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Improving financial management efficiency at BAHANA Ciawi Clean Water Facility via an Android-based mobile application

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ABSTRACT

KSM SAB BAHANA in Ciawi, Bogor is a Community Self-Help Group (KSM) for Clean Water Facilities (SAB) BAHANA located in Kampung Tipar RT 01, RW 04 Ciawi. KSM SAB BAHANA was formed based on Decree Number 36 on December 31, 2019. Currently, there are significant problems in managing clean water services, especially in terms of customer registration and management of financial reports which are still done manually. This condition causes inefficiency and has the potential to cause recording errors. To overcome these challenges, community service is carried out by introducing an Android-based application designed to improve the efficiency and accuracy of financial management. The purpose of this service is to provide a technological solution that facilitates customer registration and management of financial reports effectively. The methods used include data collection, application design, socialization, implementation, evaluation, and ongoing maintenance to ensure the successful implementation of the application. The evaluation results show that 86 percent of the community strongly agree with the use of this application, which confirms that this program has succeeded in helping residents and SAB BAHANA officers manage customer reports and data better and more sustainably.

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1. INTRODUCTION

The need for clean water is fundamental to human life, especially for daily consumption like drinking water. In Ciawi, Bogor, SAB Bahana plays a vital role in providing clean water for the local community, particularly in Kampung Tipar, Desa Ciawi. Established under SK No. 36 on December 31, 2019, the SAB Bahana community organization faces significant challenges in managing its clean water services, particularly in customer registration and financial reporting, which are still done manually. Clean water management is crucial for ensuring the well-being and health of the residents, and efficient management is needed to meet the daily water needs of the community.

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Despite the community's long tradition of managing water resources harmoniously, the manual methods currently used for customer data management and financial tracking lead to inefficiencies, errors, and difficulties in monitoring and reporting finances accurately (Azizah et al., 2024). This situation negatively impacts service quality, customer satisfaction, and financial accountability. To address these issues, technology innovations are needed to improve data management efficiency and accuracy. The proposed solution is an Android-based application that simplifies customer registration and allows for more structured and transparent financial management. The app can automate billing processes and provide easy access for both staff and customers to financial information, enhancing operational efficiency and reducing human error (Wiranti & Frinaldi, 2023).

In response to these challenges, faculty and students from Universitas BSI, in collaboration with Universitas Nusa Mandiri, have initiated a Community Partnership Empowerment (PKM) program. Funded by the Ministry of Education, Culture, Research, and Technology, this program aims to introduce and implement a mobile Android application for customer registration and financial management at SAB Bahana. The app allows for automatic bill tracking and payments, reducing manual labor and operational costs. Furthermore, the app provides real-time access to billing and financial records for both customers and staff, improving transparency and ease of financial management (Raihan & Lawolo, 2024; Yuwono & Hermawati, 2024). The PKM activities include community and staff training, hands-on support for app implementation, and continuous evaluation to ensure the program's success and sustainability (Putri & Sudiarta, 2024). With these improvements, the efficiency and quality of clean water services at SAB Bahana are expected to increase, benefiting both the community and the management team.

The problems faced by KSM SAB Bahana include the management of clean water services, which still have high pH levels due to the relief structure of the highlands. Additionally, in terms of customer registration, they still have to wait for officers to come and register when visiting residents' houses. The financial report management is still done manually, which can lead to errors in financial transactions. Effective and efficient financial management is a key factor in the success of public service management, including clean water services in villages. Proper financial management not only facilitates record-keeping and reporting but also increases transparency and accountability. Transparency and accountability in financial management are forms of responsibility that can build public trust in service managers (Wulandari & Dewi, 2024). With this application, it is expected that the customer registration process and financial transaction recording will become more efficient, accurate, and easily accessible to both staff and the community. This aligns with the need to replace the manual system that has been used with notebooks, which often leads to recording errors and difficulties in conducting financial audits (Artati et al., 2022).

The rapid advancement of technology nowadays requires society to adapt to its developments (Haryadi et al., 2022, Khoerunisa & Widilestariningtyas, 2022). The digital shift in village clean water service management is also in line with the demands of the Industrial Revolution 4.0 era, where the adoption of technology is crucial for increasing competitiveness and operational efficiency, as well as adapting to the 4.0 revolution heading towards Society 5.0. The use of digital technology in financial management is considered a solution that not only simplifies day-to-day operations but also significantly contributes to improving the overall quality of services. The implementation of this technology is also expected to accelerate the modernization of the village's clean water management system, which will ultimately improve the welfare of the community (Tahar et al., 2022).

Through this PKM activity, the aim is to develop an Android-based application as a technological solution to facilitate customer registration and effective financial report management. It is also expected that the customers and staff of SAB Bahana will be able to master and optimally utilize the technology to support the advancement of clean water management in Ciawi, Bogor. The outputs generated by this

system application can be used as a basis for decision-making in the future (Sismadi, 2021). This program not only provides short-term solutions to current technical and financial management problems but also builds a strong foundation for the development of more advanced and sustainable management systems in the future. Thus, SAB Bahana is expected to continue to play an effective role in providing reliable, efficient, and sustainable clean water services to the community in Ciawi, Bogor.

2. METHODS

Activity Methods

This community service program is implemented for six months, starting from July to December 2024 at the Community Self-Help Group in the Ciawi area, Bogor Regency. In this program, one partner involved is KSM SAB Bahana Ciawi which acts as a provider of one of the clean water facilities in Kampung Tipar. The implementation of this program is divided into 6 stages, namely data collection, application design, application socialization, implementation, evaluation, and maintenance.

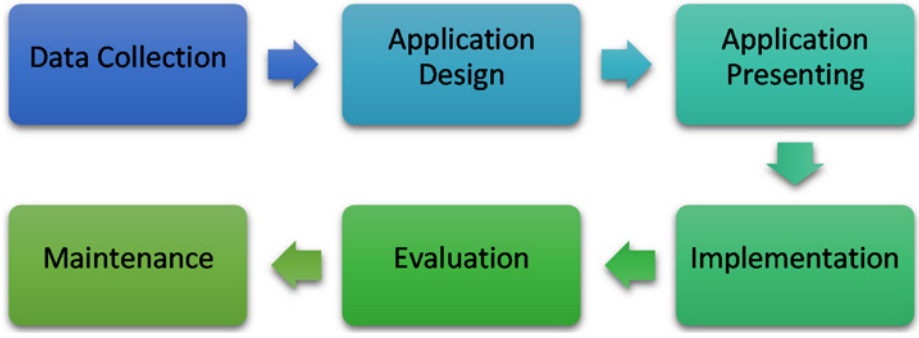


Figure 1. Program implementation stages

Data Collection

Last June, the team leader conducted a direct survey with the partners to collect data, classify problems, assess partner needs, and apply technology. The data on partner needs includes the following: first, the staff manually collects payments for SAB Bahana by recording and calculating the water meter readings to determine the amount to be paid by customers. This method can lead to errors in calculating the bill amounts. Second, the report preparation relies solely on bookkeeping skills learned in school and has not yet adopted proper accounting-based income statement calculations. Therefore, an information system will be developed to manage finances, payment billing, and the preparation of income and expenditure reports based on an Android mobile platform. This will result in more accurate outcomes by implementing accounting calculations, as compared to previous methods. The information obtained from this survey will be used as the foundation for planning an application that fits the partner's needs. The data collected during the survey includes a list of SAB Bahana customer bills recorded manually. The data can be viewed via the survey results link.

Application Design

Application design is the process that involves various steps to create the interface of a program (Azis et al., 2020). Based on the previous data, at this stage, the entire team discussed with the

programmer to design an Android application for the partner. They adapted the identified problems, and the programmer began designing and developing the application according to the partner's needs.

Application Presenting

This activity was held on July 28, 2024 at the KSW SAB Bahana Ciawi Secretariat. We involved the community as customers and SAB Bahana management staff directly so that they received information about the application. And direct questions and answers related to the application being implemented.

Implementation

The next stage is the implementation of the Android-based SAB Bahana application. This application helps partners in customer data collection, financial recording, and recapitulation of SAB Bahana's financial reports.

Evaluation

The team evaluated the SAB Bahana application through a questionnaire that assessed five main aspects. Feedback from partners was that they suggested adding a 'print to Excel' feature because they needed the format to process and analyze data further, in excel format data collection so that partners would find it easier to manage clean water service financial reports. Table 1 is a question in the questionnaire used.

Table 1. Questionnaire items

A.	**Visuals**
A-1.	How do you rate the design of the user interface (UI) of the SAB Bahana application?
A-2.	Are the colors and themes in the SAB Bahana application easy to see and comfortable for your eyes?
A-3.	Are the icons and buttons in the SAB Bahana application easy to recognize and use?
A-4.	How do you rate the consistency of the design on various pages in the SAB Bahana application?
B.	**Application**
B-1.	How easy is the installation process of the SAB Bahana application on your device?
B-2.	Is the SAB Bahana application easy to access and operate without technical obstacles?
B-3.	Does the SAB Bahana application experience crashes or other technical problems when used?
B-4.	How do you assess the security of the SAB Bahana application in protecting user data?
C.	**Convenience**
C-1.	Is the SAB Bahana application user guide easy to understand?
C-2.	How easy is it to find the information you need in the SAB Bahana application?
C-3.	Do you find the search features in the SAB Bahana application helpful?
C-4.	How do you rate the ease of navigation between pages in the SAB Bahana application?
D.	**Usefulness**
D-1.	How important is the SAB Bahana application for your PAM Desa payment needs?
D-2.	Does the SAB Bahana application help you save time in making payments?
D-3.	How do you rate the usefulness of the payment notification feature in the SAB Bahana application?
D-4.	Does the SAB Bahana application help you avoid late payments?
E.	**Performance**
E-1.	How fast is the SAB Bahana application response when used?
E-2.	Does the SAB Bahana application work smoothly without lag or delay?
E-3.	How do you rate the stability of the SAB Bahana application when used for a long time?
E-4.	Are you satisfied with the overall performance of the SAB Bahana application?

Maintenance

The team has formed an application maintenance group involving the team leader, SAB Bahana management, and the programmer to address issues and ensure the application functions properly.

The partner's role in the community service activities related to digital-based financial management includes the following: (1) Providing information on various issues related to PAMDES financial management and collaborating in finding solutions to address these problems together with the team; (2) Actively participating and assisting in the design process of the SAB Bahana information system or application; (3) Providing the necessary venue or location for the program activities. This includes spaces for meetings, training, or other activities related to the implementation of the PKM program; (4) Offering input and suggestions regarding program implementation; (5) Actively participating in monitoring and evaluation activities, both internally and externally.

3. RESULTS AND DISCUSSION

The implementation of the Android-based SAB Bahana application in this community service activity was carried out through several stages.

Data Collection

In June, the team leader made a direct visit to the partner to conduct a survey and collect data (activity documentation has been presented in Figure 2). During the survey, the team leader interacted with the partner to gain in-depth insights into problem classification, their needs, and the application of technology. The information obtained from this survey is invaluable as it will serve as the primary basis in the application design process, tailored specifically to meet the partner's unique needs.

The data collected covers various aspects such as the challenges faced by the partner, their preferences, and desired features in the application. All this information will be thoroughly analyzed to ensure that the application developed provides effective and efficient solutions for the partner.

In contrast to previous activities involving the design and development of a financial recording application for the Ikatan Alumni Santri Sidogiri (IASS) organization (Aziz & Sanjaya, 2023), this data collection is more comprehensive, particularly in addressing specific issues related to the partner's financial management. The previous activity was more limited to identifying general problems without a deep approach regarding the technology to be implemented.

Figure 2. Survey team leader to partners

Application Design

Based on the data collected during the data collection phase, the team then held a meeting with the programmer to discuss the design of the Android-based application to be provided to the partner. In the meeting, the team discussed and aligned the issues identified in the previous stage with the programmer. Compared to similar projects that have been carried out, the design in this activity is more focused on optimizing financial management and customer data tracking. In previous activities, application design placed more emphasis on social aspects, such as merely focusing on raising community awareness or providing basic training on general technology usage without emphasizing specific financial management (Susanti & Sagoro, 2018) and without offering an in-depth solution for a complex digital management system.

The results of this discussion were then implemented by the programmer to begin designing and developing the application according to the partner's needs. Figure 3 shows the discussion process carried out by the community service team.

Figure 3. Application design discussion

Application Presenting

The presentation was conducted on July 28, 2024, at the Secretariat of KSM SAB Bahana Ciawi, involving local residents as potential customers and the management staff of SAB Bahana. This socialization focused on directly introducing the functions and benefits of the Android-based SAB Bahana application. By involving both parties, it is expected that the technology adoption process will be faster and can provide feedback for further development. In comparison to previous socialization activities, this time there was a higher community participation and a deeper understanding of the application usage, unlike previous activities that were more general introductions without direct interaction (Susanti & Sagoro, 2018). Direct interaction allowed the community and management staff to experience using the application, thus facilitating the adoption and implementation process.

Figure 4. Presentation of Android application

Implementation

The Android application equipped with a manual book (user guide) that explains how to use the application (the cover can be seen in Figure 5), starting from the registration process, usage of the available features, to financial management. This manual book has been prepared in detail to facilitate users in understanding each step and function within the application. For more details, here is the link to download the manual book/user guide for the SAB Bahana application: *Link PDF Manual Book/User Guide Aplikasi SAB Bahana*

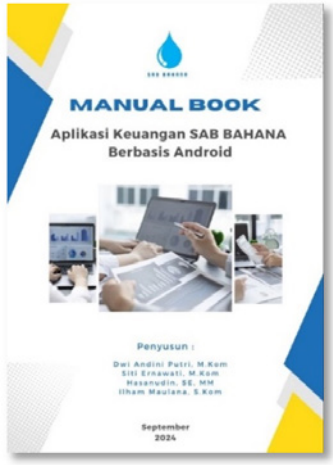


Figure 5. SAB Bahana Financial Application manual book

This application has main features such as customer data management, billing management, recording income and expenses, and automatic financial recap. Additionally, the application also provides features for water usage history, payment transactions, payment history, and integrated complaints, making it easier for partners to monitor all financial and operational activities more efficiently.

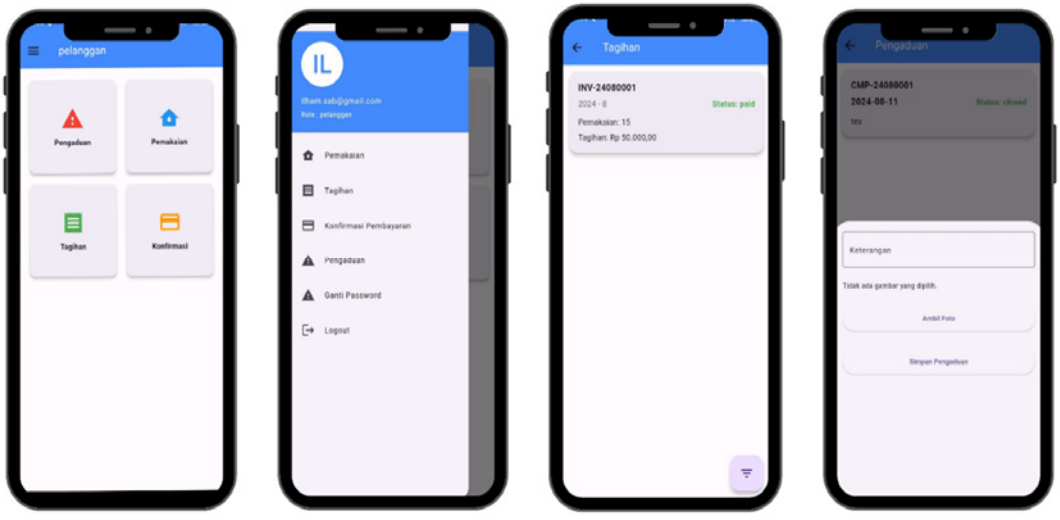


Figure 6. SAB Bahana Application menu display
Figure 7. (a) Preview of billing transaction page; and (b) Complaints page

Before using the application, users are required to register first by filling in their personal information, which will be used as the basis for user identification within the application. After the registration process is complete, users can log in using the email and password they have created. The implementation of this application is more structured and functional compared to the previous implementation, which was not fully able to accommodate the partners' needs for digital financial management (Gitawan et al., 2023).

The menu display of the SAB Bahana application consists of usage, billing, confirmation, complaints, change password, and logout, which can be seen in Figure 6. Figure 7a shows the billing transaction page to customers; on this page, the transaction process can be seen once it has been approved by the admin. Figure 7b is the complaints page, where users can input issues or problems, including evidence in the form of photos to serve as concrete proof.

Evaluation

After the implementation of the SAB Bahana application, the team conducted an evaluation by distributing a questionnaire to the partners. This questionnaire assessed five main aspects: visual appearance, menu and content of the application, ease of use, usefulness, and performance (the questionnaire questions can be seen in Table 1). Figure 8 shows the distribution of the questionnaire carried out by the team. Based on the feedback received, partners suggested adding a "Print to Excel" feature to the application. Currently, the application only provides a "Print to PDF" feature, but the Excel format is considered more flexible by the partners as it facilitates further data processing, such as analysis or data adjustment according to their needs. The addition of this feature is expected to enhance the overall benefits of the application, particularly in easing financial management and operational data.

In general, this activity has a significant positive impact on the partners. With the SAB Bahana application, partners can now conduct customer data management and financial management more efficiently and systematically. This not only reduces the burden of manual work but also improves accuracy and transparency in financial recording. Partners reported an increase in their ability to monitor and analyze financial data, which in turn supports better decision-making.

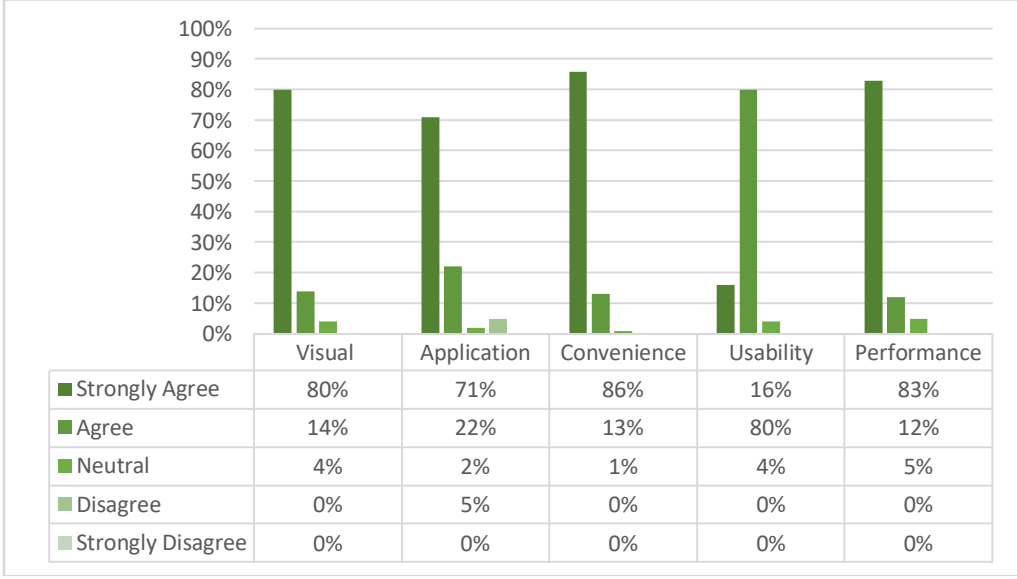
Figure 8. The team distributes the questionnaire

From the innovation perspective, the implementation of this application also encourages the development of science and technology (IPTEK) among partners. By integrating digital technology into financial management, partners are adapting to the continuously evolving digital era. They are becoming more familiar with the use of Android-based applications and digital data management processes, which opens opportunities for further innovation in the future. For example, partners can explore the use of other technologies, such as data analysis or the development of advanced applications, to enhance

their operational efficiency and effectiveness. This evaluation not only assesses the performance of the application but also illustrates how technology can serve as an empowerment tool for partners, encouraging them to innovate and adapt to the needs of the times.

Maintenance

To support the maintenance of the application, the team has formed a special group consisting of the team leader, the management of SAB Bahana, and programmers. This group was established to facilitate communication between team members, programmers, and partners in addressing any difficulties or issues that may arise during the application's use. The existence of this group is crucial to ensure that any obstacles or problems that occur can be resolved quickly and effectively, so that the application continues to function well and meets the needs of users and the management staff of SAB Bahana. A total of 20 respondents provided answers, the results of which will be presented in graphical form, as shown in the image in Figure 9.



	Visual	Application	Convenience	Usability	Performance
Strongly Agree	80%	71%	86%	16%	83%
Agree	14%	22%	13%	80%	12%
Neutral	4%	2%	1%	4%	5%
Disagree	0%	5%	0%	0%	0%
Strongly Disagree	0%	0%	0%	0%	0%

Figure 9. Questionnaire results regarding SAB Bahana Application

The graph refers to the survey results involving 20 respondents, focusing on five main aspects: visual appearance, menu and application content, ease of use, usefulness, and performance. Visual Appearance: There are 4 statements, with an average percentage of 80 percent for the "strongly agree" indicator, 14 percent for the "agree" indicator, 4 percent for the "neutral" indicator, 0 percent for the "disagree" indicator, and 0 percent for the "strongly disagree" indicator. Menu and Application Content: There are 4 statements, with an average percentage of 71 percent for the "strongly agree" indicator, 22 percent for the "agree" indicator, 2 percent for the "neutral" indicator, 5 percent for the "disagree" indicator, and 0 percent for the "strongly disagree" indicator. Ease of Use: There are 4 statements, with an average percentage of 86 percent for the "strongly agree" indicator, 13 percent for the "agree" indicator, 1 percent for the "neutral" indicator, 0 percent for the "disagree" indicator, and 0 percent for the "strongly disagree" indicator. Usefulness: There are 4 statements, with an average percentage of 16 percent for the "strongly agree" indicator, 60 percent for the "agree" indicator, 4 percent for the "neutral" indicator, 0 percent for the "disagree" indicator, and 0 percent for the "strongly disagree" indicator. Performance:

There are 4 statements, with an average percentage of 83 percent for the "strongly agree" indicator, 12 percent for the "agree" indicator, 5 percent for the "neutral" indicator, 0 percent for the "disagree" indicator, and 0 percent for the "strongly disagree" indicator.

Based on the questionnaire results, it can be concluded that the SAB Bahana mobile Android application has provided customers with convenience in their transaction activities compared to before using the application. Customers feel assisted in saving time during the payment process and can avoid late payments as experienced previously. The application's performance is very stable, allowing it to respond to customers effectively without delays. The application interface design is easy to navigate and visually comfortable. The installation process for the SAB Bahana application is accessible and user-friendly. Thus, the benefits of the activities carried out have had a very positive impact on the partners, namely SAB Bahana, and all the customers in the Tipar village community. The relevance of these results aligns with previous journals (Azizah et al., 2024), which also provide positive benefits for the partners and are greatly needed by them.

4. CONCLUSION AND RECOMMENDATIONS

The implementation of the SAB Bahana Android-based application in financial report management has successfully increased efficiency and transparency. This application facilitates customer data collection, billing, payments, complaints, and financial reporting, which are crucial steps in minimizing errors that previously occurred due to manual data entry processes. The evaluation using a Likert scale questionnaire across five factors, there are appearance, menu and content of the application, ease of use, usefulness, and performance indicates that 86 percent of respondents strongly agree that this application is beneficial and greatly needed by the partners. The results achieved from this community service program (PKM) include improved accuracy of financial data, reduced time required for recording and reporting, and increased partner satisfaction with the application. Additionally, partners reported enhanced capability in monitoring their income and expenses, positively impacting their financial decision-making. Thus, this activity not only provides practical solutions but also empowers partners to manage their finances more effectively. Another conclusion from this program is that the service initiative includes several important stages: data collection, application design, socialization, implementation, evaluation, and maintenance. This structured process ensures that every aspect of the application's development and implementation is carried out meticulously, resulting in outcomes that genuinely meet the partners' needs.

The limitations encountered in the activities carried out include a significant number of customers who do not have mobile phones to access the SAB Bahana Android-based application, as well as a general lack of knowledge among customers regarding mobile technology. Recommendations for similar community service initiatives in the future include conducting regular monitoring and evaluation of application usage to ensure that users can address their complaints or knowledge limitations in technology. If there are updates to the mobile application, it would be beneficial to provide additional socialization to users. Additionally, it is important to consistently update information about SAB Bahana-related activities within the mobile application so that customers can stay informed about the latest news and ongoing developments.

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