Waste management improvement with software application at Wringinsongo Village, Tumpang Regency, Malang

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ABSTRACT

Wringinsongo Village, Tumpang Subdistrict, Malang Regency maintains a clean environment through environmentally friendly waste management. One of Wringinsongo's BUMDes (Village-Owned Enterprises) is the Waste Bank, which uses waste as a potential sector. It needs to get special attention related to its governance, because the recording is still less effective and there are often calculation errors caused by the recording system using paper. Based on these conditions, it is necessary to develop an application to help record transaction activities at the Waste Bank. The Wringinsongo Village Waste Bank application can be accessed on both the web platform and Android mobile devices, based on the ease of access to the system by village managers and officials. After developing the application, socialization and training were conducted to the Waste Bank manager and village officials to provide information on how to use the application. After three months of use, feedback was taken to get responses related to the use of the application. The result is that BUMDes managers find it easy to record and obtain accurate and faster calculation results.

1. INTRODUCTION

The logical consequence for Indonesia, where most of the population lives in rural areas, is equitable development between rural and urban areas. This should village level government's responsibility (Yunita, 2021). In the Regulation of the Minister of Villages, Development of Disadvantaged Regions, and Transmigration of the Republic of Indonesia Number 4 of 2015 (BPK, 2016), BUMDes is one form of strengthening the village economy to reduce various gaps between villages and cities. BUMDes as a representation of the village government in initiating village development innovations based on these regulations (Parjaman & Enas, 2021). BUMDes is a business entity in which all or most of the capital is owned by the village (Hailudin, 2021) through direct participation from separated village assets to manage assets, services and other businesses for the greatest welfare of the village community. Based

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on its function, BUMDes is a pillar of economic activity in the village that functions as a social and commercial institution (Rosyadi et al., 2021) that can improve the economic standard of the village community (Aprillia et al., 2021). BUMDes as a social institution favors the interests of the community, as a commercial institution it aims to make a profit through offering local resources (goods and services) to the market. This can have an impact on increasing the original village income (PADes). The business character of BUMDes can be customized based on the needs of the local community (Ibrahim et al., 2022; Moita, 2022). From the description above, it can be understood that villages can play a role in developing themselves through BUMDes, as happened in Wringinsongo Village, which has a BUMDes with one of its business units, namely the Waste Management Unit. The function of waste management at the village level can have a good impact on environmental health and improve the economic level of village communities (Putra & Ismaniar, 2020).

Wringinsongo Village is a village located in Tumpang District, Malang Regency. Wringinsongo Village can optimize the use of the waste classification unit, which can be seen in Figure 1, including to meet the needs of residents. Because the waste management mechanism requires installation and operational costs, the waste management unit naturally sets a certain tariff. Currently, the BUMDes waste management unit of Wringinsongo Village, appointed by Wringinsongo Village officials, has approximately 110 waste bank customers divided into 6 RW in Sumber Ringin Hamlet. It is expected that in the following years, other hamlets in Wringsinsongo Village can contribute to utilizing the waste classification facilities owned by the Village.

Figure 1. Waste classification installation of Wringinsongo Village

Based on a preliminary survey conducted by the Polinema community service team, it turns out that there are still several obstacles experienced by waste managers in Wringinsongo Village, including: Problems regarding the recording system that is still manual, the application of basic tariffs from waste collectors that sometimes change, and information on changes in basic tariffs that do not reach customers. In addition, the waste bank recording system is still done manually, which creates the impression of a lack of professionalism on the part of the manager because it can lead to inconsistencies and data transparency from the manager. Therefore, both managers and village officials need an understanding of the importance of more accountable bookkeeping to increase trust between residents and managers. Because it cannot be denied that recording and billing that is carried out accountably, shows an increase in the quality of service in the Waste Management Unit. A way that can be done to get more accountable records is by using software in the form of applications that can be developed and adapted to the demographic conditions of Wringinsongo Village. In general, human resources at the Wringinsongo Village apparatus level already have basic knowledge of technology, so it is hoped that the application

can facilitate and be used for a long time. An example of the transaction logbook of the Wringinsongo Village Waste Bank can be seen in Figure 2.
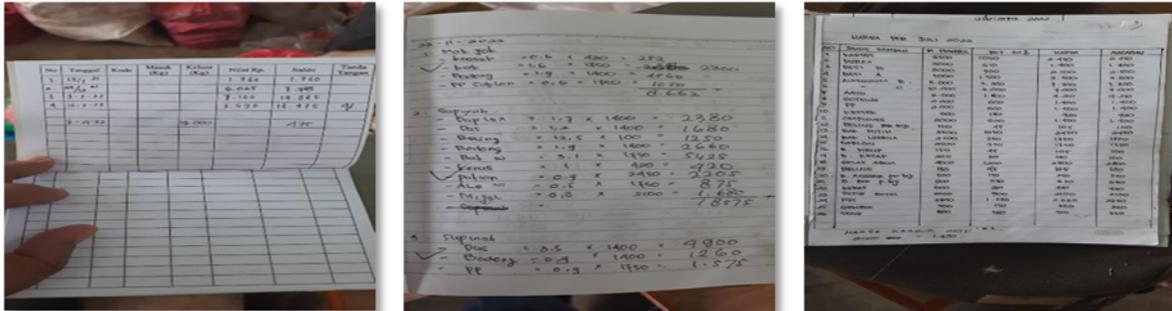
Figure 2. Waste bank notebook

Based on the conditions that occurred, the community service Team needed to do two things: First, recalculate the basic tariff of items deposited in the waste bank to be reviewed and determined by village officials. It is necessary to analyze the economic feasibility so that the tariff is more equitable, both for the villagers and for the BUMDes. In addition, it still pays attention to profit because the business unit must generate profit, but the manager also pays attention to humanitarian principles. The management of this waste bank is important to do, in the service activity carried out by Sasoko (2022), the management of waste banks can streamline and reduce the environmental impact caused by waste. This is also in line with the results of community service activities carried out by Saputra et al. (2023) and Kusumawati & Ramayanti (2023) on waste management in the form of waste bank activities. Previously, community service activities have been carried out on making waste bank applications. In the activity carried out by (Atin et al., 2023) , the development of a waste bank application was carried out with the result that the activities of the community where the service activity was carried out became more efficient. Likewise, based on community service conducted by Kodriyah et al. (2022) which states that the existence of a waste bank application can increase the efficiency of waste management and increase the economic impact on society.

In this community service activity, an application was developed for waste bank management in Wringinsongo Village, Tumpang District, Malang Regency. The application development was also followed by socialization and training activities to the stakeholders.

2. METHODS

The method used in this community service activity is application development and training on the use of the Waste Bank application involving 5 Wringinsongo Village officials and the manager of the Waste Bank. Activities include problem identification activities, application development, and socialization to Wringinsongo Village officials who will operate the Wringinsongo Waste Bank application and related officers.

Problem Identification

Problem identification is carried out to explore and get the root of the problems that occur in community service activity partners. This activity was carried out by conducting interviews with the

manager of the Wringinsongo Village Waste Bank. Problem identification activities in Wringinsongo Village can be seen in Figure 3.

Figure 3. Observation activity

Application Development

The next stage after the problem is identified is application development. Application development activities begin with the identification of software requirements, analysis and design, implementation, testing, and deployment.

The software needs identification stage is carried out after the interview activity with the waste bank manager. After the software requirement identification stage, the next step in application development is analysis and design. At this stage, the community service team conducted an in-depth analysis of the functional and non-functional needs of the application. This involves an in-depth understanding of user needs, the required data structure, and the overall system architecture. The requirement specifications can be seen at Table 1.

Table 1. Requirements spesifications

Requirements	Details
Operating system	Windows, Linux, or MacOS
Web browser	Google Chrome
Functional requirements (user)	Can see balance details Can see transaction history Can see waste transaction history Can see waste data
Functional requirements (officer)	Can see users' balance Can see users' transaction history Can see users waste transaction history Can see waste data master Can manage waste data master Can manage users' data

Once the analysis is complete, the development team steps into the implementation stage, where the source code is built according to the pre-made design. This implementation process involves the use of appropriate programming languages and best coding practices to ensure the application can run efficiently and in accordance with the development goals.

Next, the testing phase is crucial in ensuring the quality and performance of the application. The development team conducts functionality tests with the aim of finding and fixing potential bugs or

system weaknesses. This testing may involve testing on various usage scenarios to ensure that the app can operate properly under various conditions.
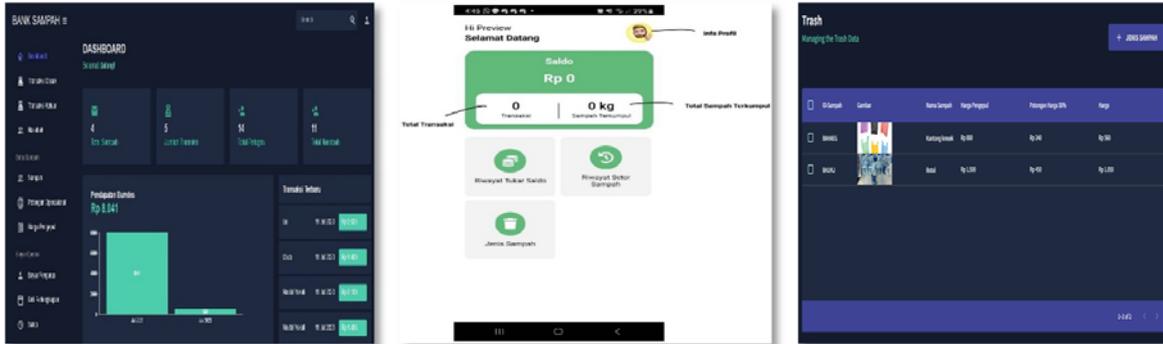
Figure 4. Waste bank application dashboard
Figure 5. User dashboard
Figure 6. Waste master data

Once the application is declared ready in terms of testing, the final step is deployment. At this stage, the application is officially introduced to end users or customers. The deployment process includes data migration, system configuration, and the official launch of the application. In addition, a technical support team is also set up to help if problems are found or requests for help from users. Examples of how the application looks after going through the testing process can be seen in Figure 4, Figure 5, and Figure 6.

Overall, the app development activity involved a structured and continuous series of steps, starting from requirements identification to deployment. This process ensures that the resulting application not only meets user needs, but also has optimal quality and performance.

Socialization and Training

Socialization is carried out after the application has been validated by the partner. This activity was directed at introducing the concept of a modern waste bank supported by application technology, in order to increase efficiency in waste management.

Figure 7. Application training for Wringinsongo Village's stakeholder

The socialization began by inviting waste bank managers and village officials. In this session, the waste bank application training was held. Participants were invited to get to know more closely how technology can simplify the process of recording, weighing, and reward systems in waste management. The application was also designed to provide transparency regarding the contribution of each waste bank member in recycling efforts. The socialization activity of the Wringinsongo Village Waste Bank application can be seen in Figure 7.

Evaluation

After completing the community service activities in Wringinsongo Village, the evaluation phase is conducted by gathering data through questionnaires from village stakeholders. The questionnaire uses Likert scale to measure satisfaction and program effectiveness. The collected data is then processed using Likert scale calculations to gain insights into the impact and benefits of the community service activity. This evaluation is crucial for improving future programs and ensuring their sustainability.

## 3.	RESULTS AND DISCUSSION

Results

The output of this community service activity is an application that can be used by the waste bank manager and Wringinsongo Village officials. In addition, the application can also be used by residents, so that monitoring of the results of funds obtained from the exchange of used goods can be seen in real time in the application.

Users who have a role in this Wringinsongo Waste Bank application are managers and the community. Waste bank managers can manage waste bank transaction data and see a recapitulation of waste bank transaction data in a certain period. While the community can see transaction history data in the form of nominal and total weight of waste that has been deposited.

Data management on officers can be done on a website platform, the Wringinsongo Waste Bank application is integrated with other BUMDes Wringinsongo application data, namely the water payment management application. The water payment management application (SIPAS) (Wibowo et al., 2023) has been carried out in the previous year, as a community service program. The community service program carried out in Wringinsongo Village is carried out in a sustainable manner, so that the applications developed by the community service team are made into an integrated portal to facilitate access for officers in carrying out related activities. An example of the Waste Bank and SIPAS application integration dashboard can be seen in Figure 8.
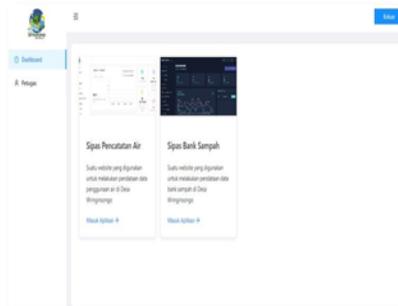
Figure 8. Integration with SIPAS application

Discussions

This community service activity carried out is a form of supporting the activities of BUMDes Wringinsongo Village in increasing the income and economy of the village community by converting household waste into money. However, efficiency needs to be done, because with waste bank records that are limited to using paper, it is very prone to errors, both in recording and converting waste deposited by the community into rupiah. Based on this, in this activity, an application for the Wringinsongo Village Waste Bank was developed to answer the above problems.

After the development, village officials and officers who are authorized to carry out waste bank activities are given training and socialization so that they can operate the application properly. After that, the community service team gave questionnaires to five persons, which are the village officials involved in operating this application. The response from the village officials regarding this application is very good as shown in Table 2. The application repair activities will be carried out if there is a failure in the application can be carried out by the community service team so as not to bother the operation of the waste bank in Wringinsongo Village.

Table 2. Questionnaire criteria

Criteria	Score
Strongly agree	4
Agree	3
Disagree	2
Strongly disagree	1

Table 3. Questionnaire results

Questions	Strongly Agree	Agree	Disagree	Strongly Disagree	Score	Percentage
This community service activities carried out provide solutions to the problems faced by partners	4	1	0	0	19	95%
Team members involved in this community service activities are active in providing assistance	5	0	0	0	20	100%
The frequency of assistance carried out by the community service team is felt to be appropriate	5	0	0	0	20	100%
There is an increase in independence or additional knowledge and skills in partners	4	1	0	0	19	95%
Overall, partners feel satisfaction with the community service activities that have been carried out	4	1	0	0	19	95%

4.   CONCLUSION AND RECOMMENDATIONS

This community service activity has been carried out and received good results and a positive response from Wringinsongo Village officials, Tumpang District, Malang Regency. Based on the results

of the questionnaire given to the Wringinsongo Village respondents, it can be concluded that the development of the Wringinsongo Village Waste Bank application is very helpful for the operational activities of the waste bank. Another positive response is the desire for continued cooperation from the Wringinsongo Village officials with the community service team, so that economic activities in the village can be carried out more efficiently and well. So that for the next year, there will be continued community service activities in Wringinsongo Village.

Based on the good results of this community service, the implementation team also needs to conduct periodic evaluations of activities that use the applications that have been developed. The evaluation can be carried out once every 6 months in order to overcome if there are errors and failures in the software used.

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REFERENCES

Aprillia, A. R., Cahyono, D., & Nastiti, A. S. (2021). Systematic Literature Review (SLR): Keberhasilan dan kegagalan kinerja Badan Usaha Milik Desa (BUMDES). *Jurnal Akuntansi Terapan dan Bisnis*, *1*(1), 35-44. https://doi.org/10.25047/asersi.v1i1.2681

Atin, S., Mutia, S., Widayanti, A., S Yatawa, H., A Rafdhi, A., & Afrianto, I. (2022). Perancangan sistem informasi bank sampah berbasis website. *IJIS-Indonesian Journal On Information System*, *7*(1), 59-70. https://doi.org/10.36549/ijis.v7i1.194

Badan Pemeriksa Keuangan (BPK). (2016). *Peraturan Menteri Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi Nomor 22 Tahun 2016*. Retrieved from: https://peraturan.bpk.go.id/Details/150615/permendesa-pdtt-no-22-tahun-2016

Hailudin, H. (2021). Peranan Badan Usaha Milik Desa (BUMDES) dalam pemberdayaan ekonomi masyarakat Desa Labuhan Haji Lombok Timur. *Elastisitas: Jurnal Ekonomi Pembangunan*, *3*(1), 1-9. https://doi.org/10.29303/e-jep.v3i1.32

Ibrahim, I., Setiadi, S., Saleh, M., Gani, A. A., Mintasrihardi, M., Am, J., & Kamaluddin, K. (2022). Karakteristik BUMDes pesisir pada kawasan pertambangan emas di Kecamatan Maluk Sumbawa Barat. *Jurnal Ilmu Sosial Dan Humaniora*, *11*(1), 14-23. https://doi.org/10.23887/jish.v11i1.35080

Kodriyah, K., Kurnia, D., Alamsyah, A. A., & Wulandari, A. R. (2022). Kontribusi bank sampah berbasis digital sebagai alternatif peningkatan pendapatan warga. *Yumary: Jurnal Pengabdian kepada Masyarakat*, *3*(2), 109-118. https://doi.org/10.35912/yumary.v3i2.1517

Kusumawati, A., & Ramayanti, G. (2023). Pengelolaan sampah untuk menanggulangi permasalahan sampah di Desa Sasahan Kecamatan Waringin Kurung Kabupaten Serang. *Journal Of Human And Education (JAHE)*, *3*(2), 613-618. https://doi.org/10.31004/jh.v3i2.302

Moita, S. (2022). Pelatihan penguatan tata kelola Badan Usaha Milik Desa (BUMDes) berbasis karakter dan potensi masyarakat di Desa Pombulaa Jaya Kecamatan Konda Kabupaten Konawe Selatan. *Jurnal Abdidas*, *3*(6), 959-966. https://doi.org/10.31004/abdidas.v3i6.703

Parjaman, T., & Enas, E. (2021). Esai: Penguatan kapasitas Badan Usaha Milik Desa (BUMDes) sebagai lembaga penggerak pembangunan perekonomian desa. *Journal of Management Review*, *5*(3), 689-698. http://dx.doi.org/10.25157/mr.v5i3.7093

Putra, W. T., & Ismaniar, I. (2020). Pemberdayaan masyarakat melalui pengelolaan sampah di bank sampah. *Jambura: Journal of Community Empowerment*, *1*(2), 1–10. https://doi.org/10.37411/jjce.v1i2.569

Rosyadi, S., Setyoko, P. I., Kurniasih, D., Ramadhanti, W., Kusuma, A. S., & Atika, Z. R. (2021). Penguatan kapasitas peran sosial BUMDes dalam penanggulangan dampak ekonomi Covid-19. *Wikrama Parahita: Jurnal Pengabdian Masyarakat*, *5*(1), 27-32. https://doi.org/10.30656/jpmwp.v5i1.2554

Saputra, F. O., Ingsih, K., Kartikadarma, E., Isthika, W., Johary, L., & Sakti, M. B. (2023). Pengelolaan sampah rumah tangga berbasis aplikasi pada seluruh bank sampah di Kecamatan Semarang Barat. *Jurnal Pengabdian Multidisiplin*, *3*(2), 1-6. https://doi.org/10.51214/japamul.v3i2.632

Sasoko, D. M. (2022). Bank sampah, sebuah upaya mengurangi jumlah produksi sampah rumah tangga (Studi kasus Bank Sampah Barokah, RW. 07 Kompleks Perumahan BDN-Rangkapan Jaya Baru Pancoran Mas, Kota Depok). *Jurnal Perspektif-Jayabaya Journal of Public Administration*, *21*(2), 15-24.

Wibowo, D. W., Rizza, M. A., Fitriana, A., Khairy, M. S., & Zandra, R. A. P. (2023). Pembuatan aplikasi SIPAS (Sistem Pencatatan Air Wringin Songo) dalam rangka peningkatan layanan Bumdes di Desa Wringinsongo. *Kumawula: Jurnal Pengabdian Kepada Masyarakat*, *6*(2), 298-302. https://doi.org/10.24198/kumawula.v6i2.41690

Yunita, E. (2021). Strategi optimalisasi peran BUMDEs dalam mendorong pemerataan ekonomi desa. *Jurnal Riset Ilmu Ekonomi dan Bisnis*, 126-135. https://doi.org/10.29313/jrieb.v1i2.512