges identified in this study is the mismatch between the competencies of human resources (HR) implementing public services and the main tasks and functions (tupoksi) they carry out. In Lumbis District, the majority of public service implementers lack the skills to operate the digital technology used in the public service system. Field findings indicate that some public service implementers still have difficulty operating basic software such as Microsoft Word and other digital applications frequently used in administrative tasks. This indicates a low level of digital literacy among human resources involved in providing technology-based public services. This indicates a gap between the expectation of using technology in public services and the reality on the ground, where implementers still struggle to utilize existing technological applications or devices.(Pangestu & Isnawaty, 2025).This

fact reflects what is referred to in digital literacy theory, which emphasizes the importance of an individual's ability to access, evaluate, and use information through digital technology in an effective and ethical manner. Without adequate digital literacy, public service providers in Lumbis District cannot utilize technology to accelerate, improve efficiency, and make public services more transparent. This limited competence also hampers the government's efforts to introduce rapid and efficient digitalization of public services.(Ebyatiswara Putra et al., 2023) .

Limited Technology Infrastructure

One contributing factor to these difficulties is limited technological infrastructure, particularly uneven and unstable internet access. In many 3T (frontier and remote) areas, including Lumbis District, poor internet network quality hampers the implementation of digital-based public service systems. Most public service providers struggle to access applications or systems that require a stable internet connection. This limitation requires them to move or seek signal from other network providers, resulting in delayed and inefficient service delivery. This not only hinders the effectiveness of service providers but also harms the public who rely on digital-based public services for various administrative matters.In the context of digitalization, solid infrastructure is one of the main pillars supporting the successful implementation of technology, as explained in TOGAF (The Open Group Architecture Framework). Good technology infrastructure, which includes a stable network, adequate hardware, and efficient data storage systems, enables organizations to implement digital solutions smoothly and optimally. Without supporting infrastructure, even advanced technology will not be effective, because limited physical resources can hinder the accessibility and performance of digital applications, which ultimately reduces the efficiency and quality of service expected from digitalization.(Judge, 2026).Therefore, TOGAF emphasizes the importance of thorough infrastructure planning and management within an enterprise architecture framework so that technology implementation can be well integrated into business processes. Good infrastructure is one of the keys to successful technology implementation in public services. Without adequate infrastructure, including a fast and stable internet connection, digitalization initiatives will face significant obstacles. This is one of the main obstacles to the development of e-government in the 3T regions.

Digital Literacy as a Factor Inhibiting and Driving Service Quality

The study also found that low digital literacy is not only limited to the technical ability to operate devices, but also to an understanding of how technology can be used to improve service quality. Most public service providers in Lumbis District do not know how to optimize existing applications. Therefore, even though an e-government system has been introduced, its use remains limited and does not produce optimal results. Public service providers in Lumbis District, consisting of more than 20 people, experience difficulties inputting data into existing government systems, with approximately 60% of them admitting to lacking basic skills in operating the information system applications used. As a result, the data input process is often delayed and inaccurate, hampering the efficiency and quality of public

services in the area.Low digital literacy results in an inability to utilize technology to obtain information efficiently and accurately, which should accelerate service processes and increase transparency. Digital literacy theory emphasizes that digital literacy is not only about technical skills, but also about an individual's ability to access, analyze, and use information in a broader context. In this regard, public service implementers in Lumbis District need to be trained to optimize the use of digital technology to provide services that meet public expectations. Therefore, efforts to improve digital literacy must encompass not only technical aspects, but also cognitive and social aspects in using technology for better public services.

Digital Literacy Innovation

One important innovation found in this study is that the Regent of Nunukan has issued a Circular Letter (SE) permitting the use of Village Funds to support further studies for public service providers in his area. This policy aims to increase the capacity and skills of human resources, particularly in the fields of technology and management, in order to improve the quality of public services in Nunukan Regency. Furthermore, the need for collaboration between the Lumbis District Government and universities in community service programs is crucial to increasing the digital capacity of public service providers in the area. Through this collaboration, digital capacity building materials can be developed to encourage digital literacy, which will accelerate the implementation of technology in public services and improve the efficiency of administrative work in Lumbis District.The training program is tailored to the needs of public service providers in the 3T (frontier and outermost) areas. Current training tends to be general and does not take into account the level of understanding and local conditions in these areas. Therefore, more flexible and accessible technology-based training is crucial. This training must be accessible to providers anytime and anywhere, for example through mobile applications or online modules accessible through existing devices. The importance of locally relevant training is also in line with literature findings showing that training programs tailored to local contexts are more effective in improving individual digital competency. Application-based training programs or online platforms will also reduce existing physical and geographic barriers, allowing providers to improve their skills without having to leave their workplace or being hindered by time and cost constraints.

Recommendations for Improving Technology Infrastructure

Improving the quality of technological infrastructure is another essential step to support the digitalization of public services. Based on the findings of this study, low-quality technological infrastructure, particularly unstable internet access, significantly hampers the implementation of e-government and public service applications. Therefore, improving infrastructure, such as satellite-based internet networks or 4G/5G in 3T (third-territory) areas, will significantly help address this issue. Collaboration between the Lumbis District Government and service providers is crucial to improving the quality of the internet network in the region. This collaboration is expected to provide a stable and fast internet connection, supporting a more efficient and optimal implementation of digital public services in Lumbis District. Providing devices

that better meet the needs of public service providers is also a crucial aspect that requires greater attention.(Rachmatullah & Purwani, 2022).The role of infrastructure in the successful implementation of e-government is highly relevant and interconnected, as solid infrastructure is the primary foundation for running an efficient and effective digital system. Technological infrastructure, which includes a stable internet network, adequate hardware, and a secure data storage system, enables technology-based administrative processes and public services to run smoothly. Without good infrastructure support, e-government implementation will encounter technical obstacles such as slow access, system disruptions, and operational difficulties that can reduce the quality of public services. Therefore, ensuring that the infrastructure is supportive is a crucial step to ensure that the implemented technology can provide maximum benefits, accelerate the service process, and increase transparency and accountability in government. Without adequate infrastructure, the implementation of digital technology will be hampered, and communities in 3T areas will not experience the full benefits of digitalized public services.

CONCLUSION

This study highlights the importance of digital literacy in improving the quality of public services in the 3T (Underdeveloped, 3T) regions, particularly in Lumbis District, Nunukan Regency. Limited human resource competencies, inadequate to operate digital technology, and low-quality technological infrastructure, such as unstable internet access, are major obstacles to the implementation of digitalization of public services. Therefore, increasing digital literacy through relevant, technology-based training, and improving technological infrastructure, such as a stable internet network, are crucial steps to improve the efficiency, transparency, and quality of public services in the 3T (Underdeveloped, 3T) regions. Possible innovations, such as collaboration with universities and internet service providers, and the use of Village Funds for further study, are expected to support the capacity building of public service implementers in managing technology and providing better services to the public.Based on the results of this study, it is recommended that the Lumbis District government collaborate with universities to develop community service programs that can improve the digital literacy of public service providers. Furthermore, it is crucial to strengthen the technology infrastructure by partnering with service providers to improve the quality of the internet network in Lumbis District. The government is also advised to accelerate the implementation of technology-based training that is accessible to public service providers in the 3T (frontier and outermost) areas, flexible and tailored to local needs.Further research could delve deeper into the impact of digital literacy training programs on improving public service performance in the 3T (frontier and lower-middle-class) regions. Furthermore, further study of technological innovations that can be implemented in underdeveloped regions to address infrastructure challenges is also urgently needed. Research examining the implementation of e-government in 3T (frontier and lower-middle-class)

regions and evaluating existing digitalization systems will provide deeper insights into the success factors and challenges of digital transformation in the public sector.

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