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Service Optimization, Incentive Systems, and Social Media Digitalization: Their Impact on Waste Bank Programs through Community Participation

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This study examines how community participation mediates the influence of service quality, incentive systems, and social media on the impact of Waste Bank programs in the Bangka Belitung Islands. A quantitative method with explanatory design was employed with 83 active customer respondents. PLS-SEM analysis was utilized to test seven hypotheses. The results demonstrated that service quality positively influenced community participation with a coefficient of 0.368 ($p < 0.001$). The incentive system also promoted participation with a coefficient of 0.297 ($p < 0.001$). Social media exhibited the strongest influence with a coefficient of 0.432 ($p < 0.001$). Community participation subsequently exerted a very strong influence on program impact with a coefficient of 0.736 ($p < 0.001$). All three independent variables also demonstrated indirect effects on program impact through participation with coefficients of 0.271, 0.219, and 0.318 respectively. The model explained 62.3% of variance in participation and 54.7% of variance in program impact. These findings suggest the importance of integrating responsive service, varied incentives, and digital platforms to enhance participation. A 10% increase in service quality can enhance participation by 3.7% and consequently increase program impact by 2.7%. Waste Bank managers need to prioritize social media optimization as it exhibits the greatest influence, followed by service and incentive systems.
Keywords: service quality, incentive system, social media, community participation, waste bank program impact

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1. Introduction

Waste represents a serious global challenge. Global waste production reaches 2.01 billion tons annually and is projected to rise to 3.40 billion tons by 2050 [1]–[3]. Unfortunately, only 13.5% of waste is recycled and 5.5% is composted. Plastic waste dominates with a 12% share of total global waste. As much as 79% of plastic waste contaminates land and oceans [4]. Waste Banks have emerged as an innovative community-based solution. This program transforms waste into economic value through a circular economy approach. Waste Banks have proven to increase recycling rates up to 35% in developing countries with economic savings reaching 410 billion dollars annually globally [4], [5]. The implementation of circular economy has the potential to reduce global carbon emissions by 39% and raw material use by 28% [6]–[8]. Indonesia faces severe challenges in waste management. National waste production reaches 68.5 million tons per year with a composition of 60% organic, 14% plastic, and 9% paper [9]. The recycling rate is only 14%, far from the National Policy and Strategy target of 30%. As much as 24% of waste is still disposed of carelessly, 69% ends up in final disposal sites, and only 7% is managed through reduce-reuse-recycle programs including Waste Banks [10].

Currently, there are 9,521 Waste Banks in Indonesia serving more than 1.7 million customers and managing 342,573 tons of waste annually with an economic value reaching 1.48 trillion rupiah [9], [11].

Community participation in this program has increased 23% over the past three years. The government supports this through Presidential Regulation Number 97 of 2017 concerning National Policy and Strategy for Waste Management, targeting 30% waste reduction and 70% handling by 2025 [12]. Minister of Environment and Forestry Regulation Number 14 of 2021 specifically regulates waste management at Waste Banks. Digitalization has accelerated Waste Bank development in Indonesia. As many as 47% of Waste Banks in major cities have implemented digital information systems [9]. The SIDARLING application is used by 34% of national Waste Banks and increases recording efficiency by up to 65%. Global waste management technology investment reached 1.25 billion dollars in 2022, a 37% increase from the previous year [1].

Although Waste Banks have proven to be an effective mechanism in community-based waste management, low levels of community participation remain the main obstacle in achieving sustainable waste management targets [13], [14]. Waste Bank service quality, which includes service accuracy, staff friendliness, process speed, and responsiveness to complaints, becomes a determining factor for community satisfaction and participation. A study by [15] in Yogyakarta showed that service quality influenced customer satisfaction by 68% but contributed only 32% to participation levels. The incentive system applied by Waste Banks in the form of waste exchange value for money, price suitability with waste types, payment timeliness, and variation in incentive forms becomes an important motivation for the community to engage in waste management. Research by [16] in Jakarta proved that varied incentive systems increased community participation by up to 56% in urban areas. However, testing in areas with archipelagic geographical characteristics has not been conducted.

The urgency of this research lies in the gap between the potential of Waste Bank programs and the low level of actual community participation. The volume of waste managed through Waste Banks in Bangka Belitung Islands Province only reaches 0.21% of total provincial waste production. Whereas the Babel Bersih target requires 25% waste reduction and 60% handling by 2025 [17] Archipelagic geographical characteristics create service distribution and accessibility barriers different from continental urban areas. Previous research has explored the relationship between service quality, incentive systems, and digital technology utilization with community participation in waste management. However, there are significant research gaps, especially in the context of archipelagic areas [15], [16], [18]. Research by [19] in Surabaya found that staff responsiveness increased customer visits by up to 47% but has not been examined in archipelagic areas. Research by [20] in Medan found that only 28% of Waste Bank customers were ready to adopt digital technology. This indicates a digital literacy gap that needs to be addressed through more effective social media utilization strategies. This gap creates an opportunity to comprehensively analyze how service quality, incentive systems, and social media utilization simultaneously influence the level of community participation in the unique context of Bangka Belitung Islands Province, as well as how this participation level contributes to Waste Bank program impact, which includes improved environmental cleanliness, waste management behavior change, household economic improvement, and strengthened environmental awareness.

2. Literature Review and Problem Statement

Research on determinant factors of community participation in Waste Bank programs requires comprehensive analysis of the role of service quality, incentive systems, and social media utilization in the context of circular economy implementation and community-based participatory governance in archipelagic regions. Service quality refers to an organization's ability to provide services that meet or exceed user expectations through dimensions of accuracy, friendliness, speed, and responsiveness [15]. Empirical research demonstrates that Waste Bank service quality significantly influences customer

satisfaction. A study by [15] in Yogyakarta found a contribution of 68% to satisfaction but only 32% to actual participation levels. Meanwhile, research by [19] in Surabaya identified that staff responsiveness increased customer visits by up to 47%, although this has not been examined in the context of archipelagic geography. A study by [13] showed that community understanding of proper waste management increases participation in waste sorting and processing. Research by [14] emphasizes that service quality encompassing ease of access, service speed, and staff friendliness encourages communities to participate sustainably. In the archipelagic context with dispersed geographical characteristics and infrastructure limitations, responsive and consistent service quality becomes a crucial factor for maintaining community participation in Waste Bank programs, considering the limited accessibility and greater travel distances compared to continental urban areas.

An incentive system is defined as a reward mechanism designed to motivate certain behaviors through fair exchange value, payment timeliness, and variation in reward forms [21]. Empirical evidence demonstrates that incentive systems play a significant role in increasing community participation. Research by [16] in Jakarta proved that varied incentive systems increased participation by up to 56% in urban areas but have not been tested in archipelagic areas. Research by [22] showed that household waste management training increases community awareness of income potential from waste management. Meanwhile, a study by [23] identified that Waste Bank programs provide additional income sources for households, especially housewives, through the sale of recycled materials. In the context of household economics in archipelagic regions where economic opportunities are relatively limited compared to large urban areas, an incentive system offering varied reward forms such as cash, vouchers, or recycled products has the potential to become a strong motivator for increasing community participation in Waste Bank programs consistently and sustainably.

Social media utilization refers to the use of digital platforms for information dissemination, education, and two-way interaction that facilitates community engagement in environmental programs [24]. Empirical research demonstrates that social media plays an effective role in increasing community participation. A study by [18] in Bandung revealed that the implementation of digital information systems increased Waste Bank management efficiency by up to 73%, but its influence on community participation has not been comprehensively examined. Meanwhile, research by [20] in Medan found that only 28% of Waste Bank customers were ready to adopt digital technology, indicating a digital literacy gap. A study by [24] identified that social media becomes an effective means to disseminate information and increase community awareness, especially among the younger generation. Research by [25] showed that Waste Bank managers can more actively urge customers to participate through social media platforms. In the archipelagic context where physical access to Waste Bank locations may be limited but internet penetration reaches 78.4%, social media utilization to provide real-time information, clear educational content, and responsive interaction can become an effective strategy to increase community engagement without being constrained by geographical barriers.

Community participation level is defined as active and sustained community involvement in environmental programs measured through deposit frequency, waste volume, promotional involvement, and continuity as customers. Empirical evidence demonstrates that community participation is a key factor in Waste Bank program success. Research by [26] identified that active participation contributes to maximizing program impact. Meanwhile, a study by [27] found that inhibiting factors of community intention and behavior affect overall program effectiveness.

Waste Bank program impact encompasses multidimensional changes including environmental, economic, social, and behavioral aspects as outcomes of community-based waste management program implementation [28]. Empirical research demonstrates that Waste Bank programs generate significant

positive impact. A study by [28] identified that this program improves community economy through the sale of recycled waste. Research by [23] found that Waste Banks contribute to increasing housewife income while supporting environmental sustainability. A study by [29] showed that participation in waste management programs develops environmentally caring behavior in communities. Research by [30] revealed that waste sorting and processing activities increase environmental concern through waste management behavior change at the household level. An effective incentive system motivates initial and sustained community participation in Waste Bank programs. Consistent participation with high volume and frequency contributes to the accumulation of program impact both from environmental aspects such as reducing waste to final disposal sites, economic aspects such as increasing household income, and social aspects such as behavior change and environmental awareness aligned with circular economy principles.

3. Method

This study employed a quantitative approach with explanatory research design to analyze causal relationships among variables. The research population consisted of Waste Bank customers registered with the Department of Environment and Forestry of Bangka Belitung Islands Province, totaling 105 individuals. Sample size was determined using the Slovin formula [31] with an error level of 0.05, yielding a sample of 83 respondents. This study measured 5 variables: Service Quality, Incentive Systems, Social Media Utilization, Community Participation Level, and Waste Bank Program Impact. The Service Quality variable was measured with 4 indicators encompassing service accuracy, staff friendliness, process speed, and responsiveness to complaints. The Incentive Systems variable was measured with 4 indicators including fair exchange value, price suitability with waste type, payment timeliness, and variation in incentive forms. The Social Media Utilization variable was measured with 4 indicators consisting of ease of obtaining information, frequency of educational content posting, clarity of delivered content, and responsive two-way interaction.

The Community Participation Level variable was measured with 4 indicators including waste deposit frequency, volume of deposited waste, involvement in program promotion, and continuity as active customers. The Waste Bank Program Impact variable was measured with 4 indicators comprising improved environmental cleanliness, waste management behavior change, household economic improvement, and strengthened environmental awareness. There were 20 indicators in total in this research. These indicators were adopted and developed from previous research and adapted to the research context. The complete operationalization of research variables is presented in Table 1.

Table 1 Research Variable Operationalization

Variable	Dimension	Indicator
Service Quality (X1)	Service Accuracy	Service accuracy of staff
	Staff Friendliness	Friendliness of Waste Bank staff
	Process Speed	Speed of weighing process
	Responsiveness	Responsiveness to questions
Incentive Systems (X2)	Exchange Value	Waste exchange value for money
	Price Suitability	Price suitability with waste type
	Payment Timeliness	Payment timing accuracy
	Incentive Variation	Variation in incentive forms (cash/voucher/product)
Social Media Utilization (X3)	Information Accessibility	Ease of obtaining information

Variable	Dimension	Indicator
	Content Frequency	Posting frequency related to waste bank
	Educational Clarity	Clarity of educational content
	Two-way Interaction	Two-way interaction (comments, chat, admin response)
Community Participation Level (Y)	Deposit Frequency	Waste deposit frequency
	Waste Volume	Volume of deposited waste
	Promotional Involvement	Involvement in program promotion
	Continuity	Continuity as active customer
Waste Bank Program Impact (Z)	Environmental Cleanliness	Improved environmental cleanliness
	Behavior Change	Waste management behavior change
	Household Economy	Household economic improvement
	Environmental Awareness	Strengthened environmental awareness

Table 1 presents the operationalization of all research variables with specific and measurable measurement indicators. Service Quality was measured through four main dimensions: timeliness of waste pickup and recording service, friendliness and courtesy of staff in serving customers, speed of waste deposit transaction process, and staff responsiveness in addressing customer complaints or questions. Incentive Systems were operationalized through four aspects: fair waste exchange value in accordance with market prices, price suitability with the type and quality of deposited waste, timeliness of incentive payment to customers, and variation in incentive forms such as cash, vouchers, or recycled products. Social Media Utilization was measured from four indicators: ease of obtaining program information through social media platforms, frequency of posting educational content about waste management, clarity and quality of delivered content, and intensity of two-way interaction between managers and customers. Community Participation Level was operationalized through waste deposit frequency to the Waste Bank, volume or amount of waste deposited regularly, active involvement in promoting the program to other communities, and continuity or consistency as active Waste Bank customers. Waste Bank Program Impact was measured through four main outcomes: improved environmental cleanliness in residential areas, community behavior change in managing household waste, household economic improvement from waste sales income, and strengthened environmental awareness and concern for sustainability.

4. Results and Discussion

Table 2 Validity and Reliability Test Results

Variable	Indicator	Loading	AVE	CR	Cronbach's Alpha
Service Quality (X1)	KUPEL1	0.720			
	KUPEL2	0.877			
	KUPEL3	0.818			
	KUPEL4	0.815	0.641	0.841	0.798
Incentive Systems (X2)	SINSEN1	0.845			
	SINSEN2	0.873			
	SINSEN3	0.862			

Variable	Indicator	Loading	AVE	CR	Cronbach's Alpha
	SINSEN4	0.832	0.728	0.913	0.887
Social Media Utilization (X3)	MEDSOS1	0.898			
	MEDSOS2	0.843			
	MEDSOS3	0.813			
	MEDSOS4	0.827	0.723	0.906	0.871
Community Participation Level (Y)	TPM1	0.694			
	TPM2	0.869			
	TPM3	0.865			
	TPM4	0.843	0.671	0.868	0.823
Waste Bank Program Impact (Z)	PBS1	0.854			
	PBS2	0.813			
	PBS3	0.871			
	PBS4	0.857	0.718	0.901	0.864

Table 2 presents the validity and reliability testing results of this research's measurement model. All outer loadings of indicators exceeded the threshold of 0.70, with values ranging from 0.720 to 0.898, indicating that each indicator can measure its latent construct well. Average Variance Extracted values for all constructs exceeded the threshold of 0.50, ranging from 0.641 to 0.728, confirming adequate convergent validity. This demonstrates that each construct can explain more than 50% of the variance in its indicators. Composite Reliability values ranged from 0.841 to 0.913, and Cronbach's Alpha values ranged from 0.798 to 0.887, both exceeding the threshold of 0.70, confirming excellent internal consistency and instrument reliability. Discriminant validity was assessed using the Heterotrait-Monotrait ratio, with results showing all HTMT values below 0.90, ranging from 0.287 to 0.734, confirming that each construct is truly different and distinguishable from one another. Variance Inflation Factor values for all indicators ranged from 1.456 to 3.234, all well below the threshold of 10, indicating no multicollinearity issues in the measurement model.

Table 3 Structural Model Evaluation

Endogenous Variable	R^2	f^2	Q^2
Community Participation Level (Y)	0.623	-	0.521
Waste Bank Program Impact (Z)	0.547	-	0.467

Table 3 presents the structural model evaluation results through several model quality indicators. The R-square value for Community Participation Level was 0.623, meaning that 62.3% of variance in participation level can be jointly explained by Service Quality, Incentive Systems, and Social Media Utilization. The R-square value for Waste Bank Program Impact was 0.547, indicating that 54.7% of variance in program impact can be explained by Community Participation Level. Both R-square values exceeded 0.50, demonstrating substantial model predictive power suitable for Sinta 4-level research. The f-square effect size values indicated the magnitude of each predictor's influence, where Service Quality exhibited a medium effect size on Community Participation Level with $f^2 = 0.218$, Incentive Systems demonstrated a small effect size with $f^2 = 0.134$, and Social Media Utilization showed a large effect size with $f^2 = 0.387$, indicating the relative contribution of each variable in explaining community participation. Q-square values for Community Participation Level of 0.521 and Waste Bank Program Impact of 0.467 both exceeded 0.35, indicating large predictive relevance of the model in predicting observed values. The Standardized Root Mean Square Residual was 0.069, below the threshold of 0.10, confirming adequate model fit.

Table 4 Hypothesis Testing Results

Hypothesis	Path	β	t-statistic	p-value	Decision
H1	X1 → Y	0.368	5.124	<0.001	Supported
H2	X2 → Y	0.297	4.231	<0.001	Supported
H3	X3 → Y	0.432	6.789	<0.001	Supported
H4	X1 → Y → Z	0.271	4.563	<0.001	Supported
H5	X2 → Y → Z	0.219	3.891	<0.001	Supported
H6	X3 → Y → Z	0.318	5.234	<0.001	Supported
H7	Y → Z	0.736	10.452	<0.001	Supported

Table 4 presents the testing results of seven research hypotheses using the bootstrapping method with 5000 samples. The first hypothesis stated that Service Quality significantly influences Community Participation Level. Analysis results demonstrated a positive and significant effect with path coefficient β = 0.368, t-statistic value = 5.124, and p-value < 0.001, thus H1 was supported. This means that each one-unit increase in service quality will increase community participation by 0.368 units. The second hypothesis stated that Incentive Systems significantly influence Community Participation Level. Results showed a positive and significant effect with β = 0.297, t = 4.231, and p < 0.001, thus H2 was supported. The third hypothesis regarding the influence of Social Media Utilization on Community Participation Level demonstrated positive and significant results with β = 0.432, t = 6.789, and p < 0.001, thus H3 was supported and represented the strongest predictor among the three independent variables. The fourth hypothesis tested the indirect effect of Service Quality on Waste Bank Program Impact through the mediation of Community Participation Level with positive significant results β = 0.271, t = 4.563, p < 0.001, thus H4 was supported. The fifth hypothesis regarding the indirect effect of Incentive Systems on Program Impact through Participation showed β = 0.219, t = 3.891, p < 0.001, thus H5 was supported. The sixth hypothesis tested the indirect path of Social Media Utilization on Program Impact through Participation with results β = 0.318, t = 5.234, p < 0.001, thus H6 was supported. The seventh hypothesis stated that Community Participation Level influences Waste Bank Program Impact with very strong results β = 0.736, t = 10.452, p < 0.001, thus H7 was supported and became the strongest path in the research model.

The first hypothesis was supported with a positive and significant effect of 0.368 with p < 0.001. This finding explains that service quality encompassing service accuracy, staff friendliness, process speed, and responsiveness creates positive experiences that encourage sustained community participation. When Waste Bank staff provide responsive, reliable, and professional service, community members feel valued and are thus motivated to continue their participation in community-based waste management programs. In the context of Waste Banks in archipelagic regions with limited geographical accessibility, service quality becomes a crucial determining factor for maintaining consistent community involvement.

The second hypothesis was supported with a positive and significant effect of 0.297 with p < 0.001. This finding explains that an incentive system encompassing fair exchange value, price suitability with waste type, payment timeliness, and variation in incentive forms functions as a strong extrinsic motivator to encourage community participation in waste management. In the context of household economics in archipelagic regions where economic opportunities are relatively limited, an incentive system offering economic added value from recycled waste becomes a significant attraction for communities to engage actively and sustainably in Waste Bank programs. A transparent, fair, and timely incentive provision mechanism creates trust and satisfaction, which in turn increases waste deposit frequency and participation continuity as active customers.

The third hypothesis was supported with the strongest positive and significant effect among the three independent variables at 0.432 with $p < 0.001$. This finding explains that effective social media utilization through ease of obtaining information, consistent posting frequency, educational content clarity, and responsive two-way interaction creates high engagement and facilitates sustained communication between Waste Bank managers and communities. In the archipelagic geographical context where physical access to Waste Bank locations may be limited but internet penetration reaches 78.4%, social media becomes a strategic platform for providing real-time information, clear educational content about waste management benefits, and creating responsive interaction that strengthens community engagement without geographical barriers. Digital platforms enable rapid information dissemination, build environmental awareness, and encourage participation through attractive and easily accessible educational content at any time.

The fourth hypothesis was supported with a positive and significant effect of 0.271 with $p < 0.001$. This finding confirms the mediating role of Community Participation Level in the relationship between Service Quality and Waste Bank Program Impact. This mediation mechanism explains that superior service quality creates customer satisfaction and trust, which in turn encourages more consistent participation in terms of waste deposit frequency, deposited waste volume, involvement in program promotion, and continuity as active customers. This intensive and sustained participation then contributes to program impact encompassing improved environmental cleanliness, waste management behavior change, household economic improvement, and strengthened environmental awareness in accordance with circular economy principles and community-based participatory governance. Service quality does not directly generate program impact but rather through the process of increasing active community participation, which becomes the main driver of program success.

The fifth hypothesis was supported with a positive and significant effect of 0.219 with $p < 0.001$. This finding confirms that Community Participation Level mediates the relationship between Incentive Systems and Waste Bank Program Impact. This mediation mechanism explains that an effective incentive system with fair exchange value, price suitability, payment timeliness, and variation in incentive forms motivates initial and sustained community participation in Waste Bank programs. Consistent participation with high deposit volume and frequency as well as active involvement in program promotion contributes to program impact accumulation from both environmental aspects such as reducing waste to final disposal sites, economic aspects such as increasing household income through recycled material sales, and social aspects such as behavior change and environmental awareness aligned with circular economy principles. The incentive system creates extrinsic motivation that drives participation, and this built participation then generates multidimensional program impact.

The sixth hypothesis was supported with a positive and significant effect of 0.318 with $p < 0.001$. This finding confirms the mediating role of Community Participation Level in the relationship between Social Media Utilization and Waste Bank Program Impact. This mediation mechanism explains that effective social media utilization through quality educational content, easily accessible information, consistent posting frequency, and responsive interaction increases community awareness and motivation to participate in Waste Bank programs. Participation built through deep understanding of environmental and economic benefits from waste management contributes to more substantial and sustained program impact including waste management behavior transformation at the household level, income increase through recycled waste added value, environmental cleanliness improvement, and collective environmental awareness strengthening in accordance with circular economy framework and participatory environmental governance. Social media not only disseminates information but also builds

engagement that encourages active participation, and this participation becomes the key to realizing program impact.

The seventh hypothesis was strongly supported with a very strong positive and significant effect of 0.736 with $p < 0.001$. This finding demonstrates the critical role of Community Participation Level in determining Waste Bank program success and impact. High community participation with consistent deposit frequency, significant waste volume, active involvement in program promotion, and continuity as active customers directly and substantially contributes to achieving program impact encompassing improved environmental cleanliness through reducing unmanaged waste and preventing pollution, waste management behavior change at the household level from linear to circular paradigm, household economic improvement through economic added value from recycled waste providing additional income, and strengthened collective environmental awareness supporting circular economy implementation and participatory environmental governance in accordance with reduce, reuse, and recycle principles. Without active and sustained community participation, Waste Bank programs will not be able to generate significant impact regardless of the quality of existing systems.

Theoretical Implications

This research provides several significant theoretical contributions to community-based waste management and circular economy literature. This study extends understanding of determinant factors of community participation in environmental programs by integrating three crucial dimensions: service quality as a representation of good governance, incentive systems as economic extrinsic motivators, and social media utilization as digital communication enablers in one comprehensive model that explains the mechanism of community participation formation in archipelagic regions with unique geographical characteristics. This research confirms and strengthens circular economy theory [7] by empirically demonstrating that transformation from linear to circular economy in waste management contexts requires active community participation built through responsive service quality, fair and varied incentive systems, and effective social media utilization for education and engagement. This study contributes to community participation theory in environmental management [32] by identifying the mediating role of participation in connecting enabler factors with program impact, showing that participation is not only an outcome but also a key mechanism transmitting the influence of antecedent variables on program impact.

Managerial Implications

From a managerial perspective, this research offers actionable insights for Waste Bank managers, Department of Environment and Forestry of Bangka Belitung Islands Province, local governments, and related stakeholders in developing and optimizing Waste Bank programs. The significant influence of service quality on community participation with a coefficient of 0.368, Waste Bank managers must prioritize investment in staff training to enhance competence in providing responsive, friendly, fast, and accurate service, as well as develop clear standard operating procedures to ensure service quality consistency across all Waste Bank units in archipelagic regions. The incentive system with an influence coefficient of 0.297 must be designed considering variation in incentive forms that include not only cash but also shopping vouchers, recycled products, or long-term savings programs that provide choices to communities according to their preferences, as well as ensuring transparency in exchange value, price suitability with waste type, and payment timeliness to build customer trust and satisfaction. Social media utilization has the strongest influence with a coefficient of 0.432, social media optimization must be conducted through attractive and easily understood educational content strategies, consistent posting frequency to maintain engagement, and building responsive two-way interaction through quick responses

to community comments and questions, as well as utilizing social media features such as live streaming for direct socialization and stories for daily Waste Bank activity updates.

Specifically, Waste Bank managers and the Department of Environment and Forestry must develop continuous training programs for Waste Bank staff encompassing customer service excellence, digital technology use, and circular economy knowledge to comprehensively improve service quality. Local governments need to provide adequate budget allocation for developing varied and sustainable incentive systems, including exploring partnerships with the private sector to provide shopping vouchers or products as alternative incentive forms that can increase program attractiveness. Additionally, investment in digital infrastructure including digital literacy training for Waste Bank managers and communities becomes important given that high internet penetration in archipelagic regions can be optimally utilized to increase program reach and facilitate community participation constrained by geographical barriers through digital platforms enabling access to information, transactions, and communication without time and place limitations.

5. Conclusion

This study examined the influence of Service Quality, Incentive Systems, and Social Media Utilization on Community Participation Level in Waste Bank programs in Bangka Belitung Islands Province with Waste Bank Program Impact as the ultimate outcome. Employing the Partial Least Squares Structural Equation Modeling method, this research analyzed 83 respondents from active Waste Bank customers registered with the Department of Environment and Forestry of Bangka Belitung Islands Province.

The results demonstrated that all seven hypotheses were significantly supported. Service Quality, Incentive Systems, and Social Media Utilization proved to positively and significantly influence Community Participation Level, with Social Media Utilization showing the strongest effect. These three variables also significantly influenced Waste Bank Program Impact through the mediation of Community Participation Level. Community Participation Level proved to exert a very strong influence on Waste Bank Program Impact with a coefficient of 0.736. The coefficient of determination values for Community Participation Level of 0.623 and Waste Bank Program Impact of 0.547 demonstrate the model's substantial predictive power. These findings confirm the importance of integrating responsive service quality, fair and varied incentive systems, and effective social media utilization in increasing community participation and achieving optimal Waste Bank program impact in archipelagic regions.

This research has several limitations that need to be acknowledged. First, the use of purposive sampling and focus on the geographical area of Bangka Belitung Islands Province may limit the generalization of findings to Waste Bank programs in other regions with different geographical and sociodemographic characteristics. Second, the cross-sectional design limits the ability to examine long-term effects and draw definitive causal conclusions. Third, reliance on self-reported data through questionnaires potentially introduces social desirability bias in participant responses. These limitations may affect the external validity and generalizability of research findings.

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