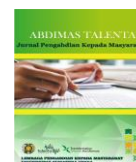




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Transforming Population Data Governance through PivotTables and Digital Archiving in Pagarbatu Village, North Tapanuli

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ABSTRACT

Digital transformation at the village-government level is essential for improving administrative efficiency, data accuracy, institutional accountability, and public information services. Pagar Batu Village, Sipoholon District, North Tapanuli Regency, covers an area of approximately 17.49 km² and is administered by only five village officials. Prior to this community engagement program, population records had been maintained using basic Microsoft Excel worksheets, while document storage lacked standardized classification, file-naming conventions, access restrictions, and systematic backup procedures. This program aimed to strengthen the capacity of village officials to manage, summarize, store, and retrieve population data through the use of Microsoft Excel PivotTables and a structured digital archiving system. The program was implemented through needs assessment, data standardization, preparation of learning materials, hands-on demonstrations, guided practice, product-based assignments, evaluation, and follow-up assistance. The outputs included a standardized population database template, automated population summaries, a classified digital archive structure, file-naming guidelines, access-level classifications, and an operational guide. The program demonstrated that optimizing familiar and readily available digital tools can provide a practical approach to improving population data governance in a village with limited human and technological resources. This initiative contributes primarily to Sustainable Development Goal 16 by supporting effective, accountable, and transparent local institutions, while also contributing to SDGs 4 and 9 through digital capacity development and administrative innovation.

Keyword: Digital Archiving, Digital Transformation, Population Data, Pivottable, Village Governance



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1. Introduction

Digital transformation has become an increasingly important component of public-sector reform, including at the village-government level. It does not merely involve replacing paper documents with electronic files. More fundamentally, digital transformation requires improvements in the processes through which data are collected, validated, processed, stored, retrieved, analyzed, and communicated. Effective implementation of digital tools may improve administrative efficiency, service accessibility, institutional accountability, and evidence-based decision-making [1][2]. Population data constitute a fundamental information resource for village

administration. These data are required for preparing village profiles, delivering population-related administrative services, identifying community characteristics, planning development programs, supporting social assistance distribution, and producing administrative reports. Therefore, population records should not be treated solely as static administrative documents [3]. They should be managed as an integrated information resource that can be updated, summarized, and used to support local-level decisions.

The effective use of digital technology in local government is influenced not only by the availability of computer equipment but also by institutional readiness, digital competence, organizational arrangements, and the suitability of the technology for local conditions. Digital transformation at the local-government level may encounter limitations related to infrastructure, human resources, technical knowledge, and organizational resistance [4][5]. Consequently, the introduction of a highly complex information system does not necessarily provide the most appropriate solution for a village with limited personnel and technological resources.

Pagar Batu Village is located in Sipoholon District, North Tapanuli Regency, Indonesia, and covers an area of approximately 17.49 km². Based on the preliminary assessment conducted by the community engagement team, the village administration was supported by only five officials. This limited number of personnel required each official to perform multiple administrative and public-service responsibilities. Under such circumstances, population data management needed to be efficient, simple, easy to learn, and sustainable without continuous dependence on external technical assistance.



Figure 1. Community Service Location at Pagar Batu Village Office

Before the program was implemented, the village administration had already used Microsoft Excel to record population data. However, its use remained limited to basic data entry in simple worksheets. The existing data had not been fully standardized in terms of variable names, category labels, date formats, and data structures. Population summaries based on sex, age group, education, occupation, marital status, and residential area were generally prepared manually. This process required repeated calculations and increased the risk of inconsistencies and administrative errors. Another identified problem concerned document storage. Digital documents were stored in folders that did not follow consistent classification and naming conventions. Some records were distributed across different computers or storage devices, making retrieval dependent on the memory of individual staff members. Such practices could increase the risks of duplicate files, misplaced documents, unauthorized access, and loss of institutional knowledge when administrative responsibilities changed. Digital records management is closely related to public-sector transparency and accountability. Well-

managed records facilitate document retrieval, strengthen institutional traceability, and support access to public information [6]. Electronic archiving can also reduce dependence on physical documents and improve administrative continuity. However, digital openness must be balanced with data-protection principles. Publicly accessible information should be limited to aggregated statistics and non-confidential administrative information, while personally identifiable population data must remain restricted.

Based on these conditions, the community engagement program introduced an integrated but relatively simple data-governance model combining population database standardization, PivotTable-based data processing, digital document classification, standardized file naming, access control, and aggregated public-information provision. PivotTables were selected because Microsoft Excel was already available and familiar to the village officials. This reduced the technological adaptation burden and enabled participants to immediately relate the activities to their routine administrative responsibilities. The contextual novelty of the program lies in the integration of data processing, digital archiving, and information-access classification into a single operational model specifically adapted to a village administration with only five officials. Rather than introducing a separate and technically demanding application, the program optimized existing software and developed templates that could be independently maintained by the village administration.

The program also contributes to several Sustainable Development Goals. Its primary contribution is to SDG 16, particularly the development of effective, accountable, and transparent institutions and improved access to public information. It also contributes to SDG 9 through the adoption of practical digital innovation in village administration and to SDG 4 through the development of digital and data-literacy competencies among village officials. Accordingly, this community engagement program aimed to improve the capacity of Pagarbatu Village officials to structure, process, summarize, store, retrieve, and communicate population data through the use of PivotTables and a digital archiving system. The program was expected to produce a standardized population database, reusable data-summary templates, an organized digital archive, improved staff competencies, and a more systematic mechanism for providing aggregated information to the public.

2. Methods

2.1. Program Setting and Participants

The community engagement program was conducted in Pagar Batu Village, Sipoholon District, North Tapanuli Regency. The program involved all five village officials whose responsibilities included population administration, correspondence, document management, reporting, and public services. A participatory and practice-oriented approach was adopted. The village officials were involved not only as recipients of information but also as partners in identifying administrative problems, defining data requirements, designing the archive structure, testing the templates, and determining appropriate levels of document access.

The program focused on two principal components:

- a) processing and summarizing population data using Microsoft Excel PivotTables; and
- b) developing a structured digital archiving system for village administrative documents.

2.2. Program Implementation Stages

The program was implemented through seven sequential stages: needs assessment, program design, material preparation, population-data standardization, PivotTable implementation, digital archive development, and evaluation and follow-up.

1) Needs Assessment

The initial stage was conducted through observation, interviews, discussions with village officials, and examination of the existing data-management practices. The assessment focused on the structure of the available population data, staff competence in using Microsoft Excel, frequently requested population reports, document-storage procedures, available computers and internet facilities, and the distribution of administrative responsibilities [7]. The findings indicated that Microsoft Excel had been used primarily for basic recording purposes. Population summaries were manually calculated, while digital documents lacked consistent classification, naming, and access arrangements.

2) Program Design

The program was designed according to the identified needs and available resources. The proposed solution consisted of four interconnected components:

- a. standardization of the population master database;
- b. population-data processing using PivotTables;
- c. classification and organization of digital records; and
- d. separation of internal, restricted, and publicly accessible information.

The population database template included relevant variables such as sex, age, age group, residential area, education, occupation, marital status, and family status. The variables were arranged consistently to ensure compatibility with PivotTable processing.



Figure 2. Simplified Pagarbatu Village Data

3) Preparation of Materials and Instruments

The implementation team prepared a PivotTable guide, an anonymized practice dataset, a standardized population database template, practical exercises, a digital folder structure, file-naming guidelines, pretest and posttest instruments, and a performance assessment rubric. Anonymized data were used for demonstrations to minimize risks to personal information. Actual population data were accessed only by authorized village officials during guided implementation.

4) Population-Data Standardization

Before creating PivotTables, participants were guided in restructuring the population database. The activities included:

- a. standardizing column names;
- b. ensuring that each row represented one population record;
- c. eliminating merged cells;
- d. correcting date, number, and text formats;
- e. standardizing categorical labels;
- f. identifying missing and duplicate records; and
- g. preparing variables for grouping and tabulation.

5) PivotTable Implementation

Participants were introduced to the steps required to create PivotTables, including selecting the data range, using the Insert–PivotTable function, and assigning variables to the Rows, Columns, Values, and Filters fields. The practical exercises included producing population summaries by sex, age group, educational attainment, occupation, marital status, and residential area [8]. Participants also practiced creating cross-tabulations and refreshing PivotTables after changes were made to the master database.

6) Digital Archive Development

The digital archive was organized according to administrative functions, document types, years, and levels of confidentiality. The process included:

- a. creating major administrative folders and subfolders;
- b. establishing standardized file-naming conventions;
- c. classifying documents by year and service category;
- d. separating internal, restricted, and public documents;
- e. assigning access permissions;
- f. creating backup procedures

3. Result and Discussion

The implementation of a data training program for Pagarbatu Village officials demonstrated substantial results in terms of improved skills, creative engagement, and awareness of data collection. Overall, the program ran smoothly and was well-received by participants and the community, demonstrating the relevance of technology-based empowerment initiatives for rural youth development.

3.1. Standardization of the Population Database

The program resulted in a more structured population database template. Participants standardized variable names, date formats, and category labels. For example, different labels representing the same category were consolidated into a single format to prevent them from being interpreted as separate categories by Excel. The standardization stage changed the function of the population file from a basic administrative register into a master dataset that could support repeated summaries and cross-tabulations. A single master database also reduced the need to maintain several manually updated summary tables. The quality of this master database remains essential. PivotTables can accelerate calculations, but they cannot automatically correct inaccurate, duplicated, or inconsistently coded source data. Therefore, the program emphasized that digital efficiency must be accompanied by data-entry discipline and periodic data validation.

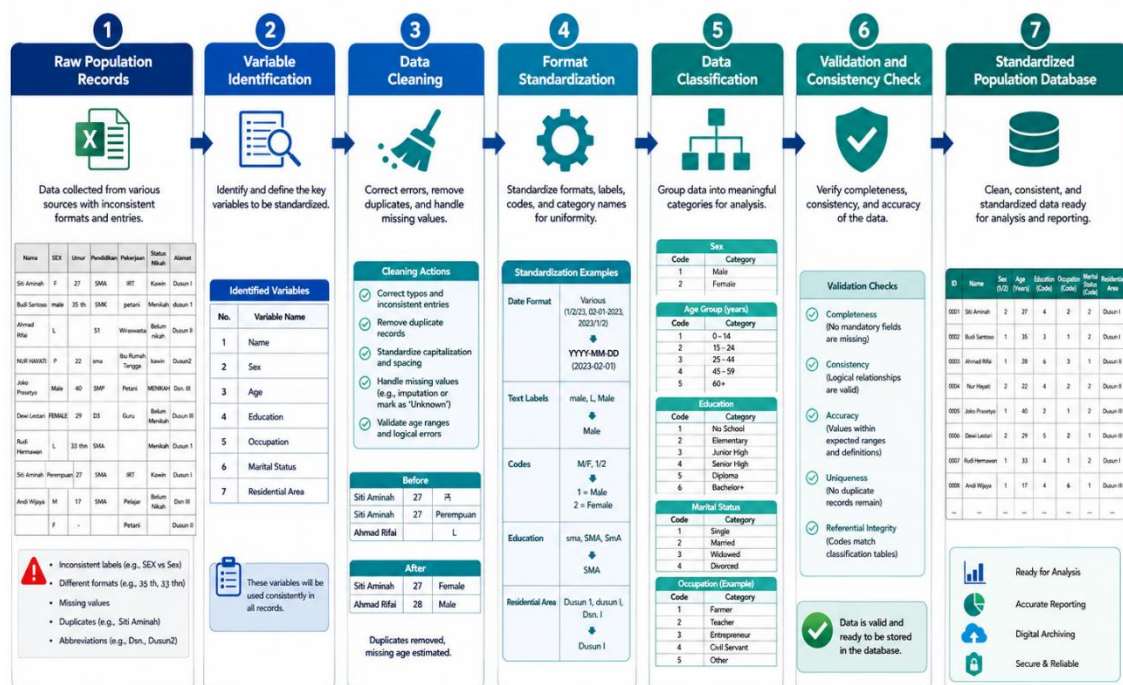


Figure 3. Standardization of the Population Database

Participants created several forms of population summaries using PivotTables. These included distributions by sex, age group, education, occupation, marital status, and residential area. They also produced cross-tabulations, such as population counts by residential area and sex. The general PivotTable procedure consisted of:

- preparing a standardized dataset;
- selecting the complete data range;
- choosing Insert–PivotTable;
- placing variables in the appropriate field areas;
- applying filters;
- reviewing the resulting summary; and
- refreshing the PivotTable after updating the master data.

The use of PivotTables reduced the need for repeated manual calculations. Once the master database had been updated, existing summaries could be revised using the Refresh function. This process offered a practical

improvement in administrative efficiency, particularly for a village administration supported by only five officials.



Figure 4. Participants take part in practical training on using PivotTables

Observational data indicated a clear progression in technical competence. Initially, participants relied heavily on instructor guidance; however, by the end of the program, many were able to perform production tasks independently or with minimal supervision. The finished T-shirts produced during the training served as concrete evidence of this skill development. Assessment of product quality—based on print clarity, colour consistency, and durability—demonstrated that participants achieved outputs aligned with basic industry standards.

3.2. Development of the Digital Archive

The program produced a structured digital archive that classified records by administrative function, document type, year, and level of access. A simplified archive structure was developed as follows:



Figure 5. Pagarbatu Village Digital Archive

Numbering the folders maintained a consistent order across computers and cloud-storage platforms. The file-naming convention allowed officials to identify documents without opening each file and improved keyword-based retrieval.

The archive also introduced three levels of document access.

Table 1. Digital Document Access Classification

Access Level	Type of information	Authorized users
Internal	Drafts, internal reports, and operational documents	Village officials
Restricted	Individual population records and personally identifiable documents	Authorized officials
Public	Aggregated statistics, public announcements, and non-confidential reports	Community members

This classification is particularly important because digital transparency should not be interpreted as unrestricted disclosure of personal population data. Aggregated information, such as the number of residents by sex, age group, education, occupation, or residential area, may be communicated publicly. Personal identity numbers, family-card numbers, detailed addresses, identity documents, and other personal records must remain protected. Improved records management can strengthen transparency because administrative evidence becomes easier to locate, verify, and communicate [9]. In the Indonesian context, digital archiving also supports the development of electronic government and more systematic public administration [10].

The program generated the following operational outputs:

- a standardized population master database;
- reusable PivotTable templates;
- population-summary and cross-tabulation formats;
- a classified digital folder structure;
- standardized file-naming guidelines;
- a document-access classification matrix;
- an aggregated public-information folder; and
- a brief operational manual.

The contextual innovation of the program lies not in the development of a new software application but in the integration of familiar digital tools into a coherent village data-governance system. The approach was designed to be affordable, maintainable, and replicable in village governments with limited personnel.

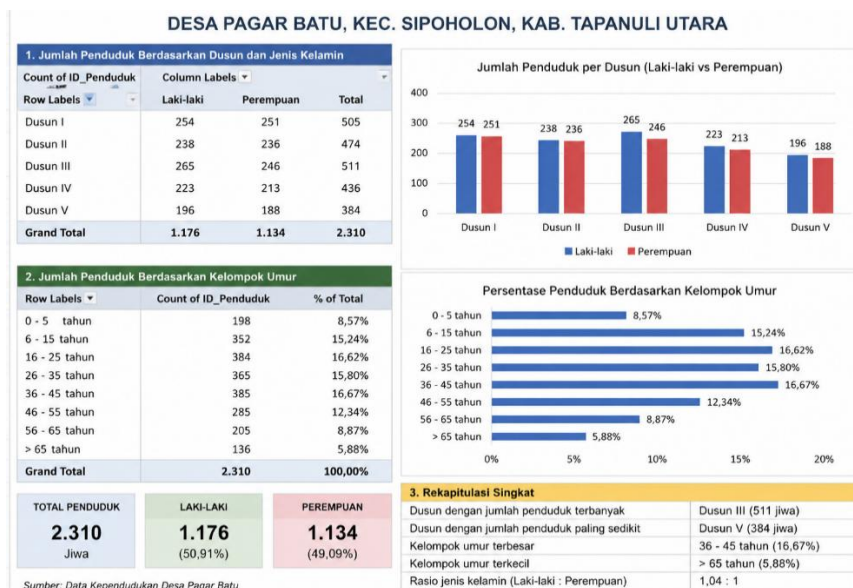


Figure 6. The results of the pivot table training service for village data collection

The choice of existing software also supported sustainability. Introducing an advanced information system may have required additional infrastructure, technical operators, licensing, and long-term maintenance. By contrast, the use of Microsoft Excel and accessible cloud or local storage allowed the village administration to improve its work processes without radically changing its technological environment.

The program involved only five village officials, limiting the possibility of statistical generalization. Its effectiveness should therefore be interpreted in the context of Pagar Batu Village. The digital archive also remains dependent on the availability of computers, internet access, storage capacity, and user-account security. In addition, long-term effectiveness cannot be fully evaluated immediately after implementation. A follow-up assessment is required to determine whether the database is regularly updated, the archive structure remains consistent, and publicly accessible information is effectively used by the community. Furthermore, PivotTables support data summarization but do not replace official population-information systems. The village administration must continue to verify the data and comply with applicable administrative and data-protection regulations.



Figure 6. Group photo with the head of Pagarbatu village

4. Conclusion

Community engagement program initiated a practical transformation in population data governance in Pagar Batu Village, Sipoholon District, North Tapanuli Regency. Prior to the program, population data were maintained primarily through basic Excel worksheets, while digital documents were stored without systematic classification, standardized naming, or clearly defined access arrangements. The use of PivotTables enabled village officials to convert population records into structured summaries based on sex, age group, education, occupation, marital status, and residential area. The developed digital archive introduced consistent folder structures, standardized file names, document classifications, access restrictions, and backup procedures. These changes improved the organization, retrieval, and potential use of village administrative information.

The principal innovation of the program was the integration of population-data standardization, PivotTable processing, digital records management, and information-access classification into a simple operational model. Rather than introducing a complex application, the program optimized familiar software and adapted it to the conditions of a village administration with only five officials. The program contributes to SDG 4 through digital-capacity development, SDG 9 through practical administrative innovation, and primarily SDG 16 through the strengthening of effective, accountable, and transparent village institutions. Nevertheless, long-term benefits will depend on regular data updates, consistent document management, periodic backups, appropriate access control, and continued commitment from the village administration. Overall, the integration of PivotTables and digital archiving offers a practical, affordable, and replicable approach to strengthening population data governance in village governments with limited human and technological resources.

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