

THE IMPLEMENTATION OF THE OJIR APPLICATION AT CENTRAL WASTE BANK IN MALANG DISTRICT FOR THE MANAGEMENT OF HOUSEHOLD-SCALE ORGANIC WASTE DIVERSIFICATION PROCESSES

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Abstract

The Ojir application, a mobile-based innovation for organic waste management at Central Malang Waste Bank (BCM), provides an effective solution to streamline the collection and management of organic waste. Addressing environmental concerns such as food scraps, dry leaves, and fruits, the application responds to Ministry of Environment and Forestry (KLHK) data indicating that approximately 61.50% of total waste is organic, necessitating efficient management to reduce waste volume. Established in 2016, BCM faced challenges in manual data management and limited organic waste search capabilities. To address these issues, Ojir was introduced to modernize the organic waste management system. This innovation surpasses traditional waste management by incorporating a process of diversifying organic waste into maggot raw material. Beyond resolving existing waste bank issues, Ojir enhances management efficiency, allowing users to easily track and manage organic waste with increased accuracy. Consequently, the paradigm of organic waste management shifts towards modernity, effectiveness, and efficiency. Aligned with efforts to create a clean and sustainable environment, Ojir represents an innovative step in reinforcing the role of waste banks in handling organic waste in the technological era. The incorporation of the maggot raw material process further exemplifies the forward-thinking approach in sustainable waste management.

Keywords: Application, Diversification, Management, Organic Waste, Waste Bank

INTRODUCTION

Waste is an inevitable reality in human life, generated from various activities and commonly divided into two main categories: organic and inorganic. Organic components, which can be decomposed by microbes, take center stage in sustainability, playing a crucial role in the life cycle and the environment. Unfortunately, in Malang Regency, facilities for managing organic waste, such as Organic Waste Centers and composting houses, are still limited (Presiden RI, 2020). Central Malang Waste Bank in Pagak serves as the research subject for implementing the maggot feeding method to utilize organic waste successfully.

Despite its success, challenges persist, including the lack of public attention to waste separation and the limited supply of organic waste suitable for maggot feeding.

To address these challenges, a solution is proposed through the design of an application called "Organik Jadi Rupiah" (Ojir). The Ojir application, a mobile-based innovation for organic waste management at Central Malang Waste Bank (BCM), provides an effective solution to streamline the collection and management of organic waste. Addressing environmental concerns such as food scraps, dry leaves, and fruits, the application responds to Ministry of Environment and Forestry (KLHK) data indicating that approximately 61.50% of total waste is organic, necessitating efficient management to reduce waste volume (46 TAHUN 2018 (KEBIJAKAN SAMPAH RUMAH TANGGA)-.Pdf, n.d.).

Established in 2016, BCM faced challenges in manual data management and limited organic waste search capabilities. To address these issues, Ojir was introduced to modernize the organic waste management system. This innovation surpasses traditional waste management by incorporating a process of diversifying organic waste into maggot raw material. Beyond resolving existing waste bank issues, Ojir enhances management efficiency, allowing users to easily track and manage organic waste with increased accuracy (Asnifatima et al., 2018).

Consequently, the paradigm of organic waste management shifts towards modernity, effectiveness, and efficiency. Aligned with efforts to create a clean and sustainable environment, Ojir represents an innovative step in reinforcing the role of waste banks in handling organic waste in the technological era. The incorporation of the maggot raw material process further exemplifies the forward-thinking approach in sustainable waste management (Istanabi et al., 2022). This application aims to streamline the deposit, collection, and data management processes at the Waste Bank. Involving users, including waste collection drivers and the general public, Ojir offers features for collecting organic waste and a point system as an incentive (Bahri et al., 2019). Additionally, the application includes a diversification process where the community is rewarded with points for depositing organic waste. These points are then calculated and can be redeemed, while the organic waste is processed into maggot feed, fertilizer, and catfish pellets (Sampah, 2019).

With a client-server approach, Ojir not only provides a practical solution for managing organic waste but also implements a point-based approach to stimulate community participation. The application serves as an efficient tool for organic waste diversification and accurately records transactions, creating a cleaner and more sustainable environment. The main challenge faced is the lack of public interest in waste separation, a significant issue in Malang Regency (Firmansyah et al., 2019). Awareness of the importance of waste separation, especially organic waste, remains low. This situation is evident at Central Malang Waste Bank in Pagak Malang District, where public attention to waste separation is minimal. Therefore, intensive efforts are needed to educate and increase awareness and interest in proper waste separation.

Education to the public about the positive impact of waste separation can be the key to increasing their active participation in the process. Additionally, the limited supply of organic waste suitable for maggot feeding emphasizes the importance of educating people on proper waste separation to create an adequate supply (Chabibah et al., 2020).

The proposed solution through the Ojir application is expected to overcome these

challenges. Ojir not only provides a practical solution to facilitate the deposit, collection, and data management processes but also serves as an effective educational tool. By utilizing features such as organic waste collection and point incentives, Ojir can increase public participation in waste separation. The points awarded for depositing organic waste serve as an additional motivation to encourage the public to separate waste more effectively (Sundarta et al., 2018). In this context, OJIR is not just an efficient tool for managing organic waste and diversification but also an educational innovation that can help change people's attitudes and behaviors towards waste separation (et al., 2021). Thus, OJIR can be a holistic solution that not only solves practical issues but also promotes cultural change in waste management at Central Malang Waste Bank.

IMPLEMENTATION METHOD

The issues faced by BCM can be categorized into three mutually agreed-upon aspects. Firstly, there is a decline in community interest in depositing organic waste due to poor governance, resulting in a decrease in financial participation from the community who are BCM customers. Secondly, BCM's role in monitoring the status of organic waste volume from customers is still suboptimal. Consequently, organic waste deposited by customers cannot be efficiently utilized by BCM, particularly in the context of its use as maggot feed. Lastly, the reduced community interest in depositing organic waste is also influenced by several practical constraints, such as distance, packaging of organic waste, and transportation issues. These factors significantly contribute to the declining participation of the community in the organic waste deposit process. By specifying the issues into three main points, it is hoped to facilitate the understanding and structured handling of each aspect.

In addressing the issues faced by partners related to the declining interest of the community in depositing organic waste, the selection of methods can be organized systematically by considering three main aspects that have been identified. The method adopted for solving this problem is the PIME method (Preparation, Implementation, Monitoring, Evaluation).

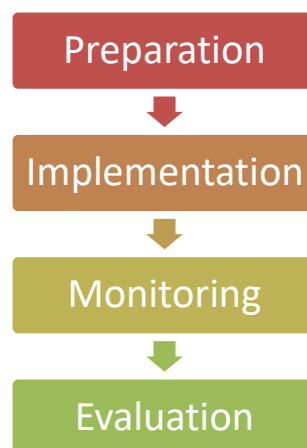


Figure 1. PIME method

Based on the previously explained issues, the proposed solutions can be organized as follows:

A. Governance Solutions:

1. Provide guidance and training on transaction governance through the web-based OJiR system, including simple bookkeeping for BCM and customers.
2. Offer guidance and knowledge on supply chain management related to waste bank management and produced products.
3. Provide guidance and training on the operational schedule management of waste banks.
4. Offer guidance and training to partner associates responsible for collecting and delivering waste to BCM through the Android-based OJiR system.
5. Provide guidance and training to BCM customers/community regarding the SOP for waste delivery and financial benefits information through the Android-based OJiR system.
6. Monitor and evaluate the implementation of solutions, focusing on strengths and weaknesses to ensure the continuity of activities in the following year.
7. Include sustainability through:
 - a) Expansion of partner utilization by the community.
 - b) Development of the maggot product supply chain as the main product of Bank Sampah Central Malang.
 - c) Packaging of processed organic waste products (maggot feed and compost).
 - d) Improvement of organic waste sorting quality according to protein needs for farming.

B. Governance Solution Implementation:

In implementing the solution for governance issues, several stages are carried out as follows:

1. Preparation:
 - a) Discussion of hardware and software needs for the OJiR system.
 - b) Preparation of human resources from the Waste Bank to become operators of the OJiR system in governance matters.
2. Solution Implementation:
 - a) Trial of the OJiR system and human resources using real-life data.
3. Monitoring:
 - a) Supervision of the OJiR system and human resources operating it to detect errors.
4. Evaluation:
 - a) Evaluation of shortcomings during the system trial to determine improvements both in terms of the system and human resources operating it.

The governance solution implementation process includes the application of Accounting Information System features to record transactions within the waste bank scope. Transaction recording involves point calculations and financial conversions, designed to meet the needs of

waste banks, employees, and customers. Point weighting is adjusted based on the selling price of maggots, the main product of BCM. The implementation of Supply Chain features involves the waste collection process by associates, collection schedules, and waste demand based on production needs. There is also the application of GPS to associates to determine the nearest location for waste collection.

C. Partner Associate Solution:

1. Preparation:
 - a) Implementation of the OJiR system for partner associates.
 - b) Ensuring the system can connect to the OJiR system at the Waste Bank.
2. Implementation:
 - a) Guidance and training for partner associates in using the OJiR system.
3. Monitoring:
 - a) Supervision of the OJiR system from the perspective of partner associates, the OJiR system at the Waste Bank, and partner associates as system users.
4. Evaluation:
 - a) Evaluation of the OJiR system, partners as users, and the Waste Bank to assess the level of success in community service implementation.

The partner associate feature process involves partner registration, waste collection scheduling, and reporting of waste deposits at Bank Sampah Central. The main feature is the application of GPS to partners to suggest waste collection from residents in the nearest location. The point calculation for waste collection by partners is adjusted based on the selling price of maggots.

D. Community Utilization Solution:

1. Preparation:
 - a) Implementation of the OJiR system on community mobile phones.
 - b) Connection of the OJiR system on mobile phones to the OJiR system at the Waste Bank.
2. Implementation:
 - a) Community guidance in using the application to request waste pick-up and earn points.
3. Monitoring:
 - a) Supervision when the system is run according to actual conditions.
4. Evaluation:
 - a) Evaluation of the OJiR system and the community using it to assess the success of community service implementation.

RESULTS AND DISCUSSION

The OJiR Application, designed for web and Android platforms, streamlines waste data management at the Central Malang Waste Bank, enhancing the waste deposition process for the local community. The system admin page plays a crucial role with an effective feature for comprehensive waste bank data management, including account verification for registered waste banks and rejection of invalid accounts. The "yes" verification status grants login access, while "no" restricts login access. Waste bank admins can also access the client menu to manage client data and validate the information.

The admin feature on this page encompasses a point menu, allowing waste banks to add, edit, and delete points. The 'add point' menu sets point prices for each waste bank, while the 'edit point' menu is utilized for necessary price adjustments. Operating on the Android platform, this application serves local heroes and users. The page facilitates driver registration by inputting information such as name, email address, phone number, password, and attaching a photo of the ID card. Drivers record the total waste and pick-ups, utilizing the QRCode menu to note the weight of the waste from the client. The client can then scan this QRCode for confirmation. The driver page also registers new driver candidates with the same requirements.

On the user/customer side of the waste bank, the primary feature is waste disposal requests. This page enables clients to request waste pick-ups by pressing the "dispose of waste" button. Clients can also open a sidebar to choose from available menus. Another feature for clients is the transaction data record, providing comprehensive information from the conducted transactions. With the implementation of the OJiR application, there is a notable increase in income for customers selling organic waste. The application simplifies transaction recording and management, enhancing customer efficiency and accuracy in tracking waste sales results. Transaction data records offer total income information, allowing customers to monitor their financial progress over time.

The positive impact of OJiR extends beyond economic aspects to encompass efficiency and sustainability in waste management. The application's functionality contributes to process optimization, facilitating more structured management of organic waste. This has the potential to reduce negative environmental impacts and provide long-term benefits in sustainable waste management efforts.

Users of the Waste Bank application are individuals who actively utilize the digital platform to interact with the services provided by the waste bank. Through this application, users can easily engage in various waste management activities, including deposition, sales, and transaction monitoring. Users of the Waste Bank application have the ability to quickly and efficiently provide information about the amount of waste generated, the types of waste deposited, and the frequency of deposition. The integrated transaction recording feature in the application allows them to monitor the progress of income from the sale of organic or non-organic waste. Currently, more than 100 people have registered as members of Central Waste Bank. Transaction data for waste bank customers during the October-November 2023 period is presented in Table 1.

Table 1. Transaction data BCM

No	Name	Month	Weight (kg)	Price (/kg)	Total income
1	Ahmad Abdullah	Oktober	4	500	2000
2	Siti Aminah	November	9	500	4500
3	Budi Santoso	Oktober	3	500	1500
4	Indah Putri	Oktober	10	500	5000
5	Joko Wibowo	November	8	500	4000
6	Rini Cahyani	Oktober	10	500	5000
7	Faisal Rahman	Oktober	4	500	2000
8	Lina Widarti	November	15	500	7500
9	Eko Prasetyo	Oktober	6	500	3000
10	Sari Utami	November	5	500	2500
11	Agus Hidayat	November	7	500	3500
12	Maya Anggraini	Oktober	12	500	6000
13	Yudi Susanto	Oktober	9	500	4500
14	Dina Wahyu	November	14	500	7000
15	Taufik Rahman	Oktober	9	500	4500
16	Rina Fitriani	November	7	500	3500
17	Joko Susilo	November	3	500	1500
18	Ria Setiawan	November	12	500	6000
19	Bambang Santoso	Oktober	13	500	6500
20	Mega Wulandari	November	8	500	4000
21	Indah Putri	November	15	500	7500
22	Rini Cahyani	November	13	500	6500
23	Faisal Rahman	November	10	500	5000
24	Maya Anggraini	November	3	500	1500
25	Yudi Susanto	November	4	500	2000

To analyze transaction data for the period October and November 2023, we can calculate several key metrics, including the average weight of waste, the average price per kilogram of waste, and the total income of residents.

Average Weight of Waste:

- The average weight is determined by calculating the sum of weights and dividing it by the number of entries.
- $(4 + 9 + 3 + 10 + 8 + 10 + 4 + 15 + 6 + 5 + 7 + 12 + 9 + 14 + 9 + 7 + 3 + 12 + 13 + 8 + 15 + 13 + 10 + 3 + 4) / 25$
- Total Weight / Number of Entries
- $(213) / 25$
- Approximately 8.52 kg.

Average Price per Kilogram of Waste:

- The average price is determined by calculating the sum of prices and dividing it by the number of entries.
- $(500) / 1$

- Total Price / Number of Entries
- 500 IDR (fixed price per kilogram).

Total Income of Residents:

- The total income is determined by summing up the individual incomes of each resident.
- 2000 + 4500 + 1500 + 5000 + 4000 + 5000 + 2000 + 7500 + 3000 + 2500 + 3500 + 6000 + 4500 + 7000 + 4500 + 3500 + 1500 + 6000 + 6500 + 4000 + 7500 + 6500 + 5000 + 1500 + 2000
- Approximately 101,500 IDR.

These calculations offer valuable insights into waste management patterns, pricing structures, and the overall income generated by residents during the specified period. The pricing for organic waste may vary based on the market selling price of maggots. This adjustment is implemented to ensure the stability of cash flow for BCM.

The implementation of the OJiR application for waste bank customers, local heroes (waste collector drivers), and waste bank managers has resulted in a significantly positive impact on optimizing the waste management system. The following is a structured explanation of the impact and key features for each user group:

1. Implementation of the OJiR Application for Waste Bank Customers:

The OJiR application provides a more efficient and transparent waste management experience for waste bank customers. They can easily deposit waste, monitor transactions, and manage account information through a user-friendly interface. Features such as transaction records and verification status provide customers with a better understanding of their activities, motivating them to actively participate in waste management. The accessibility and navigation convenience within the application create an inclusive environment, allowing more effective participation from various layers of society in the waste bank's waste management program.

2. Implementation of the OJiR Application for Local Heroes (Waste Collector Drivers):

The OJiR application simplifies the registration, recording, and reporting processes for local heroes in waste collection activities. Local heroes can quickly register as new drivers by providing necessary information and recording the quantity and types of waste from each client using the QRCode feature. The application serves as a useful tool for local heroes to enhance their operational efficiency. Monitoring waste weight, transaction recording, and ease of interaction with customers through the application create an organized work environment, ensuring that every step in the waste management chain is carried out accurately and efficiently.

3. Implementation of the OJiR Application for Waste Bank Managers:

For waste bank managers, the OJiR application becomes an effective tool for managing data and monitoring the overall performance of the waste bank. Admin features, including point management, account verification, and price adjustments, provide managers with the ability to organize waste bank operations more efficiently. Managers can easily access information related to customers and local heroes, validate data, and ensure the sustainability of the organic waste management program. The application offers valuable data insights to make informed

decisions in improving efficiency and creating positive environmental impacts.

Thus, the implementation of the OJiR application brings positive changes in waste management, encourages active participation of all stakeholders and creates a sustainable ecosystem in waste bank management. In Figure 1 below, documentation for application testing on BCM is shown. Figure 2 shows the maggot cultivation site at BCM. Figure 3 displays the Ojir application user interface.



Figure 1 Documentation for Application Testing on BCM

Source : (Personal Documentation)



Figure 2 The Maggot Cultivation Site at BCM

Source : (Personal Documentation)

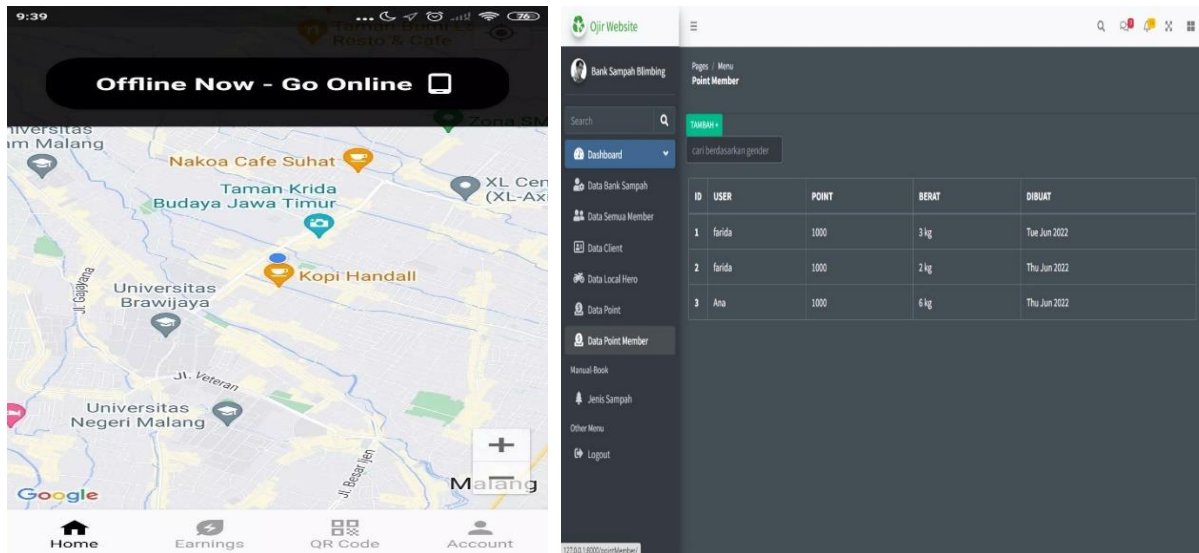


Figure 3 Ojir Application User Interface

Source : (Personal Documentation)

CONCLUSION

In this activity, through a series of dedicated stages encompassing development and testing, it can be concluded that the implementation of the Ojir Application has successfully established an organic waste verification system within the scope of household-scale waste banks, particularly at BCM. This success is reflected in the achievement of the service objectives, involving assistance in the household-level organic waste search process and data management at the waste bank. The application is designed to provide support to three main actors: Admin, Driver, and Client, each with defined roles. The Ojir Application at BCM offers a concrete solution to two crucial aspects: organic waste search and waste data processing in the waste bank. The presence of this application stimulates the efficiency of waste data management at BCM, facilitating more effective and structured waste data management.

Test results regarding the functionality of the Ojir Application for Admin, Driver, and Client indicate its alignment with BCM's needs. Admin, Driver, and Client can utilize the application according to their respective roles, optimizing the search for organic waste and streamlining waste data management at the household level. Thus, the implementation of the Ojir Application provides a significantly positive impact in supporting the operational efficiency of BCM.

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