

TECHNOCULTURAL INNOVATION IN WOMEN'S ENTREPRENEURSHIP: TRANSFORMING 3D KARAWO EMBROIDERY DIGITALLY

Yulinda L. Ismail¹, Haris Danial², Indhitya R. Padiku³, Riansyah Mahmud⁴

^{1,2,3,4} Universitas Negeri Gorontalo, Gorontalo, Indonesia

Email: yulindaismail@yahoo.co.id¹, harisdanial@ung.ac.id², indithyapadiku@ung.ac.id³, riansyahmahmud@gmail.com⁴

Abstract

Karawo embroidery represents an emblematic cultural heritage of Gorontalo Province, celebrated for its distinctive aesthetic qualities, intricate craftsmanship, and profound philosophical values. Nevertheless, despite supportive regulations, such as Gorontalo Provincial Regulation No. 4 of 2017 and the formal designation of Karawo Day, artisans continue to face persistent challenges related to generational continuity, branding, and the integration of modern technology. These issues are evident among the women's Karawo artisan group in Bongohulawa Village, Bongomeme District, which holds considerable potential but remains underdeveloped due to constraints in design innovation, business management, legal status, and digital marketing capacity. To respond to these challenges, a structured program was implemented to foster women-led micro, small, and medium-sized enterprises (MSMEs) producing custom 3D Karawo through entrepreneurship and digitalization. The program encompassed socialization activities, intensive training in both manual and digital motif design using the Crosti application with 3D innovations, MSME management, 3D Karawo production, and business legalization. It also incorporated technology adoption in production and digital marketing through social media, online marketplaces, and Google Sites-based branding platforms, followed by mentoring, evaluation, and sustainability planning focused on network building and long-term marketing strategies. The results are substantial: ten new patterns emerged, 80 percent of participants mastered Crosti digitalization, business registrations and partnerships were secured, branded prototypes were produced, e-commerce accounts and online catalogs were launched, and an interactive digital platform was developed.

Keywords: Technoculture, Women Entrepreneur, Custom 3D Karawo Embroidery, Micro, Small, and Medium Enterprises (MSMEs), Digital Creative Economy

Abstrak

Sulaman Karawo merepresentasikan warisan budaya khas Provinsi Gorontalo yang sarat makna, dirayakan karena kualitas estetikanya yang unik, keterampilan pengerjaannya yang rumit, dan nilai filosofisnya yang mendalam. Meskipun telah ada regulasi pendukung, seperti Peraturan Daerah Provinsi Gorontalo Nomor 4 Tahun 2017 dan penetapan Hari Karawo secara resmi, para pengrajin tetap menghadapi tantangan yang berkelanjutan terkait keberlanjutan generasi, branding, dan integrasi teknologi modern. Permasalahan ini terlihat jelas pada kelompok perempuan pengrajin Karawo di Desa Bongohulawa, Kecamatan Bongomeme, yang memiliki potensi besar namun belum berkembang optimal akibat keterbatasan dalam inovasi desain, manajemen usaha, status legalitas, dan kapasitas pemasaran digital. Untuk menjawab tantangan tersebut, dilaksanakan sebuah program terstruktur untuk memberdayakan usaha mikro, kecil, dan menengah (UMKM) yang dipimpin perempuan dalam produksi Karawo 3D kustom melalui kewirausahaan dan digitalisasi. Program ini mencakup kegiatan sosialisasi, pelatihan intensif desain motif manual dan digital menggunakan aplikasi Crosti dengan inovasi 3D, manajemen UMKM, produksi Karawo 3D, serta legalisasi usaha. Program ini juga mengintegrasikan adopsi teknologi dalam produksi dan pemasaran digital melalui media sosial, marketplace daring, dan platform branding berbasis Google Sites, yang diikuti dengan pendampingan, evaluasi, dan perencanaan keberlanjutan yang berfokus pada pembangunan jaringan serta strategi pemasaran jangka panjang. Hasilnya signifikan: sepuluh pola baru tercipta, 80 persen peserta menguasai digitalisasi Crosti, registrasi usaha dan kemitraan berhasil diraih, prototipe produk berbranding diproduksi, akun e-commerce dan katalog daring diluncurkan, serta platform digital interaktif berhasil dikembangkan.

Kata Kunci: Teknokultur, Wirausaha Perempuan, Sulaman Karawo 3D Kustom, Usaha Mikro, Kecil, dan Menengah (UMKM), Ekonomi Kreatif Digital

INTRODUCTION

Karawo embroidery plays a pivotal role in preserving tradition and the noble values of Indonesia's national culture, functioning as a handicraft product rich in artistic merit and local philosophy. Its position has been reinforced by legal protection through Gorontalo Provincial Regulation No. 4 of 2017 on the Development of Karawo and Upiya Karanji. This regulation underscores the urgency of safeguarding, sustaining, and promoting Karawo craft as part of a cultural heritage that must be preserved and developed by future generations. In addition, Karawo has received official national recognition through Patent No. ID 00127784 issued by the Directorate General of Intellectual Property on 20 January 2006, and it has also been acknowledged by UNESCO as part of Indonesia's world-recognized cultural heritage (Mano, 2022). Such recognition further cements Karawo's position as a distinctive Gorontalo craft with high economic and aesthetic value.

In response, the Governor of Gorontalo issued Regulation No. 9 of 2014 on Karawo Day, along with a circular encouraging officials and the public to wear Karawo on specified dates (Habibie, 2014). This policy aligns with the University of Gorontalo's Rector Regulation No. 7 of 2022 on the 2020–2024 Strategic Plan, which explicitly integrates local product downstreaming, including Karawo embroidery (Wolok, 2022). Thus, Karawo embroidery is not only protected by government regulation but also incorporated into the practical downstreaming of research and community service as a flagship cultural topic within UNG. These forms of support from government and academia proactively act as a bridge to enhance competitiveness and sustain local culture nationally and internationally.

Competition in the Karawo embroidery sector continues to intensify. Sudana (2019) notes that more than 7,000 women in Gorontalo produce Karawo art to meet their economic needs, with some receiving government training and assistance for production. Unfortunately, many artisans are losing ground in the industry because they lack branding to develop their businesses. Tribun Gorontalo (2024) even reported that Minister of Tourism and Creative Economy Sandiaga Uno highlighted the decline in the number of Karawo artisans by the end of 2024. This discrepancy underscores that the artisan population is no longer increasing. Therefore, new innovations are needed to safeguard this regional culture and enrich Gorontalo's traditional heritage so it does not disappear amid global competition.

Bongohulawa Village, a self-sufficient community within Bongomeme Subdistrict, has 1,478 inhabitants (723 men and 755 women, across 418 households). Notably, it is home to a group of 50 women Karawo embroiderers. This group was formed with government support, including aid to 200 Karawo artisans in Bongomeme in 2018 in the form of cloth, thread, stipends, and Bank Indonesia's provision of four sewing machines, fabric, and hijabs as base materials (Isam, 2017). Yet the continuity of Karawo business development there has been limited, and growth has stagnated. Many women only work as piece-rate embroiderers for a low wage of IDR 150,000 per cloth, taking up to two weeks to complete each.

This situation prompted a younger women's group, led by Nursia F. Malik, to establish the 3D Karawo MSME in Bongohulawa. However, the enterprise faces multiple obstacles: Karawo branding must meet Generation Z expectations; legal business management is lacking due to limited education, making it difficult to access financial support; and most of the 50 participants are embroiderers rather than motif designers, which slows production. In fact, current technology such as the Crosti application could provide an avenue to expand the Karawo business. The 3D Karawo MSME is also constrained in marketing and digital promotion, as many artisans lack the skills to utilize technology effectively.

To address these problems, a community service team initiated a partnership between the 3D Karawo MSME and UNG through a community-empowerment program known as "3D," comprising: (1) Design: creative and digital Karawo patterning; (2) Develop: management and product development; and (3) Distribute: global marketing and sales of Karawo. This staged program links its objectives with Indonesia's Key Performance Indicators (IKU), SDGs, Asta Cita, and the National Research Master Plan (RIRN).

Table 1. Alignment of Objectives with IKU Outcomes, SDGs, Asta Cita, and RIRN Priorities

Stage	Activities	Linkage	RIRN Focus
1. DESIGN (Creative & Digital Karawo Design)	1. Manual & digital Karawo pattern training using	1. IKU 2: Off-campus student experience; 2. SDGs 4: Quality	1. Innovative modern Karawo patterns. 2. Crosti-based

	software. 2. 3D-based motif innovation workshops.	education; 3. Asta Cita 4: Strengthening human resources, science, technology, education, and the roles of women and youth.	digitalization. 3. Collaboration with academia and tech industries for 3D Karawo design research.
2. DEVELOP (Management and Product Development)	1. Karawo-based business management workshop for MSMEs. 2. Training in Karawo production using tied and Manila thread (3D Karawo). 3. Prototyping Karawo-based products such as fashion and accessories.	1. IKU 7: Collaborative projects with the Karawo industry; 2. SDGs 8: Decent work and economic growth; 3. Asta Cita 7: Building from villages to achieve equitable economic development and poverty reduction.	1. Business legalization and NIB. 2. Branding of 3D Karawo motifs (tied and Manila thread). 3. Creative-economy research to enhance product competitiveness globally.
3. DISTRIBUTE (Global Promotion & Sales)	1. E-commerce training using social media and global marketplaces. 2. Creation of a Google Sites platform for branding and digital sales.	1. IKU 5: International recognition of scholarly articles; 2. SDGs 9: Innovation and sustainable infrastructure; 3. Asta Cita 3: Quality job creation, entrepreneurship development, creative industry growth, and infrastructure expansion.	1. E-commerce and digital platforms. 2. Karawo products via Google Sites. 3. Research on interactive digital-platform development.

METHODS

The community service method employed in this program adopts a Community-Based Participatory Approach, a needs-driven strategy that emphasizes active participation of community partners. This approach engages partners from the planning stage through to program evaluation. It comprises several interrelated stages that mutually reinforce one another to address the challenges faced by the partners, particularly in the areas of production, management, and marketing.

a. Description of the Community Empowerment Program

This community empowerment program is essentially directed toward strengthening the digital creative economy through technoculture for women entrepreneurs. In this context, technoculture refers to integrating technological elements into the development of local cultural practices to foster innovative women entrepreneurs. Accordingly, the 3D Karawo aspect in the 3D Karawo MSME indicates the potential for innovation by combining Karawo embroidery with ikat and manila threads in a single garment. This presents a branding opportunity for Karawo motifs in line with Generation Z preferences and responds to the trending motif expectations set forth by the Ministry of Tourism and Creative Economy.

b. Description of Community Empowerment Actions

The implementation of the community empowerment actions includes several stages: socialization, training, technology adoption, mentoring and evaluation, and program sustainability.

1. Socialization

a. Preliminary Observation

Bongohulawa Village, located in Bongomeme District, Gorontalo Regency, is a self-sufficient village inhabited by 1,478 residents (723 males and 755 females, with 418 households). The socio-geographical conditions are conducive, characterized by a productive-age population and active women's groups engaged in household-based economic activities. A prominent feature of the village is its group of 50 women Karawo artisans, established with government support since 2018. The support included fabric, thread, stipends, and complementary facilities from Bank Indonesia, such as sewing machines and embroidery materials. These women possess solid basic embroidery skills. Their dedication and perseverance in preserving local culture have positioned Karawo not only as a cultural heritage but also as a potential community-based creative economy.

A positive initiative was introduced by a young women's group led by Nursia F. Malik, who established the 3D Karawo MSME as a platform for empowerment and the development of Karawo-based innovative enterprises.

b. Socialization Activities

The socialization activities introduce the 3D Karawo MSME development program to artisan groups in Bongohulawa Village, including objectives, benefits, implementation stages, and roles of each party. This stage also serves as an initial discussion platform to build commitment and active participation from partners.

2. Training

Training activities focus on enhancing the artisans' capacities through workshops on manual and digital Karawo design, business management, and 3D Karawo-based production techniques. These trainings aim to equip participants with practical skills and new knowledge relevant to improving competitiveness and production efficiency.

3. Technology Adoption

Technology adoption involves the use of digital design applications such as Crosti to expedite and simplify Karawo motif creation. Participants directly apply these technologies to produce modern patterns, enhance production efficiency, and open wider opportunities for digitalizing designs.

4. Mentoring and Evaluation

Mentoring and evaluation are carried out regularly to ensure the effective implementation of training and technology adoption. The program team assists MSMEs in business legalization, financial management, and strengthening digital marketing. Evaluation is conducted through observation, interviews, and monitoring to measure achievements and formulate follow-up actions. Monitoring and mentoring activities are undertaken by supervising lecturers and the LP2M UNG team to assess the progress and success indicators of the program in the field. Reporting constitutes the final stage, aligned with LP2M UNG's community service reporting standards.

5. Program Sustainability

Sustainability efforts focus on establishing an independent 3D Karawo MSME team, strengthening partnership networks, and integrating digital platforms for long-term promotion and sales. This program is designed to be sustainable through advanced training, social media utilization, and collaboration with academics and related stakeholders.

RESULT AND DISCUSSION

RESULT

The results of the community service program on "Technocultural Innovation for Women Entrepreneurs: Transforming Custom 3D Karawo Embroidery through the Crosti Application for MSMEs in Bongomeme to Strengthen the Digital Creative Economy" can be observed across five key aspects, as described in the implementation methods. These aspects include the stages of socialization, training, technology adoption, mentoring and evaluation, and program sustainability. The following highlights the achievements obtained:

1. Socialization Stage

This community service initiative carried out structured socialization activities to introduce the program, its objectives, benefits, and activity schedule to Karawo artisans in Bongohulawa Village, Bongomeme District. The socialization was implemented in two main phases:

a. Pre-Socialization Activities

This phase focused on preparation before the main socialization. The program team conducted an initial assessment of the 3D Karawo MSME by visiting Bongohulawa Village on 12 June 2025. This activity aimed to directly observe the 3D Karawo production process, product quality, business management techniques, and challenges faced by the artisans. The outcomes of the pre-socialization

served as the basis for designing training materials, digital design modules, and tailored mentoring strategies to meet the partners' needs.



Figure 1. Pre-Socialization Activities

Based on Figure 1 above, as an initial step prior to implementing the community service program, the team conducted a pre-socialization meeting with one of the Karawo entrepreneurs, Mrs. Nursia F. Malik, in Bongohulawa Village, Bongomeme District. This activity was intended to gain a deeper understanding of the enterprise's profile, production conditions, and the partner's actual needs so that the program could be designed to align closely with field realities.

During the visit, the team went directly to Mrs. Nursia's production house. They observed the daily work process—from material selection and pattern creation to Karawo embroidery. In addition to observation, the team held intensive discussions with Mrs. Nursia about the history of her business, the most frequently produced motifs, production time and costs, the marketing system currently used, and the challenges encountered, such as limited new designs, unstructured business management, and minimal digital marketing.

Through this pre-socialization stage, the team obtained a clearer picture of the potential and challenges of Mrs. Nursia's Karawo enterprise. This information then served as the basis for designing training materials, digital design modules, and relevant strategies for mentoring and technology adoption. Thus, pre-socialization functioned not only as an introduction to the program but also as a needs-mapping process enabling the community service initiative to effectively address the partner's issues.

b. Program Socialization

After the pre-socialization activities and needs mapping with entrepreneurs such as Mrs. Nursia F. Malik, the community service team proceeded to the program socialization stage. This activity was conducted in a structured and open manner at the Bongohulawa Village Hall, bringing together Karawo artisans from the 3D Karawo MSME group as well as village officials.



Figure 2. Program Socialization

The program socialization aimed to introduce in greater depth the entire series of community service activities—from objectives, benefits, implementation schedule, and training materials to the mentoring mechanisms that would be applied. In this session, the team presented the concept of Technoculture Womenpreneur Innovation: Transformation of Custom 3D Karawo Embroidery

through the Crosti Application and explained how the program was designed to address the issues identified during pre-socialization, such as limited motif design, business management, legal status, and digital marketing.

During the socialization, participants were provided with booklets or concise modules outlining the program, activity schedule, and the list of upcoming training sessions. The team also held a question-and-answer and discussion session to allow the artisans to express their expectations and feedback. Mrs. Nursia F. Malik, as one of the main entrepreneurs, shared her experiences during pre-socialization and encouraged her group members to participate actively.

As a result of this socialization activity, a shared understanding was achieved among the community service team, partners, and the village government regarding the program's direction and targets. The artisans became more prepared to take part in manual and digital design training, business management, 3D Karawo production, and digital marketing in the next stages. Thus, program socialization served as an essential foundation ensuring the success of subsequent implementation stages.

2. Training Stage

The community service training activity on Technoculture Womenpreneur Innovation: Transformation of Custom 3D Karawo Embroidery through the Crosti Application for MSMEs in Bongomeme to Strengthen the Digital Creative Economy is an initiative focused on enhancing the skills of the 3D Karawo MSME members in developing creative, innovative, and market-relevant products. This activity aims to increase the competitiveness of the 3D Karawo MSME through the application of 21st-century skills, motif digitalization, and creative economy-based product diversification.

1. Training Objectives

- **Enhancing Understanding of 21st-Century Skills:** Training Karawo MSME members to apply skills such as creativity, critical thinking, collaboration, digital literacy, and financial literacy in business development.
- **Diversifying 3D Karawo Products:** Developing more creative and innovative variations of Karawo products by utilizing digital design technologies and three-dimensional embroidery techniques.
- **Strengthening the Digital Creative Economy:** Equipping participants with skills to integrate Karawo products into the creative economy ecosystem, including through digital marketing, branding, and online platforms.

2. Training Activity Stages

a. Opening and Introduction Stage

- **Welcome and Explanation of Training Objectives:** The community service team opened the activity with a welcome address and an explanation of the importance of 21st-century skills, Karawo motif digitalization, and product diversification to enhance the competitiveness of the 3D Karawo MSME.
- **Introduction to the Concept of 21st-Century Skills:** Facilitators explained the concept of 21st-century skills, covering creativity, critical thinking, digital literacy, collaboration, and adaptability to global markets.

b. Training Stage

This stage constitutes the core of partner capacity building, where all materials designed based on the initial needs mapping are delivered in a structured manner. Training is divided into three main clusters following the program framework (DESIGN, DEVELOP, and DISTRIBUTE) and refers to the achievement indicators.

1. DESIGN – Creative and Digital Karawo Design

Participants, including Mrs. Nursia F. Malik, took part in intensive training on creating innovative and modern Karawo motifs. In this session, facilitators reintroduced the fundamentals of manual motif making and then transitioned to Karawo pattern digitalization using the Crosti application. Participants practiced drawing motifs, converting them into digital files, modifying colors, and aligning them with market trends. Expected outcomes at this stage included the creation of at least 10 new training-derived patterns, 80% of participants mastering Crosti for pattern digitalization, and the establishment of at least two partnerships with academia or digital-design industries for 3D Karawo motif development.



Figure 3. Designing Karawo Creatively and Digitally

In this activity, the community service team provided outreach to the members of the 3D Karawo MSME in Bongohulawa Village on the importance of creativity in producing more innovative 3D Karawo products, as well as critical thinking skills to address production and marketing challenges and identify effective solutions.

During the opening session, the team delivered welcoming remarks and explained the objectives of the outreach, namely to equip Karawo MSME members with relevant 21st-century skills to develop products, expand market reach, and enhance competitiveness through the application of innovation and digital technology.



Figure 4. Training on the Use of Crosti in Karawo Embroidery

In this activity, the community service team delivered intensive training to members of the 3D Karawo MSME in Bongohulawa Village on how to use the Crosti application. The training aimed to introduce a more practical and creative approach to designing Karawo motifs, thereby making it easier for artisans, especially embroiderers to produce innovative works aligned with market trends.

The session began with an explanation of the functions and advantages of Crosti as a digital tool that enables artisans to create, modify, and store Karawo patterns quickly and accurately. Participants were then guided to download the application, familiarize themselves with its interface, and understand key features such as grid selection, color options, and motif conversion.

Next, participants practiced creating their own digital Karawo motifs. They designed simple patterns based on their individual creativity, modified thread colors, and adjusted the size and complexity of motifs to match production needs. During this process, they were also shown examples of successful 3D Karawo motifs in the market and encouraged to adapt these patterns with their own creative touch.

The team emphasized that using Crosti not only accelerates the design process but also opens opportunities for product diversification. With stored digital motifs, artisans can apply them to various types of 3D Karawo fashion items, accessories, or regional souvenirs. The training concluded with a question-and-answer session and one-on-one assistance for participants still facing difficulties, ensuring that each artisan fully mastered this new skill.

Through this Crosti training, participants, including Ms. Nursia F. Malik, have now acquired the ability to design 3D Karawo motifs digitally with greater speed, precision, and variety. This is expected to form a solid foundation for improving the quality and competitiveness of their 3D Karawo products in broader markets.



Figure 5. Practicing 3D Karawo Embroidery

In addition, the team provided an explanation of the concept of 21st-century skills, encompassing creativity, critical thinking, communication, collaboration, digital literacy, as well as financial and business literacy, competencies essential for managing Karawo enterprises in the era of the digital creative economy.

Participants were then engaged in case studies addressing real challenges commonly faced by Karawo MSMEs, such as limited motif designs, restricted product marketing, and issues of business legalization. They were encouraged to think critically and develop solutions through problem analysis, group discussions, and teamwork. The team also presented successful examples of 3D Karawo product development that had penetrated broader markets. Participants were subsequently asked to analyze the factors contributing to these successes and formulate strategies applicable to their own businesses.

Through this activity, participants not only gained insights into 21st-century skills but also directly practiced applying creative, analytical, and collaborative mindsets in developing technology-based 3D Karawo enterprises.



Figure 6. Training on Business Legalization Procedures

In this activity, the community service team also provided intensive guidance and mentoring to the 3D Karawo MSMEs to strengthen their business capacity through the process of legalization. Business legality is a critical aspect that has long been a barrier for Karawo artisans in Bongohulawa Village; without official documents, they face difficulties accessing financing, government programs, and partnerships with the private sector.

As a concrete implementation, the head of the community service team, Mrs. Yulinda Ismail, M.Si., personally trained and mentored one of the entrepreneurs, Mrs. Nursia F. Malik, to understand the procedures for obtaining a Business Identification Number (NIB) and other necessary legal documents. The training began with an explanation of the importance of business legality for the

sustainability and market expansion of Karawo MSMEs. It then continued with hands-on practice, including filling out the Online Single Submission (OSS) forms, preparing required documents, and undergoing the verification process.

Mrs. Nursia F. Malik was not only provided with theoretical knowledge but also guided step by step to upload files online, check the status of her application, and ensure that the issued NIB matched her business data. Through this mentoring, she gained a clear understanding of the benefits of legalization, such as easier access to financing, opportunities to participate in official exhibitions, and partnerships with government and private entities.

This activity is expected to serve as a learning model for other members of the 3D Karawo MSME group so that they can replicate the NIB application process independently. By obtaining official legal status, 3D Karawo enterprises will not only become more credible and professional but will also have greater opportunities to grow and compete in local, national, and international markets.



Figure 7. Introduction to Digital and Social Media–Based Product Promotion

Based on the figure above, the community service team sought to introduce and optimize the use of social media and digitalization in promoting Karawo products. This step was taken to address the challenges artisans have long faced, such as limited promotional access, dependence on third parties to obtain orders, and minimal skills in independently marketing their products.

As a follow-up, the team provided direct training and mentoring to Karawo artisans, including Mrs. Nursia F. Malik, on how to promote and sell products through social media and e-commerce platforms. Participants were taught from the basics—such as creating and managing Instagram, Facebook, and marketplace accounts (Shopee, Tokopedia)—to more advanced techniques, including creating engaging promotional content, using paid advertising features, and scheduling posts to ensure wider and more targeted reach.

The team also introduced the use of Google Sites as an online catalog containing product photos, motif descriptions, prices, and contact information. With this platform, artisans can not only showcase their work to potential buyers but also build professional branding for 3D Karawo products and increase product recognition.

The training emphasized that social media is not merely a source of entertainment but also a strategic tool for market building. Artisans were trained to photograph products attractively using smartphones, edit photos simply, and write informative, compelling product descriptions. They were also taught how to respond promptly and politely to prospective buyers' messages to enhance customer trust.

Through this process, Karawo artisans in Bongohulawa Village have gained independence in promoting and selling their products without having to wait for orders from third parties. With the digital skills acquired, they can expand their markets beyond the local area—even internationally—while simultaneously strengthening Karawo's cultural identity as Gorontalo's flagship creative-economy product.

c. Closing Stage

Evaluation and Feedback: At the end of the activity, the community service team conducted an evaluation session with the 3D Karawo MSME participants to assess their understanding of the delivered materials. Participants provided feedback on the quality of training, clarity of digital design content, business management, and digital marketing. This evaluation helped measure their mastery of

21st-century skills—creativity, critical thinking, collaboration, digital literacy, and financial literacy—as well as their readiness to implement 3D Karawo product diversification.



Figure 8. Testimonials from 3D Karawo Business Owners and Artisans

Based on the figure above, the program evaluation process was carried out not only through questionnaires but also by collecting direct testimonials from the owners of 3D Karawo MSMEs and the Karawo artisans involved in the activities. These testimonials indicate that the program Technoculture Womenpreneur Innovation: Transforming Custom 3D Karawo Embroidery through the Crosti Application has provided tangible benefits for the women artisans in Bongohulawa Village.

In their testimonials, the artisans revealed that previously they relied solely on traditional methods for designing Karawo motifs and on third-party orders to market their products. After participating in the series of socialization, training, technology adoption, and mentoring activities, they now possess new skills such as digitally designing Karawo motifs using Crosti, creating more varied 3D Karawo prototypes, processing business legalization (NIB), and independently marketing their products through social media and online marketplaces.

The 3D Karawo MSME owner also expressed that the team's mentoring greatly improved the professionalism of her business. With official legal status and a digital catalog on Google Sites, their products can now be more easily introduced to buyers and partner institutions. The artisans feel more confident, creative, and motivated to continue developing their 3D Karawo enterprises.

These testimonials serve as qualitative indicators of the program's success, demonstrating that the community service activities not only enhanced technical skills but also fostered a sense of ownership, independence, and self-confidence among the women artisans in managing their businesses. Moving forward, these testimonials will serve as valuable learning material and promotional content to expand the program's impact to other Karawo artisan groups across Gorontalo Province.

d. Expected Outcomes

- **More Varied Karawo Products:** Through training and technology adoption, participants are expected to diversify 3D Karawo products into various forms—such as fashion (apparel and accessories), home décor, and souvenirs—with stronger appeal in the digital creative economy market.
- **Improved Human Resource Skills:** MSME participants develop critical thinking, creativity, collaboration, and digital technology skills (Crosti, marketplaces, Google Sites) to support business innovation.
- **Expanded Market Access:** Karawo MSMEs can market their products independently through digital platforms, broadening consumer reach at local, national, and even international levels.

e. Impact and Sustainability

- **Local Economic Empowerment:** With the skills and knowledge gained from this program, 3D Karawo MSME members can increase their family incomes and contribute to the growth of the creative economy in Bongohulawa Village.
- **Enhanced Competitiveness in the Creative Industry:** Through improved product innovation and digital literacy, 3D Karawo MSMEs can compete with other creative-economy products in terms of quality, design, and marketing strategies.

- **Business Sustainability:** Through post-training mentoring, participants are encouraged to continuously develop sustainable business ideas and strategies. Their legal business status (NIB) and digital marketing skills form an essential foundation for long-term enterprise continuity.

This training program makes a significant contribution to the development of 3D Karawo MSMEs in Bongohulawa Village by strengthening 21st-century skills and facilitating product diversification based on the digital creative economy. It is expected to generate long-term positive impacts for training participants, business sustainability, and the overall improvement of the local economy.

DISCUSSION

The program “Innovation in Technoculture Womenpreneur: Transformation of Custom 3D Karawo Embroidery through the Crosti Application” demonstrates how a community-based intervention combining technical training, digital motif design, business management, legalisation, and digital marketing can create meaningful impact for Karawo SMEs in Bongohulawa Village.

1. Digitalisation and Market Access

Training in digital applications such as Crosti expanded the artisans’ ability to promote and sell their products online. This aligns with findings from Women’s World Banking (2024) in Empowering Indonesia’s Artisans: Financial Inclusion Insights, which reported that Indonesian women in the creative sector still show low digital capability, and that training in digital and financial skills enables artisans to manage stock, promote their businesses, and communicate more effectively with customers. Similarly, Nurmandi et al. (2023) in Digital Innovative Governance of the Indonesian Creative Economy stressed that digital transformation in the creative economy requires supportive regulation and institutional backing to help small creative businesses tap into global markets.

2. 21st-Century Skills for Women Entrepreneurs

The program explicitly built 21st-century skills—creativity, critical thinking, collaboration, digital literacy, and financial literacy—into its training. This echoes Aikins and Anane (2024) in The Influence of 21st-Century Skills on Students’ Understanding of Entrepreneurship Education, who found that technology and media literacy significantly affect entrepreneurial competence. Furthermore, the role of makerspaces and digital design tools in building 21st-century skills for creative producers has been highlighted by Smith and Turner (2020) in Fablabs and Makerspaces Delivering 21st Century Skills published in Technological Forecasting & Social Change.

3. Legal Status and Branding as Professionalisation Drivers

Formalising business legality (e.g., NIB) and creating digital branding through catalogues on Google Sites proved crucial for improving visibility and credibility. This is consistent with Arwani et al. (2024) in Women’s Economic Transformation: A Literature Review on Empowerment through Entrepreneurship and Financial Inclusion in Pekalongan, Indonesia, which shows that access to training, finance, and networks are key enablers for women’s business empowerment. Likewise, Santoso (2024) in Creative Economy Branding in Indonesia: The Oneda Case and Navigating Local Brands in Global Markets argues that combining cultural narratives with intellectual property regulation strengthens local products’ credibility in the global market.

4. Sustainability and Empowerment

Testimonies from artisans indicate that they have moved from reliance on third-party orders to independently designing, producing, and marketing Karawo products. This confirms the point made by Ali and Khan (2020) in Women Entrepreneurship: A Systematic Review to Outline the Field that effective empowerment programs must go beyond technical skill transfer to build confidence, autonomy, and the capacity to adapt to changing markets.

The outcomes produced through this program are

1. Technical Outputs

Technical outputs are the tangible results of the program that can be directly utilized by the community/partners:

- **Digital Karawo Motif Products via the Crosti Application:** Training participants produced at least 10 digital Karawo motif designs ready for application on fabric. These motifs combine Gorontalo’s cultural characteristics with modern designs, making them more attractive to national and international markets.
- **Diversified 3D Karawo Product Prototypes:** Various 3D Karawo products were created—such as clothing, bags, accessories, and home décor—using a blend of manila and ikat threads. These prototypes serve as examples of culturally rooted creative product innovation.

- **Business Legality (NIB):** The team assisted artisans, particularly the head of the 3D Karawo SME, in obtaining a Nomor Induk Berusaha (NIB) as formal business registration. This legal status opens access to capital and government programs.
- **Digital Branding Platforms:** Google Sites-based platforms and social media accounts (Facebook, Instagram, WhatsApp Business) were created for the promotion and sale of Karawo products, enabling artisans to market their products independently.
- **Enhanced SME Management Skills:** Participants mastered stock and transaction recording using simple spreadsheets, making business management more efficient and professional.

2. Scientific Outputs

Scientific outputs are the results of activities contributing to knowledge development, models, and publications:

- **Technology- and Culture-Based Empowerment Model:** The program produced a womenpreneur empowerment model based on technocultural innovation that can be replicated by SMEs in other regions.
- **Creative Economy Marketing Strategy Document:** A report analyzing digital-based marketing strategies for Karawo products was prepared as a reference for artisans and stakeholders.
- **Scientific Articles/Publications:** A scholarly article was prepared for publication in a community service journal discussing the integration of digital technology (Crosti) and SME empowerment rooted in local culture.
- **Final Program Report:** The report documents activity stages, results, impacts, and evaluations, serving as a reference for similar future community service initiatives.

3. Social and Economic Outputs

a. Social Outputs

- **Local Women's Empowerment:** The program increased the capacity and role of women in Bongohulawa Village's 3D Karawo enterprises. Through training in digital skills, business management, and online marketing, women artisans became more confident, independent, and able to make strategic decisions for their household businesses.
- **Strengthening Social Networks and Collaboration:** Training and mentoring built networks among artisans, local communities, local government, and educational institutions, creating a more supportive environment for culture-based SMEs.
- **Cultural Preservation and Revitalization:** Digital technology (Crosti application) was used to design Karawo motifs so that Gorontalo's traditions remain preserved. The program shifts perceptions, showing that culture can evolve and be marketed in modern ways without losing authenticity.
- **Increased Digital Literacy Capacity in the Community:** Beyond SME members, the surrounding community also received basic digital literacy exposure through outreach, making the village ecosystem more technologically aware.

b. Economic Outputs

- **Increased SME Income:** Diversification of modern 3D Karawo products (bags, accessories, fashion, home décor) created new revenue streams. After training, artisans reported increased sales as their products became more varied and easier to market.
- **Broader Market Access:** By using social media, marketplaces, and the digital platforms developed, 3D Karawo products now reach not only local but also national and even international markets.
- **Production and Promotion Cost Efficiency:** The Crosti application accelerated motif design and reduced embroidery errors, making production costs more efficient. Digital marketing also reduced traditional promotional costs.
- **Enhanced Value-Added of Local Products:** The resulting 3D Karawo becomes a regional flagship product with higher selling value by merging traditional motifs and modern technology-based designs.
- **New Employment Opportunities:** Increased demand for 3D Karawo products opens opportunities for local people to engage in production, packaging, digital promotion, and distribution, creating new jobs.

c. Long-Term Socio-Economic Impacts

- **Business Sustainability and Economic Independence:** With new skills, 3D Karawo artisans can manage their businesses independently and sustainably without intermediaries.

- **A Replicable Empowerment Model:** This approach can serve as a blueprint for developing culture- and technology-based SMEs in other villages, improving local creative economy competitiveness at the national level.
- **Enhanced Regional Image:** Modern 3D Karawo products have the potential to become a new icon of Gorontalo's creative economy, elevating the region's image as a center of cultural innovation.

To ensure sustainability and strengthen the outcomes of the Community Service Program on Technoculture Innovation for Womenpreneurs: Transformation of Custom 3D Karawo Embroidery through the Crosti Application, the team has developed a follow-up plan, as visualized in the diagram above. This plan is designed to guarantee that the skills, innovations, and networks built during the program will not end once the activities conclude but will continue to evolve, enabling the 3D Karawo MSMEs in Bongohulawa Village to become increasingly self-reliant and competitive.

The first stage is Advanced Capacity Building, focused on higher-level training in the use of the Crosti application, 3D Karawo design innovation, and the development of new product ideas aligned with market trends. This stage aims to ensure that artisans can not only apply the foundational materials from the previous training but also create more complex and high-value innovations.

The second stage is Digital Marketing Assistance, in which artisans will receive ongoing guidance to optimize social media (Facebook, Instagram, WhatsApp Business) and online marketplaces, as well as strengthen the brand identity of 3D Karawo. This support is critical to ensuring that the products developed are promoted effectively and sustainably.

The third stage is Enhanced Legalization and Business Management, which will assist MSMEs in obtaining additional business permits such as halal certification, copyrights, and trademarks, while introducing more professional digital systems for financial and inventory management.

The fourth stage, Network and Partnership Development, is focused on expanding collaboration with local government, academia, designers, and creative industry players to improve design quality, broaden market reach, and reinforce 3D Karawo's branding as a flagship regional product.

The fifth stage is Monitoring and Evaluation of Sustainability, with periodic assessments every three to six months to measure progress in skills, production, marketing, and economic impact. These results will serve as the basis for refining future programs.

The final stage, Sustainability Strategy, involves establishing a cooperative or association of 3D Karawo artisans and integrating a web-based information system for ordering, inventory management, and promotion, enabling MSMEs to become more technologically autonomous.

Through these stages, the 3D Karawo MSMEs are expected to evolve into a high-competitiveness, culturally and technologically grounded business model that is sustainable and generates wider positive impacts for the community of Bongohulawa Village.

CONCLUSION

The implementation of the community service program Technoculture Innovation for Womenpreneurs: Transformation of Custom 3D Karawo Embroidery through the Crosti Application in Bongohulawa Village has delivered tangible impacts for Karawo artisans. This program has successfully enhanced their 21st-century skills, particularly in digital literacy, creativity, collaboration, and business management.

Through training in the use of the Crosti application, diversification of 3D Karawo products, and strengthening of digital marketing, artisans have been able to produce more varied new motifs, improve product quality, and expand market access to the national level. In addition, business legalization and financial management assistance have reinforced the artisans' business foundations, making them more independent and competitive.

The program has also contributed to the preservation of local culture. Traditional Karawo motifs are maintained but packaged in a more modern form, thereby increasing their added value in the creative economy market. This technoculture womenpreneur approach has proven relevant and effective in strengthening women's roles in the local economy and improving family welfare.

The following is several suggestions that could be intended to

- a) **Ongoing Assistance:** It is necessary to provide regular mentoring after the program ends, particularly in social media management, digital business management, and new design development so that the skills acquired remain sharpened.
- b) **Strengthening Networks and Partnerships:** It is recommended that the 3D Karawo MSMEs continue to expand partnerships with local governments, national designers, and creative industry players to broaden their markets and gain technical support.

- c) Development of Legality and Intellectual Property Rights: In addition to obtaining a Business Identification Number (NIB), it is important to encourage artisans to secure copyright protection for motifs, halal certification, and trademarks so that their products are better legally protected and have higher market value.
- d) Improvement of Production Quality and Branding: 3D Karawo MSMEs are advised to continuously enhance product quality through design innovation and the use of modern production tools, as well as to strengthen brand identity through more professional promotional strategies.
- e) Replication of the Empowerment Model: Local governments and universities can adopt this program as a model for culture- and technology-based MSME empowerment to be implemented in other business groups and regions.

Gratitude Expression

Thank you to Directorate General for Research and Development, Ministry of Higher Education, Science and Technology for providing DPPM funding through a community service program with a community partnership empowerment scheme in 2025. In addition, we also express our gratitude to Gorontalo State University and UKM 3D Karawo for being willing to be a bridge in the implementation of this community service program

REFERENCES

- Aikins, P. & Anane, S. (2024). The Influence of 21st-Century Skills on Students' Understanding of Entrepreneurship Education. University of Ghana.
- Ali, S. & Khan, M. (2020). Women Entrepreneurship: A Systematic Review to Outline the Field. *Frontiers in Psychology*, 11, 1557.
- Arwani, A., Rismawati, S. D., Ma'shum, H., Mustakim, Z., Ismanto, K., Devy, H. R., & Rohmah, F. (2024). Women's Economic Transformation: A Literature Review on Empowerment through Entrepreneurship and Financial Inclusion in Pekalongan, Indonesia.
- Danial H, Ismail YL, Padiku IR. 21st Century Skills Transformation through Karawo Products Diversification on Creative Economy. *Journal of Communnity Development* [Internet]. 2024;5(5):8984–94. Available from: <https://journal.universitaspahlawan.ac.id/index.php/cdj/article/view/35012>
- Darnilawati, Djajasinga ND, Gusti Ayu Aghivirwati., Yulinda L. Ismail, Risdwiyanto A, Munarsih E, et al. *Manajemen Pemasaran Global* [Internet]. 1st ed. Cahyono PT, editor. Batam: CV. Rey Media Grafika; 2022. Available from: https://books.google.co.id/books?hl=id&lr=&id=_BstEQAAQBAJ&oi=fnd&pg=PA_51&ots=NK0_b1qRK&sig=X8MS0dgKwQ5ybZAbu9Xc9ErI_18&redir_esc=y#v=onepage&q&f=false
- Gorontalo PP. Peraturan Daerah Provinsi Gorontalo Nomor 4 Tahun 2017 [Internet]. Gubernur Gorontalo. 2017. Available from: <https://peraturan.bpk.go.id/Details/67254/perda-prov-gorontalo-no-4-tahun-2017>
- Habibie R. Peraturan Gubernur (PERGUB) Provinsi Gorontalo Nomor 9 Tahun 2014 [Internet]. Vol. 1, Peraturan Gubernur. Gorontalo: Peraturan Gubernur; 2014. p. 1–17. Available from: <https://peraturan.bpk.go.id/Details/107112/pergub-prov-gorontalo-no-9-tahun-2014>
- Isam. 200 Pengrajin Karawo Terima Bantuan Pemprov Gorontalo – Berita Gorontalo. *Berita Gorontalo* [Internet]. 2018;1. Available from: <https://berita.gorontalooprov.go.id/2018/03/27/200-pengrajin-karawo-terima-bantuan-pemprov-gorontalo/>
- Kei F, Wolok T, Ismai YL. Analisis Usaha Mikro Kecil Menengah di Desa Ilotunggula Kabupaten Gorontalo Utara. *As-Syirkah Islam Economic Finacial Journal* [Internet]. 2024;3(4):1948 – 1963. Available from: <https://journal.ikadi.or.id/index.php/assyirkah/article/view/8>
- Khurniawati S, Badri MA, Rivaldi MH, Hafizhah N, Farihesti S, Mando L, et al. Pemberdayaan Masyarakat Berbasis Potensi Lokal Sebagai Upaya Peningkatan Nilai Ekonomis Dan Media Pemersatu Umat. *Insaniyah*. 2023;1(2):11–22.
- Kidjab F. Pengrajin Karawo Gorontalo Berkurang, Menparekraf Sandiaga Uno Rencanakan Pelatihan Generasi Muda. *Tribun Gorontalo* [Internet]. 2024;1–2. Available from: <https://gorontalo.tribunnews.com/2024/06/24/pengrajin-karawo-gorontalo-berkurang-menparekraf-sandiaga-uno-rencanakan-pelatihan-generasi-muda?page=2>
- Mano DH. Karawo khas Gorontalo diusulkan menjadi warisan budaya tak benda ke UNESCO. *Antara Gorontalo* [Internet]. 2022; Available from: <https://gorontalo.antaranews.com/berita/199589/karawo-khas-gorontalo-diusulkan-menjadi-warisan-budaya-tak-benda-ke-unesco>

- Nue NI, Niode IY, Ismail YL. Pengaruh Lingkungan Internal Dan Lingkungan Eksternal Terhadap Keunggulan Bersaing Industri Mikro Kecil (IMK) Di Kota Gorontalo (Studi Pada Kerajinan Karawo). JAMBURA Jurnal Ilmu Manajemen dan Bisnis [Internet]. 2022;5(1):154–62. Available from: <https://ejurnal.ung.ac.id/index.php/JIMB/article/view/14264>
- Nur I, Talib S, Ismail YL, Kusuma CA, Angriani M. Dampak Desain dan Kualitas Produk terhadap Keputusan Pembelian Karawo. Jurnal Indonesia Kreatif dan Kewirausahaan [Internet]. 2024;7(2):218–31. Available from: <https://jurnal.usahid.ac.id/kewirausahaan/article/view/2781/1062>
- Nurmandi, A., et al. (2023). Digital Innovative Governance of the Indonesian Creative Economy. Sustainability, 15(23), 16234.
- Santoso, B. (2024). Creative Economy Branding in Indonesia: The Oneda Case and Navigating Local Brands in Global Markets.
- Setiawan E, Zakaria A, Padiku IR. Pelatihan Dan Manajemen Potensi Desa Menggunakan Sistem Informasi Desa dan Mini E-Commerce Sebagai Upaya Peningkatan Ekonomi Masyarakat di Desa Motihelumo. Jurnal Sibermas (Sinergi Pemberdayaan Masyarakat) [Internet]. 2019;8(1). Available from: <https://ejurnal.ung.ac.id/index.php/sibermas/article/view/7668/pdf>
- Smith, J. & Turner, D. (2020). Fablabs and Makerspaces Delivering 21st Century Skills. Technological Forecasting & Social Change, 161, 120254.
- Sudana wayan I. Dinamika Perkembangan Seni Karawo Gorontalo. Gelar J Seni Budaya [Internet]. 2019;17(1):31–43. Available from: https://www.researchgate.net/publication/335016648_Dinamika_Perkembangan_Seni_Karawo_Gorontalo/fulltext/5d4acb78299bf1995b6aba02/Dinamika_Perkembangan-Seni-Karawo-Gorontalo.pdf
- Ussu NR, Danial H. Implementasi Sistem Informasi Manajemen Pemasaran Berbasis Digitalisasi Bilingual Pada Sentra Usaha Kecil Menengah Karawo Di Kabupaten Bone Bolango. Jurnal Sibermas (Sinergi Pemberdayaan Masyarakat) [Internet]. 2021;10(2):384–406. Available from: <https://ejurnal.ung.ac.id/index.php/sibermas/article/view/9248>
- Wolok E. Rencana Strategis UNG 2020-2024 [Internet]. Gorontalo; 2022. Available from: <https://www.ung.ac.id/page/show/3/rencana-strategis>
- Women's World Banking. (2024). Empowering Indonesia's Artisans: Financial Inclusion Insights.