



IMPROVING DIGITAL LITERACY OF VILLAGE OFFICIALS TO CREATE SMART VILLAGES AND IMPACTFUL PUBLIC SERVICES

Sunaryanto¹, Eny Haryati², Sapto Pramono³

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 : sunaryantoy972@gmail.com

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Abstract :

Unequal data security and digital literacy among village officials are major obstacles to the digitalization of public services at the village level. This study aims to analyze the digital literacy of village officials and examine its relationship with technology acceptance and the implementation of impactful public services towards a smart village. The study used a mixed methods approach with a sequential explanatory design. The study population was village officials in Blitar Regency, East Java; a quantitative sample of 80 officials from eight villages, supplemented by 14 qualitative informants. Quantitative data were collected through a Likert-scale questionnaire and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), a statistical technique for testing relationships between variables; qualitative data were analyzed thematically and integrated to explain quantitative findings. Descriptive results show the highest perception of technology usefulness (average 4.06), while digital security was the lowest (2.96). PLS-SEM results prove that digital literacy has a positive and significant effect on perceived ease of use ($\beta=0.639$) and perceived usefulness ($\beta=0.547$). Both encourage system use, which subsequently has a strong influence on impactful public services ($\beta=0.614$). However, perceived ease of use did not significantly influence perceived usefulness. This finding confirms that human capabilities, not simply the availability of technology, determine the quality of digital services. The study concludes that strengthening digital literacy is a strategic lever for realizing smart villages and impactful public services, which requires support from tiered training, data security standards, and inclusive mentoring.

Keywords : digital literacy, village apparatus, smart village, public services, technology adoption

INTRODUCTION

Digital transformation has become a strategic agenda for government administration at all levels, but its penetration at the village level still faces serious disparities. Indonesia has 75,753 villages, according to the Village Potential update released by the Central Statistics Agency (2024), placing villages at the forefront of public services that directly impact citizens' lives. However, the digital readiness of Indonesians is not evenly distributed. The Indonesian Digital Society Index (IMDI) only reached a score of 43.34 in 2024—a slight increase from 37.80 in 2022—with the empowerment pillar as the lowest dimension at 25.66, reflecting disparities in digital access and skills between urban and rural areas (Ministry of Communication and Digital, 2024). The slow growth of this index indicates that the problem of village digitalization does not stop at infrastructure provision but is rooted in low human resource capabilities.



Pratama et al. (2025) found that digital literacy among village officials remains low, particularly in operating population administration applications, data security, and optimally utilizing information technology. Similar findings were reported by Artamevia et al. (2026) and Sari et al. (2026), who identified limited human resources for system management as a major obstacle to achieving a smart village. As an illustration, the innovation of online population document services in Mendalo Darat Village has been proven to reduce the burden on residents who previously had to travel long distances to the central government office, but its sustainability remains hampered by limited system management personnel (Sari et al., 2026). From this fact, the formulation of this research problem was born: why has strengthening digital literacy among civil servants not been effective, and how its improvement can create a smart village and impactful public services. A research gap is apparent, namely that the majority of previous studies have focused on aspects of technology, infrastructure, or village websites (Artamevia et al., 2026; Devianty et al., 2025), while the dimension of human capability as a driving actor of transformation has been less thoroughly studied and rarely directly linked to technology acceptance theory.

This research is built on three complementary theoretical foundations. First, the concept of digital literacy, which goes beyond the technical ability to operate devices, encompasses four pillars—digital skills, digital culture, digital ethics, and digital security—as competencies that officials must possess to provide safe and responsible services (Pratama et al., 2025; Siddik et al., 2026). Second, the Technology Acceptance Model (TAM), which explains that the acceptance and use of technology are determined by perceived usefulness and perceived ease of use (Davis, 1989). In the context of government, Anggraeni and Alijoyo (2025) demonstrated that technological awareness and government support significantly strengthen these two perceptions, thus encouraging the adoption of digital services. Third, the concept of smart villages as a strategy for utilizing information and communication technology to narrow the gap between rural and urban development, the success of which depends on multi-stakeholder collaboration and strengthening human resource competencies (Devianty et al., 2025). These three theories position the digital literacy of civil servants as an intermediary variable linking the availability of technology to the quality of public services actually experienced by the public. The combination of these three theories allows research to examine the phenomenon holistically, from civil servant competency readiness, technology adoption processes, to impactful service outcomes.

The novelty of this research lies in the integration of these three frameworks into a single model that positions the digital literacy of village officials—rather than infrastructure or applications alone—as the primary lever for smart villages and impactful public services. Previous research has tended to treat digital literacy and technology acceptance separately. Siddik et al. (2026) demonstrated the effectiveness of training that increased the psychomotor competence of village officials from 48.0 to 87.5, but did not link it to the technology acceptance framework; conversely, Anggraeni and Alijoyo (2025)

tested the TAM without focusing on village officials. This research fills this gap by positioning the notion of “impactful public services” – that is, services that are not only available digitally but whose benefits are truly felt by residents – as the measured outcome. Thus, this research offers a new perspective that simultaneously connects human capacity building, technology adoption, and social impact, something that has not been widely explored in the digital village governance literature in Indonesia.

Based on this background, this study aims to analyze the current state of digital literacy among village officials; identify factors driving and inhibiting its improvement; formulate effective and contextual strategies for strengthening digital literacy; and examine the relationship between improving digital literacy among village officials, realizing smart villages, and creating impactful public services. These four objectives are structured in a hierarchical manner so that the research findings do not stop at describing the problem but instead generate applicable recommendations for stakeholders.

Theoretically, this research is expected to enrich the study of public administration and digital village governance through the integration of digital literacy theory, the Technology Acceptance Model, and smart villages, which have rarely been combined within a single analytical framework. Practically, the research results can serve as a reference for village governments in developing apparatus capacity development programs, for regional governments and relevant ministries in designing targeted village digitalization policies, and for the community as direct beneficiaries of faster, more transparent, and accountable public services (Sari et al., 2026). More broadly, strengthening apparatus digital literacy is also in line with the national priority of developing smart villages and digital-based bureaucratic reform. Thus, this research contributes not only to the development of science but also to tangible improvements in the quality of services at the village level as one of the foundations of national development.

RESEARCH METHOD

This study employed a mixed methods approach with a sequential explanatory design. The quantitative phase was conducted first to examine the relationships between variables, followed by a qualitative phase to explain why these relationships occurred (Creswell & Creswell, 2018). This design was chosen based on the dual research objectives: to analyze the digital literacy status of village officials and to examine its relationship to the realization of smart villages and impactful public services. Quantitative data provides a measurable picture of the strength of the relationship, while qualitative data provides context and meaning that cannot be captured by numbers. The combined approach was also chosen because the issue of digital literacy among village officials is multidimensional, making it inadequate to approach it solely from a single data type.

The research was conducted in several villages across Blitar Regency, East Java Province, between February and May 2026. The locations were selected

purposively, considering that these villages were implementing service digitization programs but had varying levels of human resource readiness, allowing for meaningful comparisons between locations. Each stage of the research was systematically documented to maintain process traceability.

The population in the quantitative phase was all village officials in the selected locations. Sampling was conducted using total sampling if the number of officials was limited, or purposive sampling, with the criteria being those directly involved in the operation of the digital service system. In the qualitative phase, informants were determined purposively and consisted of the village head, village secretary, village information system operator, and residents as service recipients, with the number adjusted until data saturation was reached. This procedure ensured that each data source represented the diversity of roles within the village service ecosystem.

The variables measured included digital literacy of village officials, broken down into four pillars—skills, culture, ethics, and digital security—as well as variables derived from the Technology Acceptance Model, namely perceived usefulness, perceived ease of use, actual system use, and quality of public service as impact variables (Davis, 1989; Pratama et al., 2025). The primary instrument for the quantitative stage was a closed-ended questionnaire with a five-point Likert scale, while the qualitative stage used semi-structured interview guidelines, observation sheets, and document review guides. Each indicator was structured operationally so that it could be measured consistently and traced back to the theoretical foundation used.

Data collection was conducted using four complementary techniques. Questionnaires were distributed to village officials to obtain data on perceptions and digital literacy levels. In-depth interviews were used to explore processes, barriers, and strategies for strengthening digital literacy. Observations were conducted of digital-based service practices at village offices, while documentation examined administrative data, reports, and service archives for supporting evidence. The questionnaire distribution was preceded by a pilot test of the instrument on a small number of respondents outside the main sample to ensure readability and item accuracy.

Before use, the quantitative instruments were tested for validity and reliability. Convergent validity was assessed through factor loading values and average variance extracted, while reliability was measured using Cronbach's alpha and composite reliability. The validity of qualitative data was maintained through source and technique triangulation, namely comparing the results of interviews, observations, and documentation to ensure consistency of the findings. Furthermore, member checking was conducted by reconfirming the interpretations with several key informants to increase the credibility of the findings.

Quantitative data analysis used descriptive statistics to map digital literacy conditions, followed by Partial Least Squares-based Structural Equation Modeling (PLS-SEM) to examine relationships between variables and measure the influence of digital literacy on technology adoption and service quality (Hair

et al., 2022). Qualitative data were analyzed using an interactive model that included data reduction, data presentation, and conclusion drawing (Miles et al., 2014). In the final stage, quantitative and qualitative findings were interpreted in such a way that the interview and observation results explained and strengthened the relationship patterns found in the statistical analysis, following the logic of sequential explanatory design. This integration resulted in conclusions that not only indicated the presence or absence of influence but also explained the mechanisms and context behind it, so that the resulting recommendations were applicable to village governments.

FINDINGS AND DISCUSSION

The study involved 80 village officials spread evenly across eight anonymous villages (Villages A-H, ten respondents each) in Blitar Regency, with an average age of 41.1 years and 8.1 years of service. Most respondents had a high school/vocational high school education (40.0%) and a bachelor's degree (32.5%), while 53.8% had participated in digital training. The composition of positions included village head, village secretary, village information system operator, head of affairs/section head, service staff, and hamlet head, thus depicting actors directly and indirectly involved in digital services. The results of the descriptive analysis in Figure 1 show that the perception of usefulness obtained the highest score (average 4.06), while digital security was the lowest construct (2.96) and the only literacy dimension below the high category threshold along with digital culture (3.39). This pattern confirms that officials were aware of the benefits of technology long before practicing adequate data security.

Gambar 1. Rata-rata Skor Konstruk Literasi Digital, Penerimaan Teknologi, dan Pelayanan Publik (n = 80)

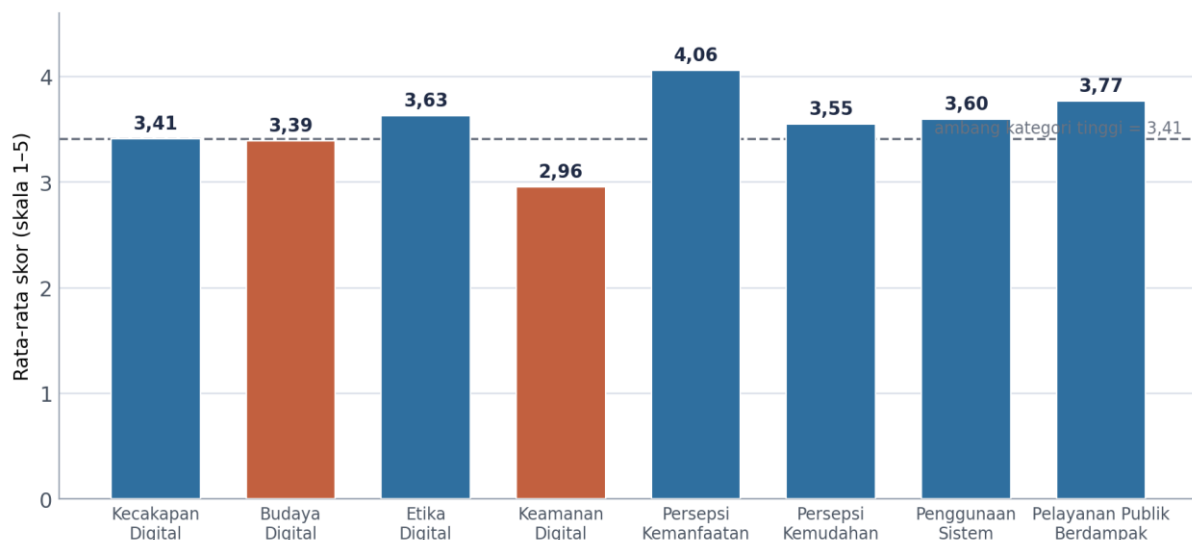


Figure 1. Mean construct scores (n = 80)

Before testing the relationships between variables, the quality of the measurement model was examined. All items had factor loadings above 0.86, with an average variance extracted (AVE) ranging from 0.75–0.82, a composite reliability (CR) of 0.92–0.95, and a Cronbach's alpha of 0.89–0.93 (Table 1). These

values exceed the recommended thresholds of $AVE \geq 0.50$ and $CR \geq 0.70$ (Hair et al., 2022), thus meeting convergent validity and reliability. The second-level construct of Digital Literacy, formed from four pillars, had an AVE of 0.59 and a CR of 0.85, with pillar loadings of 0.73–0.81. The Fornell-Larcker test showed that the root of the AVE for each construct was greater than its correlation with other constructs, thus meeting discriminant validity.

Table 1. Summary of Measurement Model

Construct	AVE	CR	Cronbach's α	Information
Digital Skills	0.824	0.949	0.928	Valid & reliable
Digital Culture	0.804	0.942	0.919	Valid & reliable
Digital Ethics	0.819	0.948	0.926	Valid & reliable
Digital Security	0.800	0.941	0.918	Valid & reliable
Perception of Benefit	0.801	0.941	0.917	Valid & reliable
Perception of Ease	0.752	0.924	0.889	Valid & reliable
System Usage	0.810	0.945	0.922	Valid & reliable
Impactful Public Services	0.786	0.936	0.908	Valid & reliable
Digital Literacy (2nd order)	0.591	0.853	–	Valid & reliable

Testing of the structural model using PLS-SEM with bootstrapping of 1,000 subsamples is presented in Figure 2 and Table 2. Digital literacy has a positive and significant effect on perceived ease of use ($\beta = 0.639$; $t = 10.39$) and perceived usefulness ($\beta = 0.547$; $t = 4.53$). Perceived ease of use ($\beta = 0.530$; $t = 7.17$) and perceived usefulness ($\beta = 0.400$; $t = 4.40$) both significantly influence system usage, which in turn strongly influences impactful public services ($\beta = 0.614$; $t = 7.93$). The model explains 40.9% of the variance in perceived ease of use, 54.6% in system usage, and 37.7% in impactful public services, while perceived usefulness only explains 23.8%, indicating the existence of other factors beyond ease that shape these perceptions. These findings position digital literacy as a key driver across the adoption chain, strengthening the argument that human capabilities – not simply the availability of technology – determine service quality.

Table 2. Structural Model Test Results (bootstrap 1,000 subsamples)

Path Relationship	Coef. (β)	t	p	Decision
Digital Literacy → Perception of Ease	0.639	10.39	<0.001	Significant
Digital Literacy → Perception of Usefulness	0.547	4.53	<0.001	Significant
Perceived Ease → Perceived Usefulness	–0.102	0.81	0.418	Not significant
Perceived Ease → System Usage	0.530	7.17	<0.001	Significant
Perceived Usefulness → System Usage	0.400	4.40	<0.001	Significant
System Usage → Public Services Impact	0.614	7.93	<0.001	Significant

Gambar 2. Model Struktural PLS-SEM: Literasi Digital → Penerimaan Teknologi → Pelayanan Publik Berdampak

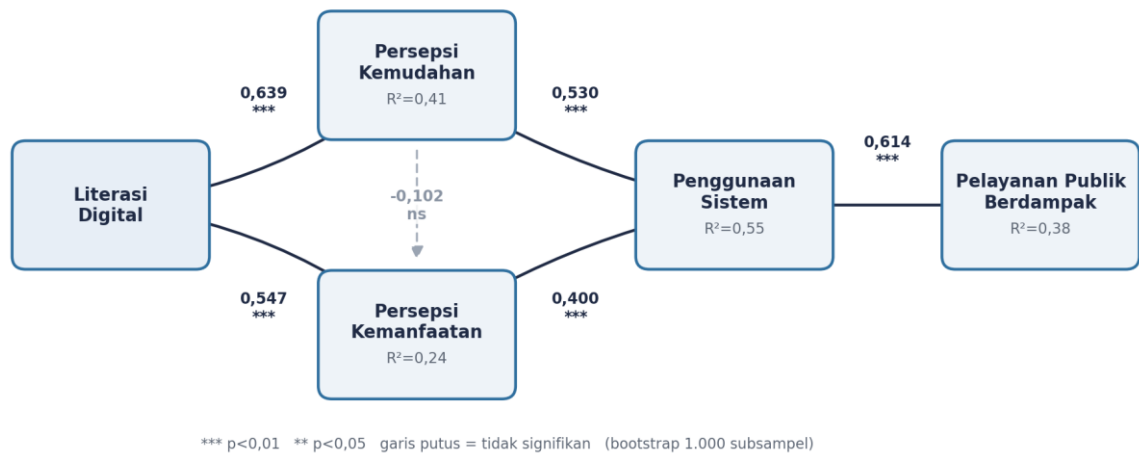


Figure 2. PLS-SEM structural model

One path was insignificant, namely the relationship between perceived ease of use and perceived usefulness ($\beta = -0.102$; $p = 0.42$). This finding deviates from the classic Technology Acceptance Model, which states that ease of use contributes to perceived usefulness (Davis, 1989), and differs from the context of digital service adoption by citizens (Anggraeni & Alijoyo, 2025). The explanation is evident in the qualitative data: for village officials, the benefits of technology are determined more by digital literacy competency than by ease of interface, as expressed by operators who received work transfers (I03) and officials who experienced efficiency after mastering the system (I05, I07). The difference in context between internal users (officials) and external users (citizens) is an important note for the implementation of TAM in the village government environment.

The integration of quantitative and qualitative data strengthens the interpretation. Low digital security (2.96) is consistent with shared account practices, insecure password storage, and personal WhatsApp use without data protection SOPs (I06, I12, I14). Moderate system usage is explained by a hybrid service pattern—electronic documents are still printed because officials do not yet fully trust digital storage (I02)—as well as operator dependence and network disruptions (I10). Positive service impacts (3.77) are confirmed by residents' experiences regarding speed and ease of access (I07, I13), but are not yet inclusive for senior citizens (I09). This inequality between literacy pillars confirms that digital literacy cannot be treated as a single competency, but rather a cluster of capabilities that need to be selectively strengthened. This pattern is consistent with the five smart village barriers identified by Devianty et al. (2025) and the low digital literacy of officials reported by Pratama et al. (2025) and Sari et al. (2026).

Theoretically, these results enrich the application of the Technology Acceptance Model to the context of internal government users. Contrary to the common assumption that ease of use precedes usefulness, the findings indicate

that digital literacy is the dominant antecedent, directly shaping both perceptions. By positioning digital literacy as a second-level construct linking human competence, technology acceptance, and service impact, this study confirms that the realization of smart villages at the village level rests on human resource readiness, not solely on system availability. This integrated framework provides a replicable model for evaluating the digital readiness of other villages with similar characteristics.

Thus, strengthening digital literacy is the most strategic lever: because it influences perceptions of both ease and usefulness, interventions in apparatus competency will ripple throughout the service chain, ultimately impacting service delivery. A relevant strategy is tiered, task-based training, proven to improve village officials' competency (Siddik et al., 2026), coupled with the implementation of digital security standard operating procedures, individual accounts, and mentoring that maintains service inclusivity. This combination is a prerequisite for digitalization to not stop at the availability of applications, but to truly realize smart villages and public services that impact village communities in Blitar Regency.

CONCLUSION

This study concludes that improving digital literacy among village officials is a key factor in realizing smart villages and impactful public services in Blitar Regency. Descriptively, digital literacy among village officials is categorized as moderate to high but uneven: the perception of technology usefulness is the most prominent (4.06), while digital security is the weakest point (2.96). PLS-SEM results demonstrate that digital literacy has a positive and significant influence on perceptions of ease of use and usefulness, which in turn encourage system use and lead to impactful public services. This series of influences confirms that human capabilities not simply the availability of technology determine the quality of village digital services. Interestingly, ease of use was not proven to shape usefulness, so for internal government users, the benefits of technology are determined more by digital literacy competency than by ease of interface.

Answering the research objectives, the actual condition of digital literacy is still unequal between pillars and between positions; the main inhibiting factors are weak digital security, dependence on operators, hybrid service patterns, and network disruptions; while relevant strengthening strategies are tiered, task-based training, the implementation of standard operating procedures for security and data protection, the use of individual accounts, and mentoring that maintains the inclusiveness of services for vulnerable groups. Theoretically, this research enriches the application of the Technology Acceptance Model in the context of government apparatus by placing digital literacy as the dominant antecedent, while practically the findings serve as a reference for village and regional governments in designing targeted capacity building programs.

This study has limitations, including the relatively small number of respondents (80 devices from eight villages) and the coverage of a single district.

Therefore, generalization of the findings should be done with caution. Future research is recommended to expand the sample size and locations, add variables such as leadership support and infrastructure quality, and test the model longitudinally to capture changes in digital literacy and the impact of services over time.

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