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Strengthening Human Resource Capacity through Digital Marketing Mentoring: Waste Bank Empowerment for Circular Economy Sustainability

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ABSTRACT

Background: Gunungpring Village in Magelang District faces serious waste management challenges despite its strategic position as a religious and educational tourism center. This community service program was designed to enhance the digital marketing skills of waste bank administrators, thereby increasing the economic value of recycled products and supporting the sustainability of the circular economy.

Purpose of the Study: This program aimed to enhance participants' abilities in product design, pricing strategies, and the implementation of digital marketing through e-commerce and social media platforms.

Method: The mentoring activities were conducted over six months, using a participatory approach with 40 participants and 4 mentors. The program included training sessions, workshops, hands-on digital marketing practice, and monitoring through pre- and post-tests, sales analysis, and participant reflection.

Result: the program resulted in a 21-point increase in participants' knowledge scores and an average 10% increase in monthly product sales. Beyond these measurable outcomes, the mentoring activities improved participants' digital confidence, collaboration, and motivation. These findings demonstrate that strengthening human resource capacity through digital marketing mentoring can effectively support community economic empowerment and enhance the sustainability of circular economy-based waste management initiatives.

Keywords

Human Resource
Empowerment, Digital
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Introduction

Gunungpring Village, located in Muntilan Sub-district, Magelang District, Central Java, has a strategic geographical position on the main Magelang-Yogyakarta route (Fany Rachma, 2024). The village consists of 11 hamlets, namely Wonosari, Sabrang, Ngadisalam, Santren, Ngasem, Bintaro, Nepen, Karaharjan, Dukuhan, Gunungpring, and Mutihan, with an area of approximately 217.49 hectares. Gunungpring Village is widely known as a religious and educational tourism village. Its identity as a religious village stems from the existence of a complex of tombs of religious leaders that are always crowded with pilgrims from various regions. In addition, the village is also recognized as an educational village because it has a variety of quality educational facilities, ranging from kindergarten, elementary, to junior high school levels, as well as a large, well-known Islamic boarding school, Pondok Pesantren Darussalam Watucongol (Mahardika, 2016).

The potential of religious tourism not only attracts pilgrims but also encourages the development of other potential areas such as accommodation facilities, local cuisine, and souvenir products. The existence of religious tourism has had a significant economic and social impact on the community of Gunungpring Village, including the creation of jobs for residents around the tourist complex and an increase in community income (Mahardika, 2016; Wulandari, 2022).

In addition to these positive impacts, religious tourism also has negative consequences including large amounts of waste. Waste volumes tend to increase dramatically during peak holiday seasons, such as those leading up to Ramadan. Data shows that tourist attractions in Gunungpring Village generate an average of 444 kg of waste per day, 41 percent of which is plastic waste (Fany Rachma, 2024). With a total population of 10,397, the household waste generated in this village is estimated at 1 ton per day. This situation poses environmental issues while also holding potential that can be developed to create a multiplier effect for the community.

In response to the waste problem, the Gunungpring Village Government has implemented several strategies. One of them is the development of a 3R Waste Management Technology (Reduce-Reuse-Recycle) in 2018, in collaboration with the Research and Development Agency of the Ministry of Public Works and Public Housing. Currently, the 3R Waste Management. This initiative aligns with national priorities for community empowerment and the United Nations' Sustainable Development Goals (SDG 12: Responsible Consumption and Production). Strengthening human resource capacity in marketing and innovation is critical to ensuring the sustainability of local waste management initiatives.

Technology is managed by the Berkah Community Self-Help Group (KSM). However, according to research, the existence of the 3R Waste Management Facility has not been fully effective in addressing the waste management issues in the area (Muhammad Alhada Fuadilah Habib, 2021). This is due to low public awareness of the urgency of waste management, insufficient public satisfaction with the services provided by the 3R Waste Management Facility, and a lack of innovation in the facility's waste management practices.

Another strategy encouraged by the Village Government is the establishment of Waste Banks at the dusun level, aimed at optimizing household waste management and reducing the burden on TPS 3R. Waste Bank managers have the primary task of sorting household waste by type and innovating ways to process waste into useful products, in line with the circular economy concept that emphasizes waste reduction, material reuse, and the regeneration of natural systems (MacArthur, 2013). The circular economy concept is often associated with the "3R" principle: reduce, reuse, and recycle (Sabina Scarpellini, Pilar Portillo-Tarragona, Alfonso Aranda-Uson, 2019). Currently, there are five active Waste Banks in Gunungpring Village, including Bank Sampah Darlingsih (Sadar Lingkungan Bersih), which has successfully processed household waste into processed products such as keychain crafts, tissue boxes, chairs, and tables, marketed under the brand "Krajan Plast" (see Figure 1-2).



Figure 1. Community Service Team and Waste Bank Manager "Darlingsih"

Although the Waste Bank in Gunungpring Village has shown initiative and capability in managing household waste and producing innovative products, its operations are constrained by various obstacles. Based on an interview with the head of Darlingsih Waste Bank, Mrs. Ayu Marpanji, in December 2024, several crucial problems were found:

1. The lack of personnel for the Waste Bank management: The management is dominated by elderly individuals, which slows down the process of sorting and processing waste.
2. Administrative and institutional systems that have not been neatly organized: As a result, the recording of savings and profit sharing for customers has not been optimized.
3. Profit generated from innovative products has not been maximized: Although the product has been produced, the profit earned has not been as expected.
4. Lack of knowledge of product marketing strategies. This is a priority issue: the innovative products produced have not been properly absorbed by the market due to management's lack of understanding of how in market them effectively.

These problems highlight how an obvious environmental challenge, waste generation, is strongly linked to the social and economic dimensions of the community. Based on research, although tourism has a positive impact in terms of job creation and increased income, it also generates a significant amount of waste burdens (Hilman et al., 2023). Waste management efforts carried out through 3R waste collection sites and waste banks are a good first step, in line with research (Diyana et al., 2019). However, the sustainability and economic impact of these efforts are hampered by a deeper problem: the lack of marketability of processed waste products. Low profitability is directly caused by marketing barriers, which in turn threaten the sustainability of the circular economy model at the local level. (Ibrahim, 2025) The predominantly elderly demographics of Bank Sampah administrators add to the complexity of this issue, as it may indicate a digital literacy gap that hinders the adoption of modern marketing strategies (Putri, 2023).

This project, as part of the University's Flagship Community Service Program (PUU), is a form of contribution from higher education institutions to the development of SMEs and digital literacy. This program specifically aims to bridge this critical knowledge gap in marketing. By optimizing the economic value of waste-derived products through digital marketing, the program is expected not only to enhance market absorption and profitability but also to strengthen sustainable circular economic practices in Gunungpring Village. This demonstrates that to achieve ambitious circular economy goals, it is essential to address fundamental barriers such as the digital divide among key stakeholders (Brahmana & Pratminingsih, 2023). Without the ability to effectively market products in the digital age, efforts in waste management and innovation may not fully realize their economic potential (Birgithri et al., 2024).



Figure 2. Waste Bank Secretariat and Products Produced

Based on the situation analysis and partner problems, this community service program is designed to specifically address the challenges of marketing Waste Bank innovation products. The main focus is to increase Waste Bank administrators' understanding and ability in designing products, determining the right price, and implementing digital marketing strategies. The relationship between problems, solutions offered, and program objectives can be summarized in Figure 3.

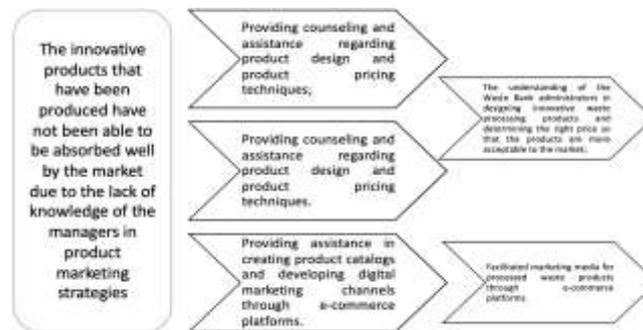


Figure 3. Problems and Solutions Offered 1

This table shows a structured approach that starts at the root of the problem and leads to concrete solutions and measurable objectives. This is an essential framework in a scientific report of community service, as it clearly illustrates the flow of thought and intervention strategies applied.

Method

This program was implemented from April to October 2025 in Gunungpring Village, involving 40 participants and four mentors from Universitas Tidar. The activities were conducted using a participatory mentoring model, which combined lectures, workshops, and direct practice.

Program Stages

This community service program will be implemented through four main methods (Figure 4.), which are designed to build partner capacity holistically and sustainably:

1. Needs Analysis and Coordination – An initial survey was conducted to identify knowledge gaps and digital readiness.
2. Training and Counseling – Participants received material on product innovation, pricing strategy, and marketing management.

This counseling aims to increase Waste Bank administrators' understanding of marketing strategies, especially digital marketing methods, which are vital to optimizing the uptake of

processed waste products in the market (Rofi, 2025). Supported by research, the material to be discussed includes the basic concepts of marketing management, *Segmenting-Targeting-Positioning* (STP) techniques to identify *target* markets, various digital marketing strategies, marketing through social media, which is now the main channel, marketing through e-commerce, and branding strategies to build a strong product identity (Chiu et al., 2024). The material delivery method will also use lectures and discussions to encourage active participation.

3. Digital Marketing Mentoring – The most prominent activity focused on creating and managing e-commerce accounts (Shopee and Tokopedia) and promoting products through social media platforms.

This stage is the practical application of the knowledge provided. The objective is to facilitate Waste Bank administrators in creating marketing materials for processed waste products on e-commerce platforms. Waste Bank administrators will be directly taught (tutorials) and assisted in creating accounts on popular *e-commerce* platforms such as Shopee and Tokopedia. In addition, they will be trained to compile attractive product catalogs and create effective marketing content to attract buyers. This approach ensures that the knowledge gained can be directly applied in practice (Ermawati & Restie, 2025).

4. Monitoring and Evaluation – Program impact was measured using pre- and post-tests, participant satisfaction surveys, and analysis of product sales before and after mentoring. The aim is to assess the success of the training and ensure its impact is sustainable. Evaluation is conducted through satisfaction surveys, *pre-/post-tests*, sales and social media analytics, and short interviews to assess improvements in partners' competencies and business performance. The results are analyzed and presented in a 360° feedback session, where the service team and partners agree on improvements and follow-up targets. The follow-up targets will be used as material for ongoing assistance in the following year.

This approach reflects a comprehensive capacity-building strategy. Starting with the basics of product development and pricing, which are important prerequisites before entering the realm of marketing.) The effectiveness of digital marketing relies heavily on well-designed products and competitive pricing (Wicaksono, 2024). Therefore, this sequence of methods demonstrates a deep understanding of the entire business value chain, not just a focus on digital tools alone. This is a robust approach to ensure that interventions not only introduce new technologies, but also build solid business foundations for partners (Hidayatullah & Antonius Alijoyo, 2024).

Evaluation Indicators

Evaluation covered three aspects: 1) Knowledge improvement (measured by pre–post test results); 2) Economic performance (monthly sales data comparison), and 3) Social impact (self-confidence, collaboration, and motivation).

Data were analyzed quantitatively using descriptive statistics and qualitatively through interviews and participant reflection.

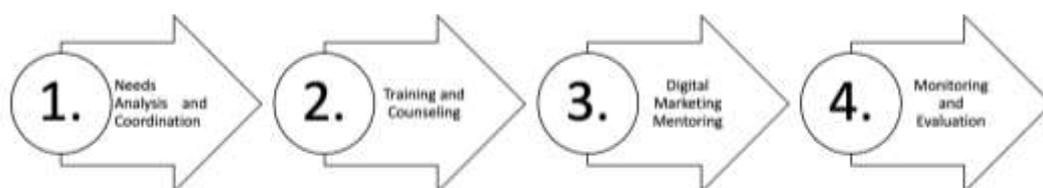


Figure 4. Stages of Program Implementation

Partner Involvement in Program Implementation

Active participation from partners is a key element for the success and sustainability of the program (Qorib, 2024). Expected participation from partners includes:

1. Program partners provide accurate and comprehensive information about the problems faced.
2. Partners fully support the implementation of the counseling provided by the Service Team by providing the necessary equipment and facilities during the activity.
3. Partners actively participate in the entire series of counseling and mentoring activities, including in the monitoring and evaluation process.
4. Partners provide constructive input related to counseling and mentoring as material for program evaluation.
5. Partners are committed to continuing the program and practices that have been taught after the service activities are completed, ensuring long-term impact.
6. The commitment of partners to continue the program after the formal intervention is over is an important indicator of sustainability. It shows that the program not only aims to provide temporary solutions, but also to build self-reliance and adaptability within the community. The evaluation focuses not only on knowledge transfer but also on long-term behavior change and economic impact.

Result

Knowledge Improvement (measured by pre-post test results),

Figure 5 shows that this community service program has successfully identified and addressed the crucial marketing challenges faced by the Waste Bank in Gunungpring Village. Through a series of structured counseling and mentoring, this program effectively improves the understanding of Waste Bank administrators in aspects of product design, pricing techniques, and most importantly, capabilities in marketing management and digital marketing strategies (Ermawati et al., 2025). Innovative waste products, such as the "Krajan Plast" craft, which previously had difficulty penetrating the market, now have a greater chance of being optimally absorbed.



Figure 5. Implementation of Phase 1 Counseling

This intervention not only focuses on improving technical skills but also fundamentally strengthens the circular economy model at the local level. By optimizing the economic value of waste through effective marketing, the program transforms waste from a problem into a sustainable economic resource, in line with the principles of *reduce, reuse, recycle*. This is in line with research (Lukman Harahap et al., 2020).

The results in Table 1 show a significant increase in participants' understanding of digital marketing, pricing, and product design.

Table 1. Participants' Knowledge Improvement

Indicator	Pre-Test (%)	Post-Test (%)	Increase (%)
Product Design Knowledge	62	83	+21
Pricing Strategy	58	81	+23
Digital Marketing Skills	60	85	+25
Overall Competence	60	83	+23

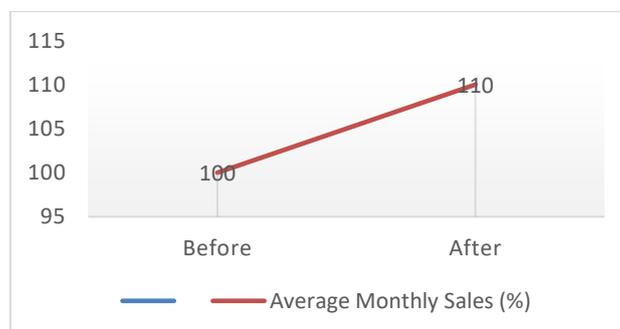
Participants actively created digital catalogues, wrote product descriptions, and uploaded products to e-commerce platforms independently. The mentoring process also encouraged peer learning, where more digitally literate members helped others.

*Figure 6. Comparison of Participants' Knowledge and Sales Before and After Mentoring*

Figure 6 illustrates the improvement achieved during the mentoring program. The average knowledge score increased from 62 to 83, while average monthly sales rose by approximately 10%. These results demonstrate that the program effectively strengthened participants' digital competence and entrepreneurial capacity, resulting in gradual yet sustainable improvements in performance and economic outcomes.

Economic Performance (Monthly Sales Data Comparison)

Two weeks after mentoring, the average monthly sales of Krajan Plast products increased an 10% (see Figure 7). The most popular products were handcrafted baskets, flowerpots, and recycled chairs. This improvement was not merely the result of training activities but a reflection of the comprehensive mentoring process that combined capacity building, market simulation, and continuous assistance.

*Figure 7. Comparison of Participants' Knowledge and Sales Before and After Mentoring*

During the mentoring phase, the community service team conducted practical sessions in which participants were guided step-by-step through creating e-commerce accounts, uploading product photos, and designing digital catalogs. Mentors also assisted participants in determining

competitive prices by benchmarking similar products on Shopee and Tokopedia. These sessions allowed participants to experience real-time online sales practices, making the mentoring program not only theoretical but also highly practical.

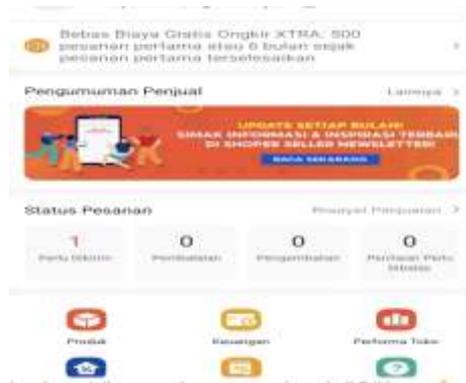


Figure 8. Proof of order via e-commerce after training

The implementation of this community service followed the principle of participatory action, ensuring that every activity, such as marketing content creation, pricing, and online promotion, was co-designed with the waste bank members. This participatory approach enhanced ownership, accountability, and confidence among the participants, particularly those who initially felt hesitant about using technology (Gaber et al., 2024).

Moreover, the mentoring activities promoted peer collaboration and community learning. Younger members of the waste bank who were more digitally literate acted as internal facilitators, assisting older members in navigating e-commerce applications. This internal mentoring model created a sustainable mechanism for knowledge transfer within the community, demonstrating the program's long-term human resource impact.

The community service team also facilitated post-training monitoring for three months, providing periodic evaluations and online feedback through WhatsApp groups and field visits. These follow-ups ensured that participants maintained consistency in updating their e-commerce stores and marketing content. As a result, participants not only gained financial benefits but also developed entrepreneurial attitudes, adaptive thinking, and digital confidence key indicators of successful community empowerment.

Social Impact (Self-Confidence, Collaboration, And Motivation).

The program has the potential to significantly improve the economic independence of Bank Sampah and waste management practices in Gunungpring Village. Research proved that capacity building in digital marketing empowers community members with skills relevant to modern markets, enabling them to independently expand their market reach and increase the profitability of processed waste products in the future (Junaedi & Rojali, 2024). Monitoring post-program marketing outcomes will be a key indicator of this sustainability, with the expectation of increased sales and market expansion on an ongoing basis. According to research, the commitment of partners to continue the initiative after the formal program ends is an important foundation to ensure lasting impact (Padil et al., 2021).



Figure 9. Implementation of Phase 2 Counseling

The focus on fundamental digital marketing and business skills, rather than highly specialized tools, means the model can be easily adapted and applied in a variety of community contexts facing similar challenges (Ausat et al., 2025). Based on the research proving community service initiatives, replicability and scalability are critical to achieving wider social impact beyond the immediate project site (Guntur Suryo Putro et al., 2024). This project, through its design, offers a practical and tested blueprint to address widespread waste management and local economic development issues in other regions, especially those grappling with the growing need for digital literacy.

The mentoring activities also generated strong social impacts that extended beyond technical skill improvement (see Figure 9). Based on in-depth interviews and participant reflections, three key dimensions of social transformation were identified.

First, participants reported higher self-confidence in using technology and promoting their products online. Before the mentoring program, most administrators particularly senior members felt anxious about using digital tools. Through repetitive guided practice and peer assistance, they gradually overcame this fear. The ability to independently upload products, manage transactions, and respond to online buyers fostered a sense of personal achievement and digital empowerment (Carmen et al., 2024).

Second, the program encouraged better collaboration and solidarity among waste bank administrators. Joint planning sessions during product pricing and content creation stimulated teamwork and mutual support. The creation of WhatsApp communication groups and shared online folders strengthened their coordination even after the formal mentoring ended. This shift from individual work to a collective approach indicates the growth of social cohesion and trust within the community organization (Wang & Ke, 2024).

Third, the program fostered greater motivation to innovate and sustain waste management activities (“11,3 Million Tons of Garbage in Indonesia Are Mismanaged,” 2024). As participants witnessed the tangible results of their efforts such as increased online visibility and new customer interactions they became more proactive in generating new product ideas and marketing campaigns. Some members even initiated plans to collaborate with neighboring waste banks to expand collective branding under the Krajan Plast label.

These results indicate that community engagement through human resource development generates multidimensional outcomes economic improvement, social empowerment, and organizational resilience. The integration of digital mentoring with participatory methods transformed the waste bank from a traditional waste management group into a dynamic, learning-oriented social enterprise (MacArthur, 2013).

Discussion

The community service program in Gunungpring Village demonstrated that a digital marketing mentoring model can significantly strengthen the capacity of waste bank administrators. Notably, participants' digital marketing skills improved by 25%, outpacing the 21% increase in product design knowledge. This difference is attributed to the hands-on, practice-oriented nature of digital marketing tasks, which provided immediate feedback and aligned with adult learning theory adults learn best through direct experience rather than abstract instruction. In contrast, product design requires longer-term creative development, explaining its slower rate of improvement.

A peer-learning dynamic also emerged, with younger, more digitally literate members guiding older participants. This internal knowledge transfer supports theories of community empowerment, emphasizing sustainable capacity building through internal facilitation rather than reliance on external trainers. This finding is consistent with Putri (2023), who highlights generational digital divides and the value of collaborative learning, and with Brahmana and Pratminingsih (2023), who argue that digital mentoring enhances grassroots marketing performance.

Comparisons with existing literature show strong alignment. The program's success in increasing online visibility and initial sales mirrors findings by Ermawati & Restie (2025) and Junaedi & Rojali (2024), who note that digital literacy boosts micro-business competitiveness. The growth in confidence, motivation, and collaboration among participants also supports Wang and Ke (2024), who identify social cohesion as vital for community sustainability. The shift in mindset from waste handlers to digital entrepreneurs echoes broader circular economy perspectives (MacArthur, 2013; Scarpellini et al., 2019), which stress the importance of empowering human resources to create value from waste.

However, the study has limitations:

1. The economic impact assessment covered only three months, limiting insights into long-term change.
2. Confidence and motivation were self-reported, introducing potential bias.
3. External factors like seasonal demand and market trends were not controlled.

For future programs, it is recommended to conduct longitudinal studies and comparative research across different villages. Building stronger partnerships with local government and MSME agencies could further enhance scalability and sustainability.

Conclusion

This community service program has successfully strengthened the human resource capacity of waste bank administrators in Gunungpring Village through a structured digital marketing mentoring model. The results of this service align with other services, and the scalability of the program through this training and mentoring model is highly recommended for replication in other waste banks or villages facing similar challenges in waste management and the marketing of processed products. The activities enhanced participants' knowledge, confidence, and teamwork, resulting in tangible economic gains, including a 10% increase in monthly product sales and the successful creation of e-commerce accounts on Shopee and Tokopedia.

Beyond these measurable outcomes, the program fostered deeper social transformation. Participants experienced a shift in mindset from conventional waste handlers to adaptive digital entrepreneurs capable of sustaining innovation within their community. The mentoring approach, which combines participatory learning, peer collaboration, and continuous follow-up, has proven

to be a practical model for empowering human resources in community-based circular economy initiatives.

Academically, this program contributes to the broader discourse on community engagement and human resource development by demonstrating how digital literacy interventions can serve as catalysts for sustainable economic and social empowerment. Methodologically, it highlights the importance of integrating capacity-building elements (knowledge, practice, reflection) within a participatory mentoring framework to ensure lasting behavioral change and organizational resilience.

For long-term sustainability, future programs should institutionalize digital mentoring by establishing partnerships with local governments, MSME agencies, and higher education institutions. Developing community-based data analytics systems and shared digital platforms among waste banks could further enhance visibility, competitiveness, and collective learning. Replicating this model across other villages will support Indonesia's national circular economy agenda and the achievement of Sustainable Development Goals, particularly SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production).

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