

Article

Digital technology adoption for village public administration—Evidence from Indonesia

Tunggul Sihombing^{1,*}, Roy Deddy Hasiholan Lumbantobing²¹ Faculty of Social and Political Science, Universitas Sumatera Utara, Medan, North Sumatera 20155, Indonesia² Faculty of Vocational, Institut Teknologi Del, Toba, North Sumatera 22381, Indonesia* **Corresponding author:** Tunggul Sihombing, tunggul@usu.ac.id

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Abstract: Village administration in Indonesia has changed its scope and operation with the integration of digital technology into public services at various levels. These conditions prompt questions about the successful digital transformation of public administration services. Digital transformation encompasses not only technological aspects but also socio-cultural factors. This paper reports the study related to implementing ICT-based applications in village administration policy in Indonesia. The study involved 315 village officials from 167 villages in 16 sub-districts within Toba district, North Sumatera province. A village administration software prototype was developed and introduced to the villages' officials during the study. This study aims to gain insights from the officials' response regarding digital technology-supported village administration. The research revealed that many village officials must gain the necessary knowledge and skills to conduct administrative tasks digitally, as they still rely on traditional, non-digitized methods. Recommendations include increased support and assistance from the Regency Government to help villages understand and implement digital administration and capacity-building activities to familiarize village officials with ICT advancements. The study also found that digital transformation in village administration remains challenging, with digitization and digitalization processes often overlooked. Addressing these challenges requires additional training and improved infrastructure availability. Finally, we propose a conceptual model of digital transformation for public administration at village level as generic components for digital implementation of village administration.

Keywords: village administrative; public administration; village fund; e-governance

1. Introduction

The advancements in digital technology have had a profound impact on various aspects of human life. Individuals can utilize digital services offered by the private sector to simplify and enhance their daily routines. A notable example in Indonesia is the ride-hailing application, which enables easy access to transportation, facilitates purchasing goods with delivery services, and even allows for topping up phone or electricity credits (Almunawar et al., 2021; Irawan and Belgiawan, 2023; Olayode et al., 2023). Additionally, e-commerce applications streamline the process of purchasing goods, eliminating the need to physically visit brick-and-mortar stores for transactions. Through the use of smartphones, people can access product catalogs, read product reviews, place orders, make payments, and track the delivery of their ordered items (Molla and Heeks, 2007; Roggeveen and Sethuraman, 2020). Thus, the availability of these numerous digital technology-based services has raised public expectations for receiving government services that leverage the convenience offered by digital

technology. Digital technology is recognized as a catalyst for enhancing public services (Kostka, 2023).

Meanwhile, government administration is integrating digital technologies to enhance public services, improve efficiency, and foster better communication with citizens and businesses. These technologies facilitate the adaptation of public administration models to reflect societal realities, paving the way for the emergence of a “smart state” that employs innovative approaches to economic regulation and planning (Meijer and Bolívar, 2016; Unynets-Khodakivska et al., 2023; Venkatesh et al., 2016). The incorporation of digital technologies into public administration has the potential to generate positive outcomes, such as improved access to public services, a greater focus on consumer needs, and increased citizen engagement in decision-making and oversight (Decman, 2021). Nevertheless, the process of government digital transformation has its challenges and risks, including the imperative to develop further the legal and regulatory framework underpinning digitalization efforts.

The use of digital technology in public services facilitated by the government is often referred to as e-government (Lean et al., 2009; Magro, 2012; Revyakin and da Rocha, 2021). The technology used starts from the use of websites for information dissemination to mobile applications that make it possible to serve various services expected from public servants. Several examples of the implementation include growing initiatives in Indonesia that implement ICT-based public administration (Siahaan and Sihombing, 2018) or the recent creation of the PeduliLindungi application by the Indonesian government, which was initiated as part of a policy to control the spread of the COVID-19 virus (Darmawan and Lussak, 2022). The latter example is still in use even though the number of daily cases has decreased. A popular feature of this application, apart from providing access to pandemic trend data, is that it also acts as a vaccination certificate and barcode scanning app, which is a requirement to enter public places.

However, it is necessary to revisit the process of adoption and diffusion of digital technology, especially those used for the provision of public services. The implementation of e-government is a complex process and often needs to go according to plan. The transformation carried out by utilizing this technology has various challenges, such as the utilization investigation conducted in Russia (Revyakin and da Rocha, 2021), challenges reported in the case in Uzbekistan (Kuldosheva, 2021), and a recent study that explored barriers along with the strategies to achieve digital government (Wilson and Mergel, 2022). It is necessary to investigate the use of digital technology for public services in Indonesia and the implementation process.

Moreover, the implementation of digital technology can be carried out at the level of digitization, digitalization, and digital transformation (Mergel et al., 2019). These three concepts are essential to distinguish the adoption of digital technology in particular public services. In addition, digital-based innovations for public services can also be categorized based on this scope of the adoption for planning purposes.

Villages are the primary form of local government in Indonesia, which is regulated in accordance with Law No. 6 of 2014 concerning Villages. The administration of the village has already been regulated in the Minister of Home Affairs Regulation Number 47 of 2016 concerning Village Government Administration. Moreover, the Indonesian government is committed to supporting and

empowering villages by providing village funds by issuing Government Regulation Number 60 of 2014 concerning Village Funds. The so-called “Dana Desa” is sourced from the State Revenue and Expenditure Budget (Anggaran Pendapatan dan Belanja Negara/APBN). Currently, villages have greater flexibility in managing administrative activities, public services, and implementing programs for community welfare because of fund availability. However, more research is necessary to investigate how public services have been improving and how village administrations have been using digital technology to support the process.

The objective of this paper is to assess the extent of the adoption of digital technology, particularly within village-level public services. This study presents the results derived from a case study involving a software prototype designed for village administration, which was utilized to gauge the responses of officials with respect to digitally-supported village administration. Additionally, this research delves into the methods employed for implementing digital technology, the accomplishments achieved, and the hurdles encountered during the implementation process. These insights can serve as valuable inputs for shaping policies aimed at fostering the integration of digital technology into village-level public services.

The paper is organized as follows. The first part explains the research methodology; the next section explains the study case for this research; the third section presents the results and discusses the findings; and lastly, the fourth section presents the conclusion and recommends future research topics.

2. Literature review

The adoption of digital technology comes with stages of implementation, which have different scopes and magnitudes towards the implementation (Mergel et al., 2019) namely digitization, digitalization, and digital transformation to understand the scale and scope of each concept. Digitizing village population registration from analog format using the paper form to become performed by having an office application in the computer is different in concept if compared with the shift in the traditional ride-hailing business process caused by the existence of digital applications that can transmit and process the transaction in digital format. Changes in behavioral patterns and more significant affected aspects come in digital transformation, instead in digitalization or even less in digitization. A better understanding of the different options available beforehand can adequately equip the government to perform digital transformation.

Digital transformation is considered an act to remodel, reorganize, modify, reorder, or eventually revolutionize the value creation process by applying digital technology as the key ingredient to the process (Hinings et al., 2018; Mergel et al., 2019; Vial, 2019). This activity has been carried out in various fields such as accounting, commerce, and supply chains (O’Leary, 2023). Despite the long history of digital technology adoption implementations and research, there are still efforts to make exact definitions of digital transformation (Hinings et al., 2018; Mergel et al., 2019; Tratkowska, 2020; Vial, 2019). However, Vial (2019) founds that extant literature mainly defines digital transformation for organizations, society, and industry without a formal realization process. Research on this topic within the scope of digital

government reports the barriers and strategy (Wilson and Mergel, 2022) and empirical research that has in-depth discussion about transformation reasons, objects, processes, and values (Mergel et al., 2019). This research contributes to empirical study to gain a better understanding of the issue related to digital transformation, especially in village public administrative services.

Additionally, individuals or organizations go through a series of stages, starting from the introduction of innovation to then deciding to accept or reject the innovation according to the popular theory of innovation diffusion (Rogers, 1982). At the village level in Indonesia, the internet is considered the basis for adopting digital technology (Nurchim and Nofikasari, 2018). The internet enables communication for the adoption of other digital technologies, for example, website-based administration applications or mobile applications, CCTV (Closed Circuit Television), and even internet television.

In a review conducted by Vial (2019), there is still a lack of knowledge on basic principles, implementation guidance, and implications of digital transformation, regardless of the large amount of collected literature. Digital transformation, whose emphasis is on changing culture, organization, and relationships (Mergel et al., 2019), is a challenging task, as witnessed in the initiatives to improve data interoperability within government (Maail, 2018). More research on the digital transformation of public administration, particularly at the village level, is still required. The topic is wider than just the technical aspect of the process but also the socio-cultural implications and the technology adoption and diffusion process. Moreover, village public administration has different conditions and assumptions for attempting digital transformation, i.e., infrastructure, technology options, demographic and social profile, and even location.

The difference between the selected reviewed studies and this study is presented in **Table 1**.

Table 1. Summary of barriers for digital transformation.

Previous studies	This study
Define model of cultural and structural barriers along with the strategies for digital government implementation (Wilson and Mergel, 2022).	Explore the cultural barriers and structural barriers of digital technology implementation for village-level public administration within a developing country.
Propose Digital Government Evolution Model (Janowski, 2015).	Investigate the evolution of village-level administration to move from digitization towards transformation.
Provide four dimensions of digital transformation in public administration (Mergel et al., 2019).	Provide empirical result from the case study of digital transformation in village-level public administration.

3. Research methodology

3.1. Research philosophy

Defining the philosophy of science is essential to initially explain the research methodology as it aims to “analyze the methods of inquiry used in the various of science” and to “question assumptions that scientists take for granted” (Okasha, 2002). Philosophy of science itself refers to “a system of beliefs and assumptions about the development of knowledge” (Saunders et al., 2019). The determination involves a

process for choosing a paradigm—“a scientific approach to some phenomena that provides model problems and solutions to a community of scholars” (Rogers, 1982).

Ontologically speaking, this study leans towards subjectivism rather than objectivism (Kivunja and Kuyini, 2017), which views reality based on perceptions, an individual’s experience, or social interaction. Digital transformation in village-level public administration involves various interconnected actors and village contexts, namely culture, education background, access, and mastery of digital technology. Thus, this research uses the interpretivism paradigm at a philosophical level in an arguably complex social problem in which digital technologically supported public service involves other aspects, namely the human workforce, culture, and governance structures (Wilson and Mergel, 2022). The knowledge of digital transformation within village-level public administration can have multiple realities.

3.2. Research design and data

The study is exploratory research and conducted using the qualitative method shown in **Figure 1**. Through this approach, the research aims to investigate and understand village administrative service and emerging issues at each administrative level, study digital adoption, as well as to examine adjustments made in response to the resulting policies from Law No. 6/2014 on Villages.

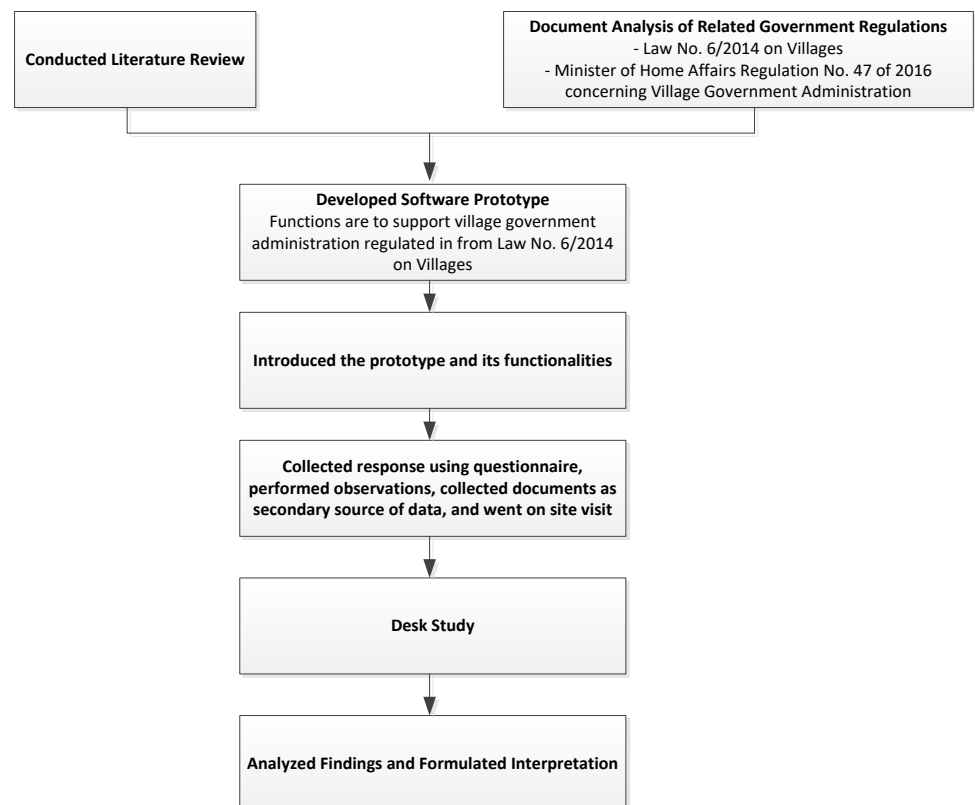


Figure 1. Research design using qualitative method and employing interpretivism paradigm.

In addition to conducting a literature review, we undertook document analysis to explore pertinent information pertaining to public administration, specifically within the context of villages. Through this process, we identified Minister of Home Affairs

Regulation No. 47 of 2016 regarding Village Government Administration as the focal point of this research in the realm of public administration. The development of the digital public service application was guided by the structures, operational procedures, and reporting requirements outlined in this regulation. In brief, this regulation encompasses five distinct categories: Public Administration, Population Administration, Financial Administration, Development Administration, and Other Administration. Each category, with the exception of Other Administration, encompasses a set number of forms, totaling 9, 5, 6, and 4 forms, respectively.

Subsequently, we initiated the creation of a software prototype designed to digitalize village administration services. This application comprises both a desktop and a mobile version. The former serves as a platform for data input and recording within the administration, facilitating the generation of various official documents as public services for the villagers, as well as the production of reports. Conversely, the mobile application is intended to assist the village head in conveniently accessing village administration data, thereby ensuring the head remains well-informed, particularly concerning village population information.

The subsequent phase involved the development of a case study (Yin, 2014) to assess the implementation of this digital application. During this stage, officials from villages located in the vicinity of Toba Regency in North Sumatra province were invited to participate in training sessions. It is important to note that the selection of villages within this regency as the study location was meant to represent Indonesia partly, as the nature of technology implementation and its level of adoption vary across different regions of the country.

Next, the study encompassed officials hailing from 167 villages within the regency, spanning eight out of ten sub-districts within the area, effectively representing 63% of the total number of villages. Data collection during the study was conducted via a combination of questionnaires, observations, the gathering of documents as secondary sources of data, and field research. The first three data collection processes were executed within the authors' university computer laboratory. For the field research aspect, the authors conducted visits to several villages to gain deeper insights into how digital technology-supported public services were currently being executed and how the software prototype can be utilized to transform village administration.

During the training session in the third phase, all participants in the village administration training were presented with questions pertaining to their understanding of village administration and ICT-based supporting applications. Additionally, each voluntary village was requested to provide people administration data in its original format. The researchers also collected various documents, scrutinized them, and formulated questions based on the content of these documents. Data for this study was amassed over one year, spanning from August 2017 to August 2018.

For this research, the collected information was processed progressively. Data processing was performed simultaneously during the research phase. The result of the first phase's data-processing activity was used to design the digital application for a case study. Next, the developed digital application was implemented in the second phase to gain information in the third phase. Researchers analyzed further data

collection from the third phase to determine which information required further exploration, comparing it with other sources, categorized for further examination, and the field activities. Finally, the authors concluded and summarized the findings to address the objectives of this research.

3.3. Case study

Indonesia, an archipelagic country in Southeast Asia, comprises 38 provinces across three different time zones. With a population of 255.6 million in 2015, the country ranks 114th in the Human Development Index (HDI), classifying it among nations with high human development (HHD).

With various government initiatives, Indonesia’s international ranking in e-government has improved. The United Nations (UN) has recently released the results of its 2022 E-Government survey, and the findings are immensely encouraging that Indonesia has significantly improved its position, moving up from 88th place in 2020 to 77th place in 2022 (UN DESA, 2022) as shown in **Figure 2**. The survey is created as a development tool for United Nations member countries to identify their respective strengths and challenges in efforts to enhance the implementation of e-government policies and strategies. This improvement reflects the successful development and implementation of Electronic Government Systems (EGS) in the country.

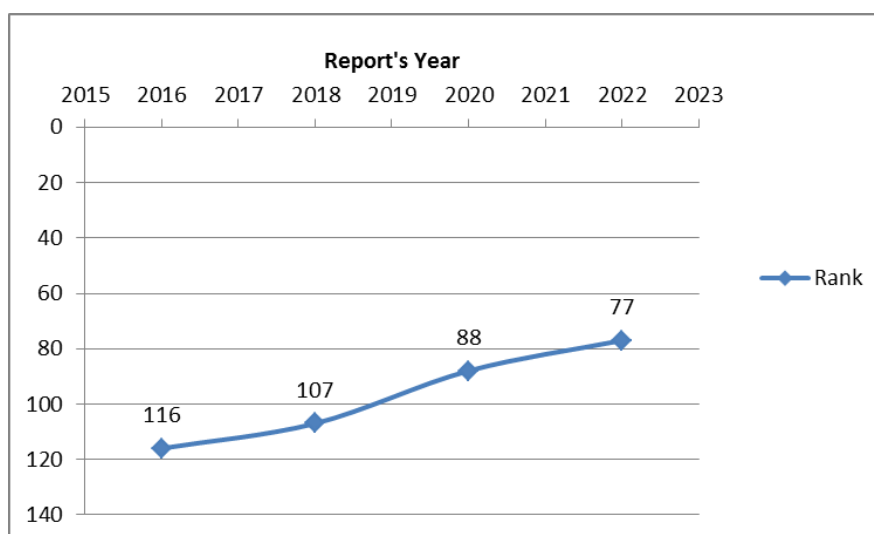


Figure 2. Indonesia’s e-government development index (edgi) rank by the United Nations e-government survey. (Source: UN DESA, 2022).

To put into perspective of the government structure in Indonesia, **Figure 3** shows the visualization from the central government to the village/sub-district level. Each province is divided into smaller governments, which are known as district/regency/municipality (kabupaten/kotamadya). This regency has a number of sub-districts (kecamatan). The village is the basic unit of local administration. The village itself can be categorized into two types, namely desa and kelurahan. A distinctive difference between both of them is that the head of the kelurahan is called the lurah and is elected by the regent/mayor. Meanwhile, the head of desa is elected by the residents through general elections, which are held every six years.

This research was conducted in Toba Regency, which is situated in North Sumatera province of Indonesia and is one of the regencies located in the Super Priority National Tourism Strategic Area (Kawasan Strategis Pariwisata Nasional Super Prioritas). The landlocked area spans an expanse of 2,021 square kilometers with a total 231 desa and 13 kelurahan and a combined population of 208,754 people in 2021 (Statistics, 2022). The condition implies the complexities faced by the local public administration’s attempts for digital transformation with various stakeholders and relationships. This research focuses on desa, because the number is more than kelurahan in Toba regency.

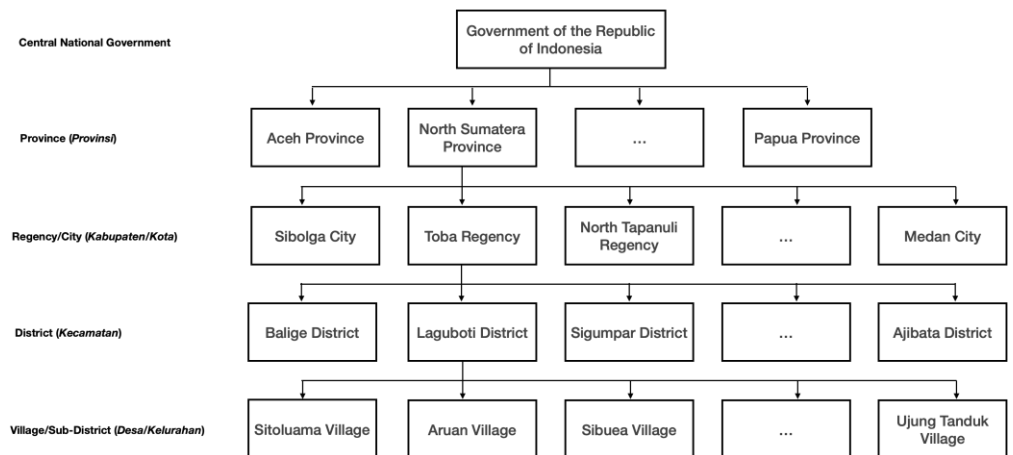


Figure 3. Government structure from the central to the village/sub-district level.

Mostly, the officials are part of the Village Head campaign success team, which has a limited educational background and the knowledge and skills to run the village administration. The conditions to run for village office require a minimum education level of a junior high school graduate and do not involve specific managerial skills set according to Article 21 of Minister of Home Affairs Regulation No.65 of 2017 on Amendments to Minister of Home Affairs Regulation No. 112 of 2014 on Village Head Elections. A number of desa and kelurahan are grouped into a sub-district (kecamatan). Government regulations regulate the division of administration and authority from each level of government.

Starting in 2015, the government has allocated significant sums of money, amounting to billions of Indonesian Rupiahs, to support village programs across Indonesia. The enactment of Law 6/2014 on Villages has expanded the resources available to villages, creating new opportunities for them to enhance local governance and expedite advancements in social, cultural, and economic domains. Notably, village funds have been allocated for the establishment of digital technology infrastructure, including desktop computers, printers, internet connectivity, various software applications, and even training initiatives. This investment sets the stage for the anticipated digital transformation of village-level administration. Furthermore, the onset of the COVID-19 pandemic has spurred villages to innovate in the provision of services to their residents.

Meanwhile, village administrative duty could have been more transparent, and the public services offered were getting more complex compared to the pre-village fund era. Villagers usually involve the office in issuing various statement letters,

namely resident certificates, certificates of land ownership, or certificates of being economically incapable/poor. During the pre-village fund era, the village officials tended to hesitate to perform administrative tasks, such as population administration, financial administration, and even development administration, because of limited funding and human resources. It is expected to encounter a village without an office that has proper facilities and infrastructure to cater to the villagers. Not to mention that village officials needed help to generate reports for related stakeholders.

Public policy is widely understood as a structured process of problem-solving led by the government. Nowadays, village administration has been regulated through the establishment of Minister of Home Affairs Regulation Number 47 of 2016 concerning Village Government Administration. There are five main village administration categories, namely 1) general administration; 2) population administration; 3) financial administration; 4) development administration, and 5) other administration. Finally, the administrative tasks can be supported by sufficient funds.

4. Results and discussion

This section presents the findings and discusses the results related to the digital transformation of village administration. In this part, the digital implementation of current village administrative tasks is also reported to give perspective on the topic.

4.1. Overview of current village administrative tasks implementation

The authors have encountered several situations based on our personal experience and before conducting the research that indicated the village's officials' need for support related to digital technology implementation for public administration. However, to our surprise, most villages still do the process manually, to the extent that every government program that requires population data must repeat the data-collecting process. One village official even stated that: "we know a village that has its officials to count people that walk over their crossroads to collect data about current population".

Another official also states that: "church or mosque seems to have more complete population data because there are records of births, marriages, and deaths".

Nevertheless, most of the villages already have computers, printers, scanners, and even internet connections in their office. However, the utilization could be higher due to the educational background and age of the village officials. The village, despite having capable operators in using software, i.e., Microsoft Excel and Microsoft Word, might not always be available in the office due to conditions such as traditional ceremonies or pregnancy for married women officials.

People of the Toba region is mainly of the Batakese race. Traditional ceremonies are common during office hours. The culture encourages village officials to attend the ceremony out of courtesy because of the status of officials within the society. Additionally, pregnancy is a common reason for married women in Indonesia to leave the office for a paid holiday for at least three months. However, the village does not usually have other capable officials to replace the on-leave worker temporarily. The condition affects the duration of public administration service and also its quality. The

village officials will also need help keeping records of conducted administration and accessing the information. This problem can be solved using digital technology.

The villagers can go directly to the office without making any appointment during the working hours. However, they might not get the service because the officers have other duties outside the office, a limited number of trained officials to operate computers and printers, and officials need to be more disciplined. There is no accessible information regarding the progress of the requested service. Hence, the administration is still dependable on human resources in the village.

Administrative order is very dependent on the vision of the village head. During visits to several village head office locations, the available space needed to be improved. For example, standard document types are ready to be filled for each required service, a place for service and filing processes, and an adequate file storage container. There needs to be standards for the administrative service delivery process to follow. Villagers become confused when dealing with administrative processes at the village level because there is no accessible information on standard operating procedures. These activities and conditions are prone to be misused by irresponsible parties. Examples are village head office employees providing inappropriate, long-winded services and giving money to officers to smooth the process.

4.2. Digital technology prototype for village public administration

The prototype of the software for village administration was presented to village officials, demonstrating its architecture and features. The application was developed for use on laptops or computers (desktop application) as well as feature access through smartphones via the mobile application. Both applications are exclusively designed for and can only be used and accessed by village officials.

Village residents can visit the village office to access the desired village administrative services. They must provide the necessary information to enable village officials to provide the required administrative services. Village officials can hierarchically access the available features, with feature limitations based on their roles. Application operators can only access data management features, with data modification authorization held exclusively by the village head. Operators also have limited access to specific reports. Meanwhile, the village head has full access to all features.

Simultaneously, mobile applications on smartphones allow village officials to access village data directly from anywhere. This application can be used offline, with data downloading required before use. In summary, the working process and architecture of the application are illustrated in **Figure 4**.

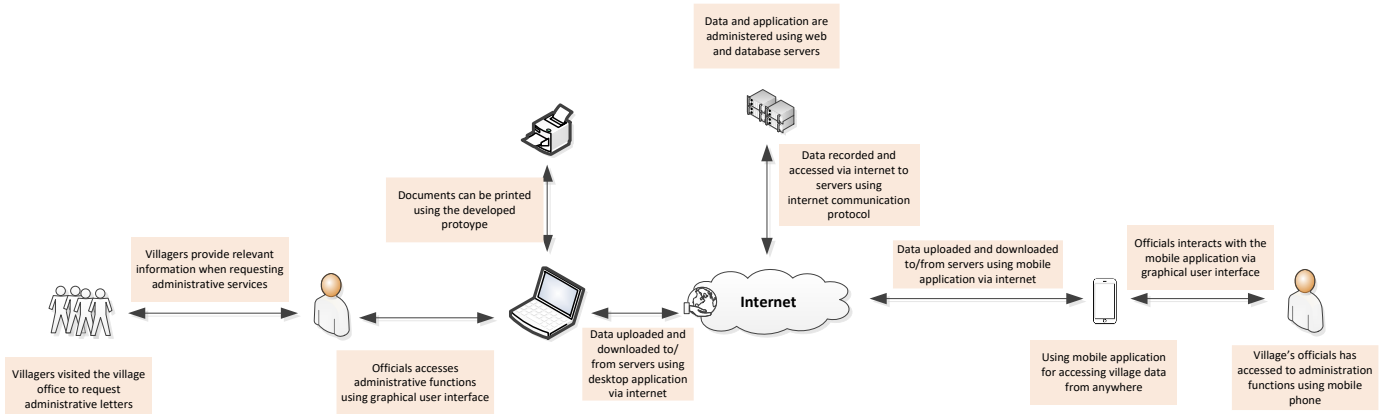


Figure 4. Workflow and architecture of the digital technology-supported village administrative tasks.

4.3. Findings

Only a few village officials are familiar with the Minister of Home Affairs Regulation Number 47 of 2016 concerning Village Government Administration. However, the village officials are mainly familiar with producing letters of acknowledgment as the primary public administration duty. The letter will be produced by the officials based on the villagers' request.

Moreover, the officials are primarily aware of the financial administration related to the village fund report. Based on the regulation, village funds will be transferred in three terms with a combination of 20%, 40%, and 40%, respectively. The transfer usually takes place in mid-April, August, and December. Before getting the next transfer, the village has to prepare a complete report of previous village fund usage. Hence, officials are relatively busy with this administration. On the other hand, most officials still needed help learning and implementing village fund reporting procedures. They were also required to master the government-issued financial software.

Only one village has applied all administration included in Minister of Home Affairs Regulation Number 47 of 2016 concerning Village Government Administration. However, the contents were separated into different digital documents created using word processing software. To access and distribute the information, the village officials have been using USB flash disks. The information is not centralized in one computer.

Moreover, the operators were required to provide an email address to register a user into the village administration application. However, training sessions were used to teach the officials how to create email addresses, steps to manage email accounts, and do practical tasks, i.e., sending emails, replying to emails, forwarding emails, and even how to send emails with CC (Carbon Copy) and BCC (Blind Carbon Copy) because most village officials did not yet have an email account.

To make matters worse, we found several villages that have not updated their data for more than two years, especially about the population. The reasons were 1) the villagers usually do not report their current information related to population administration, such as birth, move-in, move-out, and death; 2) the officials are required to be proactive in collecting the data; however, there was no incentives, dedicated resources, or technology implementation to ease the process, and 3) the village officials have no capability or skill in processing or presenting the data. There

is a village that needs to have officials from related backgrounds to perform the task.

Despite the fact that all villages already have computers and laptops, around 30% of the villages still perform paper-based administration. For example, population administration was collected in the form of a Family Card (kartu keluarga) paper copy. In addition to that, some villages list all the villagers in a book. The village officials have to count the number of people based on demographic profiles manually. This process took a relatively long time and was prone to error. It can also bring social problems, especially if the results are politically significant, i.e., the number of registered voters for village, regional head, and even for presidential election.

In the village administration application training and assistance activities, not many village officials have been exposed to the advancement of information and communication technology. Only a few officials have backgrounds in computer and office software operating training. These officials were either college graduates or had finished short-term computer training. The office software skills were mainly related to data storage and simple formatting. They need to gain more knowledge on how to do advanced document formatting and producing, using formulas, or combining the available office software function to ease repetitive tasks, such as mail merging or exporting graphics and tables. We found that several officials still use calculators for counting villagers' ages. Furthermore, more than 90% of the participants do not have smartphones. They mostly have feature phones and are only familiar with voice and messaging services.

We found out that the participants suggested that implementing Village administration application will face obstacles. The suggested problems were: 1) Current village officials needed to be assigned to operate the system. Hence, the village has to discuss the implementation approach after finishing the training. In the previous case of using village accounting software, the village decided to recruit an operator and pay the salary from the village fund. Following a similar approach can be difficult due to the limited village funds. 2) Considering the village officials' background, most of them will still be required to extend the training and assistance period. However, each village has a different village fund amount and allocation priority. They have to wait for the next financial book year to be able to accommodate the following training. 3) Some of the villages will face an election period to choose a new village head. The situation can affect the person in charge of operating the Village administration application. A new village head tends to change the person or even has different priorities.

At the end of the training and assistance period, most participants admitted to being more aware of the Minister of Home Affairs Regulation and its administration process. However, further assistance from the local government to socialize the regulation is still required. The village officials regard Village administration applications as tools to centralize the administration record and simplify administration inquiries.

Reflecting on the findings of this research, digital transformation for public administration, especially at the village level, still requires a long process. In accordance with the theory of diffusion of innovation there are four stages (Rogers, 1982). However, the data collected about village officials and villagers in the Toba district suggested that there are still many early adopters of digital technology. The

condition contrasts with the need for more implementation of digital-based public services within the village community, especially with the COVID-19 pandemic. The existence of a novel virus for which there is no cure or preventive vaccine with a high level of spread and fatality when it appears has forced government offices to limit service hours and service delivery methods.

The primary problems faced when implementing digital technologies for village-level public administration include infrastructure, limited exposure to technology, and a culture or habit in rural communities that rarely use applications for administrative services. There are two main groups of barriers to the development of digital government, namely structural and cultural (Wilson and Mergel, 2022). The following **Table 2** summarizes the challenges experienced in adopting digital technology at the village level.

Table 2. Summary of barriers for digital transformation.

Structural barriers	Capacities and resources	<ul style="list-style-type: none"> • Limited number of assigned officers for digital adoption. • Lack of capacity. • Infrastructure might not be available in all villages. • Limited number of continuous trainings.
	Governance structures	Limited number of assigned government officer to assist digital transformation of village administration.
Culture barriers	Institutional culture	Work-time is bounded to traditional culture.
	Lack of awareness	Officials does not have knowledge of digital technology for administration.

Furthermore, public services that are digitized through this research do not have a fundamental paradigm that animates the creation and development of applications. The resulting software products tend to digitize the forms contained in the Minister of Home Affairs Regulation No. 47 of 2016 concerning Village Government Administration adapted. The main process changes lie in the ownership of citizen data, which can be accessed quickly by the village head via mobile devices. In addition, letters and reports generated as a service product can be generated quickly. To the author's knowledge, the development of digital-based public services using a particular paradigm, such as the New Public Service paradigm, still needs to be developed (Denhardt and Denhardt, 2000).

Several recommendations are proposed in this research. First, more socialization attempts to deliver the details of the Minister of Home Affairs Regulation to village officials are still needed. The Regency official office is the representative of the state and is responsible for assisting the village in achieving good governance and proactively monitoring and supporting the village officials. It can be in the form of annually scheduled officials training, providing newly elected village heads with intensive guidance, or process assistance in the village.

Next, village officials are suggested to have intensive computer training, primarily that can support the administration process. The process has to be routinely followed by the officials and as a means to improve their capacities. Rotating the person responsible for a particular administration task too often is not recommended. The learning curve takes much time and resources.

Village administration application users have to create a community for learning and sharing media. The Village administration application developers can choose and

guide potential officials to be champions in village administration and its supporting application. The knowledge transfer can be done without a formal training session. The officials can get immediate help regarding the software and the administration knowledge.

The village has to have an ICT-based administration implementation roadmap. The roadmap can be formulated with the help of an official state office or a private consultant. By having the roadmap, the officials can plan activities to improve the quality of office service and their exposure to recent advancements in information and communication technology. In the end, the village can have good governance supported by proper technology.

On top of that, the universities can contribute to the government's attempts to accelerate digital transformation in public administration, such as through Independent Learning Programs by students and Independent Campus Programs by lecturers that are established by the Indonesia Ministry of Education (Simamora et al., 2022). Collaboration can also be done with other actors in developing and executing public service innovations such as this digital transformation (Pratama, 2020).

Finally, the emergence of Law No. 23 in 2014 about Local Government shows that the central government provides opportunities for local governments to innovate. Precisely in Article 386, which states that "in order to improve the performance of regional government administration, regional governments can innovate." However, it is necessary to look systematically at the main factors that influence innovation, such as digital transformation in public services at the village level. This activity can provide an overview of rule-making and intervene in these critical factors.

4.4. Proposed conceptual model for digital transformation for public administration at village level

Taking the incremental digital technology implementation and the complexity of performing them for public administration, especially at the village level, we propose a conceptual model based on the data collected in this study and knowledge from previous studies reported in extant literature. The conceptual model incorporates Digital Transformation in Public Administration taxonomy (Mergel et al., 2019) and structural and cultural barriers and strategies (Wilson and Mergel, 2022) as the input for the public administration digital transformation process.

Additionally, the adoption of digital technology by public administration has to comply with government policies. This policy acts as the foundation for the adoption to ensure the safety, security, and ethical use of technology, safeguard against potential threats or vulnerabilities that could compromise national interests, and ensure that digital products and services meet specific standards, protecting citizens from fraud, misinformation and cover privacy and data protection issue. The following **Figure 5** visualizes the conceptual model of digital transformation for public administration at village level.

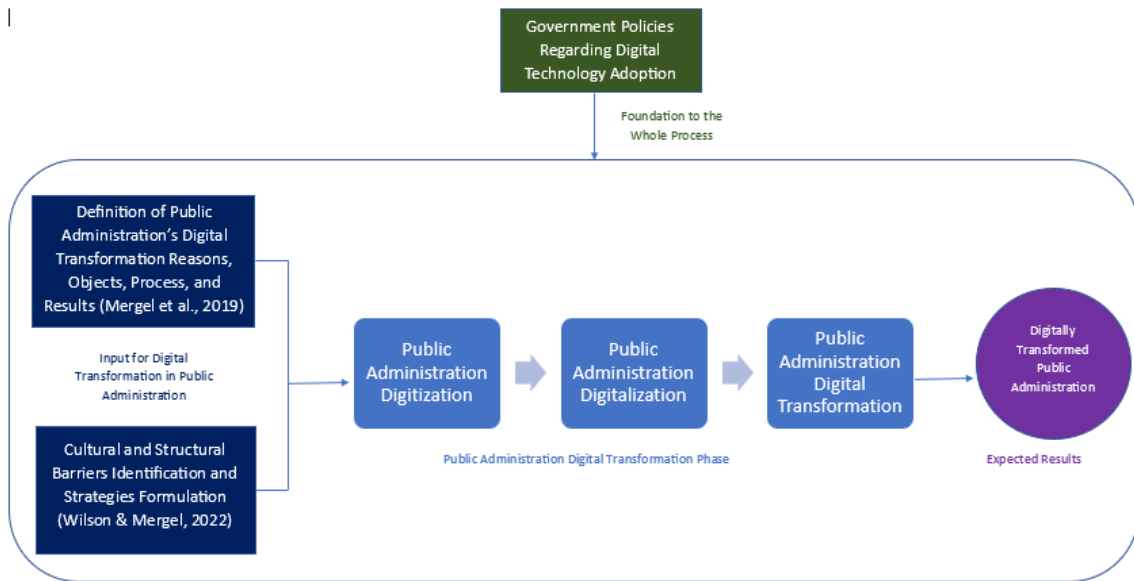


Figure 5. Conceptual model of digital transformation for public administration at village level.

Digital transformation is a complex and lengthy process that must be preceded by digitization and digitalization. This scope of digital technology becomes the primary roadmap for the digital transformation of public administration. The roadmap aims for planning purposes and distinguishes the steps to attain the expected results. As the step gets further from digitization, the complexities grow more prominent as the main focus is not only on technology selection but also on the impacts on society, politics, and economies (Kuldosheva, 2021). However, the digital technology adoption process in this model has a different scope compared to the Digital Government Evolution Model (Janowski, 2015). In both models, digitization refers to a similar purpose, which is characterized by the implementation of technology in the village-level government without internal, external, or context-specific transformation. However, digitalization in our model comprises Janowski's Transformation and Engagement stages. Digitalization is defined as leveraging digital technologies to change existing public administration processes in order to make improvements. It impacts the internal structure of local government and can affect external stakeholders. The transformative effects caused by the adoption of digital technology that have an impact on society, politics, and even economies are characteristics of the digital transformation stage in our model and Janowski's model.

5. Conclusion

This research focuses on the investigation of the attempts to perform digital transformation within public administration services at the village government level. Given the historical timeline of technological advancements and their integration into society, the argument here is that government services have entered a transformative phase, transcending mere digitization and digitalization. Its primary objective is to examine the preparedness of local governments, particularly at the village level, to adopt and implement digital technology across their administrative functions for transformative purposes.

The study employed a case study of the implementation of digitally improved public administrative activities at several villages within a specific regency in Indonesia, the Toba Regency in North Sumatra province. The selection of these particular villages was primarily based on practical considerations, such as time constraints and accessibility, rather than random sampling. Consequently, the results may not be fully representative of the broader population, as they are confined to a specific area in North Sumatra province, rendering them context-bound and less externally valid.

Moreover, it is crucial to acknowledge that the landscape of innovation in Java and non-Java islands in Indonesia significantly differs. Java typically exhibits a greater quantity and quality of innovation, and the profile of its government and society tends to be more advanced. Therefore, the findings of this study are inherently contextual. Future empirical research should compare conditions on the island of Java and other large islands in Indonesia to gain a comprehensive understanding.

Additionally, the authors propose the necessity of digital innovations mapping within the realm of village government in Indonesia. This mapping would illustrate the extent to which digital technology adoption has been implemented in public administration. These contemporary insights can serve as valuable inputs for policymaking and reference materials for the equitable diffusion of digital technology within village administration.

Furthermore, future research should consider modeling system dynamics in the implementation of digital technology for public administration at the village level. Employing a system thinking approach would involve investigating the digital transformation of public services within villages, with an aim to identify critical driving variables and their interrelationships. The resulting model could be instrumental in policymaking, supporting digital technology adoption, enhancing the success of diffusion into public services, and leveraging critical factors within the system.

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