



Increasing productivity of tile craftsman in Darmasaba Village, Badung District

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ABSTRACT

The lack of knowledge of tile craftsmen regarding ergonomic working attitudes, lack of knowledge regarding business management starting from bookkeeping and marketing strategies, as well as knowledge regarding innovation in clay-based products has caused the tile crafts industry in Darmasaba Village to experience many problems ranging from health problems and economic problems. This community service implementation is carried out to overcome partner problems through training in work attitudes, business management and product innovation to increase the productivity of roof tile craftsmen. This method of implementing community service is generally carried out through several stages, namely preliminary survey, coordination with related parties, socialization of activities, and implementation of activities and evaluation of activities. The results of community service showed that roof tile craftsmen had an understanding of appropriate work attitudes for ergonomics, business management and product innovation based on the results of the pre-test and post-test questionnaire assessments. Roof tile craftsmen were also enthusiastic about participating in community service events from start to finish. Of all the participants who attended the implementation of community service, they showed an increase in knowledge of the material presented.

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1. INTRODUCTION

Darmasaba Village is one of the villages in Abiansemal District, Badung Regency, Bali Province which has a population of around 9,993 people consisting of 4,989 men and 5,004 women ([Badan Pusat Statistik Kabupaten Badung, 2021](#)). This village is located at the southern tip of the Abiansemal District area with approximately 5 kilometers from the Badung Regency Government Center. Darmasaba Village is a village that has quite large potential in developing the roof tile industry because most of the residents of Darmasaba Village work as roof tile craftsmen who use it as a livelihood so that Darmasaba Village is known as an area that produces roof tiles made from clay in Bali Province.

Roof tile craftsmen in Darmasaba Village produce thousands of roof tiles to be marketed locally and nationally. Based on monographic data from Darmasaba Village in 2008, the number of roof tile

craftsmen was around 315 people, divided into seven banjars, including Banjar Bucu, Baler Pasar, Banjar Tengah, Banjar Telanga, Banjar Peninjoan, Banjar Darmasaba and Banjar Gulingan (Badan Pusat Statistik Kabupaten Badung, 2021). The roof tile industry in Darmasaba Village is currently still traditional, namely relying on orders and management of conventional crafts and there are no sustainable efforts to manage this roof tile craft. Tight competition in the industry that produces basic building roofing materials using modern materials such as spandex and multiroof. Reasons consumers choose roof tiles modern because this material is relatively light, strong, durable, and not susceptible to leaks. However, tile roofing products are still an option for some consumers. Consumers choose traditional roof tiles as the roofing material for their homes on the grounds that traditional tiles are considered more permanent and do not make annoying sounds when it rains. This convenience reason is the basis for consumers to maintain traditional roof tiles as the main material for roofing houses or buildings (Ernawatiningsih et al., 2022).

Roof tiles are a product that still has high value and is still widely used. The process of making roof tiles begins with selecting and mixing roof tile materials. The materials for making roof tiles consist of clay, fine sand as a mixture and water as a melting agent. The three ingredients that make up roof tiles are processed in certain proportions to produce good clay, neither too hard nor too soft. The next process is molding using a machine so that it becomes quality clay. The smoothed roof tile material is then printed using roof tile printing to produce various types of roof tile shapes and models (Aminuddin et al., 2019). Next, the roof tiles produced from the printing process are dried and then dried in the sun. The final process in making roof tiles is the burning process. The burning process requires a burning time of six days, of which four days are for smoking which aims to adapt the heat and remove remaining water vapor. The next two days are the process of finalizing the roof tiles. The advantage of clay roof tiles is that apart from being cheap, the clay material is resistant to all weather and is lighter than concrete roof tiles (Nariani et al., 2021).



Figure 1. Manual production and drying process of traditional roof tiles

Roof tile making in Darmasaba Village still applies a conventional system with manual material transfer activities. Roof tile craftsmen often carry out lifting activities manually by carrying out movements, namely lifting movements, moving movements, and lowering materials. Apart from that, the process of mixing raw materials is still carried out using a hoe to separate the soil from the stone, the activity of moving raw materials using a cart from the mixing process to the grinding process (Permana, 2016). Of all the movements carried out by roof tile craftsmen, there is a potential risk of musculoskeletal complaints if they use a work posture that is less ergonomic, so this can disrupt the work productivity of roof tile craftsmen. Therefore, efforts are needed to reduce musculoskeletal complaints. A less ergonomic working attitude can cause complaints such as muscle pain. Working continuously with a less ergonomic work attitude for a long-time result in fatigue (Biomi et al., 2023). If not addressed, it can

result in musculoskeletal complaints which can reduce work performance. Previous research conducted by [Prianthara et al. \(2017\)](#) revealed that the average roof tile craftsman in Darmasaba Village experienced complaints of lower back pain caused by work attitudes and continuous repetition of movements that were less ergonomic. The process of roof tile craftsmen for target partners can be seen in the Figure 1.

The roof tile craftsman industry has experienced ups and downs, especially in the post-Covid-19 pandemic situation. Market conditions are not supportive, quite a few roof tile craftsmen are starting to leave their businesses and switch to other businesses. Increasingly quiet market conditions require traditional roof tile entrepreneurs to find ways to overcome this condition, such as innovating alternative products using roof tile raw materials and roof tile waste. Thousands of roof tiles are produced, sometimes there are tiles that do not meet market quality, thus causing waste in roof tile production ([Ernawatiningsih et al., 2022](#)). Human resources and the level of innovation in waste utilization are still minimal, making roof tiles just waste. One effort that can be made to reduce roof tile waste while increasing the creative value of roof tile craftsmen is by managing and utilizing roof tile waste into handicrafts that have sales value as an alternative solution to continue to increase income ([Broto et al., 2020](#)).

Based on the explanation of the problems above, the author intends to carry out community service activities in the form of Community Empowerment (PMP) with the aim of to help solve partners' problems in order to increase productivity and income by providing an understanding of ergonomic working attitudes so as to reduce muscle complaints, assisting business management in terms of finance, production and marketing of products that can be done sustainably, and providing alternative product innovations from waste raw materials rooftop. Apart from that, this activity is a form of realizing the IKU (Key Performance Indicators) of Higher Education. The IKU that can be achieved from this community service activity is Lecturer Activities Off Campus (IKU Number 3) where lecturers can carry out Tri Dharma Higher Education activities, especially community service which is carried out according to the needs of partners. Another IKU that can be achieved is the Lecturer's Work Results Used by the Community (IKU Number 5) where the provision of training in the form of work attitude education, bookkeeping, and marketing training as well as product innovation produced can provide future benefits for roof tile craftsmen in improving their health and economy. For students, the IKU that can be achieved is that students get learning experience outside campus (IKU Number 2) and can apply it Independent Learning Campus (MBKM) because students are directly involved in community service activities, can interact directly with the community, and can apply knowledge from several courses related to community service activities which focus on the health and economic fields

2. METHODS

The design of community service activities is carried out roof tile craftsmen in Darmasaba village, especially at UD. Anindya Genteng. The partners involved were 6 members of the UD. Anindya Genteng. This activity will be carried out from September to October 2023. The stages of community service are carried out in several stages, namely preparation phase, implementation phase, and activity evaluation.

Preparation Phase

A preliminary survey was carried out to identify problems experienced by target partners, namely traditional roof tile craftsmen in Darmasaba village, especially at UD. Anindya Genteng. This preliminary survey is also used to assess needs, design activities, mentoring and technology implementation

training that will be provided to target partners. Target partners' participation in this activity is carried out optimally so that the implementation of this service activity is able to provide the solutions needed by the partners. Implementation of activities does not run optimally without good coordination with related parties. Coordination with related parties is carried out by involving target partners. Based on the results of discussions with partners, the community service team discovered several problems faced by partners, namely: (1) Health Field. The process of making roof tiles in Darmasaba Village still uses a conventional system with material transfer still done manually. The work attitudes often used by roof tile craftsmen are lifting, hoeing, moving material manually and are less ergonomic. This work attitude carried out continuously over a long period of time can result in musculoskeletal complaints which can disrupt the work productivity of roof tile craftsmen; (2) Business Management Field. Market conditions are increasingly quiet and there is a lot of competition, making many roof tile craftsmen switch to other, more promising professions. This condition is also exacerbated by the fact that roof tile craftsmen in Darmasaba Village do not yet have a good system or management in terms of production, finance and marketing strategies. Records regarding the production of goods produced and financial management have not been made in a good bookkeeping system. Apart from that, promotional media for marketing products has not been carried out optimally. Craftsmen usually only put-up name signs at production sites and rarely promote their products on social media. This has an impact on decreasing the income they generate; (3) Creative Economy Sector. Roof tile waste is produced from roof tile production that is not of good quality or because of roof tiles breaking during the production process. Roof tile waste will be piled up because these products are single-use products. If roof tile waste is not utilized properly, it will continue to accumulate and have no economic value. If left untreated, it can disrupt production activities because it requires a lot of space.

As a form of implementing the Tri Dharma of Higher Education, especially in community service, the community service implementation team is trying to carry out service to the roof tile industry in Darmasaba Village, especially at UD. Anindya Genteng Pres. The implementation team consists of 3 lecturers in the fields of physiotherapy, public health and economics and is assisted by 2 students. The aim of implementing this community service is to solve problems for partners, namely in the health sector, business management sector and the creative economy sector.

Implementation Phase

Socializing activities to target partners is an important stage to carry out, at this stage reminding all the activities that will be carried out starting from the process of socializing the objectives of the activity program in improving work attitudes, marketing training, and partner sales, making handicrafts using tile as basic materials. Before providing socialization to participants, the community service team first provides a pre-test questionnaire to measure the community service participants' abilities regarding work attitudes, business management and product innovation. The activity implementation team carries out programs related to partner problems as follows: (1) Implementation of knowledge transfer activities regarding work attitudes and postures such as lifting procedures, carrying materials for making roof tiles, good body position, good body posture when working as well as preventive measures to prevent musculoskeletal complaints; (2) Implementation of knowledge transfer activities regarding business management is by providing training to roof tile craftsmen to use bookkeeping recording applications with applications and promoting their products on social media and e-commerce; (3) Implementation of knowledge transfer regarding product innovation from roof tile waste materials by providing training in making handicrafts made from clay from production waste, assisted by an expert in making them.

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Evaluation Phase

Mentoring is provided by the community service team after providing training materials for 1 month. At the end of the community service session, a post test is carried out to measure the participants' final abilities regarding the program that has been given. The evaluation stage is carried out to see the success of the program among partners. The evaluation stage is carried out by assessing the success of the program implemented by the target partners based on increasing knowledge regarding work attitudes, business management and product innovation by providing a questionnaire containing 10 multiple choice questions in the end of programs. The questionnaire given to participants was divided into 3 questionnaires, namely: work attitude questionnaire, business management and product innovation, where each questionnaire consisted of 10 questions. Participants answer the questions given in the questionnaire by choosing the correct answer. The scoring for this test is determined based on the rights only method, namely the correct answer is given a score of one and the wrong answer is given a score of zero (no score). The score obtained by each participant is determined by counting the number of correct answers. The final score is obtained by counting the number of correct answers then dividing by the number of questions and to get a scale of 100 multiplying by 100.

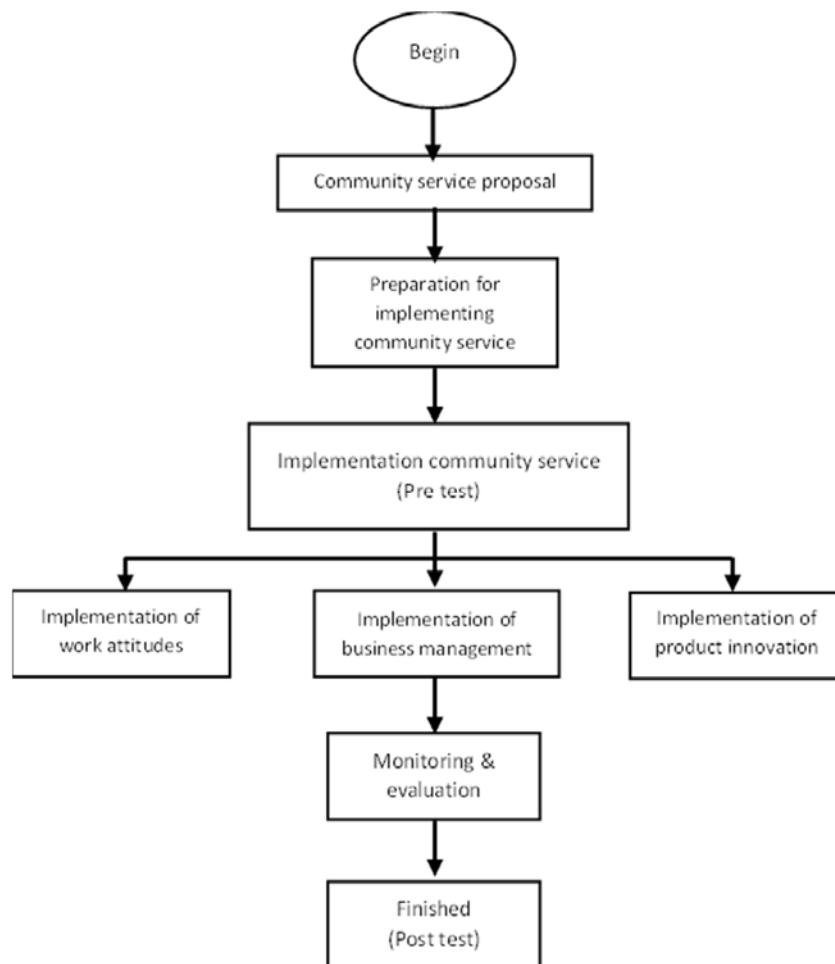


Figure 2. Flowchart of community service activity phases

3. RESULTS AND DISCUSSION

Community Service activities were carried out in 3 material presentation sessions, namely material presentation regarding work attitudes, business management and product innovation. This community service activity was carried out on 12 September 2023-12 October 2023 at roof tile craftsmen located in Darmasaba Village, Badung Regency, Bali. Before providing material to community service participants, the service team provides a pre-test questionnaire for the service participants to answer which aims to determine the participants' initial understanding. Then at the end of the program, service participants are given a post test questionnaire to determine the increase in participants' knowledge regarding the training material that has been provided. After providing training materials, the community service team provides assistance to partners for one month so that the program provided can be absorbed by partners and can be applied in everyday life.

This community service is carried out in 3 phases, namely the preparation phase, implementation phase and evaluation phase. In the preparation phase, the service team carries out assessments and discussions regarding problems experienced by partners. After getting the problem then proceed with the implementation of community service to solve partner problems. And the last is the evaluation stage to find out to what extent the community service program has been successfully implemented.

Preparation Phase

At this stage, coordination and assessment is carried out with partners to find out partner problems. Apart from that, at this stage discussions are also held regarding permits and equipment that will be used so that the implementation of community service can be carried out. The result of the coordination obtained was that there was an agreement regarding the start date for the community service implementation and the place where the community service program would be implemented. Implementation begins on September 12 2023 with 6 roof tile craftsmen participating.

Implementation of Work Attitude, Bussiness Management and Product Inovation

The implementation of community service for roof tile craftsmen in Darmasaba Village began with the presentation of material regarding work attitudes. It is very important to provide exposure to this material to roof tile craftsmen because based on the results of observations by the community service team, it was found that many roof tile craftsmen complained of pain in the lower back. This can be caused by the tile craftsman's less ergonomic working attitude when working.

The process of making roof tiles in Darmasaba village is still carried out manually. Starting from the process of lifting raw materials to the burning process. Lifting techniques that are performed in a less ergonomic manner can increase the risk of lower back pain complaints ([Mistry et al., 2014](#)).

In this case, roof tile craftsmen are taught how to prevent low back pain by applying lifting techniques that are in accordance with ergonomics. The lifting technique is carried out by bending the knees when lifting and keeping the spine in a perpendicular position. Based on the initial assessment carried out by the community service team, there were many complaints of low back pain that occurred among roof tile craftsmen. This is also confirmed by research conducted by [Prianthara et al. \(2017\)](#) which stated that roof tile craftsmen in Darmasaba Village experienced many complaints of low back pain. Complaints of low back pain can be caused by poor positioning when carrying out lifting and carrying activities in the roof tile making process. Evaluation is carried out using a questionnaire in the form of multiple choices which is carried out before and after the implementation of community service activities.

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Figure 3. Work attitude material

Figure 4. Implementation of lift and transport according to ergonomics

Figure 5. Business management socialization

When lifting or lowering, use your knees as support. The position used is squatting. Make sure your back remains straight (not bent or arched). Center your body on your feet, hold the object and pull it closer to your body first before lifting. Use the strength of your legs to lift your body, not your back.

Table 1. Results of pre-test and post-test assessment of work attitudes

Participant	Pre-Test	Post-Test
NMN	1	10
IKS	0	8
NNR	1	9
IWPB	1	9
NNA	0	8
IWA	1	10
Mean	0,6	9
Percentage (%)	6,6	90

Table 1 shows the results of increasing knowledge regarding work attitudes based on the results of the questionnaire. Based on the results of the questionnaire given to community service participants, the score calculation uses the rights only method. The questionnaire consists of 10 questions where each correct answer gets a score of 1 while incorrect answers get a score of 0. The total score in this questionnaire is 10. Table 1 shows that there has been an increase in participants' knowledge in understanding work attitude material as indicated by the percentage value, namely 6,6%, increasing to 90%. Based on the results of the pre-test and post-test assessments, it was found that roof tile craftsmen in Darmasaba village understood work attitudes that were in accordance with ergonomics. This can be seen in Table 1. The results of the pre-test and post-test assessments showed an increase before and after being given material regarding work attitudes. Ergonomics can make someone feel comfortable when doing their work so they can avoid work accidents and work-related illnesses (Susandi et al., 2014). This is very beneficial for the workplace because productivity will directly increase, which will be followed by an increase in the health, welfare, and quality of life of workers (Putri et al., 2023). Because if ergonomic factors are ignored, it will increase the risk of musculoskeletal complaints, namely disturbances in the function of muscles, nerves, tendons, joints, and spine as well as fatigue, thereby

affecting work productivity (Aprillia & Rifai, 2022). If a work attitude that is not ergonomic if left for a long time will cause habits that are difficult to change and a decline in health, it is necessary to be consistent in implementing an ergonomic work attitude, especially for roof tile workers (Biomi et al., 2023).

In terms of business management, roof tile craftsmen in Darmasaba Village do not yet have records of production results, sales results, and marketing techniques that they have not used *E-commerce*. This is the basis for the community service team providing understanding to roof tile craftsmen through socializing the use of bookkeeping applications and promoting production results through social media and *e-commerce* like Instagram, facebook and shopee. The material presented in this activity is that roof tile craftsmen are given socialization regarding recording production results and sales results as well as sales techniques through social media and e-commerce.



Figure 6. One example of implementation of business management: Feed on Instagram, Facebook, & Shopee

Following a course on using social media and marketplaces for online marketing, tile profiles were created and shared on Facebook, Instagram, and Shopee (Figure 6). The participants then in charge of managing this account, which will be utilized as promotional material for the company's online product sales (Irianti et al., 2021).

Table 2. Pre-test and post-test assessment results for business management

Participant	Pre-Test	Post-Test
NMN	1	7
IKS	1	10
NNR	1	8
IWPB	1	9
NNA	1	9
IWA	0	10
Mean	0,8	8,8
Percentage (%)	8,8	88

Table 2 shows the results of increasing knowledge regarding business management based on the results of the questionnaire. Based on the results of the questionnaire given to community service participants, the score calculation uses the rights only method. The questionnaire consists of 10 questions where each correct answer gets a score of 1 while incorrect answers get a score of 0. The total score in this questionnaire is 10. The Table 2 shows that there has been an increase in participants' knowledge in understanding business management material as indicated by the percentage value, namely 8,8%, increasing to 88%. Based on the results of an assessment using a business management questionnaire for

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roof tile craftsmen in Darmasaba Village, the results showed that there was an increase in the knowledge of roof tile craftsmen before and after being given material regarding business management. After being given socialization on business management, roof tile craftsmen can understand the importance of recording production results and sales results to find out the profits obtained by roof tile craftsmen. Insufficient bookkeeping skills or a lack of professionalism in recording transactions means that current bookkeeping is less informative for making business decisions and does not accurately reflect the company's situation. Therefore, there is an urgency in financial management for small businesses (Larasdiputra & Suwitari, 2020). One of the financial recording activities that occurs in the business or enterprises that we manage is bookkeeping. It is important for us to keep accurate records in our books to assess the growth of our business and determine the profits or losses we experience. Apart from that, bookkeeping is also important as a guide or compass for us when we run a business (Suranta & Sudaryono, 2015).

The final activity in this community service is providing material regarding product innovation and practicing how to make product innovation using clay. The product made by community service participants is coblong. Coblong is a type of clay cup used in Balinese rituals (pottery for ceremonial purposes). The basis for carrying out this activity is to provide additional knowledge to roof tile craftsmen in Darmasaba village and to utilize waste tile production to make goods of economic value.



Figure 7. Socialization of product innovation

Figure 8. One of product innovation is *Coblong*

One of the products resulting from product innovation activities is the manufacture of coblong. Coblong is a type of clay cup which in Balinese rituals is said to have many meanings and is used as a place for holy water in religious activities in Bali. Coblong making was chosen for this activity because the public is in high demand for this product because of its usefulness in the daily lives of Hindus in Bali (Darma et al., 2022).

Table 3. Product innovation pre-test and post-test results

Participant	Pre-Test	Post-Test
NMN	1	8
IKS	1	10
NNR	1	8
IWPB	3	8
NNA	0	10
IWA	0	10
Mean	1	9
Percentage (%)	10	90

Table 3 shows the results of increasing knowledge regarding Product Innovation based on the results of the questionnaire. Based on the results of the questionnaire given to community service participants, the score calculation uses the rights only method. The questionnaire consists of 10 questions where each correct answer gets a score of 1 while incorrect answers get a score of 0. The total score in this questionnaire is 10. The table above shows that there has been an increase in participants' knowledge in understanding Product Innovation material as indicated by the percentage value, namely 10%, increasing to 90%. Based on the results of an assessment using a product innovation questionnaire for roof tile craftsmen in Darmasaba Village, the results showed that there was an increase in roof tile craftsmen's knowledge regarding product innovation from clay. Product innovation is very important for company growth. Apart from that, various kinds of Indonesian crafts are produced using clay, thus requiring innovative products that can compete on a world scale. Therefore, those who continue the traditions of their ancestral skills must have creativity and be able to turn it into a reliable source of income (Purwaningrum et al., 2020).



Figure 6. Making innovative products from clay

In this activity, roof tile craftsmen were taught how to make innovative products from clay. Roof tile craftsmen practice directly using equipment so that they can provide tile craftsmen with experience in making innovative products from clay.

Evaluation Phase

Evaluation of community service activities is carried out on community service participants, namely roof tile craftsmen. After receiving an explanation regarding work attitudes, business management and product innovation, the service team evaluated the activities that had been carried out. This aims to determine the effectiveness of this activity and it is hoped that it can help solve the problems faced by target partners and can contribute to the partner's health and economy.

4. CONCLUSION AND RECOMMENDATIONS

It can be concluded that the process of implementing community service activities for roof tile craftsmen in Darmasaba village is going well. Roof tile craftsmen already know about ergonomically appropriate working attitudes. Roof tile craftsmen implement methods for lifting and transporting roof tile raw materials as well as when making roof tiles. Tile craftsmen understand that by following methods that comply with ergonomics, they can reduce the risk of musculoskeletal complaints. For business management, roof tile craftsmen, previously roof tile craftsmen, did not have good bookkeeping management and poor marketing strategies. After being given training on bookkeeping management

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and marketing strategies through social media and e-commerce, roof tile craftsmen understand the importance of business management by implementing a bookkeeping management system and marketing strategies through social media and e-commerce. Apart from that, there are many materials from leftover tile production that are not utilized properly, roof tile craftsmen also understand how to utilize the remaining tile production by creating innovative clay-based products. Based on the results of the assessment using a questionnaire, it showed very good results after being given training. Community service participants were also enthusiastic about participating in activities from start to finish. The limitation that exists in this community service is the limited time for implementation because roof tile craftsmen still work during their working hours so they prioritize their work first. Another limitation is that it takes time for roof tile craftsmen to get used to working in an ergonomic position, such as the correct way to lift and transport. In addition, the process of creating product innovation requires a long time to gain new skills to create more innovative products. Suggestions for future activities include the need to provide further assistance regarding ergonomic techniques, business management and product innovation. In terms of ergonomics, it is necessary to reconsider providing equipment that can help roof tile craftsmen work in accordance with ergonomic positions to reduce the risk of musculoskeletal complaints. For business management, a continuous program is needed to always update posts on social media or e-commerce so that buyers can more easily find out about the products being sold. Finally, product innovation is recommended for packaging products that have been made so that they look more attractive when marketed so that the income of roof tile craftsmen can increase.

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