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Data Visualization Training Using Microsoft Excel for Village Government Officials: Enhancing Data Management and Evidence-Based Decision Making

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Abstract. Village governments are increasingly required to utilize accurate and timely data to support administrative services, development planning, financial accountability, and evidence-based policymaking. However, many village government officials still have limited competencies in organizing, analyzing, and presenting data effectively. Most administrative reports are prepared manually, making it difficult to interpret information and communicate development achievements to stakeholders. This community service program aimed to enhance the data visualization competencies of village government officials through hands-on training using Microsoft Excel. The training employed a participatory learning approach consisting of four stages: needs assessment, instructional workshops, guided practice, and performance evaluation. Twenty-five village officials participated in practical sessions covering data organization, data cleaning, Pivot Tables, Pivot Charts, conditional formatting, dashboards, and interactive visual reports. Participants completed pre-tests and post-tests to measure improvements in knowledge and technical skills. The evaluation results demonstrated a substantial increase in participants' competencies, with the average assessment score improving from **56.4** before the training to **86.7** after the program, representing an increase of **53.7%**. Participants also showed greater confidence in producing graphical reports, summarizing village demographic and financial data, and developing dashboards that support administrative transparency. Feedback collected through questionnaires indicated a high level of participant satisfaction with the relevance of the training materials and the practical learning approach. The novelty of this community service program lies in integrating practical Microsoft Excel dashboard development with village administrative datasets to strengthen data-driven governance at the local government level. The program demonstrates that structured digital capacity-building activities can significantly improve data literacy and support better decision-making processes within village administrations.
Keywords: Community Service, Data Visualization, Microsoft Excel, Village Government, Data Literacy, Dashboard Development

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INTRODUCTION

The rapid advancement of digital technology has significantly transformed public administration across various levels of government. Local governments are increasingly expected to adopt digital tools that improve transparency, accountability, and evidence-based decision-making. At the village level, government officials play a crucial role in managing administrative data, population records, financial reports, and development programs. Consequently, the ability to organize, analyze, and visualize data has become an essential competency for village officials in delivering effective public services and supporting sustainable rural development [1].

Data visualization is recognized as an effective approach for transforming raw datasets into meaningful graphical information that facilitates understanding, communication, and decision-making. Rather than presenting numerical information in lengthy tables, visual representations such as charts, dashboards, and interactive reports enable government officials to identify trends, monitor performance indicators, and communicate development outcomes more effectively. According to Knaflic [1], effective data visualization enhances the ability of organizations to make informed decisions by presenting complex information in a clear and concise manner. Similarly, Few [2] argues that graphical representation significantly improves human cognitive processes compared to conventional tabular reports.

Digital transformation has become one of the strategic priorities of public sector reform in many developing countries, including Indonesia. The Indonesian Government continuously encourages village administrations to improve governance quality through digital innovation and data-driven public services.

Various national policies, including the implementation of digital village programs, emphasize the importance of strengthening digital competencies among village government officials. Nevertheless, technological infrastructure alone is insufficient without adequate human resource capacity. Digital literacy, particularly data literacy, remains one of the primary challenges in rural public administration [3]. Several recent studies have highlighted the importance of digital literacy and capacity building for public servants. One study reported that continuous digital skills training substantially improves administrative efficiency in local government institutions. Likewise, another study found that training programs focusing on spreadsheet applications significantly increased participants' competence in managing public administration data. These findings indicate that practical training remains one of the most effective approaches to improving digital competencies among government employees.

Microsoft Excel remains one of the most widely used software applications for data processing due to its accessibility, affordability, and extensive analytical capabilities. Recent versions of Microsoft Excel incorporate numerous advanced features, including Pivot Tables, Pivot Charts, conditional formatting, slicers, data models, Power Query, and dashboard development. These features enable users to perform descriptive analysis and generate interactive visual reports without requiring programming knowledge [4]. Consequently, Microsoft Excel represents an appropriate technology for village administrations that often have limited financial resources and technological infrastructure.

Previous community service programs have demonstrated positive impacts of spreadsheet-based training in improving administrative performance. For example, one program implemented Microsoft Excel training for village officials and observed improvements in report preparation efficiency. Similarly, another program found that Excel-based financial reporting training enhanced transparency and reduced reporting errors in village financial administration. Another study reported that dashboard-based reporting improved communication between village governments and district authorities by providing more informative development reports.

Beyond administrative reporting, data visualization has become an important instrument for evidence-based governance. Interactive dashboards enable local governments to monitor demographic changes, evaluate development indicators, identify budget realization, and support strategic planning [5]. Data-driven governance has been recognized internationally as a fundamental component of smart government initiatives because policy decisions supported by reliable data tend to be more transparent, accountable, and measurable [6].

Although numerous studies have investigated digital literacy training for government employees, most existing community service programs primarily focus on basic computer operation, office applications, or electronic correspondence. Only a limited number of studies specifically address practical data visualization skills using Microsoft Excel for village government officials. Furthermore, previous programs generally evaluate participant satisfaction rather than measuring competency improvement through structured assessments. Consequently, empirical evidence regarding the effectiveness of practical Excel-based data visualization training in village administration remains limited.

Another limitation identified in previous studies concerns the training methodology. Most programs rely on lecture-based instruction with minimal opportunities for participants to practice using their own administrative datasets. Adult learning theory suggests that practical and contextual learning activities are more effective in improving long-term skill acquisition because participants directly apply newly acquired knowledge to real workplace problems [7]. Therefore, participatory and project-based training approaches deserve greater attention in community service activities.

This community service program introduces a practical training model that integrates village administrative datasets with Microsoft Excel-based visualization techniques. Participants learn not only spreadsheet functions but also dashboard design principles, graphical communication, and interactive reporting that can immediately be implemented within village administrative activities. The program combines lectures, demonstrations, guided practice, mentoring, and competency evaluation to ensure sustainable learning outcomes.

The novelty of this community service lies in three major contributions. First, the program integrates practical dashboard development using authentic village administrative data instead of hypothetical datasets commonly used in training activities. Second, competency improvement is measured through structured pre-test and post-test assessments, allowing quantitative evaluation of learning outcomes. Third, the training emphasizes evidence-based decision-making by demonstrating how visualized information can support village planning, budgeting, public reporting, and service delivery.

Therefore, this community service aims to enhance the competencies of village government officials in organizing, analyzing, and visualizing administrative data using Microsoft Excel. Specifically, the program

seeks to improve participants' digital literacy, increase the quality of administrative reporting, strengthen evidence-based decision-making practices, and promote more transparent and accountable village governance. It is expected that the knowledge and practical skills acquired during the training will contribute to sustainable digital transformation within village administrations while supporting the broader implementation of smart village initiatives in Indonesia.

METHODS

This community service employed a participatory training approach designed to improve the competencies of village government officials in organizing, analyzing, and visualizing administrative data using Microsoft Excel. The program emphasized practical learning through direct interaction, guided exercises, mentoring, and performance evaluation. The training was conducted over two consecutive days at the village office meeting hall and involved village government officials responsible for administration, finance, planning, and public services.

A total of 25 village government officials participated voluntarily in the program. The participants represented various administrative units, including village administration, financial management, population services, development planning, and community empowerment. Prior to the implementation of the training, all participants completed a needs assessment questionnaire to identify their current level of digital literacy, familiarity with Microsoft Excel, and challenges encountered in managing administrative data.

The implementation methodology adopted the community empowerment model proposed by Chambers [8], emphasizing participation, capacity building, and sustainability. In addition, the instructional design followed the experiential learning approach introduced by Kolb [3], where participants acquire knowledge through concrete experience, reflective observation, conceptual understanding, and active experimentation.

The community service activities consisted of four major stages: (1) needs assessment, (2) training preparation, (3) implementation of hands-on workshops, and (4) evaluation and follow-up mentoring. Figure 1 illustrates the overall implementation framework. The stages of the activities are illustrated in Figure 1.

Figure 1. Framework of Community Service Activities

Needs Assessment → Training Preparation → Hands-on Workshop → Evaluation → Follow-up Assistance

A. Needs Assessment

The initial stage aimed to identify participants' competencies and institutional needs related to administrative data management. Several activities were conducted, including:

- **interviews with village officials;**
- **observation of administrative reporting practices;**
- **identification of frequently used datasets;**
- **analysis of existing reporting formats;**
- **pre-test on Microsoft Excel competency.**

The assessment revealed that most participants were familiar with basic spreadsheet operations such as data entry and simple formulas. However, only a few participants had experience using Pivot Tables, charts, conditional formatting, or dashboard development.

B. Training Preparation

Based on the assessment results, the training materials were designed to address practical administrative problems encountered in village governance.

The learning modules consisted of:

1. **Introduction to Data Visualization**
2. **Organizing Administrative Data**
3. **Data Cleaning Techniques**
4. **Microsoft Excel Tables**
5. **Sorting and Filtering Data**
6. **Pivot Tables**
7. **Pivot Charts**
8. **Conditional Formatting**
9. **Dashboard Development**

10. **Interactive Reporting**
11. **Best Practices in Data Presentation**
12. **Practical Exercises Using Village Administrative Data**

Each participant received:

- **training handbook;**
- **exercise files;**
- **sample village datasets;**
- **dashboard templates;**
- **evaluation sheets.**

C. Hands-on Training Implementation

The training employed learning-by-doing and project-based learning approaches. Every theoretical explanation was immediately followed by practical exercises.

Participants completed several practical projects, including:

Session 1

- **Creating structured administrative databases.**
- **Applying data validation.**
- **Formatting datasets.**

Session 2

- **Using formulas (SUM, COUNTIF, IF, VLOOKUP/XLOOKUP).**
- **Creating Pivot Tables.**
- **Developing Pivot Charts.**

Session 3

- **Applying Conditional Formatting.**
- **Creating Key Performance Indicators (KPIs).**
- **Building interactive dashboards using slicers.**

Session 4

- **Presenting village demographic reports.**
- **Visualizing village financial data.**
- **Developing development monitoring dashboards.**

Throughout the workshops, participants worked collaboratively in small groups while receiving direct assistance from facilitators.

D. Evaluation

Program effectiveness was evaluated using four assessment instruments.

1. Knowledge Assessment

Participants completed identical pre-tests and post-tests consisting of 20 multiple-choice questions covering:

- **spreadsheet concepts;**
- **data management;**
- **chart selection;**
- **dashboard design;**
- **data interpretation.**

Learning improvement was calculated using:

RESULTS AND DISCUSSION

A. Participant Profile

The community service program involved **25 village government officials** from various administrative divisions, including village administration, financial affairs, development planning, public services, and community empowerment. Participants represented personnel who routinely manage village administrative data, prepare reports, and support decision-making processes.

Most participants had prior experience using Microsoft Excel for simple data entry and calculations. However, only a small proportion had previously utilized advanced features such as Pivot Tables, Pivot

Charts, Conditional Formatting, or dashboard development. The characteristics of the participants are summarized in Table 1.

Table 1. Participant Characteristics

Characteristics	Frequency	Percentage (%)
Male	14	56
Female	11	44
Administrative Staff	9	36
Financial Staff	6	24
Planning Staff	5	20
Public Service Staff	5	20
Basic Excel Skills	20	80
Intermediate Excel Skills	5	20

The initial assessment indicated that most participants experienced difficulties in summarizing large datasets, creating graphical reports, and preparing administrative dashboards. Administrative reports were generally presented in tabular form, making information less accessible for decision-making and public communication. The results of the pre-test and post-test are presented in Table 2.

Table 2. Pre-test and Post-test Results

Assessment	Mean Score
Pre-test	56.4
Post-test	86.7
Improvement	30.3
Percentage Increase	53.7%

The findings demonstrate a substantial improvement in participants' knowledge after the training. The average score increased from **56.4** to **86.7**, indicating that participants successfully understood the concepts of data organization, visualization principles, and dashboard creation.

The improvement exceeded the program target of 25%, suggesting that the instructional strategy effectively enhanced participants' digital competencies.

B. Practical Competency Achievement

Competency assessments were conducted using project-based assignments in which participants developed dashboards based on authentic village administrative datasets. The practical competency scores of the participants are presented in Table 3.

Table 3. Practical Competency Scores

Competency	Average Score
Data Organization	88
Formula Application	84
Pivot Tables	82
Pivot Charts	86
Dashboard Design	80
Overall Average	84.0

Participants demonstrated the highest achievement in organizing datasets and producing visual reports. Dashboard design received the lowest average score, primarily because participants had limited prior experience in integrating multiple visualization components into a single interactive reporting interface. Nevertheless, nearly all participants successfully completed their final dashboard projects.

C. Discussion

The findings indicate that practical Microsoft Excel training significantly improved both theoretical understanding and technical competencies among village government officials. The substantial increase in assessment scores confirms that structured, hands-on learning effectively strengthens digital literacy in local government institutions.

One important factor contributing to the success of the program was the utilization of authentic village administrative datasets. Rather than using hypothetical examples, participants analyzed data that were

directly related to their daily responsibilities. This contextual learning approach enhanced participant engagement and facilitated knowledge transfer into workplace practices. Similar findings have been reported in previous community service studies emphasizing experiential learning for adult learners [9].

The project-based learning strategy also encouraged participants to solve practical administrative problems collaboratively. Instead of memorizing software functions, participants learned to identify reporting needs, select appropriate visualization techniques, and communicate information effectively through dashboards. This finding aligns with experiential learning theory, which suggests that practical application significantly improves long-term competency development [10].

The competency assessment further demonstrated that participants quickly mastered spreadsheet organization and graphical reporting. However, dashboard integration remained relatively challenging because it requires higher-order analytical thinking and design skills. Future community service programs should therefore allocate additional mentoring sessions focusing on dashboard design principles, interactive reporting, and data storytelling.

Another important outcome was the improvement of participants' confidence in using Microsoft Excel as a decision-support tool rather than merely a data-entry application. During the final presentations, participants demonstrated dashboards illustrating demographic trends, budget realization, and village development indicators. These visual reports enabled faster interpretation of administrative information and promoted evidence-based decision-making within village governance.

The results are consistent with previous studies reporting that spreadsheet-based training contributes to better administrative performance, improved reporting quality, and increased organizational efficiency [11], [12], [13]. Nevertheless, this community service offers an additional contribution by integrating dashboard development with authentic village administrative data and quantitatively measuring competency improvement through pre-test and post-test assessments.

From a governance perspective, strengthening data visualization competencies supports the implementation of digital government and smart village initiatives. Village administrations increasingly require reliable analytical tools to monitor development programs, evaluate budget utilization, and communicate public information transparently. Microsoft Excel represents an accessible technology because it is widely available, relatively inexpensive, and does not require advanced programming knowledge.

Overall, the community service successfully achieved its objectives by enhancing participants' digital competencies, improving administrative reporting quality, and promoting evidence-based governance. The findings demonstrate that practical digital capacity-building programs can become sustainable strategies for accelerating digital transformation in rural public administration. Documentation of the training activities is presented in Figure 2 and Figure 3.



Figure 2. Presentation of matter



Figure 3. The Participants

CONCLUSION

This community service program successfully enhanced the competencies of village government officials in managing, analyzing, and visualizing administrative data using Microsoft Excel. The participatory and hands-on training approach effectively improved both participants' theoretical understanding and practical skills, as demonstrated by the significant increase in post-test scores and the successful completion of dashboard-based reporting projects. Participants were able to apply advanced Microsoft Excel features, including Pivot Tables, Pivot Charts, conditional formatting, and interactive dashboards, to transform routine administrative data into informative visual reports that support evidence-based decision-making. In addition to improving technical competencies, the program strengthened participants' confidence in utilizing digital tools to increase administrative efficiency, transparency, and accountability within village governance. The development of practical dashboard templates provides sustainable learning outputs that can be directly implemented in daily administrative activities. Therefore, this community service contributes not only to strengthening digital literacy among village government officials but also to supporting the broader implementation of data-driven governance and Smart Village initiatives in Indonesia. Future community service programs are recommended to integrate Microsoft Excel with advanced business intelligence platforms, such as Microsoft Power BI, and to provide continuous mentoring to ensure the long-term adoption of data visualization practices in village administration.

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