

The Instructional Development toward Enhancement District People's Income

A Study about the Redesign of Minangkabau Ornament toward Metal Handicrafts

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Abstract—Home industries which produce souvenirs of West Sumatera are one of main business opportunity to be developed in this free trading era. The development of tourism object along with areas of products and services cannot be separated from the goals of developing the bass cast products at Sungai Puar. The development of the products can be obtained by having innovations at a campus. The campus is the centre of knowledge, technology, and information development which is important in synergizing the instructional design based on the needs of the worlds of business and industries. The framework applied is a way of optimizing the available sources in order to improve the economic sector and people's quality of life. By conducting the research and applying the development method, it was found that the brass cast products of Sungai Puar which used to be recognized as having less recasting, metal engraving, and etching processes. The final Product appear to be innovative and meet with the industrial prototypes.

Keywords—Minangkabau ornament redesign, recasting, engraving, etching.

I. INTRODUCTION

Sungai Puar is an area in Agam Regency of West Sumatra which has huge tourism and industry potential. Opportunities to develop the tourism sector are not only in terms of natural wealth with a number of beautiful sceneries that become the objects of tourism but also from the human resources capable of producing craft by applying casting techniques with basic materials of brass.

Most Sungai Puar people are very skillful in processing brass handicrafts from used metal objects. Brass is a combination of two metals, copper and zinc, with a mass content of 60 to 96%. The material is melted in a heating furnace and then molded into a mold made of wax. So far, brass products that have attracted the attention of art lovers are Talempong, ganto, martabak pan, Kembang loyang cookie mold, and baked fish-shaped cookie mold. Because most of the brass products are categorized handicrafts, the value of the function gets more attention than its aesthetic value. In other words, brass products become part of the tools needed to fulfill daily needs. If there are ornamental motifs on brass products, then they are just complements, and not infrequently art observers find products with a simple pattern that is plain without a motif or relief. This makes the products look monotonous.

Ideally, works produced by craftsmen can be more varied and able to lift the image of West Sumatra as a tourist visiting place through souvenirs. The souvenir products are able to compete with similar products from various other regions in the archipelago. Preliminary observations in the field showed that the craftsmen actually had a difficulty in meeting the raw material of brass. Used metal objects obtained from junk sellers could not all be melted into a brass mixture. Only those that were really made from copper and zinc materials could be used in the melting process.

Since metals and the processing were discovered about 4000 BC in Egypt and Mesopotamia, the work of processing metals has been known as metallurgy or the processing of natural materials into metals, which are further processed into certain objects according to the desired characters. Natural organic materials found in the earth's crust are called minerals such as bauxite and aluminum silicate, while minerals that can be used as sources for commercially produced materials are called ores. The most common metal ores are oxides, sulfides, carbonates, silicates, halides, and sulfates. Silicates are actually the most abundant materials but relatively worthless because of their difficult processing. This was a challenge for the team to be able to overcome the problems faced by artisans. In addition to offering solutions to the difficulty of fulfillment of raw materials, it was as well as to add value to the products by adding Minangkabau ornamental motifs on the existing brass products.

The study aimed at creating the right model in developing as well as applying Minangkabau ornamental motifs on existing brass casting products so that created new works that were more innovative and competitive but did not eliminate the cultural elements of the ancestral heritage having been maintained by the craftsmen. Contributions were given by the University related to the production of campus innovation products and industrial prototypes.

Literature Review

Model

Normally the term model is associated with learning activities where the model becomes the design that develops the process of details and the creation of environmental situations which enable students to interact so that there is a change or development in students (Dadang : 2005). Furthermore Soedjadi (1999 :101) stated that learning strategy was a tactic of conducting learning activities aimed at changing the learning state into expected learning. Changing the situation can be pursued by various learning approaches. Then, Soedjadi stated that in one approach, it could be done more than one method, and one method could use more than one technique. Simply, it can be arranged as a series:

Technique \longrightarrow method \longrightarrow approach \longrightarrow strategy \longrightarrow model

But in this study the term model refers to the product prototype as a result of the development of techniques, and processing tools and materials in metal works of casting technique.

Validity of design is determined by description of development pattern, description of aesthetical elements, image of the sustainability of the implementation, made reference by artisans, up to date, in accordance with the craftsmen vision, and compatibility of the technique.

Beyond the collaboration of campus and industry field, the new achievement should accomplish in accordance with the craftsmen's vision, effective and efficient suggestion, flexible, give direction to project, increasing revenue, help manage workshop and having connectivity with business field and industry fields.

Ornamental Motifs

Realist motifs are motifs which can be taken from real natural states, such as plants, animals, rock forms, cloud shapes, the sun and others. Abstract motifs are motifs which are hard to recognize, beside they use free form. Decorative motifs are motifs with the aim at beautifying objects drawn in motifs. They modify the shape of nature as beautifully as possible without changing its original form. Geometric motifs are motifs that have regular shapes and measurable forms. The examples are circle, cone, square, triangle, and others (Soesatyo, 1983). The existence of decorative motifs can provide a dual function on the material they occupy. The essential

Metal Materials

There are 70 metal elements of the 92 types of natural elements that exist on earth, and there are also artificial elements of metals produced by humans. The metals are obtained from the activity of compounds reduction. Their difficulties range from the highest to the lowest depending on the reactivity of each of the metal characters. Handicrafts use metal materials such as iron, bronze, gold, silver, and others. The techniques used usually are casting system, carving, forging or printing in accordance with the desired shape. The examples of metal crafts are glasses, lampshades, jewelry, multipurpose containers and even trophies as championship symbols. Metals have a hard nature, so the processing requires techniques that are not easy, such as processed through the technique of burning / heating and forgings

- a. Ore concentration. Ore contains worthless rocks called gangue. The purpose of ore concentration is to get rid of as many gangue as possible. The ore is crushed and ground until it is detached from the gangue. Further separation can be performed through physical separations such as flotation or magnetic separation. In the flotation process, the ore that has been crushed is given a certain oil. The minerals will attach to the foam so that they are separated from the gangue, or the gangue will attach to the foam.
- b. Smelting. This process is also known as melting which is done by reducing the ore into metal elements that can be used for various substances such as carbide, hydrogen, and active metals, or by electrolysis. The choice of this reducing agent depends on the reactivity of each substance.

The more active the metal the more difficult to reduce that a stronger reducing agent is needed. Less active metals such as copper and gold can be reduced only by heating. Metals with moderate reactivity, such as iron, nickel and tin, can be reduced by electrolysis. Often the smelting process is coupled with a flux, which is a material that binds impurities and forms an easily melted substance, called slag. The next step is purification. This process is also known as refining in which there is an adjustment of the dirt composition in the crude metal.

The nature of metal that becomes the basis of consideration for its processing into various forms namely: Strong. The hardness and the strength of metal can be increased by mixing metals with other metals or with nonmetals called aliases (alloys) for example aliases aluminum with magnesium which is used as building construction material, bridges and motor vehicles, which can be forged and stretched. Metal will not crush when hit. In other words, metal can be forged to become various tools, handicrafts and jewelry. Metal can also be extended into a wire which is a good electrical conductor. These natures underlie the use of metal as electrical wires as well as cookware such as kettles, pans, and cauldrons.

Casting Technique

Casting technique is divided into 2, namely: Recurrent casting technique (bivalve). The technique uses two pieces of mold made of stone and can be used repeatedly as needed. Lost-wax casting technique (A cire Perdue), the technique is used in the manufacture of metals which have a more complicated forms and decorations. The technique is started by making a mold of clay. Next, the mold is coated with wax, and covered by clay. Then the object is burned to remove the wax to produce a cavity. The metal is poured into the cavity. Once cool, the clay mold is broken.

Hurst (1996:2) stated that *The advantage of casting is that it enables the production of many identical objects cheaply. The secondary advantage is that it enables the forming of precision objects that cannot be produced by any other method.* Producing specific products through casting process is just like printing a lot of products that have exactly the same shape and size at a cheaper cost.

Brass

Brass is a metal consisting of a mixture of copper and zinc. Copper is a major component of brass, and usually grouped as copper alloy. The color of brass varies from brown to dark reddish to silvery yellow depending on the amount of the zinc content. Zinc is the most influential material to the yellow color. Brass is stronger and harder than copper. Brass is also a material that is easily molded into many forms, as well as a good heat conductor. Basically brass is resistant to corrosion from water and salt.

Brass products are mostly found in pipes, tubes, screws, radiators, musical instruments, marine ship applications, and firearms. Brass can consist of 3 types:

- a. Brass wire, copper content between 62-95%
- b. Seamless brass tube, copper content between 60-90%
- c. Brass sheet, copper content between 60-90% (Dep.PU, 1985)

Copper is known to be the first metal produced by primitive societies to meet their needs in 3500 BC. Allegedly it was produced from the decomposition of rocks at the campfire, while the iron sample is thought to have come from a meteorite that fell on earth.

II. METHOD

The method used in this study was research and development or R & D. Gall, Gall and Borg (2003:569) stated that research and development in education was: *an industry-based development model in which the finding of researcher used to design new product and procedures, which then systematically field-tested, evaluated, and refined until they meets specified criteria of effectiveness, quality, or similar standards.* This study was conducted to develop an innovative product that would be used as an industry prototype. The research and development model that was thought appropriate to achieve the target was the 4D model (Define, Design, Development and Deliberate). Then it was elaborated into more operational implementation steps in 5 stages, in which the design of model development to apply Minangkabau decoration in metal handicrafts of casting technique made of brass in Sungai Puar West Sumatra was conducted in:

- a. *Define*, the first stage was analysis of the need and the product design, the second stage was development, and the third stage was model testing. On the first stage, new motifs were designed by changing the traditional motifs that had been known and applied by craftsmen. At the beginning they were often found on wood carving products, but in its development, the decorative motifs can also be applied to products other than wood, such as on songket weaves and metal materials. The needs analysis which was conducted referred to the review of existing products, and the analysis of how expectations addressed to the product to meet the goal of increasing aesthetic value while increasing the income of craftsmen community. By reviewing current conditions and what to expect, the problem whose solution was found through campus innovation products was found out. The data collecting was done by the team and instruments to capture the data were designed. The result of discussion and the discussion provide a model recommendation that can increase the selling value of products produced by brass craftsmen.
- b. *Design*, the second stage was designing the development of ornamental motifs which became the Talempong ornament. Thus the development was referred to some of the existing motifs such as; *daun siriah, kaluak paku kacang balimbiang, kapeh kambang, lumuik anyuik, bada mudiak, kuciang lalok, limpapeh, ramo-ramo si kumbang janti, ampiang taserak, jarek takaka, saluak laka, and si ganjua lalai* (Depdikbud, 1983). The design of new ornamental motifs pattern were manifested in a new form called *Maambua batang aia*, and *Batagak panghulu*, then added with some other interesting motifs chosen to match the selected engraving and etching techniques.
- c. *Development*, the third step was developing model by proposing validity and practicality test through expert judgment and Focus Group Discussion. while the effectiveness of the design was tested in the form of effectiveness questionnaires to lecturers who taught subjects of Visual Arts in the Faculty of Languages and Arts of State University of Padang.

Using the formula from Sudjana et.al (2001), the descriptive data were analyzed by:

$$\text{Ideal score} = \frac{\text{Average score}}{\text{Maximal score}} \times 100\%$$

Followed by calculating the level of value achievement based on the category classification

Table 1. category of validity, practicality, and effectiveness of the development design of Minangkabau ornamental motifs on metal handicrafts

Level of Value Achievement (%)	Validity	Practicality	Effectiveness
90-100	Very valid	Very Practice	Very Effective
80-89	Valid	Practice	Effective
65-79	Quite Valid	Quite Practice	Quite Effective
55-64	Less Valid	Less Practice	Less Effective
0-54	Not valid	Not Practice	Not Effective

Source: Sudjana, et al (2001)

- d. Deliberate, on the fourth stage, a limited trial was conducted on the designed model, and on the fifth, a widespread trial was conducted on the implementation of learning development related to findings in the field.

III. FINDING AND DISCUSSION

As people have known, Sungai Puar is a center of brass handicrafts having been producing since a long time ago. The crafts they produce are generally made of metal and produced through casting resulting in brass handicrafts. Of the many brass handicrafts, ranging from ganto, martabak pans, kamba loyang prints, and pancakes pan, it can be stated that the prima donna was the musical instrument of Talempong.

Talempong is a musical instrument that is played by hitting it by hand. The music produced from this instrument is used as an accompanist to traditional ceremonies and as a musical accompaniment of other dances (Syailendra, 2000). Basically, Talempongs have almost the same size and shape, but the voice has been arranged in such a way that produces diatonic notation (solmization). The form of Talempong can be seen in figure 1:

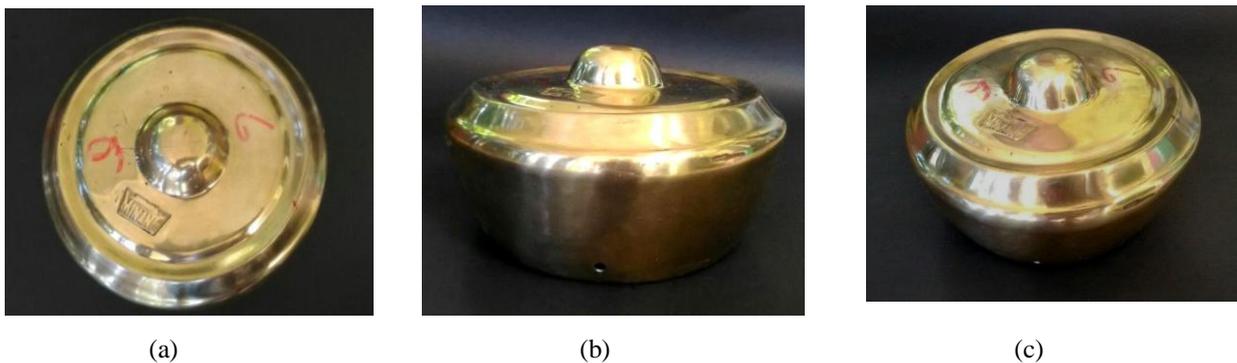


Fig. 1. The form of Talempong

Information:

- (a) Top view
- (b) Side view
- (c) perspective view

A follow-up review indicated that there had been an attempt to make Talempong look more beautiful and elegant by adding some motifs on the top and sides of the body of Talempong such as:

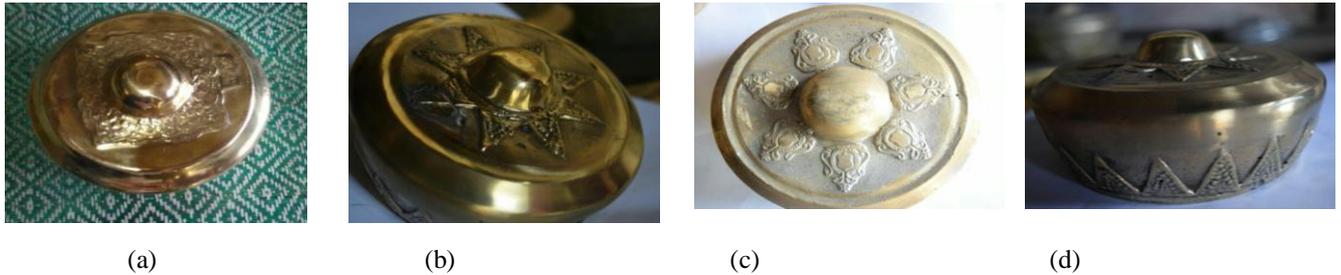


Fig. 2. Motif of Talempong

Information:

- (a) Top part adding by square motifs
- (b) Top part adding by triangular motifs
- (c) Top part adding by oval motifs
- (d) Side part adding by triangular motifs

However, almost all craftsmen agreed that the addition of ornaments on the top or side influenced the sound produced by the Talempong. This influence can be useful, but on the other hand can also be detrimental in terms of production. The sound that is not in accordance makes the Talempong rejected or not received. Moreover, craftsmen had difficulties to do the finishing on the Talempong that was given a lot of additional carving motifs because the tool used was a grinding wheel that had limitations to smooth prominent and small parts.

The team therefore tried to instill a pattern of development of new work procedures in a more effective and efficient way. The developed plan was implemented based on 2 main groups combining two jobs simultaneously. The first one was at campus, as a forum for the development of science and technology, and as a place to create new ideas for the benefit of society's production in the form of prototypes, and the second one was at the studio which in its community terms was known as "APA".

Techniques used to add value to existing products were done by: 1) Chasing-Repousse; 2) Engraving; 3) Etching. Chasing-Repousse is a metal engraving technique which gives the impression of a relief or a high-low pattern according to a particular motif or pattern. Engraving is a technique of sculpture by giving the impression of a scratchy streak on the metal, while Etching is a technique that gives the impression of high low with the help of metal erosion using chemical solution. The procedures conducted to apply ideas to add value to existing brass products can be further described as follows:

Chasing-Repousse

The first step to give the impression of a relief or a high low like a carved motif on wood was by rebuilding the skeleton of Talempong (remodeled). This process was done through the process of wood lathe. The size and the shape were sought to be the same or close to the original size and shape. Next, several alternative sketches or designs were selected to be applied on the new model of Talempong.

- a. Moving the sketch on the model
This method was applied by using carbon paper and followed by carving the developed part of the motif.
- b. Following up the sketch
 - 1. The process of carving or sculpting a wooden model with a metal chisel in accordance with the sketch
 - 2. Melting the glue wax with the help of electric glue gun for motive to arise and produce the impression of a relief
 - 3. Sticking the flower candle (butserwass) and forming the corresponding sketch motif
 *(Choose one way)
- c. Printing the new model
 - 1. Coating the existing wood model with fiber to obtain the negative shape and repeating the fiber coating process for the second time to obtain the positive form that would be reproduced.
 - 2. Coating the entire surface of the wooden model with soap, then dipping it repeatedly into hot liquid wax according to the desired thickness and soaking it in water to separate or remove it from the starting model.

Engraving

The same initial process as giving ornament on Chasing-Repousse process was also applied to engraving process. The selected sketch was transferred to the Talempong part which would be carved or scratched after the entire surface was ensured

clean and shines, free of dust and oil. To make it easier to move the sketch, carbon paper could be used. Next, the process of grafting was done by using the machine.

Etching

Etching was a process that could be conducted in developing the motif through the process of erosion with these chemical solutions, among others:

- a. Covering or coating all the inside part of Talempong.

This was done by painting all the inside and leaving only the part to be varied with new decoration so that it would not be eroded by HCL during the etching process.

- b. Making the motif stamp

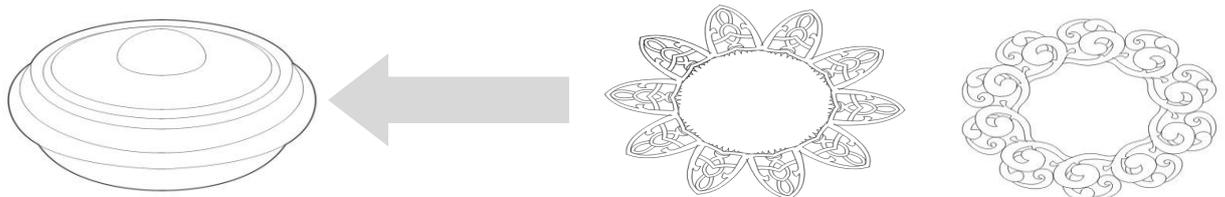
This was done so that the resulting sketch could attach to the product more effectively. The seal or stamp was engraved on lino rubber so that when printed the high part affected by the ink would leave the sketch on the surface of the Talempong.

- c. Setting up the placement on the product

For the top of the Talempong, the stamp adjusted to the sketch was composed circularly on the top of the Talempong, while for the side, it was positioned flat or straight around the body of the Talempong.

- d. Conducting dyeing process in chemical solution.

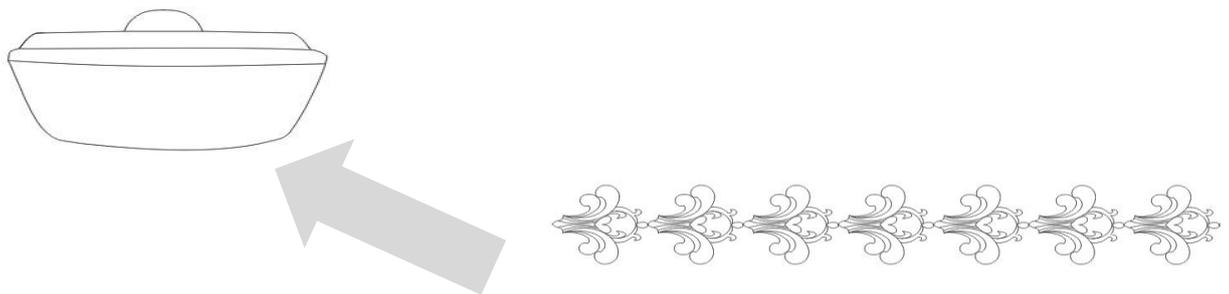
Talempong that had been decorated with new motifs through stamp technique was dipped into a container containing a chemical solution that served to erode the uncovered part of the paint.



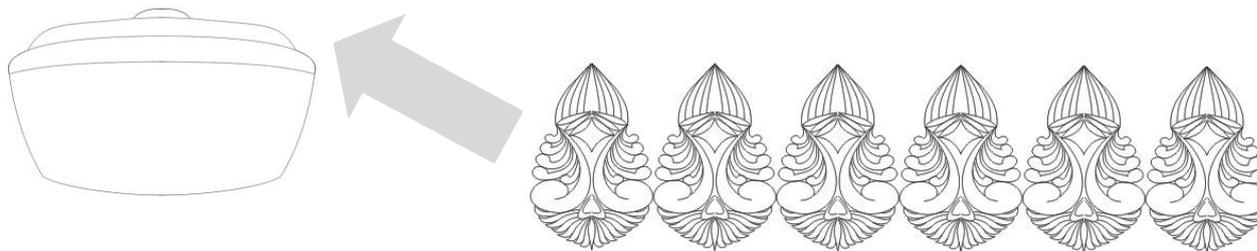
new ornament to be applied to the top of the product by way of engraving.



new ornament to be applied to the top of the product by way of etching.



new ornament to be applied to the top of the product by way of engraving.



new ornament to be applied to the top of the product by way of etching

So far, the evaluation of the design had been done as the second stage in the study process where the following findings were obtained:

Table 2. Recapitulation of The Validation of the Development Design of Minangkabau Ornamental Motif on Metal Handicrafts

No	Validity aspects	Percentage	Category
1	Description of development pattern	85	Valid
2	Descriptions of aesthetical elements	85	Valid
3	Image of the sustainability of the implementation	85	Valid
4	Made reference by artisans	85	Valid
5	Up to date	90	Very valid
6	In accordance with the craftsmen vision	85	Valid
7	Compatibility of the technique	90	Very valid
	Average	86,43	valid

Then the design practicality was tested by giving questionnaires to the craftsmen as the main executor of the manufacture of metal products of brass material produced through casting technique.

Table 3. Recapitulation of the Practicality of the Development Design of Minangkabau Ornamental Motif on Metal Handicrafts

No	Practicality aspects	Percentage	Category
1	In accordance with the craftsmen’s vision	80	Practice
2	Effective and efficient suggestion	84	Practice
3	Flexible	83,33	Practice
4	give direction to projects	84	Practice
5	means of increasing revenue	76,67	Quite Practice
6	Help manage workshop	76,67	Quite Practice
7	Du-di* connectivity	86,67	Practice
	Average	81,67	Practice

*Du-di means business and industry field

The practicality questionnaire given by team has the number of aspects/indicators and statement that vary depending on the type of practicality given. Researchers uses grading scale which has scores range from 1 to 5 depending on the degree of agreement of craft worker on casting brass production. According to most of them, etching and engraving are not popular among them and they avoid of using those technique to minimize productions cost.

Table 4. Recapitulation of the Effectiveness of the Development Design of Minangkabau Ornamental Motif on Metal Handicrafts

No	Effectiveness aspects	Percentage	Category
1	Applicable	93,75	Very Effective
2	the urgency of adding value	88,75	Effective
3	Implementation	93,75	Very Effective
4	Effective and efficient process	91,25	Very Effective
5	Scholarly benefits	95	Very Effective
	Average	92,5	Very Effective

As the innovative comes from campus, and the final works done in industry field, lecturer as effectiveness respondent agree upon the team effort based on etching and engraving. It takes a little more effort to beautify the existing product in order to

increase market selling. Since the craftsmen feel enough survival with what they has been producing, by adding etching and engraving technique, their product will valuable meaning.

IV. CONCLUSION AND RECOMMENDATION

The development of Minangkabau ornamental motif on metal handicraft made of brass using casting technique is an essential effort to preserve the work of the nation's children. However, the development is adjusted to technological advances and market needs. If previously the products were more dominantly created to meet the needs for traditional ceremonies or people's event only, the creation of a new design can give a variant to perform other functions not only as objects used but also as the objects of high value art.

he addition of quality values to existing brass products can be pursued by reengineering the form of Talempong intact with a touch of Chasing-Repousse technique, engraving techniques, and etching techniques. All of the processes can be obtained from the campus innovation project through research, and by working together with the business and the industrial world in generating models that become industry prototype. Campus and the business world can collaborate to add value to the beauty of brass products produced by craftsmen as well as to be able to increase the sale value of the products.

It is suggested that all parties be more intent in guaranteeing cooperation and complement each other in establishing new patterns that are expected to be able to answer the challenges of business and industry needs in global competition. The characteristic and the uniqueness of Minangkabau ornaments from West Sumatera become the spearhead in managing any other campus innovation products that will result from collaboration of campus and craftsmen in each workshop.

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