
PROCEEDING OF RESEARCH AND CIVIL SOCIETY DESEMINATION

ISSN 3024-8426, Volume 3, No. 1, Pages 237-244

DOI: <https://doi.org/10.37476/presed.v3i1.134>

A Design Thinking-Based Digital Marketing Model and Production Facility Optimization for Gula Aren Processing

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Abstract: The development of Village-Owned Enterprises (BUMDes) plays a crucial role in enhancing the value-added of local commodities, including palm sugar (gula aren), which is a leading potential product in Tassese Village. However, several constraints hinder its competitiveness, namely traditional production processes, inconsistent product quality, and the absence of a digital marketing platform, which makes product information difficult to access. This study aims to design a digital marketing model and optimize production facility design using the Design Thinking approach at BUMDes Manggallebaji. The research employs a qualitative method with descriptive analysis, following four stages: Empathize, Ideate, Prototype, and Test. Data were collected through observation, interviews, documentation, and pre-test and post-test assessments using a 20-item questionnaire. The results indicate a significant improvement in the artisans' understanding and skills, with the average score increasing from 2.76 to 4.41, a rise of 59.8%. Product innovations such as coin-shaped sugar, liquid sugar, and granulated sugar (gula semut) were successfully developed through hygienic production technology, along with optimized production facility designs, packaging designs, and marketing website designs. The study concludes that Design Thinking is an effective model for holistic innovation in BUMDes business development, particularly in enhancing production facilities and digital marketing

Keywords: Design Thinking, BUMDes, Digital Marketing, Palm Sugar, Product Innovation

A. Introduction

The development of Village-Owned Enterprises (BUMDes) is a strategic instrument for enhancing village economic independence through the optimization of local potential, product innovation, and the strengthening of managerial capacity

(Asbara, N. W., 2025). Law Number 6 of 2014 affirms that BUMDes serve as drivers of the economy, managing assets and business opportunities based on the needs and characteristics of the village community. However, in practice, many BUMDes face challenges such as low innovation capacity,



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weak governance, and minimal adoption of technology in both production and marketing processes (Harobu et al., 2019; Salihin, 2021).

One local commodity with significant economic potential is palm sugar. Tassese Village in Gowa Regency, for instance, has abundant palm sap resources. Nonetheless, its production process remains traditional, leading to non-uniform quality, low production capacity, and less competitive economic value (Kusumanto, 2016). Previous research indicates that diversifying palm sugar products—such as liquid sugar, granulated palm sugar, and mini molded sugar—has the potential to increase product value and expand market segmentation (Zulhiyah et al., 2022). However, such innovation is difficult to realize without an approach capable of systematically identifying user needs, formulating innovative solutions, and testing prototype feasibility.

Design Thinking emerges as a relevant approach to address these challenges. This method places the user at the center of innovation and guides the creative process through five stages: empathize, define, ideate, prototype, and test (Brown, 2009). In the context of BUMDes and palm sugar artisans, Design Thinking helps to uncover the artisans' needs, identify production constraints, design new products, and improve management systems based on a deep understanding of on-the-ground realities. The application of Design Thinking in SMEs has been proven to enhance creativity, production process efficiency, and product quality through a deep engagement with user needs and iterative solution development (Liedtka, 2015).

Beyond production aspects, marketing digitalization and the strengthening of processing facility design are strategic necessities for the sustainability of the village's palm sugar

enterprise (Candra, A., 2025). Various studies indicate that weaknesses in digital marketing management, production data recording, and non-standard physical facilities are primary factors causing the low competitiveness of palm sugar products in the modern market (Adewasti et al., 2024; Alkadafi et al., 2020; Kusumanto, 2016). In this context, the Design Thinking approach serves as a relevant framework, as it enables the BUMDes to deeply identify user needs, design fit-for-purpose digital solutions, and optimize production facility layouts to be more hygienic, efficient, and compliant with industry standards (Sudarmanto, E., 2023).

Therefore, research on "Designing a Digital Marketing Model and Optimizing Production Facility Design for Palm Sugar Using a Design Thinking Approach" is crucial. This study is expected to yield an effective digital marketing model to expand the market reach of palm sugar products, as well as produce a standardized and more efficient production facility design. Ultimately, this will systematically and sustainably strengthen the performance of the BUMDes, making it more adaptive to the demands of the digital market.

B. Materials and Methods

The research approach employed in this study is qualitative with descriptive analysis. This approach was selected to gain an in-depth understanding of the phenomena, specifically related to the product innovation process and business management development of palm sugar within the context of the Mangngallebaji BUMDes in Tassese Village. Qualitative research allows the researchers to explore the experiences, needs, constraints, and behavioral changes of the artisans and BUMDes managers throughout the innovation process.

Descriptive analysis is used to systematically illustrate each stage of the applied Design Thinking process during the

activities, including the outcomes, community responses, and implications for improving product quality and marketing. All data were collected through direct observation, informal interviews with palm sugar artisans and BUMDes managers, analysis of activity documents, and field notes maintained during the research.

This study applies the Design Thinking theory, which consists of four main stages: Empathize, Ideate, Prototype, and Test (Brown, T. 2009). These four stages are illustrated in the methodological design presented in Figure 1. Flowchart of Design Thinking Implementation.



Figure 1. Flowchart of the Design Thinking Implementation

C. Result and Discussion

The implementation of the Design Thinking approach in this study yielded two primary outputs: a digital marketing model

for palm sugar products and an optimized production facility design for the Mangngallebaji BUMDes.

1. Empathy Stage

During the Empathy stage, researchers conducted observations and interviews which revealed that the palm sugar production process at BUMDes Mangngallebaji was still traditional. Artisans used conventional wood-fired stoves, which produced excessive smoke and negatively affected product quality.

In terms of management, the BUMDes lacked a Standard Operating Procedure (SOP) for production, financial records were still maintained manually and were disorganized, and marketing strategies were unfocused. This situation indicated a critical need for an easy-to-use digital marketing system, specifically for uploading products, updating prices, displaying contact information, and building the BUMDes brand identity.

2. Ideation Stage

In the Ideation stage, the team formulated a system design to address the users' primary needs: easy access to product information and efficient sales processes. The outcome was a use case diagram, shown in Figure 2, involving two main actors: an Admin and a Customer. The core functions include login, product management, contact management, and customer access to the homepage, product catalog, and communication features.

This design ensures that the user interaction flow, for both managers and consumers, is simple, clear, and capable of effectively supporting the marketing digitalization process within the BUMDes context.

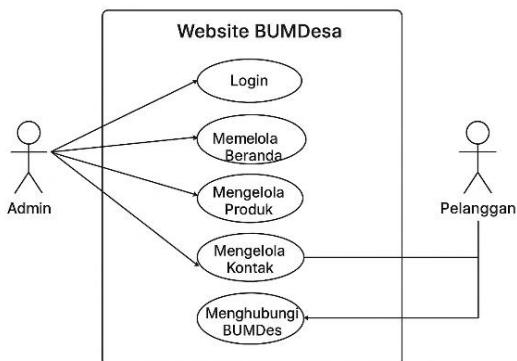


Figure 2. Use Case Diagram for the Marketing Website

Furthermore, the team also explored designs for a more efficient production facility based on the principles of a one-way flow and hygienic standards. The facility improvement ideas included redesigning the production stove into a dual-chamber, smokeless stove. A preliminary sketch of this smokeless dual-chamber stove was developed using SketchUp, as shown in the draft model.

3. Prototype Stage

Based on the defined use case, a prototype website for marketing the palm sugar was designed. The website consists of a homepage, a product catalog (featuring coin-shaped sugar, granulated sugar, and liquid sugar), product detail pages, and an integrated contact page that links directly to the BUMDes's WhatsApp.

The admin dashboard was designed to be simple and easy for the BUMDes managers to use, featuring functionalities for uploading photos, editing text, and managing prices. This visual website prototype was tested with internal users and received positive feedback, particularly regarding its easy navigation and attractive product presentation.

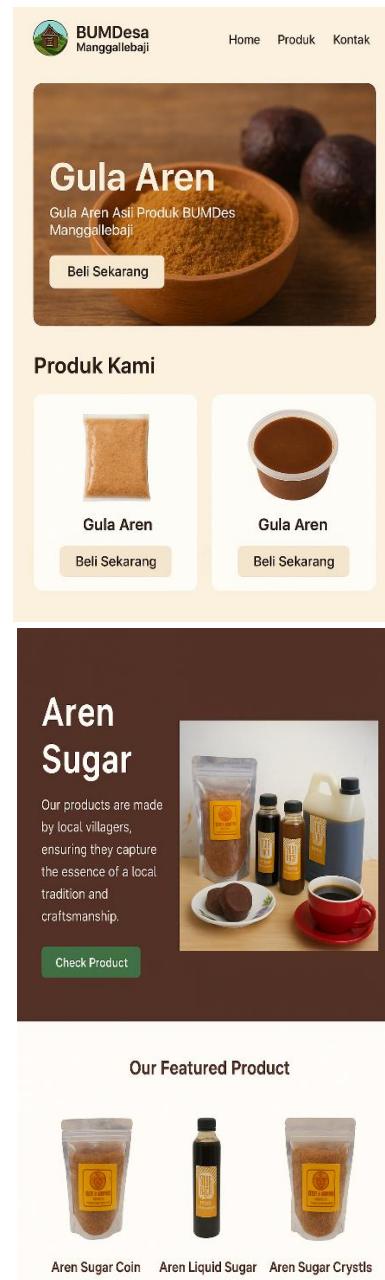


Figure 3. BUMDesa Website Design

And for the production facility prototype—comprising the dual-chamber smokeless stove design, cooling rack, and molding area—was modeled using SketchUp. The 3D model demonstrates significant improvements in thermal efficiency, artisan workflow, and smoke ventilation direction.

The production layout prototype was also developed in both 2D and 3D formats to clearly illustrate the complete workflow from raw material → heating → molding → packaging → storage. This visual representation effectively showcases the logical, unidirectional flow designed to enhance both productivity and workspace safety.

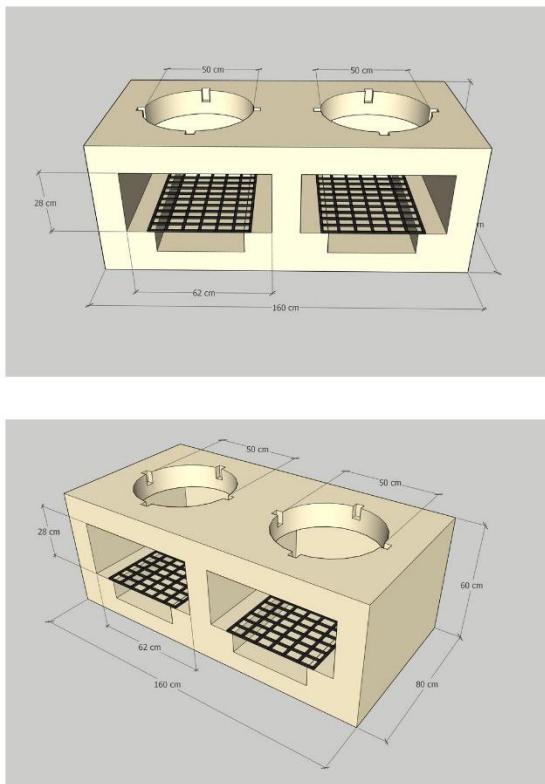


Table 1. Questionnaire Results of the Design Thinking Stages

Stage	Indicator	Pre-Test Score	Post-Test Score	Remarks
Empathize	Knowledge of basic production & the role of BUMDes	2.80	4.40	Understanding improved significantly due to direct field observation and discussions.

Figure 4. Production Facility Prototype Design

4. Test Stage

The website prototype and production facility prototype were tested with the artisans and BUMDes management. The testing results indicated that the website design significantly enhanced promotional efforts by making it easier for customers to access product information.

Concurrently, testing of the production facility prototype demonstrated a marked improvement in process efficiency. Workflow simulations indicated an approximate 30% reduction in material travel time, a 20% increase in stove thermal efficiency, and a significant decrease in smoke exposure within the working area. Artisans reported that the dual-chamber stove design was more effective at maintaining a stable temperature, resulting in a brighter and more consistent color for the palm sugar.

These qualitative findings are further corroborated by the results from the questionnaire distributed to the artisans and managers of the Tassese Village BUMDes, as presented in the accompanying table.

Stage	Indicator	Pre-Test Score	Post-Test Score	Remarks
Ideate	Understanding of product innovation	2.85	4.45	Participants were able to generate and design ideas for new products.
Prototype	Skills in packaging, labeling, and tool testing	2.73	4.38	The product and tool prototypes were easily adapted and used by participants.
Test	Ability to improve product quality and evaluate the business	2.70	4.47	Participants demonstrated the capability to perform iterations and make quality improvements.

The questionnaire findings substantiate the process-mapping conducted during the Empathy stage, confirming that the identified issues accurately reflect the real-world conditions of the artisan community. Three key insights from the Pre-Test questionnaire were established as design criteria: The need for standardized production hygiene; The importance of digital marketing and; 3. The optimization of facilities and product diversification. Consequently, the developed prototypes were not only well-received but also proven to be fully operational and functional.

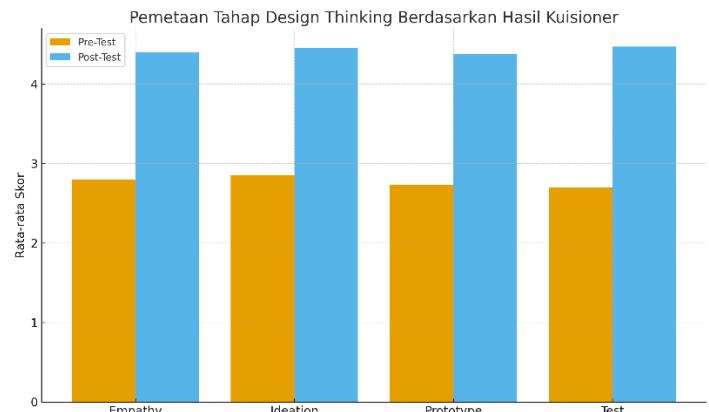


Figure 5. Design Thinking Stage Mapping Graph from Evaluation Results

D. Conclusion

This study concludes that the application of the Design Thinking approach successfully yielded a digital marketing model and an optimized production facility design for palm sugar that are highly relevant to the needs of the Mangngallebaji BUMDes. Through the stages of Empathize, Ideate, Prototype, and Test, the research effectively identified fundamental issues, including traditional production processes,

a lack of hygiene standards, and weak digital marketing strategies.

The developed solutions—comprising a marketing website, digital use case diagrams, a hygienic production facility design, and a dual-chamber smokeless stove—proved effective in enhancing process efficiency and improving product presentation and accessibility. These outcomes are strongly supported by the questionnaire results, which showed a 59.8% increase in the artisans' understanding and skills from the pre-test to post-test scores. This significant improvement indicates that the developed model is operationally viable and can be successfully implemented by the BUMDes and the local artisans.

For future research, it is recommended to develop an integrated digital recording system that connects production and marketing data. Furthermore, expanding this innovation model to other village commodities could strengthen local economic independence in a sustainable manner.

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