



TRANSFORMING OF THE SUMBA PATTERN INTO LIGHT, SHADOW, AND SHADE FOR
CONTEMPORARY LAMP DESIGN



By
Mr. Erwin Ardianto HALIM

A Thesis Submitted in Partial Fulfillment of the Requirements
for Doctor of Philosophy DESIGN ARTS (INTERNATIONAL PROGRAM)

Silpakorn University

Academic Year 2023

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Mr. Erwin Ardianto HALIM : TRANSFORMING OF THE SUMBA PATTERN INTO LIGHT, SHADOW, AND SHADE FOR CONTEMPORARY LAMP DESIGN Thesis advisor : Professor Dr. Eakachat Joneurairatana

East Sumba is known for its rich historical heritage, diverse traditions, and unique local arts, making it a potential hotspot for tourism. The tourism industry in East Sumba is considered a vital contributor to the country's foreign exchange earnings. Additionally, it is expected to boost the local economy and create employment opportunities. East Sumba's woven fabric patterns are unique and represent the area's cultural symbol. They have a special meaning and are considered national intangible cultural heritage of Indonesia.

The objective of this study is to develop East Sumba's woven fabric pattern into contemporary product design. The research has three primary goals: (1) to investigate the niches of East Sumba's woven fabric patterns, (2) to experiment with light, shadow, and shade through the patterns for contemporary lamp design, and (3) to create a contemporary lamp design based on East Sumba's woven fabric patterns.

The research approach is practice-based and qualitative. It begins with a literature review of East Sumba's woven fabric patterns and then analyzes their structure using ethno-mathematics. The second step involves using folding techniques to convert two-dimensional shapes into three-dimensional ones. The resulting design is evaluated using questionnaires from academics, designers, and cultural communities.

The research concludes that the folding technique provides more value to the research process. The traditional transformation method, known as IMO(E), is applied to process the design. The research outcome is a contemporary design product that is not just an ordinary product but a cultural product (CDP) full of cultural values.

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CHAPTER I

INTRODUCTION

1.1 Background of the Study

1.1.1 Sumba Island



Figure 1. East Sumba District Maps

Source: Google.com, 2021

Tourism in East Sumba has good prospects and can still be developed even better. There are a variety of tourism objects in this area, both nature tourism, agro-tourism, and cultural tourism. Nature tourism in this area includes the beauty of the sea and vast mountains, rivers, dense tropical forest tourism, with a variety of wild flora and fauna species, such as those found in the Lalwani Wanggamet National Park area. Cultural tourism in East Sumba encompasses the historical heritage and diversity of traditions, specific and interesting local/indigenous arts. With such tourism potential, the tourism sector in East Sumba is considered a prima donna for generating foreign exchange for the country. In addition, this sector is expected to improve the economy of the population and absorb as many workers as possible. The most important prerequisites for this are security and political peace. These two things are highly expected by foreign tourists visiting Indonesia, especially East

Sumba. The number of tourists visiting East Sumba in 2004 was 4,227 people, decreased slightly in 2005 3,529 people, and increased in 2006 with 5,228 people.

Talking about Sumba Island cannot be separated from the Province of East Nusa Tenggara (NTT). Written documentation of NTT was first discovered in the 17th century, when expeditionary voyages were carried out by foreign ships (Miller & Agustina, 2012). The record was made in the form of a travel journal by ship captains such as James Cook (1770) and William Bligh (1789). The list was then further expanded by botanists and naturalists Russel Alfred Wallace (1854) and Henry Forbes (1882) (Miller, 2011). Thereafter, there have been many research reports including on East Sumba weaving such as researches on the system and importance of Sumba cloth by Monni Adams (1969) and James Fox (1970), on the impact of the democratic system on the government of West Sumba from 1986-2006 by Jacqueline Vel (2008), to the impact of tourism on the Hinggi ikat weaving of Biranul Anas in 2007 (Ningsih & Widjaja, 2020).

The attraction of the Sumba Island initially lay in sandalwood and horse cattle as potential trade goods for foreign traders. The trading activities then created a good relationship characterized by the presentation of woven fabric with patola pattern to the King of Sumba (East Sumba). Patola cloth itself has become very popular in various regions of the archipelago, including NTT, as evidenced by the use of the word patola which basically means flower as a pattern/motif. In addition, the word patola is also part of the naming system that symbolizes a high position in Sumba, such as the patterns Patola Ratu, Patola Kamba and Patola Bunga which can only be worn by the nobility.

1.2 Statement of Problem

Based on the BPS data on the Human Development Index in Indonesia, NTT province is one of the provinces that have a very low IPM index, namely 65.23 or 1-5 points above Papua (60.84) and West Papua (64.70). This score is far below the other provinces, whose average is 70-80. This shows that the quality of human resources in NTT is still low even though NTT is one of the most popular destinations for domestic and foreign tourists. NTT, which consists of 3 major islands, namely Sumba,

Flores and Timor, and many other small islands, have become tourist destinations because of the exoticism of nature and its cultural products. One of the cultural products that have been influenced by tourism is the traditional woven fabrics of East Sumba. This is shown by the results of Biranul Anas' 2007 dissertation (Anas, 2007), which examined in detail the changes in a particular type of weaving, namely Hinggi weaves from East Sumba. From the results of this research, the change in the visual style of Hinggi weaves can be traced back historically from the post-independence period to the year 2000. In the last ten years, not only the visual style has changed, but also the traditional weaving in the eastern Sumba region has received much attention. Due to the uniqueness of the patterns and the processes involving both nature and manual production, Sumba weaves have attracted several well-known fashion designers who have chosen to use Sumba weaves in their work. Apart from clothing, Sumba fabrics are also used in other lifestyle areas such as home, hotel, and office interiors. Nevertheless, the quality level of Sumba's labor has not improved significantly and the PM in Indonesia is still very low. That is why the potential of East Sumba traditional woven fabrics is needed to be explored so that they can be used for creative lifestyle products, especially interior products. This research is considered important because there are often irregularities in the use of traditional Sumba weaves used in both fashion and interior design. For example, cutting fabrics to make creative products often results in some parts of the woven fabrics, being wasted. It even happens that the part that is wasted is an important part of the meaning of the pattern. This is very unfortunate because the production of woven fabrics itself is a very complicated process that takes a lot of time. In addition, the character of traditional woven fabrics has a certain visual style that has a special meaning, such as the arrangement of animal line patterns in the elongated module, which cannot be simply cut off because it has a symbolic meaning and the placement of certain sacred patterns in the application of creative products cannot be done carelessly.

To solve this problem, the research process is divided into 2 main phases, namely a visual style study and an analysis of the potential use of woven fabrics as a creative product. In the first phase, the visual style study includes the style, color,

visual direction, material and manufacturing process which is an important factor in shaping the visual form of woven fabrics. The purpose of the visual style study is to capture the meaning of the existing patterns. This serves as the basis for the second process, which is to analyze the use of woven fabrics as a material for creative lifestyle products. This research is expected to provide design recommendations that follow the philosophy of the importance of traditional East Sumba fabrics and provide new insights for East Sumba weavers to produce fabrics that meets market needs and evolve accordingly.

Table 1. Comparison Of Woven from East and West Sumba

No	Picture	Hometown
1		East Sumba
2		West Sumba

Considering the potential of East Sumba woven fabrics and the comparison table of both East Sumba and West Sumba woven fabrics, it can be concluded that East Sumba woven fabrics have patterns and colors and that each pattern and woven fabric from East Sumba is full of meaning and philosophy than other Indonesian woven fabrics, which is why this woven fabric is the subject of this research.

1.3 Research Hypothesis

This research attempts to bring about a change for the better in the form of contemporary lifestyle products for interior design through the development of fabrics from East Sumba, and to create a new paradigm where fabrics from East Sumba are not only used in the form of fabrics but can also be used for the interior design products without eliminating the philosophy. With the problem statement above, it is hoped that this research can help East Sumba to develop income for the existing community or have a greater impact on Indonesia and even the world.

1.4 Objectives of the Research

1. To investigate the non-existing patterns of woven fabrics from East Sumba.
2. To experiment with light, shadows, and shades of patterns of woven fabric from East Sumba for contemporary lamp design.
3. To create the contemporary lamp design based on patterns of East Sumba weaves.

1.5 Scope and Area of Research

The objective of this research is to explore the history and concept of Sumba Pattern, with the aim of creating a contemporary lamp design that incorporates modern patterns, folding techniques, materials and the flower machine technique. The study will primarily focus on Pattern Sumba as seen in woven fabrics, which will be extracted and translated for application in lamp design. The site of the research by conducting a field survey and collecting data on the conditions of traditional weaving artisans in the villages of East Sumba region, namely Tambolaka Southwest Sumba (House of Sumba Culture, meet Pastor Robert Ramone), Watupuda Village, East Sumba, Rende Village, East Sumba, Kaliuda Village, East Sumba, Mauliru Village, East Sumba, Prailiu Traditional House, Waingapu Town, East Sumba.

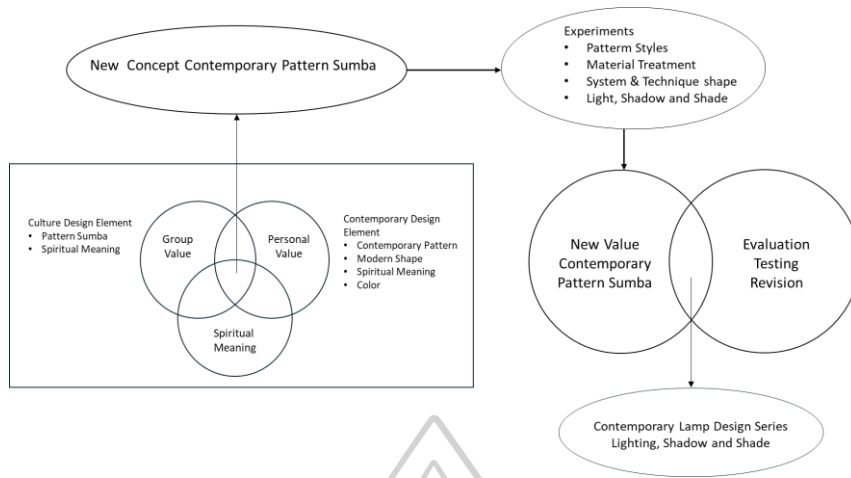


Figure 2. Conceptual Research

1.6 Research Methodologies

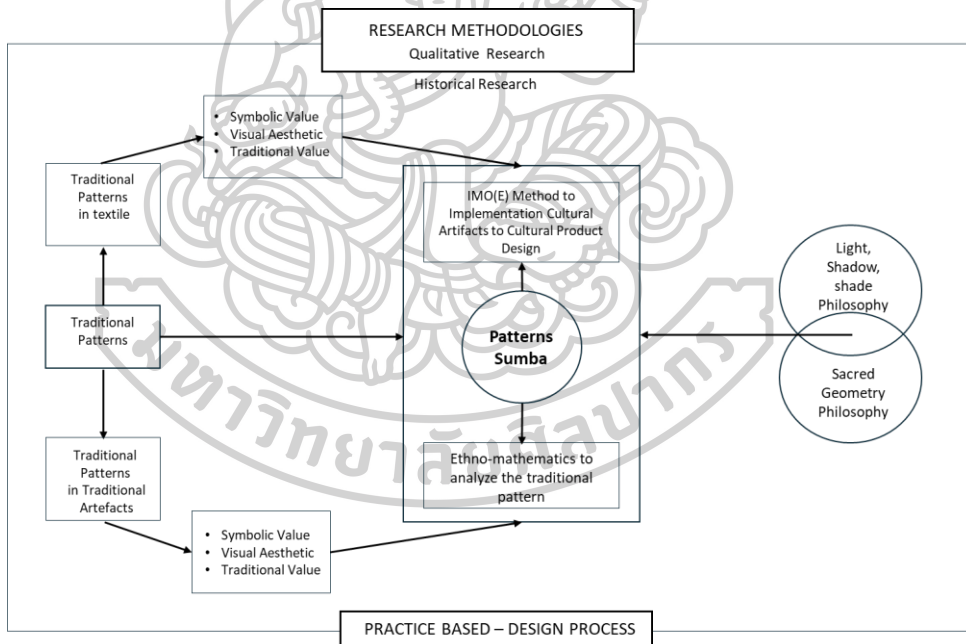


Figure 3. Research methodologies to develop the Pattern Sumba concept into a contemporary concept from the start to the final design process in lamp design products

This type of research is a qualitative research designed to develop the potential of the woven fabric from East Sumba for contemporary creative lifestyle

interior products. The research process has been divided into 2 main phases, namely the study of visual style and the analysis of the potential use of woven fabric as creative products. In the first phase, the study of visual style includes style, color, visual direction, materials, and manufacturing processes which are important factors in designing the visual form of woven fabrics. The purpose of the visual style study is to determine the meaning of each existing pattern. This forms the basis for the second process, which is to analyze the use of woven fabrics as materials for creative lifestyle products. This research is expected to: Understanding the characteristic of patterns of woven fabrics of East Sumba to produce new contemporary creative lifestyle interior products based on the woven fabrics of East Sumba contemporary lamp design collection (hanging, floor and table lamp), hence, the contemporary products design collection.

1.7 Research Process

1. Literature Review

This research contains a comprehensive literature review on the historical background and development of the Sumba patterns. The research is supported by relevant archival sources.

2. Field Research

This research was conducted in East Sumba, Indonesia, with research subjects from the region.

3. Data Analysis

The data from the field and historical research data were analyzed to develop the concept of light and shadow for contemporary lamp design.

4. Data Summary and review

The data was compiled, analyzed, and reviewed with the participants based on design practice. The creative process was critical to the development and innovation of lamp design.

5. Computer Simulation

The artistic designs were created using computer software such as Word, SketchUp, and AutoCAD.

6. Experiments with laser cutting and blooming flower machine

Once the new patterns and lamp designs had been developed, the production process involved experimenting with laser cutting, folding and blooming flower machines to create a digital 3D format. The stainless factory was then used to produce the artwork. Finally, the finished artwork was exhibited together with the light installation.

7. Lamp design process and production

After developing the concept of light, shadow, shade, and lamp design, Lamp production follows.

8. Conclusions

The artifact of Pattern Sumba can be transformed into light, shadow, and shade to create contemporary lamp designs and artworks. The development of technology can increase the value of the final product.

1.8 Research Outcome

The expected benefits are as follows:

Sustainability – the woven fabric of East Sumba is a fabric that is made by hand involving nature in its production and has a unique motif with deep meaning so sustainable development is required.

Economic aspect - East Sumba weaves are now well known both in Indonesia and abroad, but currently the weavers have not achieved good prosperity in the economic field, so wider awareness and new products developed by the artisans in addition to the production of woven fabrics are needed to achieve an improvement in the economic aspect for the artisans.

Young Generation (Z Gen) - The rapid development of the era and technology, the young generation has forgotten traditions and local products which are even more admired abroad, with the existence of creative life style interior products, it is hoped that the young generation will recognize and want to use this Woven Fabric of East (Prijosusilo, 2017). This type of research is a qualitative research that focuses on developing the potential of East Sumba woven fabric for contemporary creative lifestyle interior products. The research process has been

divided into 2 major phases, namely the study of visual style and the analysis of the potential use of woven fabrics as creative products. In the first phase, the study of visual style includes style, color, visual direction, materials, and manufacturing processes which are important factors in shaping the visual form of woven fabrics. The purpose of the visual style study is to determine the meaning of each existing pattern. This forms the basis for the second process, which is to analyze the woven fabrics as materials for creative lifestyle products. It is expected that this research will provide design recommendations that follow the philosophy of the importance of traditional East Sumba fabrics and offer new insights to East Sumba weavers for the production of appropriate and evolving fabrics according to market needs. This research is considered important because there are often a mismatch (irregularity) in the application process when using traditional Sumba fabrics, which exist both in the form of interior products. For example, cutting fabrics to make creative products often results in some parts of the woven fabrics being lost. It even happens that the part that is wasted is an important part of the meaning of the pattern. This is very unfortunate because the production of woven fabrics itself is a very complicated process that takes a lot of time. In addition, the character of traditional woven fabrics has a certain visual style that has a special meaning, such as the arrangement of animal line patterns in the elongated module which cannot be easily cut off because it has a symbolic meaning and the placement of certain sacred patterns in creative products cannot be done lightly.

Based on the above explanation, this research has stages in the research process, the following is a diagram. The results of the research methodology as a drawing following

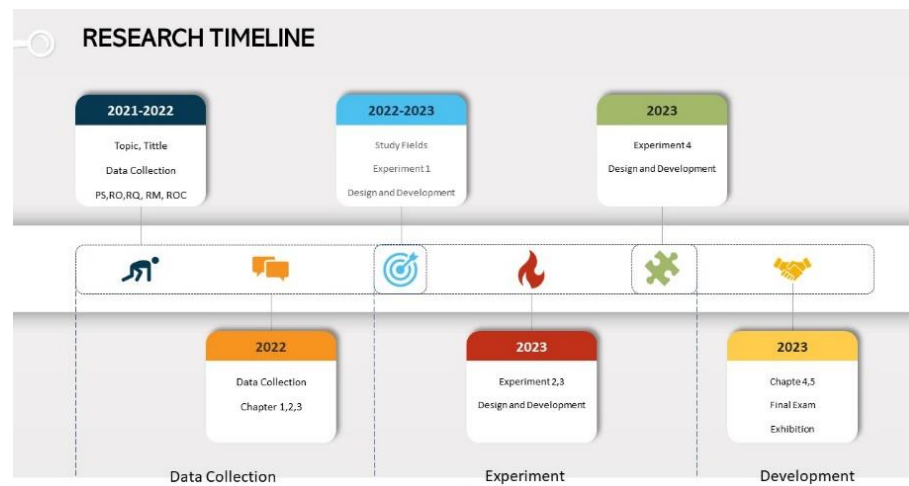


Figure 4. Research Timeline

The first methodological approach of the research is data collection through questionnaires with the target population being the East Sumba weavers' community and a survey of East Sumba weavings, local wisdom and local products made East Sumba people.

1.9 Limitation of the Research

The main objective of this study is to delve into the intricacies of the Pattern Sumba, utilizing mathematical geometry and exploring both the tangible and intangible implications. Given the richness of the patterns under investigation, the design development will focus solely on the summarized findings of this research. This research focuses on the Pahikung weave from East Sumba as it has various patterns and meanings.

Due to time constraints and the large study area, not all lamp designs can be customized, therefore, only a few lamps are shown as examples.

1.10 Research Results

The expected results are as follows:

1. The knowledge gained in this research enhances creative skills in the development of contemporary Sumba patterns applied to the product sector. New knowledge will be created in transforming culture into contemporary lamp design

2. The application of contemporary Sumba patterns using technology, materials and colors can increase value and open up new opportunities of the application of patterns in the world of interior design products.

3. Create and enhance new values for Pattern Sumba and inspire academics, Sumba weave artisans, and especially the younger generation to develop product experiments based on the results of this research

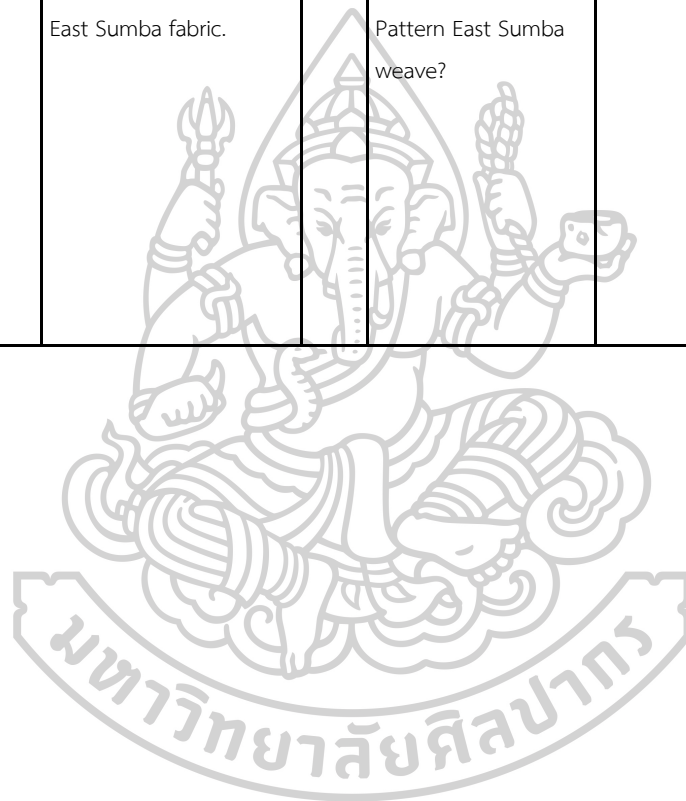
4. New innovations in contemporary Sumba patterns can popularize Sumba patterns and fabrics in the world.

1.11 The Relationship between Research Objective (RO), Research Questions (RQ), Research Methodology (RM), and Research Outcomes (ROC)

Table 2. The relationship RO, RQ, RM, ROC

PROBLEM STATEMENTS (PS)		RESEARCH OBJECTIVES (RO)		RESEARCH QUESTIONS (RQ)		RESEARCH METHODOLOGY (RM)	RESEARCH OUTCOMES (ROC)
1.	Sustainability – Need for sustainable development	1.	To investigate the niche of the pattern from East Sumba fabric	1.	WHAT are the characteristics of Patterns- East Sumba fabrics?	Observation Literature review Data analysis	Understanding the meaning, data, and analysis the pattern east Sumba woven fabric
2.	Economic aspect needs wider distribution and new products developed by craftsmen in addition to the production of woven fabrics, so that there is an improvement from	2.	To experiment with light, shadow, and shade – the woven fabric patterns from East Sumba for contemporary lamp design	2.	WHY are Pattern East Sumba fabric regarded as potential for contemporary products?	Experiment and designing Case study Questionnaire (community, designer)	To produce new contemporary lamp design based on the pattern east Sumba woven fabric east Sumba

	the economic aspect.					
3.	Young generation (Z gen) The young generation has forgotten traditional and local products, the young generation is not interested and has no successor.	3.	To create the contemporary lamp design based on Pattern East Sumba fabric.	3.	HOW can you create a contemporary lamp design based on the Pattern East Sumba weave?	Questionnaire for the final collection Collection contemporary Lamp design (Floor lamp, Floor lamp, table lamp, hanging lamp, chair) To get IMOIE Methodology translation cultural artifact to contemporary Product design









Chapter 2


LITERATURE REVIEW





2.1 Woven Fabric Indonesia

Woven fabric is a part of cultural heritage and Indonesian clothing known since prehistoric times, derived from the development of body-covering clothing based on grasses and bark. Weaving is a cultural identity that has been popular in the archipelago to foreign countries, including Indonesia is one of the largest weaving-producing countries, especially in terms of the variety of patterns decoration that can be seen in terms of color, decoration, and the quality of materials as well as the yarn used. Areas in Indonesia that are famous for ikat fabrics include: Toraja, Sintang, Jepara, Bali, Lombok, Sumbawa, Sumba, Flores, and Timor. Gringsing fabric from Tenganan, Karangasem, Bali is the only fabric in Indonesia that is made using the technique of double ikat weaving (double ikat). In many symbols and works, woven fabrics become the language of life, as daily clothing to protect the body, as traditional clothing, and dance as appreciation and respect in marriage, as appreciation and prayer in the funeral ceremony, as a symbol and effort to restore social balance, as a symbol of ethnicity and the inner motif of certain patterns and designs. Based on the above phenomenon, the author is interested in discussion how the art and culture of ikat weaving in the archipelago (Saputra, 2019). The following is an overview of Indonesian woven fabrics:

Table 3. Mapping Woven Fabrics Indonesia

No	Fabric Name	Picture	Hometown
1	Woven Ikat Ende		Flores
2	Woven Siak		Riau
3	Woven Ikat Dayak/Sintang		West Kalimantan
4	Woven Ikat Sumba		East Nusa Tenggara
5	Woven Sukomandi		West Sulawesi
6	Woven Donggala		Center Sulawesi

7	Woven Ikat Inuh		Lampung – Sumatera Island
8	Woven Ulos		North Sumatera
9	Woven Gringsing		Bali
10	Woven Lurik	 <p data-bbox="826 1301 1066 1350">tokotenun.com</p>	Java
11	Woven Toraja		South Sulawesi
12	Woven Buna Insana		Nusa Tenggara (Timor)

13	Woven Songket	 <p>shutterstock.com · 1826358065</p>	Palembang, Bali, Lombok
14	Woven Pandai Sikek	 <p>tokotenun.com</p>	West Sumatera Sumatera
15	woven Doyo	 <p>tokotenun.com</p>	Kalimantan
16	Wovem Buton	 <p>tokotenun.com</p>	West kalimantan

Hand weaving is one of the arts of Indonesian culture, produced by Indonesian people using a very simple or traditional loom. Weaving has a high significance, historical value, and technique in terms of colors, motifs, and the type of materials and threads, used and each region has its own characteristics. In addition, weaving is also a false cultural heritage of the Indonesian nation that deserves to be nurtured and preserved. Weaving is one of the equipment of human life that has been known since prehistoric times, originating from the development of garments made from grass and tree bark. The development of weaving leads to the quality of the materials used and the motifs and colors that takes priority in the woven product. Woven fabric has a function in some aspects of people's lives to produce both social, economic, religious, and social aspects beauty.

The design of the products outlining the accessories inside is not only a decoration element, but also has a function as an interior decorator. The accessories

also play a role in supporting the creation of atmosphere in the room because without the atmosphere of decoration, the beauty of the room will be reduced.

2.2 Traditional Patterns in Indonesia

2.2.1 Definition of Patterns

Patterns Variety or Motif comes from the Greek "ornare," which means decoration or jewelry (Soepratno, 2010). Motives, according to Toekio M, are found in society as a medium for expressing feelings that are depicted in a visual manner. As a result, decoration is constantly associated with the surroundings, and it can be described as a complement to the esthetic sense. Apparently, each decoration has a meaningful purpose (Kuntjoro-Jakti, 2010). Pattern diversity was introduced as a new aspect of local culture during the Hindu and Buddhist kingdoms in Indonesia, serving as a complement to esthetic value and creativity. In Indonesia, the ornamental diversity of flora and fauna in indigenous decorative art is associated with Hinduism, human response to nature, and human gratitude to the Creator. The decorative variety encompasses the ornamental variety. The motifs are the results of the application of natural philosophy, in which nature serves as a source of inspiration for their creation. Patterns can take the form of figurative, geometric shapes, as well as flora and fauna. In addition, Patterns can be used in two- or three-dimensions art (Hasanadi, 2014). Patterns variety is a heritage that dates back to prehistory. In the context of this long historical background, Indonesia as an island nation has several ornaments. The natural environment, flora and fauna, and the humans who inhabit the archipelago all have an impact on ornamental variety in Indonesia. This leads to a natural human desire to decorate. This belief aspect is critical in the development of decoration, so it has a particular significance (Halim, 2022). Patterns elements are frequently adapted or created from natural processes, according to (Tri Prasetyo Utomo, 2006). There are five types of ornament: geometric, botanical, animal, figurative, and polygonal. Animals are often the main characters in the Indonesian variety of ornamental. According to the experts' definitions and descriptions, the Hinggi Ikat design in East Sumba was a figurative motif with an animal figure as the main character.

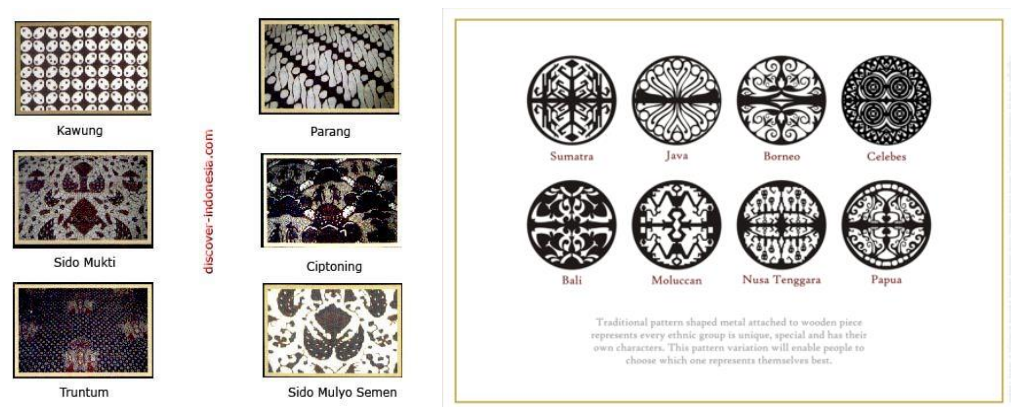


Figure 3. Types of Traditional Patterns in Indonesia

Source: discover-indonesia.com, Accessed on 12 January 2022

Indonesia as an archipelago has many traditional patterns is an intellectual property that has developed since prehistory which is commonly known as the archipelago pattern. Patterns are influenced by several factors, namely the natural environment, flora and fauna, and the people who inhabit it (Kuntjoro-Jakti, 2010).

Variety Patterns in Indonesia is a legacy that has evolved since prehistory. Indonesia as an archipelagic country has many ornaments. The variety of ornaments in Indonesia is influenced by the following factors: the natural environment, the flora and fauna, and the people who live there. The desire to adorn oneself is a human instinct. The belief factor plays important role in the development of decoration, so this ornamental diversity has a special meaning. According to T.P. Utomo (2007), ornamental elements are often adapted to or developed from natural phenomena (T.P. Utomo, 2007). There are five types of ornaments, namely geometric, botanical, animal, figurative, and polygonal. Animals are generally the main figures in Indonesia ornaments. Geometric shapes are ornamental shapes that are developed from lines that are then designed according to the taste and imagination of the creator. Geometric ornaments, or commonly referred to as geometry, were originally created due to technical and material factors. Geometric ornaments are ornamental patterns developed from geometric shapes and then designed according to the taste and imagination of the creator. Geometric ornaments are ornamental patterns developed from geometric shapes. Geometric patterns develop from simple patterns into complex patterns by repeating dots, lines, or surfaces. This pattern can be found in

the archipelago, such as Java, Sumatra, Kalimantan, Sulawesi, and Papua. Geometric shapes can be created by combining geometric shapes into new patterns. This theme uses more geometric elements such as curves and lines, circles, triangles, quadrangles, zigzag shapes, swastikas (cross-shaped symbols or ornaments that are bent vertically and are often interpreted as symbols for the cycles of the universe, the sun) and circular shape, etc.

R.A. Diah Resita I. Kuntjoro-Jakti (2010) Ornamental variety is one of the expressions of human beauty expressed in daily objects of human life such as in drinking water containers, food containers, wicker, and others. From a strictly historical point of view, because man as a living being strives to constantly perfect his life, ornamental diversity aims to achieve an esthetic value as an element of human culture, which in certain social contexts fundamentally has a relationship between man's relation to a higher realm. In other words, man is the creator of the environment. Esthetic works show the nobility and inner serenity of man as a successful spiritual leader. The ornamental variety should complement the esthetic sense of the whole. The past has given us an idea of what and where works there are both private and social. We can even know why.

The work appears or there is a symbolic imposition in the esthetic work that produces it. Patterns are there to embellish and maintain the desired beauty. In addition, the author also qualifies that the discussion of ornamental varieties only those born in the prehistoric, classical Hinduism Buddhism and the Islamic period. Because in these three periods, the time of creation of a very ornamental variety was rich in creation. So that people in the present, simply repeat the variety of ornaments and apply it in modern life. Why the ornamental diversity of the archipelago? Because based on the writing of Prof. Primadi Tabrani (1999) in the book *Learning from History and the environment*, it is conveyed that the variety of different ornaments is the result of the thinking of the Nusantara people, namely that the "Island People" are different from the "Continental People". Humans have essentially emerged from a common ancestor, namely from the continent of Africa, and spread to all corners of the world. Originally the Negrito race, the Caucasian race and the Mongolian race (Tabrani, 1999, 2005).

Those who crossed the archipelago were continental people but after passing through the period of 4 oscillations, the Heavy Ice Age, the three races merged into the Indo-Indonesian race, which was not black, white, or yellow, but merged into brown-skinned races. Slowly but surely, islanders formed who have sailing skills and a high sense of peace, because there is a possibility that if he sails and get stranded on another island, he can live there.. (R.A. Diah Resita I. Kuntjoro-Jakti) 249 without suspicion from the locals. So the islanders have also accepted it with open hands when the islander refers to his country not with the word motherland or country but with the word homeland. This is because the sea is the connecting element between the islands (archipelago).

Therefore, the variety of ornaments scattered across the Indonesian archipelago shows different forms of expression from one region to another. This is because this peace-loving nation does not want to insist that the work of one island must be transferred to another. But it is precisely between the islands that one can complement the other and enrich the sense of beauty that is spread throughout the region of this archipelago. The mentality of the islanders also produces their everyday objects beautifully, not just to please the eye. Rather, their beauty merges with moral rules, customs, taboos, religion, and so on, so that it is not only beautiful but also full of meaning. So, it can be seen from the art of Indonesian tradition that nothing is as naturalistic or as Western as the bastrake, but rather decorative and full of ornamental variety. There is no Western sespermetry or seasimetry, but rather a dynamic balance, and communication that is not as concrete or fundamental the West, but rather symbolic. So, it is appropriate to describe it more accurately as the richness of the ornamental diversity of the archipelago.

The archipelago variety of patterns is something that has been possessed since antiquity, originating from a nation among the islands that expresses its sense of beauty in its own way and whose centerpiece is part of the offering to the Supreme Creator. This is also corroborated by the opinion of Abraham Maslow, a figure of humanistic psychologist who also said the Aesthetic or beauty of a work is one of the basic needs of human. The use of ornamental varieties that have basic esthetic values is said to exert a strong attraction to recognize the truth and

goodness that the Creator desires for human. As an introduction to ornamentation, the discussion begins with the basic visual elements, namely dots, lines, shapes, textures, and colors.

As with the patterns in East Sumba fabrics, there is usually more than one motif in a fabric, depending on the source. The motifs are in the form of mamuli motifs, chickens, pigeons, horses, turtles, and crocodiles (Wulandari & Nuhamara, 2020). In the book Chandra Kirana Prijosusilo (2017) states that every symbol and motif that is on a piece of cloth is a hope and prayer conveyed through the cloth, therefore fabrics and motifs are unique as a work of art (Prijosusilo, 2017).

2.3 Woven Fabric East Sumba



Figure 4. Woven Fabric East Sumba

Source : Indonesia.go.id (Accessed on 4 March 2022)

Weaving is one of the handicrafts of the people of East Sumba. The production of ikat cloth has been a custom of women in Sumba for hundreds of years. Each ikat has different characteristics and features in each region in East Sumba, both in terms of the dyeing process and the motifs included in ikat weaving. It is claimed that one of the cultures that survive and thrive in Sumba is ikat weaving. The Sumbanese have long produced, used and traded ikat cloth or Sumba cloth. According to the BPS data on the Human Development Index in Indonesia, NTT

province is one of the provinces that have a very low IPM index, namely 65.23 or 1-5 points above Papua (60.84) and West Papua (64.70). This score is far below the other provinces whose average is 70-80. This shows that the quality of human resources in NTT is still low even though NTT is one of the most popular destinations for domestic and foreign tourists. NTT, which consists of 3 major islands, namely Sumba, Flores and Timor, and many other small islands, have become tourist destinations because of the exoticism of nature and its cultural products (Ningsih, 2019). The traditional woven fabrics of East Sumba have been influenced by tourism. Research conducted by Biranul Anas in 2007 highlights the changes in the Hinggi weaves from East Sumba, a particular type of weaving. The visual style of the Hinggi weaves has changed historically from the post-independence period to the year 2000. Traditional weaving in the eastern Sumba region has also received much attention due to the uniqueness of the patterns and the processes involving both nature and manual production. Sumba weaves have attracted several well-known fashion designers who have chosen to use Sumba fabrics in their work. Apart from clothing, Sumba fabrics are also used in other lifestyle areas such as home, hotel, and office interiors. However, the quality level of Sumba's labor has not improved significantly and is still very low in Indonesia..

Sumba woven fabrics have distinct colors and motifs, particularly in West and East Sumba woven fabrics (Ledi, Kusmanto, & Agustito, 2020). Sumba Woven Fabric, the traditional woven fabric of East Sumba, is one of the cultural products that have been influenced by tourism activities. This is shown by the results of Biranul Anas' dissertation in 2007, in which examined changes in a specific weave, namely the Hinggi woven fabrics from East Sumba. Hinggi weaves can be traced back to the post-independence period and up to the year 2000. Apart from the changes in visual style in the last decade, traditional weaving from the East Sumba region has received much attention due to the uniqueness of the motifs and the processes that involve both nature and manual production. The motifs of East Sumba fabrics have a variety of meanings and forms, such as motifs from fauna with images of crocodiles, which represent greatness, magic, and great influence (Therik, 1989) (Sumba, 2020). The Patula Ratu motif is a geometric, continuous, hooked, symmetrical, harmonious, and

beautiful geometric motif that is usually placed in the center of the woven fabric; this motif is only used by the Queen. The meanings and values of the Sumba cloth motif are cultural values based on noble values.

To fully understand the context, the history of woven fabric and Mamuli patterns were explored as follows:

1. Ikat Weaving Pattern: Woven fabric in Indonesia encompassed a variety of patterns that usually characterized the tribe or region of origin. These patterns were created and used as initial ideas in crafting attractive ornaments that gave a special first impression (Sunaryo, 2009).

2. Structural principles of Hinggi Ikat weaving in East Sumba: Hinggi is carefully designed, with patterns arrangement in harmonious patterns. Lines play a significant role in the composition of Sumba weaving patterns. These lines are horizontal, divide the fabric into sections, each designated for a weaving pattern. Padua (central plane) is located in the transverse stripe and in the center of the fabric. Different types of lines, such as straight, curved, interrupted, or dotted, appear on the fabric (P Soeriadiredja, 2013).

2.4 Patterns East Sumba Woven Fabric



Figure 5. East Sumba Woven Fabric Pahikung

Source: google.com

The woven fabric from East Sumba is classified as weft fabric due to their method of production. In addition to the ikat method, there is also weaving using a production method such as songket, which is known as pahikung weaving. In contrast to ikat weaving (Hinggi), Pahikung weaving is specifically intended for women, whose woven products are sewn into a sarong. The peculiarity of Sumba weaving lies in the manufacturing process, shape, pattern, and color (Adams, 1972). The weaving process, which is believed to be the binding rope between the living and the dead, is related to the formation of the fetus in the womb, warp threads form a protective skin, weft threads form body parts, and interwoven threads form cloth symbolizing growth to adulthood (K. K. S. E. Jay, 2010). The color of Sumba weaving is produced by the cold dyeing method, blue comes from tarum dye and red from noni which uses a mixture of wood and loba leaves which produces a red color typical of Sumba (P. Robert Ramone, 2013) . East region weaving consists of three types, namely as follows (Rede Ju, 2020).

1. Plain woven fabric without motif in white or black.
2. Ikat is a woven fabric whose color is created by knotting a series of threads into a specific image or pattern, then untying the threads and weaving them. The Ikat weave is more productive (hinggi) and belongs to menswear. Ikat weaving has motifs such as horses, chickens, parrots, people, war memorials and others that have a meaning and understanding of the East Sumba way of life.
3. Songket woven (pahikungu) is a woven fabric whose motifs and images are obtained with the help of songket / hikung, namely by copying the pahudu motif onto a woven cloth and then weaving it, songket weaving produces more sarongs.



Figure 6. A. Fabric, B. Sarong, C. Shawl (from left from right)

Source: (Murniati, M., & Takandjandji, M. (2016)

In the early days, East Sumba woven fabrics were made from cotton yarn, which was spun manually by the craftsmen. However, along with the development of machine spinning technology and the decline of cotton trees (*Gossypium hirsutum* L) as cotton producers, artisans now use machine-spun yarn as the raw material for the production of East Sumba fabrics, making the production faster. The manufacturing process of East Sumba ikat cloth begins with winding the yarn, followed by stretching the yarn (pamening) and tying the yarn. In the past, the threads were tied with kalita rope (from the gewang tree/*Corypha gebanga*), but today most artisans use raffia rope because it is easy to obtain or can be bought at an affordable price. The knotted yarn is ready to be dyeing and coloring with natural dyes. So far, artisans in East Sumba have only used the colors blue or black and red. Some artisans collect and process dyes or provide liquid dye to dye the knotted threads directly. Others use the services of other people who work as collectors and dyers (providers of liquid dye and yarn dyeing services and pay a certain wage. After the yarn is dyed, it is dried under the roof and is then ready to be woven according to the designs made or provided. The weaving work can be done by the artisans or their family members alone, but they can also use the services of weaving workers. (Murniati & Takandjandji, 2016). Analisis usaha tenun ikat berbasis pewarna alam di

kabupaten sumba timur: kasus di kecamatan kampera dan umalulu. *Dinamika Kerajinan dan Batik*, 33(1), 67-84.)



Figure 7. Production Woven Fabric, A. Pamering B. Yarn that has been tied and dyed, C. Weaving activities

Source: Murniati, M., & Takandjandji, M, 2016

In Indonesia, several researchers have investigated the Mamuli pattern and the East Sumba fabric. However, a comprehensive exploration of the pattern as a source of creative inspiration for contemporary product creations has not yet been conducted. Most of these studies have focused primarily on the history and function of the Mamuli as sacred objects for the Sumba tribe. For instance (Kaka & Hidayat, 2021) explains that it was a characteristic cultural element used as a dowry on Sumba. Geirnaert (1989) further elaborates that Mamuli represented a tribute to women. It is carried along with other sacred tools and weapons, exclusively by the first-generation ancestors, and part of the Pustaka is stored in the attic (Geirnaert, 1989). According to Steven & Yunanto (2019) Mamuli holds significant importance as a valuable dowry when a groom proposes to a bride (Steven & Yunanto, 2019). An article titled "Eksplorasi Tenun Ikat Sumba Timur ditinjau dari Etnomatematika (Exploration of East Sumba Woven Fabric through Ethnomathematics)" emphasizes the prevalence of geometric mathematical activities within the Sumba woven fabric pattern (Wulandari, 2020). Focusing on cultural features as inspiration, this study assumes that a harmonious and clear relationship between culture and contemporary design has emerged in today's global marketplace. For contemporary design, culture enhances the value of esthetic experience and adds value to globally competitive products (Wu, Hsu, & Lin, 2004). According to (Boonpracha, 2022), the reciprocal relationship between design and culture over time has transformed design into a reflection and tangible outcome of local culture, which serves as inspiration.

Other research defined local wisdom or culture as an essential component in the process of teaching product design that should be understood by the designers (Busch, Carson, & Lappin, 2002). Langi et al. (2020), emphasize that the making contemporary products is a creative process that requires rethinking and redefining cultural elements through creativity, yielding new products that align with the evolving creative industry while preserving culture and Aesthetic (Langi, Sabana, Ahmad, & Widiawati, 2020) . When embarking a contemporary culturally inspired product, there are two crucial elements to investigate, namely the cultural philosophy, and features of contemporary products (Asino, Giacumo, & Chen, 2017). Several studies highlight the significance of connecting contemporary products with local wisdom, which increasing the value of esthetic and emotional experiences for novel creations (Lin, 2007). In addition, Sugiarto et al. (2023) underscored how Batik, a traditional Indonesian textile, can be functionally transformed into an esthetic element within modern interior design, creating an esthetic connection between traditional textile art and modern interior design (Sugiarto, Halim, & Syarif, 2023). Another cultural analysis centered on Javanese ornaments, imbued with the esthetic values taught by Islam, adds value to the carving and the local economy while preserving the eroding diversity of Javanese culture (Hildayanti et al., 2023)

The Hinggi pattern originates from East Sumba and is characterized by its symmetrical design, which is divided into three different levels: the upper, the middle, and the lower. This particular design principle is in keeping with the long-standing tradition of mirroring found in woven Sumba fabrics. To compose the Ikat pattern of East Sumba, it's crucial to divide the fabric surface into three ambivalent fields, a principle that underscores the interrelationship between the top, middle, and bottom fields. (P Soeriadiredja, 2013).

The Hinggi Ikat Weaving's Cosmos Division in East Sumba is a collection of figurative patterns that are inspired by the local culture and environment. These patterns depict living creatures such as humans, fauna, and flora, as well as natural objects such as jewelry. There are also abstract patterns that are derived from local concepts and influenced by external sources such as Indian, Chinese, Portuguese, and Dutch culture. The category of foreign-influenced themes includes eco-cultural

patterns from outside the East Sumba region, particularly from India, China, Portugal, and the Netherlands. The Patola Ratu pattern, which is designed to cover the fabric sheet's surface, along with figurative, schematic, and foreign-influenced patterns, reflects the impact of Indian culture (Anas, 2007). The Hinggi pattern is categorized into two different groups, which are separated by a geometric intermediate pattern path. The central pattern includes figurative designs that incorporate both local and foreign influences, while the foreign-influenced pattern replaces the central pattern, often in a larger size (Anas, 2007). This process emphasizes the transfer of traditional East Sumba weaving patterns and contemporary designs from a cross-cultural perspective and serves as a strategy to elevate the value of new creations. Moreover, designers wishing to develop cross-cultural contemporary products can draw on these references as a valuable resource.

Based on the results of exploration, interviews and documentation, Woven Fabric East Sumba has unique patterns, can be explained as follows:

2.4.1 Fauna Patterns

2.4.1.1 Crocodile patterns (Wuya)



Figure 8. Crocodile Patterns (Wuya)

Source: (Rede Ju, 2020)

The crocodile patterns (Wuya) as a symbol of magic, greatness, and influence. The Sumba people set crocodile motifs for Kings and Queen (Australia, 2019)

2.4.1.2 Turtles Patterns (Karawulangu)



Figure 9. Turtles Patterns (Karawulangu)

Source: (Rede Ju, 2020)

The turtles patterns (karawulangu) are similar to the crocodile motif, symbolizing wisdom, and greatness (Australia, 2019).

2.4.1.3 The Lion Patterns (Mahang)



Figure 10. Loin Patterns (Mahang)

Source: (Rede Ju, 2020)

The Lion patterns is an influence by the Renaissance style in Europe from the time of King Henry III in the middle of 16th century. Entry into Indonesia is via Hindu culture. There is generally no lion on East Sumba. It is used as a pattern in woven fabric to show the Sumbanese people have known relations with outside (Australia, 2019).

2.4.1.4 The Cockatoo Patterns



Figure 11. Cackatoo Patterns

Source: (Rede Ju, 2020)

The Cockatoo Patterns symbolizes about unity and oneness, reflects the soul of the Sumbanese people in making decisions on various affairs (Australia, 2019).

2.4.1.5 The Rooster Patterns (Manu)



Figure 12. The Rooster Patterns (Manu)

Source: (Rede Ju, 2020)

The Rooster Patterns symbolizes wakefulness, meaning that the rooster always crows before sunrise and wakes people up in the morning. It is also a symbol of

masculinity, a sign of life and a protective leader. Roosters are specially reared to be used as sacrificial animals in traditional Marapu Rituals (Australia, 2019).

2.4.1.6 The Horse Patterns (Njara)



Figure 13. Horse Patterns

Source: (Rede Ju, 2020)

The Horse Patterns symbolizes masculinity, courage, agility, and heroism. Horses for Sumba people as a transportation, are used in war, and even have a high economic value. In Sumba culture the horse is an important symbol for marriage customs and a vehicle symbol for funeral rituals (Australia, 2019).

2.4.2 Geometric Patterns

2.4.2.1 Patula Ratu Patterns



Figure 14. Patula Ratu Patterns

Source: (Rede Ju, 2020)

The Patula Ratu pattern is geometric, continuous, hooked, symmetrical, harmonious, and beautiful and is usually placed in the center of the woven fabric. This motif is only used by Queen (Australia, 2019).

2.4.2.2 Mamuli Patterns



Figure 15. Mamuli Patterns

Source: (Rede Ju, 2020)

The Mamuli Pattern is characteristic of the Sumba Island. The basic shape of the jewelry resembles a uterus or the female genitals, which symbolize femininity and fertility, and are intended to honor the position of women (Liliweri, 2018). Mamuli plays a crucial role in the traditional marriage customs of Sumba, serving as the main dowry and a symbol of reconciliation between men and women. This pattern holds significant impact on the harmonious relationship between the families of the bride and groom, signifying the highest respect for Sumbanese women (Steven & Yunanto, 2019). Made of metal, this jewelry is believed to have celestial origin and considered sacred, which is why it is kept in places believed to possess divine power (Kaka & Hidayat, 2021). Due to its profound uniqueness and philosophy, the Mamuli pattern serves as a cultural inspiration for designing the contemporary Kandunnu floor lamp. Mamuli holds a distinct cultural significance in Sumba, serving as adornment and part of the dowry in Sumba culture (Kaka & Hidayat, 2021). It is also

used as an offering in marriage and death ceremonies, and symbolizes femininity, and womanhood due to its similarity to the female reproductive organ (Purwadi Soeriadiredja, 2022). Meaning and purpose of the Mamuli pattern in Sumba society, Mamuli serves as part of the dowry, and symbolizes peace between the bride and groom as well as fertility and femininity. In tribal life, Mamuli is often associated with social status, manifested in large-sized ear ornaments with complementary ornaments. As jewelry defines human civilization, Mamuli is considered a symbol of identification and Sumba culture. The basic shape of Mamuli jewelry, which resembles the female reproductive organ, holds symbolic significance in honoring the role of women (Kaka & Hidayat, 2021).

2.4.3 Floral Patterns

2.4.3.1 *Bunga* Pattern



Figure 16. Floral Patterns

Source: Chandra Kirana Prijosusilo (2017)

The Bunga pattern on the woven cloth of East Sumba is a motif consisting of a composition of geometric shapes. The floral shape on this woven cloth serves as decoration. It has the meaning of human life that is connected and needs each other, and it also has the meaning of beautiful.

2.4.3.2 *Wala Watar* Pattern



Figure 17. *Wala Watar* / Corn Flower
Source: Chandra Kirana Prijosusilo (2017)

The *Wala Watar* pattern on the woven fabric of East Sumba consists of a composition of geometric shapes and represents prosperity.

2.5 Product Design

According to Osborne (1982), the production of good and high-quality products that fulfil both function and form is always closely related to the selection of materials and the manufacturing process. Knowledge of the properties of the materials and the manufacturing process determines the success of a product. Before starting the design process for a product, it is necessary to carry out a design strategy in relation to the product to be manufactured. The strategy to be considered relates to the materials used, the construction of the product, the manufacturing process, the production costs involved and the quality of the product to be manufactured. The design strategy that designers can use in this case is to look for new methods that get the best solution out of the existing products because the old product is no

longer appropriate or does not fit the current situation. This is done by developing new products that are better in terms of usability, design, and price.

2.5.1 Folding Furniture

2.5.1.1 Definition of Foldable furniture

According (Tachmatzidou, 2020) Space-saving pieces of furniture have long been widely used in our daily lives, on vacation, at workplaces, even in schools or in motor vehicles. Transformable, collapsible, or foldable furniture offer effective space-saving and portability. Deployable structures are capable of varying their shape automatically from a packaged, compact configuration to an expanded one with operational capabilities when it's needed (Singh et al., 2007). Over the past decades, people's needs have led to inventive solutions to make life easier and more convenient. Therefore, saving space does not depend on downsizing but on efficient ways of folding a piece of furniture. Among the many space-saving methods such as stacking, imploding and bundling (Li, Hu, Alhashim, & Zhang, 2015; Mollerup, 2001), folding is perhaps the most common in furniture. This type of furniture is created to cater to the constantly evolving requirements for portability and functionality. Generally, this furniture is comprised of lightweight and easy-to-assemble structures that can be transformed safely and conveniently into various configurations. This feature enhances its usefulness in different settings and situations. (De Temmerman et al., 2014). As mentioned earlier, the folding principle is widely used in the furniture market due to its simplicity. The possibilities of transforming an interior or exterior space are almost endless through the use of foldable surfaces, flexible materials, or linear components. Models with foldable parts are considered economical and sustainable as they are easy to use, and can be moved linearly and radially. This can reduce the use of complex parts and make maintenance easier. In recent decades, designers from various disciplines have experimented with folding techniques to create both functional and decorative handmade or manufactured objects (Jackson, 2022). "Folding furniture benefits comes from their ability to change state and facilitate new functionality; all within a single system" (Singh et al., 2007)).

FURNITURE is the movable objects used to make a room or building suitable for living or working in, such as tables, chairs, or desks. 1. The small accessories or furnishing needed for a specific task or function: door furniture. 2. In many cases, furniture includes a wide range of moveable items, which are divided into four main categories: devices to support the human body, surfaces and objects to support various activities, storage and display pieces, spatial partitions 3 . Furniture pieces are designed and fabricated to help people sit and rest, work, and play, organize and display objects, and divide up space (Smardzewski, 2015). This view suggests a broad utilitarian framework in which function is seen as the primary purpose of furniture. Although function, utility, and social benefits are important aspects of furniture performance, function alone rarely inspires great design. The furniture design draws on notions of beauty, design principles, theory, material properties, manufacturing technologies, business economics, environmental design, and the spatial context in which it is placed, all of which are interwoven with function, utility and social use. Considerations that influence how we think and feel about furniture design include: Aesthetic (the importance of form) Historical precedents (examples from the past) Design principles (i.e. unity, harmony, hierarchy, spatial order) Furniture 3 Function and social use (ergonomics, comfort, proxemics) Design processes (sketches, iterative overlays, model studies, digital modeling, full-scale prototypes, collage assemblies) Material (classification, characteristics, properties, availability, cost) Fabrication processes (manual, electrical, digital) Environmental design (sustainability, renewable materials, off-gassing) Surrounding context (the spatial setting of the furniture) Professional practice (economic, legal, and business decisions). The goal when designing furniture is to consider all design aspects in a comprehensive and integrated way maintaining focus and critical engagement with the primary concepts and ideas that inspire the design (Postell, 2012).

In "Folding Furniture from Plan to Production" by Smaroula Tachmatzidou, it is explained that people seek innovative solutions to make their lives more comfortable without sacrificing space. Folding furniture is one of the most common space-saving solutions, along with stacking, imploding, and bundling. Transformable, collapsible or foldable furniture offers effective space-saving and portability.

Deployable structures can also change their shape from a compact setup to an extended one with operational capabilities when needed.

Folding is one of the most popular options for space-saving furniture and is therefore well-established in the furniture market. There are endless ways to modify an interior or exterior space through the use of foldable surfaces, adaptable materials, or simple mechanisms. Furniture models with foldable parts are considered a cost-effective and practical solution, as they are easy to use and can be moved straight and radially, reducing the use of complex parts and allowing for easy maintenance.

In general, wood joints are considered to have advantages such as strength, flexibility, appearance, durability, and more. Different joining techniques are used to meet the various needs in the production of folding furniture.

.Most folding furniture requires hinges and joints to create a rigid construction with moving parts. To obtain a folding piece of furniture, a traditional hinge mechanism is often used, which usually only allows a limited angle of rotation and has no more than one degree of freedom.

Hinges are made of metal, aluminum or plastic, and there are many different types to choose from depending on the occasion. There are different types of hinges that can be chosen depending on the intended use and desired model.

2.5.1.2 Type of Folding furniture

Wooden folding chair



Figure 18. Wooden folding chair by Winsome Wood

Source: <https://www.amazon.com/WinsomeWood-Folding-ChairsNatural/dp/B004XYNE52>)

Folding furniture has become a necessity in modern life due to limited living space and the need for portability and space-saving. This research has shown that folding furniture is available in every category, including beds, chairs, tables, and stools, and in various styles ranging from minimalist to overwhelming and loud. Folding chairs, stools, and tables are commonly seen everywhere, such as in dorms, dormitories, restaurants, and waiting rooms. Stackable furniture designs are also very popular, along with flat-packed furniture that can solve many transportation problems. The most popular types of folding furniture are those that are easy to assemble, use, and cost little. The wooden folding chair is a popular piece of folding furniture that can be easily folded using pegs and becomes flat by sliding the seat and backrest into each other (Tachmatzidou, 2020).

Director's Chair



Figure 19. Director's chair, designed by Felipe Hidalgo

Source: <https://www.cb2.com/curator-white-cowhidechair/s431266>

Director's chair adopted the design because they are easy to fold and transport when needed on a set for a location shoot. The first time this chair was shown was at an exhibition conference in Chicago the end of 19th century. During the exhibition this design was awarded as an outstanding piece of leisure furniture. The best-known design today is the lightweight armchair, which can be folded from side to side with a scissors action, using a canvas or similarly strong fabric for the backrest and seat. This design also has its roots in the Renaissance. In the 19th century,

American directors began to use the folding armchair on set as it offered the advantage of portability, giving the armchair its modern name and establishing the design in modern furniture culture. The construction of the director's chair seems simple, but the importance of the design cannot be overlooked. The most important consideration when building a Director's Chair is its joints. The chair is built from relatively slender wooden profiles that are subjected to considerable stress in daily use. The weight of the users ensures that the chair functions as the body pulls the canvas seat taut making the chair stable (STEPHEN, 1982).

Origami furniture



Figure 20. Paper folding or origami folding furniture

Source: <https://weburbanist.com/2010/05/20/sit-on-it-15-more-marvelously-modern-chair-designs/>

Origami furniture, whether in terms of visual or practical function is are similar to folding a sheet of paper and origami work of art. This type of folding is used to fold furniture into flat packages; they are usually made of wood, plywood, or hard cardboard. Depending on the design and base material, paper folding can be done in different ways, e.g. using hinges and pivots. According Paper folding by (O'Rourke, 2011), origami structures (Tachi, 2010), is perhaps the most popular way of folding. In paper folding origami, a piece of paper is folded and shaped to create a 2D or 3D form. In most cases, the folds are straight, but the creation of 3D shapes through curved folding has also been explored. Origami designs can result in intriguing 3D shapes that are freer than the furniture pieces discussed in this paper.

Pop-up Mechanisms Furniture



Figure 21. Folding table with pop-up mechanism, designed by Steve Silver

Source: <https://www.homedepot.com/p/SteveSilver-Crestline-Cherry-Lift-TopCocktail-Table-CL200CL/303815865>

A popular trend in folding furniture is folding with pop-up mechanisms. A pop-up mechanism usually works in parallel pairs that are used to lift the upper part of a piece of furniture. It consists of a pair of cantilevers connected by an upper elongated member and a lower elongated member running parallel to each other, and each pivotally attached to opposite ends of the pair of cantilevers. In pop-up designs, it is common to adapt the hinges of the hydraulic pull-out devices to the function of the furniture (Ruiz Jr, Le, Yu, & Low, 2014).

2.6 Ethnomathematics (D'Ambrosio, 1977)

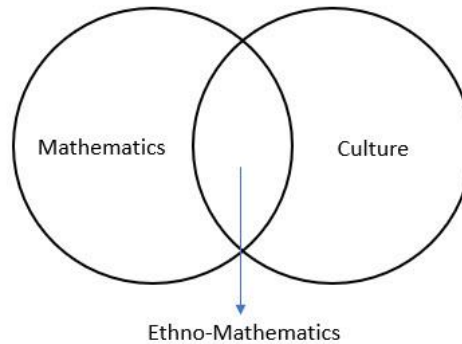


Figure 22. Ethnomathematics Diagram

2.6.1 Background

The term ethnomathematics, which was introduced in 1977 by the Brazilian mathematician, D'Ambrosio, is composed of the word "ethno," which stands for something comprehensive and refers to socio-cultural contexts, the word "mathema", which means explaining, knowing, comprehending, and engaging in activities, and "tics" derived from "techne," meaning technique (D'Ambrosio & Rosa, 2017).

Ethnomathematics is the study of mathematics within a cultural context, encompassing the understanding and reasoning of mathematical systems used (Wahyuni, Tias, & Sani, 2013). Another definition by Shirley characterizes it as mathematics that emerges and evolves within a society, aligning with the local culture and integral to learning and teaching processes (Shirley, 1995). Moh. Zayyadi identified the proximity of this concept to culture and emphasized that ethnomathematics encompasses various mathematical concepts that develop within a tribe, including those manifested in cultural artifacts, such as temples, traditional tools, fabric patterns, and settlement patterns (Zayyadi, 2018).

Ethnomathematics is the science of mathematics put into practice by cultural groups such as ethnic groups, children of a certain age and professional classes (d'Ambrosio, 1985). Therefore Ethnomathematics is the result of the merging of cultural relations with mathematics habits have been passed down from generation to generation and have developed in society (Jainuddin, 2022).

2.6.2 Principle of Ethnomathematics

Ethnomathematics is a bridge between culture and mathematics. It was founded in 1977 by a Brazilian scientist named Ubiratan D'Ambrosio. It is an idea that uses socio-cultural aspects in mathematics learning in order to understand mathematics in terms of adapting and expressing the relationship between culture and mathematics (Bili, 2019). Ethnomathematics refers to a variety of mathematical activities owned or developed by a community, including mathematical concepts such as cultural heritage in the form of temples and inscriptions, pottery and traditional tools, local units, batik and embroidery motifs, traditional games, and patterns of community settlements. Ethnomathematics refers to the results of a tribe's activities in which there are mathematical concepts that are sometimes disregarded by the community (W. Setiawan, & Listiana, Y, 2021).

According to the above-mentioned expert's explanation, ethnomathematics is a summary of thoughts and practices developed in a culture as a result of their respective activities, particularly in the motifs of woven fabric in East Sumba.

Based on the above explanation of the background, the purpose of this research is to explore and examine the mathematical elements or mathematical concepts in the ikat weaving of East Sumba. Thus, the results of this research can later be used as a reference for the development of teaching materials for mathematics and interior design/architecture courses based on local wisdom with an ethnomathematical approach. Therefore, it is necessary to conduct research entitled Identification of Ethnomathematics in East Sumba's Woven Fabric Motifs.

Culture and mathematics have an unconscious mutually supportive knowledge and both play a crucial role in enhancing human cognitive abilities. It has also been observed that mathematics has seamlessly integrated into human culture, even though individuals may not be aware of its pervasive presence and application in their daily lives. Mathematics emerged and evolved through the cultural process of human learning, which served to create systems of ideas, actions, and creative outcomes to shape and enrich people's lives. This led to the development of a concept known as ethnomathematics, which closely intertwined the cultural aspect of mathematics with human life.

Ethnomathematics has been further explained as the mathematical activity conducted by specific cultural communities and integrated into their daily lives. These communities include workers, farmers, fishermen, intellectuals, professionals, and others. The concept was based on the activities, experiences, and creative outputs of cultural groups that are related to mathematics.

2.7 IMO(E) Method Leong & Clark (2003)

2.7.1 Background

The IMO method serves as a means of translating cultural elements into design elements, formulated by (Leong & Clark, 2003), using an ethnomathematics approach. This method was modified based on an article titled "Transforming Local Culture into Contemporary Product Design using the IMO Method (Gumulya & Meilani, 2022). The following table shows the concept of IMO in the context of the culture and characteristics of contemporary design.

2.7.1.1 Four Fundamental Element in the IMO Concept

Table 4. Description of IMO in Culture and Contemporary Design Features

Level	Culture	Contemporary Design Features
Inner	Inner Culture: <ul style="list-style-type: none"> • Spiritual meaning • Belief meaning Examples: Religion, cultural philosophy, and embraced values	Inner Contemporary Design: <ul style="list-style-type: none"> • Special content Examples: Special meanings and narratives embedded in the work
Middle	Middle Culture: <ul style="list-style-type: none"> • Human relationships and social organization 	Middle Contemporary Design: <ul style="list-style-type: none"> • Function • Operational aspects • Utility
Outer	Outer Culture: <ul style="list-style-type: none"> • Physical or material culture Examples: Daily needs, transportation	Outer Contemporary Design: <ul style="list-style-type: none"> • Shape • Decoration • Details • Material • Color

The above table illustrates that the inner element represents abstract cultural aspects and the middle element encompasses broader cultural behaviors, while the outer and experimental elements provide designers with effective flexibility in interpreting cultural elements from the inner and middle levels. CPD is expected to exhibit innovation and make meaningful connections between local cultural and contemporary design elements that create uniqueness and significance. This customization increases the potential for meaningful and innovative CPD. In accordance with previous investigations, a research framework with the following phases was necessary:

Identification

- Outer Level: This involved the analysis of tangible cultural elements, such as form, color, material, pattern, detail, and style. These components were observed in artifacts, traditional architecture, traditional dances, clothing, textiles, and traditional jewelry. In the first phase of identification, stage, ethnomathematics was used to analyze patterns.
- Middle Level: The analysis included aspects such as function, use, behavior, and cultural habits related to these elements. •
- Inner Level: In this phase, elements such as values, beliefs, and cultural philosophies were analyzed.
- Experimental Level: The analysis of the design process involved tracking the path to create a contemporary work, under the direction of the designer.

Implementation This second stage involved the integration of the four levels, from the inner to the outer stage. Following diagram presents the stages of the IMO method:

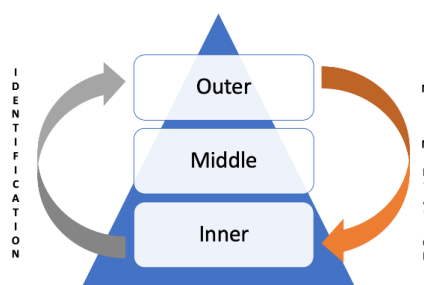


Figure 23. IMO Method Diagram

Source: Devanny Gumulya & Fanny Meilani, 2020

This diagram shows the implementation process that moves from the inner level to the outer level. After identifying the cultural elements, the functions and the materials used are analyzed to final move to the experimental level. This phase is crucial for designers to explore elements of the outer level, including design aspects such as form, material, color, and details.

2.7.1.2 Identification Stage of Local Mamuli Pattern Cultural Elements

Table 5. Identification of Local Mamuli Pattern Cultural Elements

IMOE (Element)	Description
Tribe	The Sumba Tribe (Orang Sumba – Tau Humba) is one of the indigenous tribes inhabiting Sumba Island, Indonesia. Renowned for diverse cultural heritage, their most notable contribution lies in Sumba woven fabric, skillfully crafted using the Gedong tool and Ikat weaving technique (Rizki, 2020).
Level Outer Artefak Mamuli Pattern	Mamuli Pattern in East Sumba Woven Fabric Mamuli holds a distinct cultural significance in Sumba, serving as adornment and as part of the dowry in Sumba culture. It is also used as an offering in marriage and death ceremonies, symbolizing femininity and womanhood due to the resemblance to the female reproductive organ. The selected Mamuli element for this study referred to the pattern in woven fabric, which has the same form and meaning as Mamuli jewelry.
Level Middle	Ikat Weave from East Sumba The Hinggi pattern is depicted symmetrically and divided into three parts, namely the upper, middle, and lower planes. This corresponds to the principle of mirror image in Sumba woven fabric. A key principle in the arrangement of Ikat

	<p>patterns in East Sumba is to divide the surface of the woven fabric into three ambivalent fields, (top, middle, bottom) (P Soeriadiredja, 2013), to emphasize their reciprocal relationships. The following description outlines the Cosmos Division in Hinggi Ikat Weaving, East Sumba. Hinggi patterns consist of figurative groups from the local environment and culture, that depict living being (humans, fauna and flora) alongside natural objects such as jewelry artifacts. The group of schematic patterns, characterized by openwork bases, includes patterns based on local concepts and external influences (Indian, Chinese, Portuguese, and Dutch) in abstract form. The category of foreign-influenced patterns originating from eco-cultures outside the East Sumba region, particularly from India, China, Portugal, and the Netherlands. The Indian influence can be seen in Patola Ratu pattern, which is meant to cover the surface of the fabric, as well as in figurative, schematic, and foreign-influenced patterns (ANAS, 2007). The Hinggi pattern is divided into two groups that are dramatically separated by a geometric intermediate patterns, which included both local and foreign influences are referred to as central patterns, with foreign-influenced patterns occupying the central pattern position and often depicted on a larger scale (Anas, 2007).</p>
Level Inner	<p>Meaning and Purpose of the Mamuli Pattern</p> <p>In Sumba society, Mamuli serves as part of the dowry and symbolizes peace between bride and groom as well as fertility and femininity. In tribal life, Mamuli is often associated with social status, which manifests itself in large-sized ear ornaments with complementary ornaments. As jewelry defines human civilization, Mamuli is considered a symbol of identification and Sumba culture. The basic shape</p>

	of Mamuli jewelry, which resembles the female reproductive organ, holds symbolic meaning for honoring the role of women (Kaka & Hidayat, 2021).
Level Experiment	At this stage, the Sumba tribe continues to uphold traditional practices that are passed down from generations to generations and preserved in the minds of Sumba artists.

The Identification phase of the local Mamuli pattern culture in East Sumba fabric aimed to reveal the depth and layers of meaning within the local culture. This could then be integrated into the design of the Kandunnu floor lamp. So, this research also develops an old method into a new method, namely the IMO Method becomes the IMO(E) Method with experiments adding an important level.

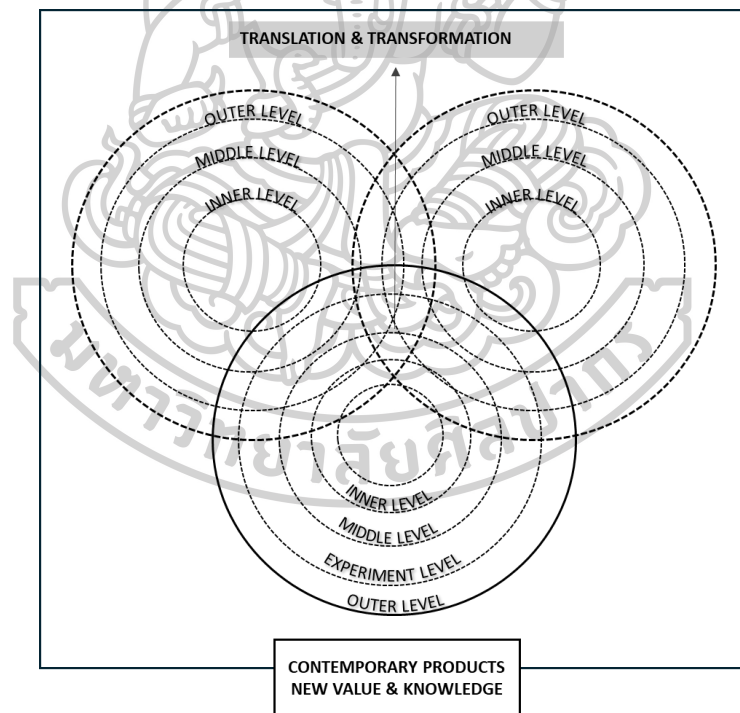


Figure 24. New IMO(E) Method Diagram

2.8. Cultural Inspiration

Culture holds significant role in the creative design process and requires a clear understanding of its definition. According to (Leong & Clark, 2003), it refers to the living activities of a society, and includes valued ways of life and symbolic structures. Another definition describes it as encompassing the intellectual capacities of creation, perception, and emotions (Koentjaraningrat, 1970). Based on these definitions, culture becomes a source of creative values and emotional identities in design. The relationship between culture and design is profound because cultural design enhances the value of a product; design serves as a means to promote cultural uniqueness (Lin, 2007).

Cultural inspiration (CI), a particular type of inspiration from “ancient cultural artefacts”, is discussed in this study on the basis of inspirational knowledge. It plays an important role in the design process as a definition of context, as a trigger for idea generation, and as an anchor for structuring designers’ mental representations of designs (Eckert & Stacey, 2000). It is also to get an overview of what is already available on the market (Herring, Chang, Krantzler, & Bailey, 2009). Knowing more about the sources of inspiration that designers use in their work is an essential step in investigating the influence of inspiration in idea generation (Gonçalves, Cardoso, & Badke-Schaub, 2014). Previous research has shown that there are several common types of inspiration, including images (photographs, drawings, design sketches, diagrams, schematic solution examples), objects (mock-ups, prototypes, commercial products, works of art) and texts (Cheng, Mugge, & Schoormans, 2014). Since “old cultural artefacts” are stored in museums or private collections, designers can more easily access image and textual information than a physical (tangible and visible) entity in the context of cultural product design (CPD). This research shows a traditional and typical cultural artifact called Pattern Sumba.

Cultural inspiration effectively communicates local culture and encourage designers to develop ideas and establish a creative design process. Acknowledged as a crucial aspect of a design process (Eckert & Stacey, 2000), cultural inspiration fosters a robust connection to design, leading to a new concept referred to as "Cultural Product Design" (CPD). This concept involves re-imagining or reviewing the

features of ancient cultural artifacts and adapting into contemporary product designs with functional and esthetic aspects (Luo & Dong, 2017).

Previous studies have emphasized the importance of two critical elements in designing contemporary products with cultural inspirations, namely cultural philosophy and creative learning for designers (Asino et al., 2017). Busch also identified Local Wisdom or culture as a crucial component in the process of teaching product design, which should be understood by designer (Busch et al., 2002). Similarly, in CPD, Kezia Langi has mentioned that creating a contemporary product involved a creative process that requires rethinking and redefining the cultural elements through creativity. This process produces new products that are in line with the evolving creative industry, while preserving culture and Aesthetic (Langi et al., 2020).

In conclusion, experts have identified cultural inspiration as an appropriate strategy in the creative process, leading to the production of contemporary products. In this study, the lamp Series of Sumba served as a contemporary product created through cultural inspiration. However, designers should avoid simply replicating ancient cultural artifacts as inspiration. Previous investigations has mainly focused on theory and methodology, with limited exploration of the experimental process. To address this problem, several unique innovations have been introduced: (1) Cultural inspiration through the distinctive pattern of East Sumba Woven Fabric, a material previously limited to textiles; (2) The integration of an experimental element into the IMO method, resulting in IMOE; and (3) The explication of the cultural features that hold significance and inspire the creation of the Contemporary Lamp series.

2.9 Theory on Aesthetic

In Greek, the word "aesthetic" originates from "aistheta," which means "perceived by the senses". (Junaedi, 2016). According to Djelantik, Rahzen, and Suryani (1999), Aesthetics is a branch of philosophy that deals with the nature of beauty. Ratna emphasizes that humans and beauty are inseparable, and any artistic representation of beauty must be preserved. Different experts describe Aesthetics in various ways. For instance, Herbert Read defines Aesthetics as the unity and

relationship between forms and our sensory perceptions, while beauty is often misunderstood (Djelantik, Rahzen, & Suryani, 1999). Furthermore, aesthetic is used to things that have beauty value but are not lovely, according to J.W. Moris. According to Moris, aesthetics can be both lovely and not beautiful (Ratna, 2011). In Kartika's 2004 publication on Kant's theories, it is explained that there are two categories of aesthetic values. The first is the pure aesthetic value, which can be found in elements such as lines, shapes, colors, and fine art. The second type is the extra aesthetic value, which is present in human, nature, and animal forms. Art enthusiasts can appreciate this additional beauty (Kartika & Ganda, 2004). People's feelings are linked to aesthetics, according to Kattsoff (1953), and these sensations are focused on things that have important items and attractive forms. Consequently, the audience can enjoy them (Kattsoff, 1953). The aforementioned description states that because animal themes express many other beauties, the extra aesthetic value of animal motifs in East Sumba Hinggi was incorporated.

2.9.1 Theory on Paradoxical Aesthetic Aesthetic

Jacob Sumardjo defines paradoxical aesthetics as the understanding that the pre-modern aesthetic is part of a mystical, spiritual, and religious culture that views humans as equal components of the universe and thinks cosmologically. As a result, each person's thoughts determine reality (Sumarjo, 2008). In this study, the dualistic theory and the three patterns of Jakob Sumardjo were used, i.e.: 1. Two Pattern Aesthetic : This two-pattern theory assumes mystical-spiritual and cultural-religious thinking and is based on the essential premise that life is divided and conflicts exist in two pattern communities. A number of social groups becomes divided (Sumardjo, 2013). The culture is not a culture of harmony. The paradox of pattern two attempts to reconcile two antagonistic parts that are both opposed to each other. Pattern two is evident in society in the manner of a paradigm that emphasizes opposites rather than complementary (Sumardjo, 2013). The aesthetic of the three triple patterns is based on the beliefs of primitive peoples. The pattern, suggested by Jakob Sumardjo, brings together two antagonistic but complementary elements in an attempt to unify them. This unification results in the creation of a third universe called the "middle

world". The middle world can unify the opposing upper and lower worlds, and the harmony of the two opposing worlds is represented by the events in the threefold pattern. In this pattern, everyone wins, and no one loses.

The Hinggi ikat motif in East Sumba is investigated based on the concepts of "pattern two" and "pattern three" to discover its aesthetic..

2.10 Case Studies

This Research, there are two study cases that are used as inspiration for the outcomes to be applied, as follows:

2.10.1 Indonesia Interior Designer

Namely Agam Riadi, Anita Boentarman, Eko Priharseno, Joke Ross, Reza Wahyudi, Sammy Hendramianto, Suyin Pramono, Andi Lim, Ary Juwono, Fifi Fimandjaja, Prasetio Budhi, Roland Adam, Shirley Gouw, and Yuni Jie. The Sumba fabric becomes a design element for the interior design, entitled "Woven Indonesia Textile for the Home" (S. E. Jay, 2013).



Figure 25. Woven Indonesia Textiles for The Home

Source: Cita Tenun Indonesia (CTI)

The second case study is on folding furniture to provide a good idea of the construction, color, material, and folding system used in this study. Here you can see folding furniture with different types and folding systems:

2.10.2 Resmo Furniture designer Chien-Hui Ko

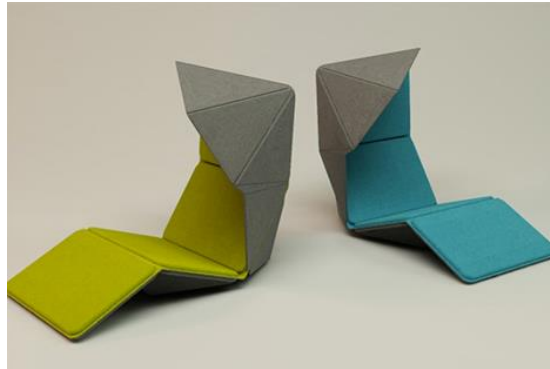


Figure 26. Resmo Furniture, designed by Chien-Hui Ko

Source: <https://www.smow.com/blog/2012/07/resmo-by-chien-hui-ko/>

Resmo is designer furniture that folds up, is nice and flat and therefore should not be a problems to store. It is lightweighted, easy to transport and because it is made from felt, it also has an acoustic effect, meaning it helps to reduce background noise, improving the ambiance for all. A not unimportant consideration given the potentially high number of irritated passengers: that soothes the atmosphere must be positive (Smow, 2012).

2.10.3 Convertible Table designer by Alfio Padovan



Figure 27. Convertible table designed by Alfio Padovan

Source: <https://www.arredatutto.com/en/furnishings/tables-and-coffee-tables/convertibletables/imultifunzione-piccolo-p-33918.html>

It is about foldable furniture with a kind of pop-up folding furniture where accessories are needed to support this furniture. So., from these two case studies, it can be concluded that only woven fabrics are directly used in an interior design in Indonesia, and from Alfio Padovan's furniture, it can also be seen that construction and accessories become important in a furniture with a folding system. This research is very well conducted to provide new knowledge and contemporary design innovation (Tachmatzidou, 2020).



Chapter 3

RESEARCH METHODOLOGY AND DESIGN PROCESS

3.1 Research Methodology

This study uses a variety of descriptive research methods, including literature review, observations, questionnaires, and experiments. The research process involves several steps. First, we look at into the history of Pattern Sumba's development, focusing on the creative concepts underlying its production. Second, we examine the meaning of Pattern Sumba and analyze its mathematics geometry using ethnomathematics method. Third, we conduct questionnaires with Pattern Sumba experts or owners of Sumba weaving workshops to discuss the challenges they face, gain insight into their unique patterns, and explore the market needs that support the creative process of developing contemporary Pattern Sumba into contemporary lamp design. Fourth, we process the analysis results using traditional transformation methods, namely IMO(E), developed by Leong & Clark (2003). The creative process involves designing and making the new Pattern Sumba, applying it using the blooming flower technique and folding techniques. Finally, we conduct a survey by distributing questionnaires to designers, experienced Sumba fabric makers and design students. The outcome of this research is a contemporary Sumba pattern that shines with light, shadow, and shade for contemporary lamp design with modern values.

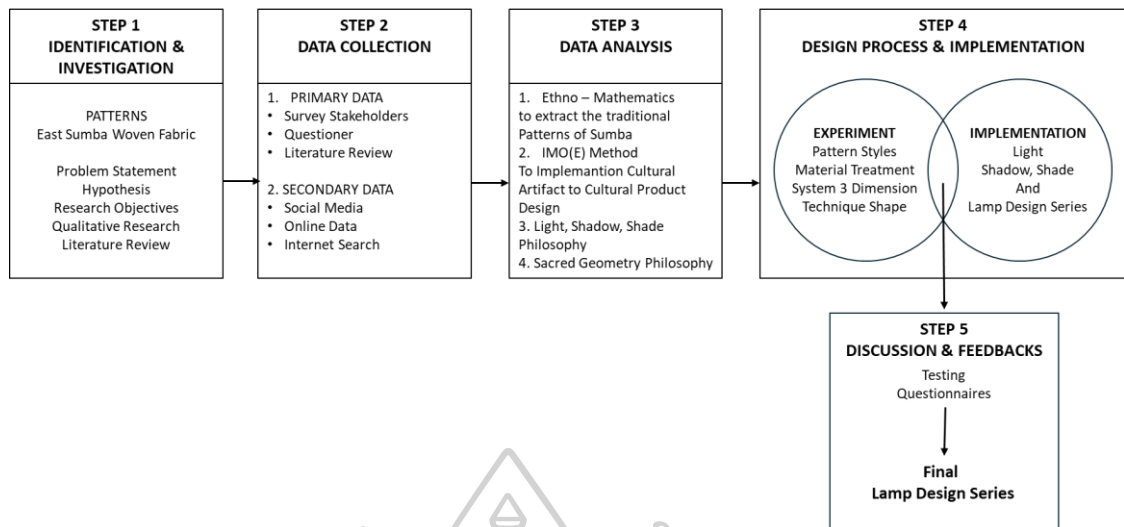


Figure 28. Diagram displaying the process of the Research Methodology

3.1.1 Qualitative Research

This is a qualitative study with an ethnographic approach that investigates and studies the ikat motifs on East Sumba's woven fabric. This investigation focuses on East Sumba woven fabric. The information was collected through literature review and documentation. The data collected in this study was processed using qualitative data analysis techniques. This included the data collected during the process of data reduction, data presentation, and drawing conclusions (Anggito & Setiawan, 2018; Rukajat, 2018; Sugiyono & Lestari, 2021).

In this chapter, we look at the systematic process of collecting and analyzing data using quantitative research methods. This type of research is widely used in the social sciences and uses various techniques such as questionnaires, interviews, observations, and collect data.

On the other hand, qualitative research is often used in the humanities, fine arts, and design disciplines. This type of research is based on direct action rather than facts and involves various forms of narrative – and experimental research methods. The outcomes of qualitative research are mainly subjective and reliant on the researcher's interpretation (Joneurairatana, 2021). The researcher chose to use qualitative research methods for this study in order to obtain the necessary information.

This study utilizes a qualitative method with a practice-based approach to analyze the collected data effectively and achieve the research objectives. These methods are suitable for research related to culture (Darmayanti, Tawami, & Halim, 2022). Therefore, the author must be a reflective practitioner who becomes a part of the study community for a certain period to understand the culture and community better (Andalas & Setiawan, 2020; D. Setiawan, Hardiyani, Aulia, & Hidayat, 2022).

3.1.2 Practice Base Research

The concept of practice-based research has gained a large following in the field of creative arts research. However, there is still a need for a clearer, consensual definition and application of this approach in other fields. It is used differently in the various disciplines in which it is most widely used. In design research, the focus is on understanding the essence of practice and how it can be improved, rather than on creating and reflecting new objects. Conversely, in the creative arts such as new media, the focus is on the creative process and the resulting works. Here, the object plays a decisive role in developing new perspectives for practice. By merging practice and research, new knowledge is formed, which can be shared and scrutinized closely (Candy & Edmonds, 2018) (Candy, Edmonds, & Vear, 2021) (Clift, 2012).

Practice-based research is a groundbreaking exploration of new knowledge that utilizes both practical application and the resulting outcomes. In a doctoral dissertation, exceptional creative designs, digital media, music, performances, and exhibitions can testify to the uniqueness and contribution to knowledge. Although words may convey the context and importance of these assertions, a full understanding can only be gained through direct reference (Rismantojo, 2023).

If the basis of the research is a creative artifact that contributes to knowledge, it can be classified as practice based. Based on this explanation, our study falls into the category of practice-based research as the discoveries are artistic creations that make a novel contribution to the process of developing the pattern Sumba design that can be applied in the product industry.

The research is practice-based in which integrates in the developing of potential patterns of woven fabrics from East Sumba for contemporary creative products design.

The first part focuses on reviewing the knowledge required for the production of handwoven textiles in Indonesia and abroad, as well as the processes and craftsmanship skills.

The second part focuses on the use of experimental methods to produce contemporary hand-woven fabrics, considering three key elements: patterns to produce a variety of hand-woven fabrics. This research experimented with a wide range of natural materials, and explored the technical processes by which these are incorporated into the woven structure of experimental textile works using traditional handlooms.

The instruments of exploratory research for data collection were questionnaires, notes, interviews, observation, photography, and experiments. Data collection methods included interviews and site visits. Participants included local weavers, community leaders, and other stakeholders. Questions related to knowledge and practical experience of the materials, patterns and colors used in the traditional process, and in particular, the craft skills required - all in the context of contemporary creative practices for interior products practices. The research is practice-based research, integrating research into the development of the potential patterns of woven fabrics of East Sumba for contemporary product design. As stated in the article titled Knowing and learning in practice-based studies: an introduction find The practice- based approach may be useful for: a renewed conception of organization as a texture of interconnected practices that expand into a web of action sustained by a knowledge-in-action that renews and transforms itself into practice; a renewed conception of knowledge as a situated, negotiated, emergent and embedded activity; a renewed conception of materiality as a form of distributed agency and an intimate relationship with people; a methodology for analyzing the new forms of work as knowledge-in-practice; and a lexicon that includes new items and concepts for the renewal of organizational studies.

3.2 Data Collection

3.2.1 Literature review and Interviews

For this research, the researchers conducted literature studies in professional journals and books, and conducted interviews with several fashion designers who have done a lot of research on Sumba weaving, as well as several experts and Sumba weaving fabric companies, especially in relation to the Sumba pattern to obtain direct information from the source persons about the types and meanings of the Sumba pattern which is full of philosophical meanings.

3.3 Design Thinking Process for Developing Pattern Sumba

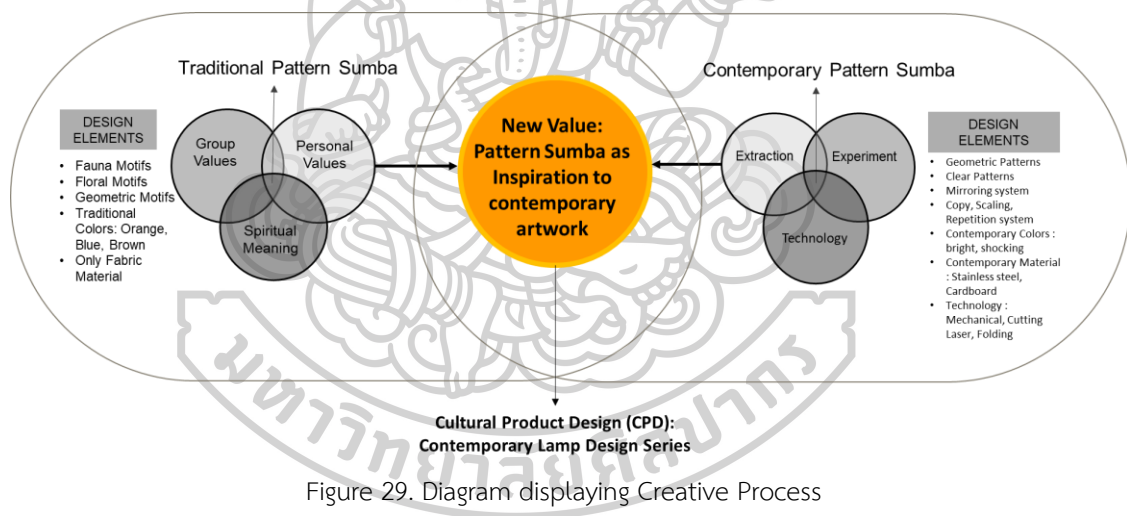


Figure 29. Diagram displaying Creative Process

Based on the diagram above, the first stage carried out is to extract the Sumba pattern to obtain a basic shape called mathematical geometry, where in the Sumba pattern basic shapes such as rhombus, square, triangle are obtained, so that this relationship becomes the basis for creating a new form of modern Sumba pattern and becomes relevant and meaningful for the Sumba woven fabric community. As mentioned in Chapter 2, this research has systematically researched the patterns for woven fabric from East Sumba, which are divided into three parts,

namely Identification, Translation & Experiment, and Implementation as shown

below

with:

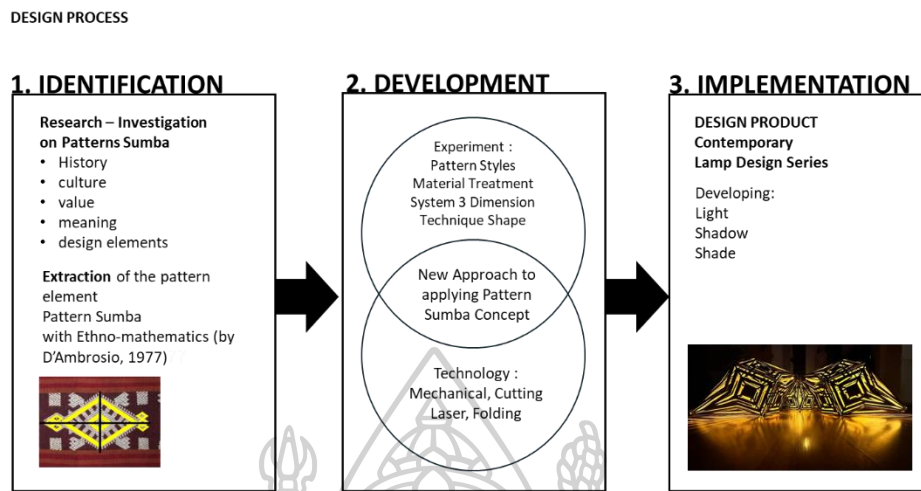


Figure 30. Diagram showing the Design process from identification until implementation

3.3.1 The First Phase (1st Phase): Identification

Previous studies have defined ethnomathematics as mathematical concepts and practices that exist within a society and are deeply rooted in its own cultural life (Putri, 2020). An ethnomathematical examination refers to the exploration and analysis of geometric concepts in wall decorations in Lesotho and the surrounding areas of South Africa (Gerdes, 2001). According to (Barta & Shockey, 2006), this complex and dynamic representation shows the cultural influence on mathematical use in practical applications. In this study, ethnomathematics was used to identify the fundamental geometric shapes in East Sumba woven fabric pattern, establishing the groundwork for designing new shapes in Kandunnu floor lamp. The analysis of the pattern shape using ethnomathematics is presented as follows (Halim, 2022).

The identification of the patterns of East Sumba woven fabrics in this study utilizes theoretical ethnomathematics where we look for the basic forms of buildings and systems that are widely used in the original patterns of East Sumba woven fabrics, below is the analysis:

3.3.1.1 Category Animal













Category Fauna (Animal)			
Name of the Motif and the Figure	Analysis	Result	Description
1. Crocodile motifs (<i>Wuya</i>) 		1. Rhombus Shape 2. zigzag Line 3. Line system 1. Repetition 2. symmetric	
2. Tortoise Patterns (<i>Karawaluŋu</i>) 		1. Rhombus Shape 2. Zigzag Line 3. Line 4. Square System 1. Repetition	
Category Fauna (Animal)			
Name of the Motif and the Figure	Analysis	Result	Description
7. The Dragon 		1. Hexagonal 2. Circle 3. Line System 1. Mirror	
Category Fauna (Animal)			
Name of the Motif and the Figure	Analysis	Result	Description
3. The Lion Patterns (<i>Mahang</i>) 		1. Rhombus Shape 2. Triangle shape 3. Line 4. Zigzag Line 5. Rectangle shape System 1. Mirror	
4. The Horse Patterns (<i>njara</i>) 		1. Rhombus Shape 2. Line 3. zigzag Line 4. Circle System 1. Mirror	
Category Fauna (Animal)			
Name of the Motif and the Figure	Analysis	Result	Description
5. The Rooster Patterns (<i>Manu</i>) 		1. Rhombus shape 2. Line 3. Circle 4. Hexagonal system 1. Mirror	

Figure 31. Ethnomathematics analysis Animal Patterns

3.3.1.2 Category Geometric




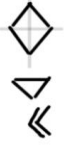



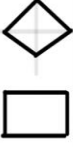
Category Geometric			
Name of the Motif and the Figure	Analysis	Result	Description
1. Patula Ratu Patterns 		1. Rhombus shape 2. Line 3. Square shape system 1. Repetition	
2. Mamuli Patterns 		1. Rhombus shape 2. Triangle shape 3. Line 4. Repetition system 1. symmetric 2. Repetition	
Category Geometric			
Name of the Motif and the Figure	Analysis	Result	Description
3. People 		1. Rhombus shape 2. Line 3. Hexagonal system : 1. Repetition 2. Mirror	

Figure 32. Ethnomathematics analysis Geometric Patterns

3.3.1.3 Category Floral Patterns

Category Floral (Plant)			
Name of the Motif and the Figure	Analysis	Result	Description
1. No Name 		1. Rhombus shape 2. Rectangle shape system 1. Repetition	

33. Ethnomathematics analysis Floral Patterns



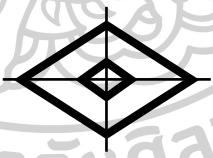
The Ethnomathematics analysis above is discussed in more detail below:
 Mathematical Concepts The concept in question is an abstract idea that is used to classify several objects, elaborate on them with knowledge, and then use it to group





and name some of these objects (W. Setiawan, & Listiana, Y, 2021). The process of creating a work, especially the motifs on the East Sumba woven fabric, generates a concept and a name. Thus, the motif of the East Sumba weaving fabric becomes a tool for introducing mathematical concepts that are familiar to us, the geometric concepts that help us to recognize abstract ideas such as lines, triangles, rhombuses, symmetrical, and parallel. The following is the mathematical concept underlying the East Sumba woven fabric motif:

Mathematical concepts and mathematical geometry in East Sumba weaving motifs (ethnomathematics)




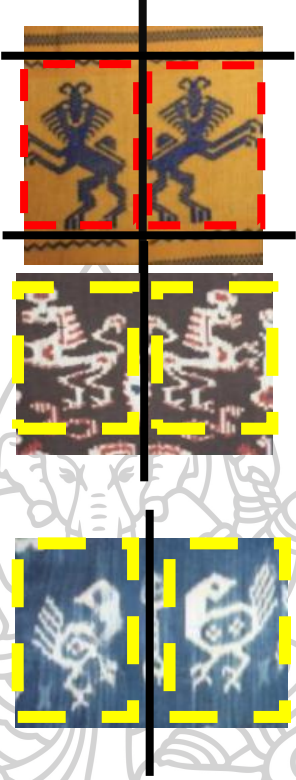
The ethnomathematical concept contained in the East Sumba woven fabric motif can vary depending on its shape. Mathematical concepts are expected to be described in the cultural motifs. The following is a description of the Mathematical concept found in East Sumba woven fabric motifs:

Table 6. Ethnomathematics Analysis of East Sumba Woven Fabric Pattern

Name of the Pattern and the Figure	Ethnomathematics Concept with Rhombus Geometric Shapes	Description
<p>Crocodile Pattern (Wuya)</p>  <p>Turtles Pattern (Karawulangu)</p> 		<p>The geometric shape of the rhombus is found in the typical patterns of East Sumba weaving, such as crocodile, turtles, and floral patterns, which are dominated by white. In crocodile, turtles and floral patterns, there are rhombus shapes in different sizes, which are combined to form distinct patterns.</p>

Name of the Pattern	Ethnomathematical Concept with Triangle and Symmetrical Fold Concept	Description
<p>Bunga Pattern</p>  <p>Patula Ratu Pattern</p>  <p>Mamuli Pattern</p> 		<p>The triangle concept is frequently used in East Sumba woven fabric pattern, particularly in the Patula Ratu and Mamuli patterns, which were specifically designed for Sumba women and symbolize female fertility. This triangular pattern is also found on East Sumba woven fabrics.</p> <p>The symmetrical fold, shown with a yellow dotted line, represents a sophisticated mathematical concept in where the two parts of the fold close symmetrically when Mamuli pattern is folded along the yellow line. The triangle is also the most stable geometric shape.</p>



Name of the Pattern and the Figure	Ethnomathematical Concept with Symmetrical Concepts and Reflective Mathematical Concepts	Description
<p>Lion Pattern (Mahang)</p>  <p>Horse Pattern (Njara)</p>  <p>Rooster Pattern (M)</p> 		<p>The idea of symmetrical black lines and reflective mathematical concepts is found in the properties of woven fabrics, specifically in Lion, Horse, Rooster patterns.</p> <p>The transfer or displacement of all object points in the same direction with the same distance is referred to as the reflective mathematical concept (Purnama et al., 2020).</p> <p>The Lion and Horse patterns, whether separated by geometric patterns or not, clearly show the symmetrical and reflective mathematical concepts. The X and Y lines, depicted with black lines, are also similar to the patterns found on East Sumba woven fabrics.</p>

Based on the findings and discussions, it can be concluded that the motif of the woven fabric from East Sumba has very authentic and iconic features, as well as a very deep meaning:

1. Reflective and symmetrical ethnomathematical concepts are frequently found in animal motifs on East Sumba woven fabrics with very good and precise ethnomathematical concepts.

2. The most common ethnomathematical elements found in East Sumba woven fabrics are flat shapes such as the Rhombus.

3. Geometric transformations such as mirroring, symmetrical weaving, reverse weaving such as mirroring on animal motifs were also discovered in this study.

The above study can help lecturers who teach culture and mathematics to understand the relationship between mathematics and culture that has existed for a long time, especially in East Sumba woven motifs and it provides a new paradigm for young interior designers.

3.3.2 Second Phase (2nd Phase): Translation

3.3.2.1 Transformation Cultural into Contemporary Product

The patterns on East Sumba woven cloths are in the form of geometric surfaces, in geometric shapes such as rectangles, pentagons and circles, while non-geometric motifs are in the form of free surfaces inspired by flora and fauna (Kusumo, Irawani, Poerwosedjati, 2013). With the geometric field analyzed using the ethnomathematical method continues with the translation process using the IMO method.

In this phase of the translation process, an example of Mamuli Patterns to Kandunnu Floor lamp is given as follows:

Inspiration is a crucial factor in the conception and development of innovative design products. In today's creative world, an innovative product goes beyond purely esthetic factors, and also encompasses intrinsic values.

This study investigates a framework for transforming the Mamuli pattern found in East Sumba woven fabrics, into a modern and innovative product in the form of a floor lamp. This work is served as a guide for designers and design students for a precise and effective implementation of the local culture.

Innovation took place through materialization, observation, and experimentation (IMO). They were applied to cultural artifacts structured on four levels: inner, middle, outer, and experimental. The experimental element played a central role in the methodology. The inner level comprised the meanings and symbols of the cultural artifact (Mamuli patterns), while the middle level comprised the creative

process. The outer level represented the physical appearance, including materials, colors, and ornaments. The experimental element involved the creative process of transforming the cultural artifact into a contemporary form.

The experiment was aimed at designers and design students in order to facilitate the creation of contemporary products through a culturally sensitive transformation and thus promote innovations. It was developed using an ethnomathematical theory and experimental folding techniques and resulted in experimental innovative product designs. It transformed the Mamuli pattern from East Sumba woven fabric into a Kandunnu floor lamp inspired by both the outer and inner levels.

Culture plays an important role in the creative design process and requires a clear understanding of its definition. According to Leong & Clark (2003), it refers to the living activities of a society, encompassing valued ways of life and symbolic structures. Another definition describes it as encompassing the intellectual faculties of creation, perception, and emotion (Koentjaraningrat, 2010). Based on these definitions, culture emerges as a wellspring of creative values and emotional identities within design. The relationship between culture and design is profound, wherein cultural design enhances the value of a product; design serves as a means to promote cultural uniqueness (Lin, 2007).

Cultural inspiration effectively conveys local culture, triggering designers to generate ideas and establish a creative design process. Acknowledged as a crucial aspect of a design process (Eckert & Stacey, 2000), cultural inspiration fosters a robust connection with design, giving rise to a new concept termed "Cultural Product Design" (CPD). This concept involves re-imagining or reviewing the features of ancient cultural artifacts and adapting into contemporary product designs with functional and esthetic aspects (Luo & Dong, 2017)

Previous studies have emphasized the importance of two critical elements in designing contemporary products with cultural inspirations, namely cultural philosophy and creative learning for designers (Asino et al., 2017). Busch also identified local wisdom or culture as a crucial component in the process of teaching product design that should be understood by the designers (Busch, 2002). Similarly,

in CPD, Kezia Langi has mentioned that creating a contemporary product involved a creative process necessitating rethinking and redefining the cultural elements through creativity. This process generates new products in line with the evolving creative industry, while preserving culture and Aesthetic (Langi et al., 2020).

In conclusion, experts have identified cultural inspiration as an appropriate strategy in the creative process, leading to the production of contemporary products. In this study, the Kandunnu floor lamp served as a contemporary product generated from cultural inspiration. However, designers should avoid simply reproducing old cultural artifacts as inspiration. Previous study has mainly focused on theory and methodology, with limited exploration of the experimental process, while some analyzes have presented data from student groups. To address this problem, several unique innovations were introduced: (1) Cultural inspiration from the distinctive pattern of East Sumba Woven Fabric, a material previously limited to textiles; (2) The integration of an experimental element into the IMO method, resulting in IMOE; and (3) The explanation of the cultural features that have meaning and inspire the creation of the Kandunnu floor lamp. Ethnomathematics, introduced in 1977 by D'Ambrosio, a Brazilian mathematician, has its origin in the word "ethno," meaning something encompassing and referring to sociocultural contexts, "mathema" which means explaining, knowing, comprehending, and engaging in activities, and "tics" derived from "techne," meaning technique (D'Ambrosio & Rosa, 2008). Ethnomathematics is the study of mathematics within a cultural context, encompassing the understanding and reasoning of mathematical systems used (Wahyuni et al., 2013). Another definition by Shirley characterized it as mathematics that emerges and evolves within a society, aligning with the local culture and integral to learning and teaching processes (Shirley, 1995). Moh. Zayyadi identified the closeness of this concept with culture, emphasizing that ethnomathematics encompasses various mathematical concepts developing within a tribe, including those manifested in cultural artifacts, such as temples, traditional tools, fabric patterns, and settlement patterns (Zayyadi, 2018). Indonesia as an archipelago has many traditional patterns is an intellectual property that has developed since prehistory which is commonly known as the archipelago pattern. Patterns are

influenced by several factors, namely the natural environment, flora and fauna, and the people who inhabit it. (Kuntjoro-Jakti, 2010). As in the patterns that exist in East Sumba woven fabrics, East Sumba patterns in one fabric usually have more than one motif, based on sources. The motifs are in the form of mamuli motifs, chickens, pigeons, horses, turtles, and crocodiles (Wulandari & Nuhamara, 2020).

In the book Chandra Kirana Prijosusilo (2017) states that every symbol and motif that is on a piece of cloth is a hope and prayer conveyed through the cloth, therefore fabrics and motifs are unique as a work of art. (Prijosusilo, 2017).

The IMO method serve as a means of translating cultural elements into design elements, formulated by Leong & Clark (2003), with an ethnomathematics approach. This method was modified based on an article titled "Transforming Local Culture into Contemporary Product Design using the IMO Method" (Gumulya & Meilani, 2022). The table below shows the concept of IMO in the context of culture and the features of contemporary design.

Table 7. Description of IMO in Culture and Contemporary Design Features

Level	Culture	Contemporary Design Features
Inner	Inner Culture: Spiritual meaning Belief meaning Examples: Religion, cultural philosophy, and embraced values	Inner Contemporary Design: Special content Examples: Special meanings and narratives embedded in the work
Middle	Middle Culture: Human relationships and social organization	Middle Contemporary Design: Function Operational aspects Utility
Outer	Outer Culture: Physical or material	Outer Contemporary Design:

	culture Examples: Daily needs, transportation	Shape Decoration Details Material Color
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The table above highlights that the inner element represents abstract cultural aspects, and the middle element encompasses broader cultural behaviors, while the outer and experimental elements provide designers with effective flexibility in interpreting cultural elements from the inner and middle layers. CPD is expected to be innovative and make meaningful connections between local cultural and contemporary design elements that create uniqueness and significance.

This customization increases the potential for meaningful and innovative CPD. In accordance with previous investigations, a research framework with the following phases was necessary:

Identification

Outer Level: This entailed the analysis of tangible cultural elements, such as form, color, material, pattern, detail, and style. These components were observed in artifacts, traditional architecture, traditional dances, clothing, textiles, and traditional jewelry. Ethnomathematics was used to analyze patterns in the initial identification phase.

Middle Level: The analysis included aspects such as function, utility, behavior, and cultural habits in relation to these elements.

Inner Level: In this phase, elements such as values, beliefs, and cultural philosophies were analyzed.

Experimental Level: The analysis of the design process involved tracking the path of creating a contemporary work under the direction of the designer.

Implementation

This second stage involved the integration of the four levels, from the inner to the outer stage. Following diagram presents the stages of the IMOE method:

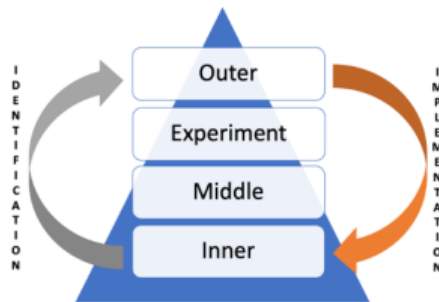


Figure 34. IMOE Method Diagram Kandunnu Lamp

Source: Modification for Devanny Gumulya & Fanny Meilani, 2020

This diagram shows the implementation process that moves from the inner level to the outer level. After identifying the cultural elements, the functions and the materials used are analyzed to final move to the experimental level. This phase is crucial for designers to explore elements of the outer level, including design aspects such as form, material, color, and details.

Discussion

This case study focused on the design of a contemporary floor lamp known as "Kandunnu", which was inspired by the traditional Mamuli pattern of East Sumba woven fabric. To fully understand the context, the history of the woven fabric and Mamuli pattern was explored as follows:

Ikat Weaving Pattern

Woven fabric in Indonesia encompassed a variety of patterns, which usually characterized the tribe or region of origin. These patterns were created and used as initial ideas in crafting attractive ornaments that provided distinct first impression (Sunaryo, 2009).

Structural Principles of Hinggi Ikat Waving in East Sumba

Hinggi is meticulously designed, with patterns arranged in harmonious patterns. Lines play a significant role in the composition of the Sumba woven fabric designs. These lines are horizontal and divide the fabric into sections, each designated for a woven fabric pattern. Padua (central plane) is located in the transverse stripe and in the center of the fabric. Different types of lines, such as straight, curved, broken, or dotted, appear on the fabric (Soeriadiredja, 2013).

Hinggi Pattern of Ikat East Sumba

The Hinggi pattern is depicted symmetrically and is divided into three parts, namely the upper, middle, and lower levels. This follows the principle of mirroring in Sumba woven fabrics. A key principle in the composition of the East Sumba Ikat pattern is the division of the fabric surface into three ambivalent fields. This feature illustrates the relationship between the fields: top, middle and bottom (Soeriadiredja, 2013).

The Cosmos Division in the Hinggi Ikat Weaving, East Sumba, is described as follows: Hinggi patterns are figurative groups inspired by the environment and local culture and include images of living beings (humans, fauna and flora) as well as natural objects such as jewelry artifacts. The schematic pattern group, or patterns with an openwork base, consists of abstract patterns derived from local concepts and influenced by external sources (Indian, Chinese, Portuguese, and Dutch). The category of foreign-influenced themes integrates ecocultural patterns from regions outside East Sumba area, particularly India, China, Portugal, and the Netherlands. The Patola Ratu pattern, which is intended to cover the surface of the fabric sheet together with figurative, schematic, and foreign-influenced patterns, reflects the influence of India (Anas, 2007).

The Hinggi pattern is classified into two groups, which are separated by a geometric intermediate pattern path. The central pattern encompasses figurative patterns that have both local and foreign influences, while the foreign-influenced pattern replaces the central pattern, often in a larger size (Anas, 2007). The study shed light on the process of transferring traditional patterns of East Sumba weaves and the design of contemporary products from a cross-cultural perspective, as a strategy to enhance new designs and products. Ultimately, valuable reference was also provided for designers who want to create cross-cultural contemporary products.

Mamuli Pattern



a

b

Figure 35.a. Mamuli Pattern, b. Mamuli Jewellery

Source: www.Google.com

The Mamuli pattern is unmistakable for the Sumba Island. The basic shape of the jewelry resembles a uterus or female genitalia, which symbolizes femininity and fertility and is intended to honor the status of women (Liliwiri, 2018). Mamuli plays a crucial role in traditional marriage customs on Sumba, serving as the most important dowry and a symbol of reconciliation between men and women. This pattern has a significant influence on the harmonious relationship between the bride and groom's families and signifies the highest respect for Sumbanese women (Steven & Yunanto, 2019). Crafted from metal, this jewelry is believed to have celestial origin and considered sacred, hence, it is kept in locations believed to possess divine power (Kaka & Hidayat, 2021). Due to its profound uniqueness and philosophy, the Mamuli pattern serves as a cultural inspiration for the design of the contemporary Kandunnu floor lamp. The mapping of Mamuli pattern culture onto East Sumba woven fabric using the IMOIE method was conducted as follows:

Identification Stage of Local Mamuli Pattern Cultural Elements

Table 8. Identification of Local Mamuli Pattern Cultural Elements

Source: Author, 2023

IMOIE (Element)	Description
Tribe	The Sumba Tribe (Orang Sumba – Tau Humba) is one of the indigenous tribes inhabiting Sumba Island, Indonesia. Renowned for diverse cultural heritage, their most notable

	<p>contribution lies in Sumba woven fabric, skillfully crafted using the Gedong tool and Ikat weaving technique.</p>
<p>Level Outer Artefak Mamuli Pattern</p>	<p>Mamuli Pattern in East Sumba Woven Fabric</p> <p>Mamuli holds a distinct cultural significance in Sumba, serving as adornment and as part of the dowry in Sumba culture. It is also used as an offering in marriage and death ceremonies, symbolizing femininity and womanhood due to the resemblance to the female reproductive organ.</p> <p>The selected Mamuli element for this study referred to the pattern in woven fabrics, which has the same form and meaning as Mamuli jewelry.</p>
<p>Level Middle</p>	<p>Ikat Woven Fabric from East Sumba</p> <p>Hinggi pattern is depicted symmetrically and divided into three parts, namely the upper, middle, and lower planes. This adheres to the principle of mirror imagery in Sumba woven fabric. An essential principle in arranging Ikat pattern in East Sumba involves segmenting the surface of woven fabric into three ambivalent fields, (top, middle, bottom), highlighting their interrelated relationships. The following description outlines the Cosmos Division in Hinggi Ikat Weaving, East Sumba. Hinggi pattern consists of figurative groups from the local environment and culture, depicting living entities (humans, fauna, and flora) alongside natural objects such as jewelry artifacts. The schematic pattern group, characterized by openwork bases, includes pattern stemming from local concepts and external influences (Indian, Chinese, Portuguese, and Dutch) in abstract form. The category of foreign-influenced pattern comprises designs originating from eco-culture sources outside the East Sumba area, particularly India, China, Portugal, and the Netherlands. The Indian influence is evident in Patola Ratu pattern,</p>

	<p>designed to cover the surface of the fabric sheet, as well as figurative, schematic, and foreign-influenced patterns (ANAS, 2007). Hinggi pattern is divided into two groups, dramatically separated by a geometric intermediate pattern path.</p> <p>Figurative pattern, encompassing both local and foreign influences, is termed central patterns, with foreign-influenced pattern occupying the central pattern position, often depicted on a larger scale</p>
Level Inner	<p>Meaning and Purpose of Mamuli Pattern</p> <p>In Sumba society, Mamuli serves as part of the dowry and symbolizes peace between the bride and groom as well as fertility and femininity. In tribal life, Mamuli is often associated with social status, manifested as large-sized ear ornaments with complementary ornaments. As jewelry defines human civilization, Mamuli is considered a symbol of identification and Sumba culture. The fundamental shape of Mamuli jewelry, resembling the female reproductive organ, holds symbolic significance in honoring the role of women</p>
Level Experiment	<p>At this phase, the Sumba tribe continues to uphold traditional practices that are passed down from generations to generations and preserved in the minds of Sumba artists.</p>

The Identification phase of the local Mamuli pattern culture in the East Sumba woven fabrics aimed to reveal the depth and layers of meaning within the local culture. This could then be integrated into the design of the Kandunnu floor lamp.

Implementation Stage of Local Mamuli Pattern Cultural Elements

This study required an analytical model for the development of a new contemporary product that would ensure the seamless integration of inspirations from the local Mamuli pattern culture of East Sumba fabric into the existing Kandunnu floor lamp. To achieve this, the VIEW model was used, which

encompasses Visibility, Information, Emotional Appeal, and Workability (Pramesti, 2021).

3.3.2.2 Implementation of Local Mamuli Pattern Cultural Elements

Table 9. Implementation of Local Mamuli Pattern Cultural Elements

Source: Author, 2023

IMOE (Element)	Description	
Emotional Appeal	Local Cultural Meaning	Contemporary Meaning
	Social Status Indicator Personal Identity Precious Object	This study primarily focused on floor lamp, a contemporary product inspired by the Mamuli pattern of the East Sumba weaves. The contemporary significance of this product includes: Illumination Room Status Indicator Space Enhancement Creation of Ambiance
Visibility	Visibility Analysis was carried out to analyzed the use of design elements for the product, as outlined below: The basic geometric shape was a rhombus. The color was a natural metallic tone in silver. The chosen material was metal, following the Sumba tribe's belief that metals come from the sky, similar to the Mamuli jewelry. The Mamuli within the pattern used either light or dark colors, depending on the background color of the woven fabric. The experimental construction is reminiscent of paper folding and dynamic movement. The pattern is characterized by repetitions and mirrorings. Modular and Repetitive Proportions is used.	

	The placement followed ceremonial practices and was reserved for important places.
Information	Both the traditional and contemporary patterns and their meanings were visually recognizable.
Workability	Both can be moved, touched, carried, and stored.

After analyzing the cultural and contemporary design elements of the fabric, the design concept was harmonized with the elements obtained from the IMO analysis. The Kandunnu floor lamp draws inspiration from the Outer, Inner, and Experimental levels to illuminate a space and create an ambiance in a room. In today's context, modern floor lamps go beyond the traditional roles of providing artificial light or decoration but have evolved to create an ambiance and evoke a mood in a room. This is similar to the many functions of Mamuli patterns on fabric and jewelry that have a deep meaning to their owner.

Development Stage of Kandunnu Standing lamp

Kandunnu Standing lamp

The term "Kandunnu" is a pattern name discovered in East Sumba woven fabric, symbolizing stars and hope. It has been transformed into a contemporary design through a process of adaptation. This transformation involves incorporating the rhombus shape and repeating modules of the Mamuli patterns, which are harmonized with the characteristic features of the patterns in woven fabrics, and the concepts experimented with folded paper. The innovation of this chandelier lies in its large shape, characterized by repetition. The shape of a modern pattern is manipulated in such a way that it enlarges and shrinks, creating striking and dynamic shadows.

Kandunnu is a contemporary floor lamp that has been carefully designed with the keywords sophisticated, luxurious, and communicative in mind. These terms are rooted in the local culture, with "sophisticated" reflecting the meaningful and captivating tradition of the fabric pattern. "luxurious" is represented by the use of the color silver, which stems from the belief that metals are divine gifts, while "communicative" refers to the dynamic pattern movement, similar to the

continuous growth of the pattern and the woven fabric. The lamp resembles a blooming flower and is meant to promote the continuous development of the pattern and fabric in Indonesia and on a globally. The design process of the Kandunnu floor lamp as follows:



Figure 36. Transformation of Mamuli Pattern Shape

Source: Author, 2023

In the first phase of development and implementation, a transformation process was employed to craft a novel contemporary form. The basic rhombus shape of the pattern, which was analyzed using ethnomathematical methods, was subjected to a further contemporary transformation.

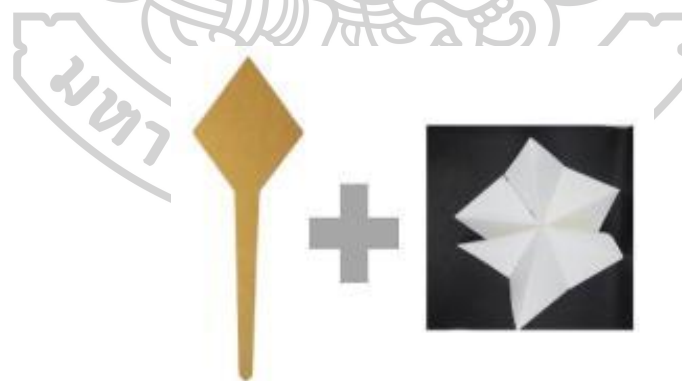


Figure 37. Experiment shape Kandunnu lamp with Folding Paper

Source: Author, 2023

In the first phase of development and implementation, a transformation process was employed to create a novel contemporary form. The basic rhombic

shape of the pattern, which was analyzed using ethnomathematical methods, was subjected to a further contemporary transformation.

The third stage of development and implementation comprised the final steps of weaving the fabric and creating a Mamuli pattern. Based on the observed pattern, a basic concept of geometric transformation was identified, which included dilation, rotation, reflection, translation and repetition. This phase involved the effort of researching design and form. The Kandunnu floor lamp applies these geometric transformation concepts to shape its design.

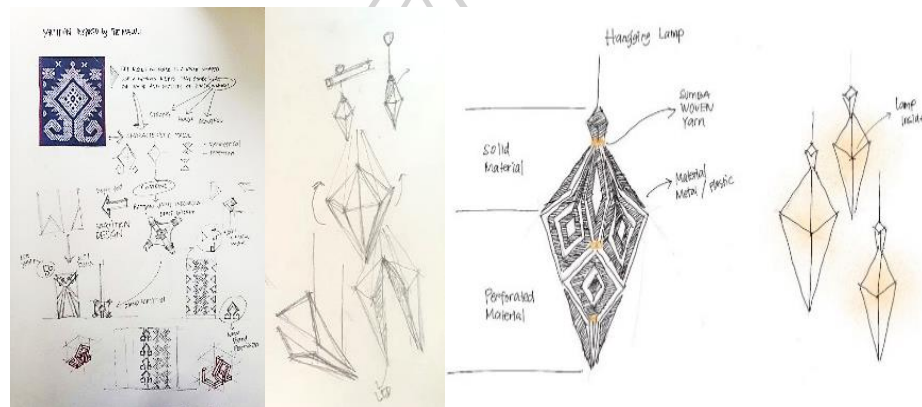


Figure 38. Initial Sketch of Kandunnu Floor lamp

The process moved on to the 1:1 scale model exploration phase to evaluate the successful integration of local Mamuli pattern, which served as inspiration for the lamp crafting. This assessment was carried out through cardboard cut using a laser cutting system.

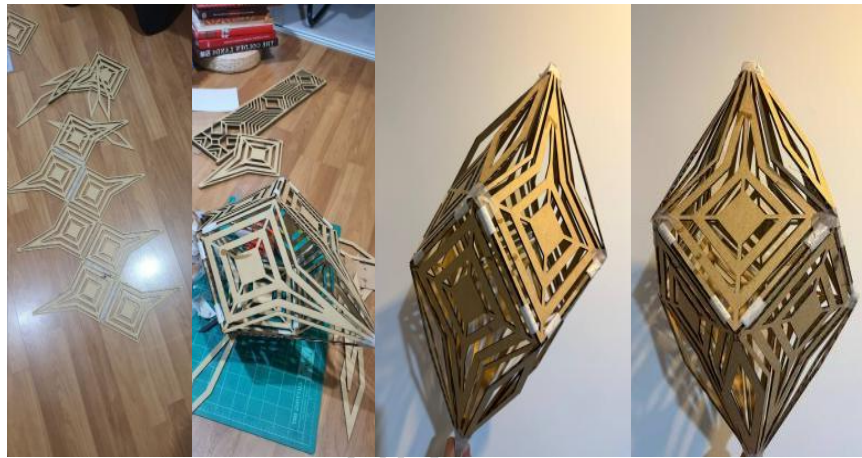


Figure 39. Initial Prototype of Kandunnu Floor lamp

The above prototype clearly shows how the Mamuli pattern inspired the design of the Kandunnu floor lamp. This is further described as follows:

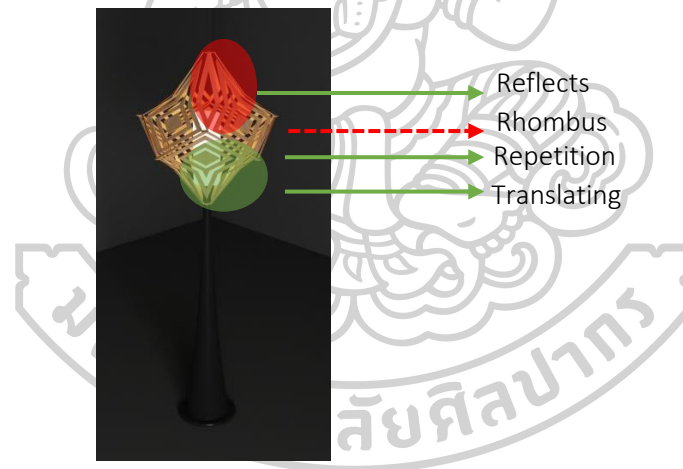


Figure 40. Implementation of Ethnomathematics Analysis

The uniqueness of the Kandunnu floor lamp goes beyond being a contemporary embodiment of the Mamuli pattern. It lies in the interplay of light and shadow, which transforms a room and is reminiscent of the interplay of light and shadows created by the lamp on a woven fabric pattern. This particularity gives the design a special value and creates new philosophical meanings and effects. The final phase of the design included all the previously mentioned phases and experiments and led the Kandunnu floor lamp into the production phase. This is explained in more detail below:

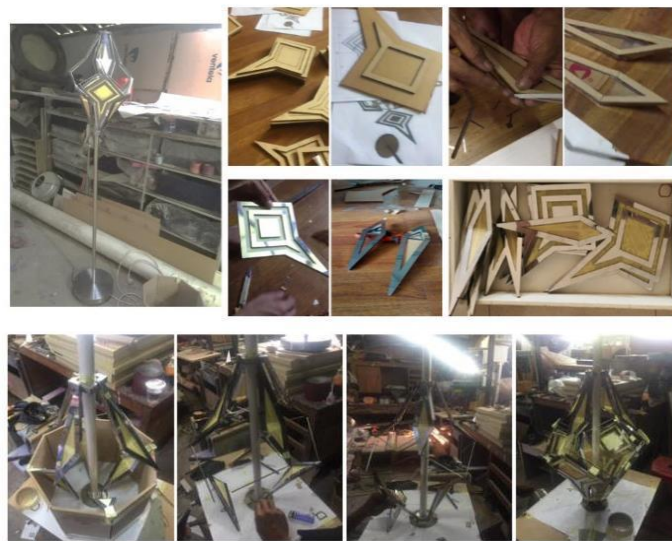


Figure 41. Production Process of Kandunnu Floor lamp

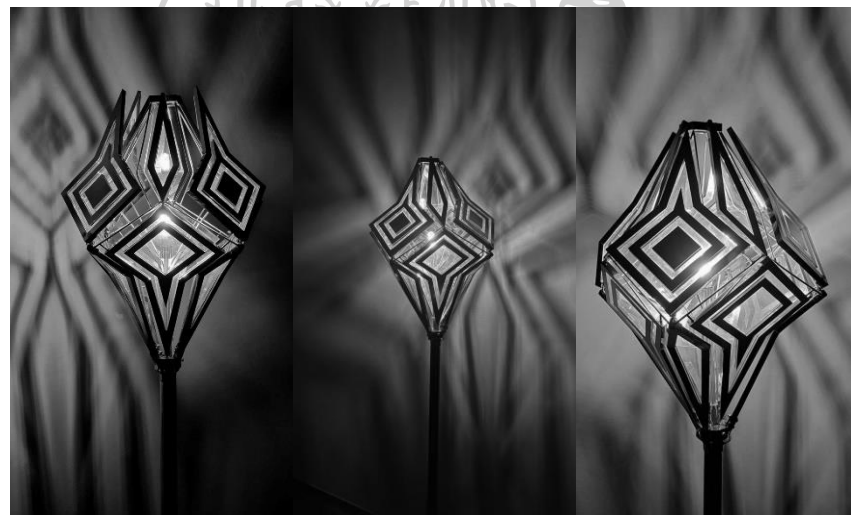


Figure 42. Final Kandunnu Floor lamp

The form and material of the lamp embody a philosophy aligned with based on the meaning of "Kandunnu," which signifies a star, that is a symbol of hope believed for the Sumba tribe. In order to incorporate contemporary elements, the lamp integrates the "blooming flower" system was integrated into the lamp, which is implemented through using an automatic adapter. This adaptation encompasses refers to the teachings of the Sumba tribe, wherein in which metal, the selected material chosen for this lamp, is considered seen as a gift from God. The Kandunnu floor lamp aims to bring the revered Mamuli pattern of the Sumba tribe into the

modern world while preserving the appeal of local Indonesian culture. This endeavor can always captivate young designers and inspire innovative designs. In Indonesia, the Mamuli pattern and the East Sumba Woven Fabric have already been the subject of several studies. However, a comprehensive exploration of the pattern as a source of creative inspiration for contemporary product creations has not yet been extensively conducted. Most of these studies have focused primarily on the history and function of the Mamuli as sacred objects for the Sumba tribe. For instance (Kaka & Hidayat, 2021) explains that it was a distinctive cultural element used as a dowry on Sumba. Geirnaert (1989) further elaborates that Mamuli represented a tribute to women. It is carried exclusively by the first-generation ancestors along with other sacred tools and weapons, and part of the Pustaka is stored in the attic. According to Steven & Yunanto (2019), Mamuli holds significant importance as a valuable dowry when a groom proposes to a bride (Steven & Yunanto, 2019). An article titled "Eksplorasi Tenun Ikat Sumba Timur ditinjau dari Ethnomatematika (Exploration of East Sumba Woven Fabric through Ethnomathematics)" emphasizes the occurrence of geometric mathematical activities within the Sumba woven fabric pattern (Wulandari & Nuhamara, 2020).

The study focuses on cultural features as inspiration and assumes that a harmonious and clear relationship between culture and contemporary design has emerged in today's era of the global-local market. For contemporary design, culture enhances the value of esthetic experience and adds value of globally competitive products (Wu et al., 2004). According to (Boonpracha, 2022), the reciprocal relationship between design and culture over time has transformed design into a reflection and tangible outcome of local culture, which served as inspiration. Other investigations defined local wisdom or culture as an essential component in the process of teaching product design that should be understood by designers (Busch, 2002). Langi et al. (2020), emphasize the crafting of contemporary products is a creative process that requires rethinking and redefining cultural elements through creativity, yielding new products that align with the evolving creative industry while preserving culture and Aesthetic . In developing a contemporary culturally inspired

product, that are two crucial elements warrant investigation, namely cultural philosophy and features of contemporary products (Asino et al., 2017).

Several studies highlight the significance of combining contemporary products with local wisdom, enhancing the value of esthetic and emotional experiences for novel creations (Lin, 2007). In addition, Sugiarto et al. (2023) underscored how Batik, a traditional Indonesian textile, can be functionally transformed into an esthetic element within modern interior design, creating an esthetic connection between traditional textile art and modern interior design. Another cultural analysis focused on Javanese ornaments, imbued with esthetic values taught by Islam, adding value to the carving art design and boosting the local economy while preserving the eroding diversity of Javanese culture (Haryanto & Prameswari, 2023). The following conclusions have been drawn based on the above studies:

Mamuli held sacred significance for the Sumba tribe.

Local or traditional culture was a suitable source of creative inspiration, adding value to contemporary products.

Designers needed to analyze both the local cultural and contemporary product design features and combine them to create amazing contemporary products

Amidst the extensive investigation on Mamuli and local culture as inspiration for contemporary products, there is still a dearth of studies on appropriate methods to help designers in transforming cultural features into contemporary products and further enhance their values. This study played a crucial role in developing the IMO method into an indispensable tool for designers and design education worldwide. This study used a qualitative and Ethnomathematics method in conjunction with the IMO product approach to data analysis. This combination ensured the fulfillment of the research objectives. A single case study approach was used to address the question of how and what lends itself to flexible examination. In the initial phase, the ethnomathematical method was applied to analyze the fundamental forms of East Sumba weaves. Subsequently, the IMO method guided the design process for the floor lamp. This study divides the process into 4 parts. 1) Studying data from related documents and investigation on the value and patterns of East Sumba

woven fabrics. 2) Collecting data and field surveys by taking photos and recording important details of East Sumba woven fabrics. 3) Case studies and experiments were conducted using a specific method and considering the criteria for the selected folding paper in product design. 4) Design and development of the results from parts 1, 2, and 3 applied to contemporary products in the form of floor lamps.

This study focuses on floor lamps “Kandunnu Lamp” with the aim that the lamp best represents contemporary products and can produce light and shadow that will create patterns in the space.

Previous studies have defined ethnomathematics as mathematical concepts and practices existing within a society, deeply rooted in its own cultural life (Lisnani et al., 2020). An ethnomathematical examination refers to the exploration and analysis of geometric concepts in wall decorations at Lesotho and surrounding areas of South Africa (Gerdes, 2001). According to (Barta & Shockey, 2006), this complex and dynamic representation shows the cultural influence on mathematical usage in practical applications. In this study, ethnomathematics was used to identify the fundamental geometric shapes in the East Sumba woven fabrics, providing the basis for the development of new shapes for the Kandunnu floor lamp.

In conclusion, the East Sumba weaving can be compared to a painting, with each fabric sheet being distinctive and possessing significant artistic value due to its originality and ancestral importance (Prijosusilo, 2017). This study successfully developed the IMOIE design method and the production of Kandunnu lamps which transformed local culture into contemporary products. The essence of this innovation lay in the inclusion of the Experimental Level and additional indicators in the design process, encompassing both the Inner and Outer Levels. This integration resulted in new innovations within the process of designing contemporary products. The methodical approach and process employed in the design of the Kandunnu floor lamp could elevate the East Sumba woven fabrics, particularly the Mamuli pattern, to a global stage. It could help the Sumba tribe not only in the fabric production but also in the production of various modern products in the future. The innovation of this method is depicted in the following diagram.

3.3.2.3 IMO(E) Method Development in Contemporary Lamp Design

Figure 43. IMO(E) Method Development Table

IMO by Leong & Clark 2003		IMO(E) 2023 Research	
Level	Local Culture	Contemporary Design Features	Contemporary Design Features
Inner	Inner Culture Elements: Spiritual meaning Beliefs meaning Such as: Religion, cultural philosophy, and adopted values	Emotional Appeal: The contemporary product in this study was floor lamp inspired by Mamuli pattern of East Sumba woven fabric. Its contemporary significance included: Illumination Room Status Indicator Enhancement of Space Creation of Ambiance	
Middle	Middle Culture Element: Human relationships and social organizations	Information: Both the pattern and its meanings were visibly evident in traditional and contemporary contexts.	Workability: Both could be moved, held, carried, and stored
Outer	Outer Culture Element: Physical or material culture Such as: Daily necessities and transportation	Visibility: The basic geometric form was a rhombus shape Natural metal color used was silver Metal material was	

		<p>believed to come from the sky for Mamuli jewelry, while bright or dark colors were used based on the background color of woven fabric for the pattern.</p> <p>Experiment with folding paper construction and movement</p> <p>Repeating pattern, mirroring</p> <p>Modular and repeating proportions</p> <p>The layout of both was placed in important ceremonies and locations</p>	
		Experiment	Kandunnu floor lamp was created through paper folding experimentation technique.

The Mamuli pattern of East Sumba woven fabric is a unique cultural heritage of Indonesia. In this research, it was carefully designed and developed using the IMO method with inspirations from the Inner, Outer, and the essential addition of the Experimental level. The results show that local cultural inspirations can influence design performance and creativity. These different levels play a crucial role in effectively transforming local cultural features and contemporary product features into a new and meaningful work. Therefore, it is imperative to prioritize the

comprehensive exploration of cultural features serving as inspiration, and the experimentation process proves to be highly beneficial for the creation of cultural products.

3.3.3 Third Phase (3rd Phase) : Experimental

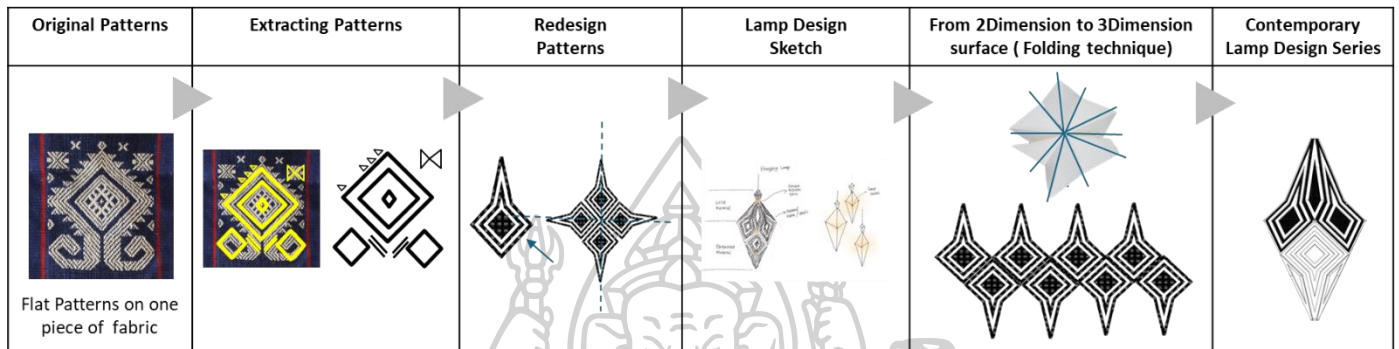


Figure 44. New Approach to Applying the Pattern Sumba Concept

Shape experimental Design Process: The patterns on the woven fabrics of East Sumba are in the form of geometric and non-geometric fields, on geometric shapes such as rectangles, pentagons, and circles, while non-geometric motifs are formed by free fields inspired by flora and fauna (Kusumo, Irawani, Poerwosedjati, 2013). Using the fields of geometric and non-geometric on the patterns of woven fabrics in East Sumba, the development of patterns for contemporary products design using Folding, Cut and Fold Techniques by: Paul Jackson as follows:

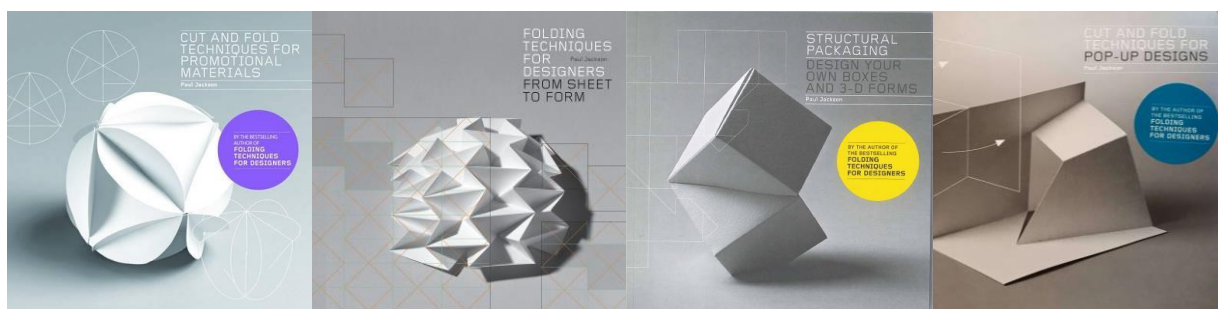


Figure 45. Book about Folding, Cut and Fold Techniques by: Paul Jackson

source : Paul Jackson,2022

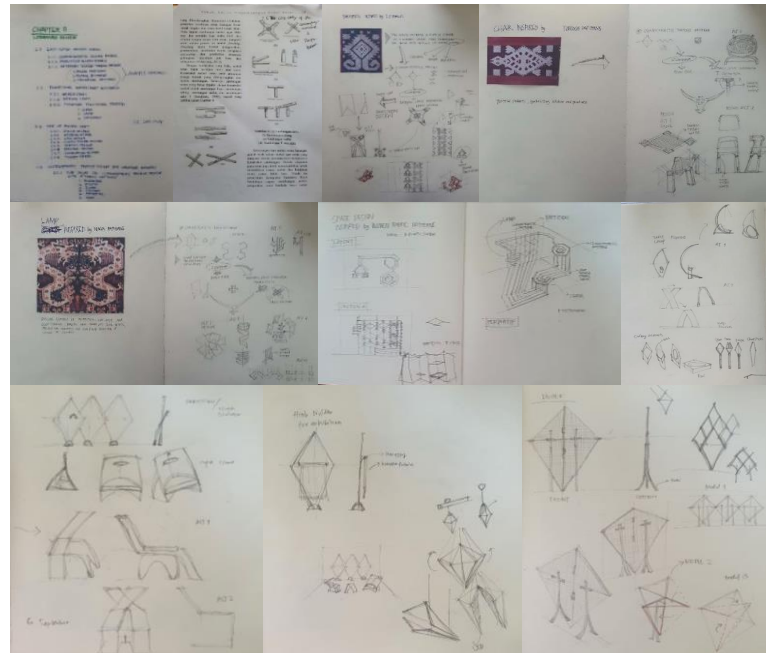


Figure 47. Fist design process sketches

At The design and development phase is the fourth phase, in which the data researched in second and third phase is further developed. In this phase, the design and development for Contemporary Products was inspired by the possible patterns of East Sumba woven fabrics: Phase one begins with the search for inspiration through sketches

The following phase of experimentation and sketching, looking for a shape that can be directly applied to the chosen type of furniture.

3.3.3.1 Partition Sketch Design

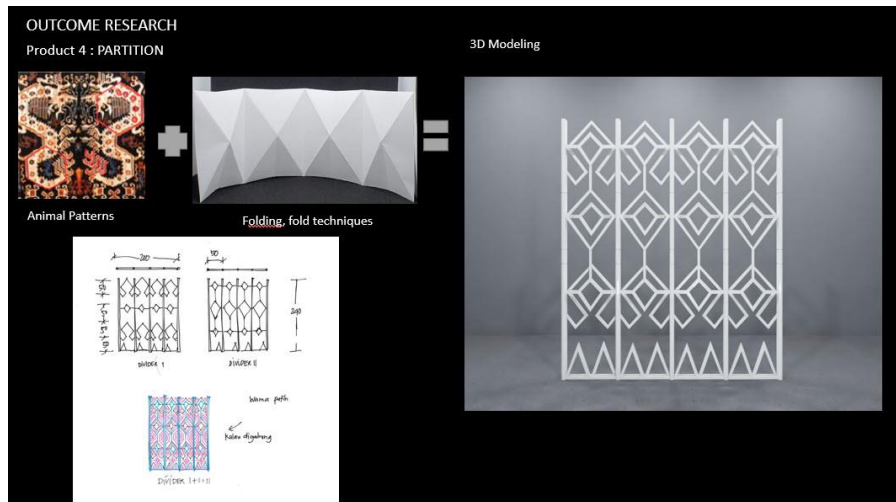


Figure 48. Partition design sketches



Figure 49. First Partition Sketch

The dragon is a mythological animal influenced by China. The East Sumba woven fabric pattern symbolizes courage, power, and authority. According to the meaning of the pattern, it fits perfectly with the partition wall, which has a function as a barrier to show authority in the room. The pattern on the partition is the result of analyzing the basic form of the original pattern so that the meaning can still be felt.

3.3.3.2 Chair Sketch Design

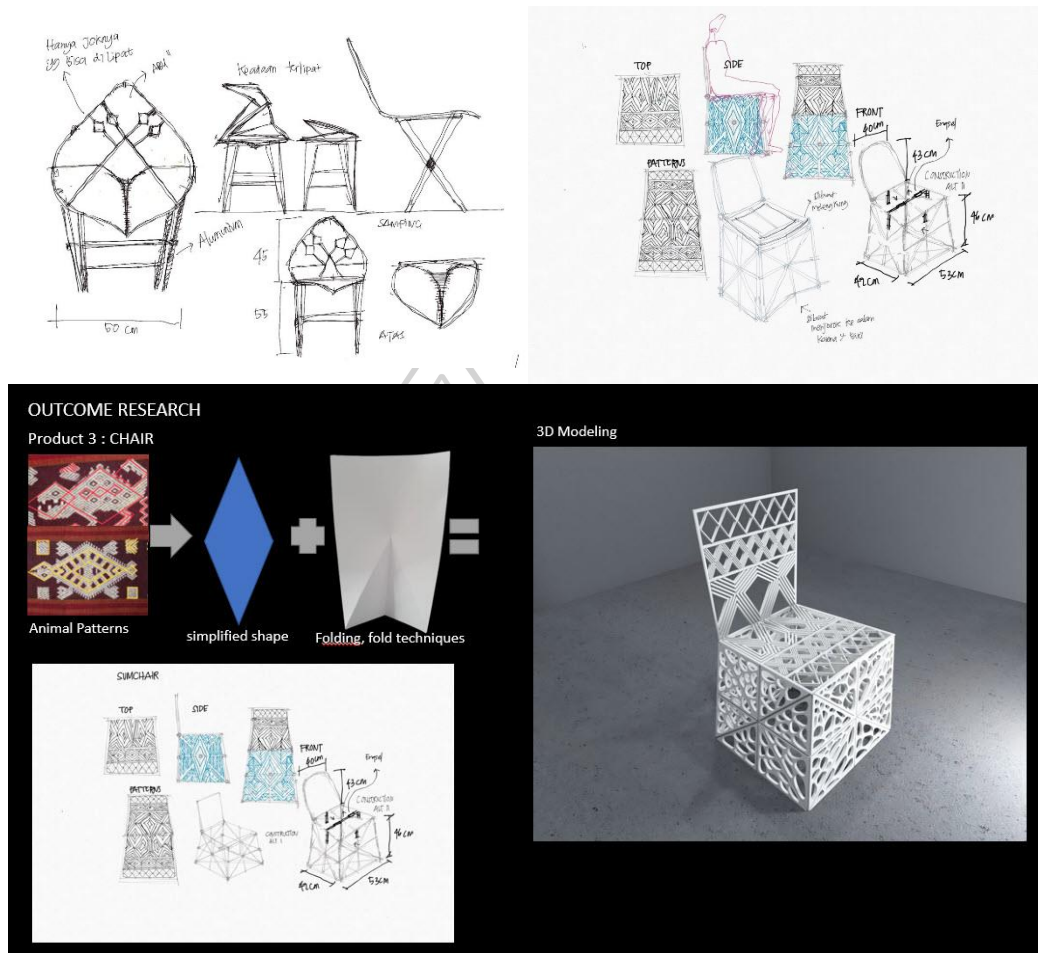


Figure 50. First Chair Sketch

Wuyarara Chair is a seating product commonly referred to as a chair. Wuyarara is the name of a region in East Sumba and means Crocodile, which is a symbol of royalty, nobility, and courage (for the King). By definition, a chair is a seat used to support a person in a seated position), especially, for one person, and usually has four legs for support and a backrest for the back²⁷. Based on this, the

meaning of the name Wuyarara and the function of a chair in general have a philosophical similarity. The chairs developed in this study are single seats.

3.3.3.3 Lamp Sketch Design

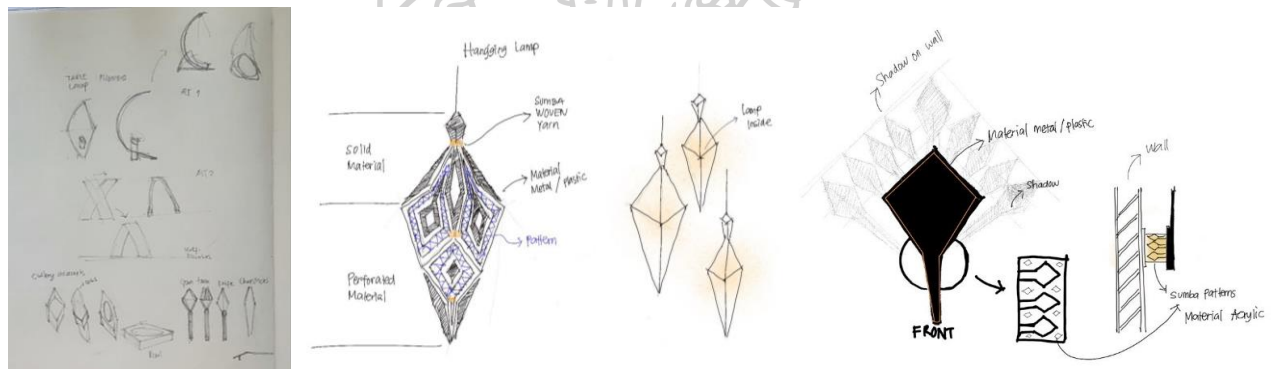
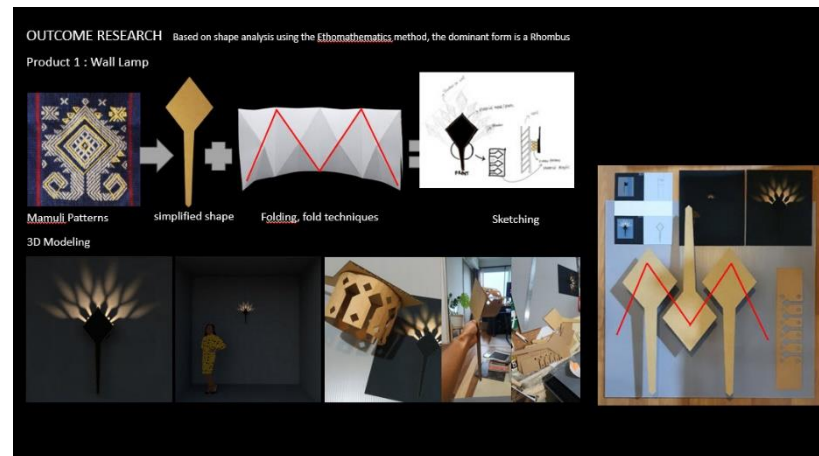


Figure 51. Lamp design sketch

This wall lamp is designed with the transformation of mamuli patterns with a rhombus shape and a system of repeated modules (repetitions) according to the characteristics of the patterns on the woven cloth of East Sumba and in the folding, fold paper experiment. the luminescence that forms the mamuli pattern, shadow and pattern will be better when this wall lamp is arranged repeatedly on the wall, so that people will enjoy a different atmosphere.

3.3.3.3.1 Hanging Lamp

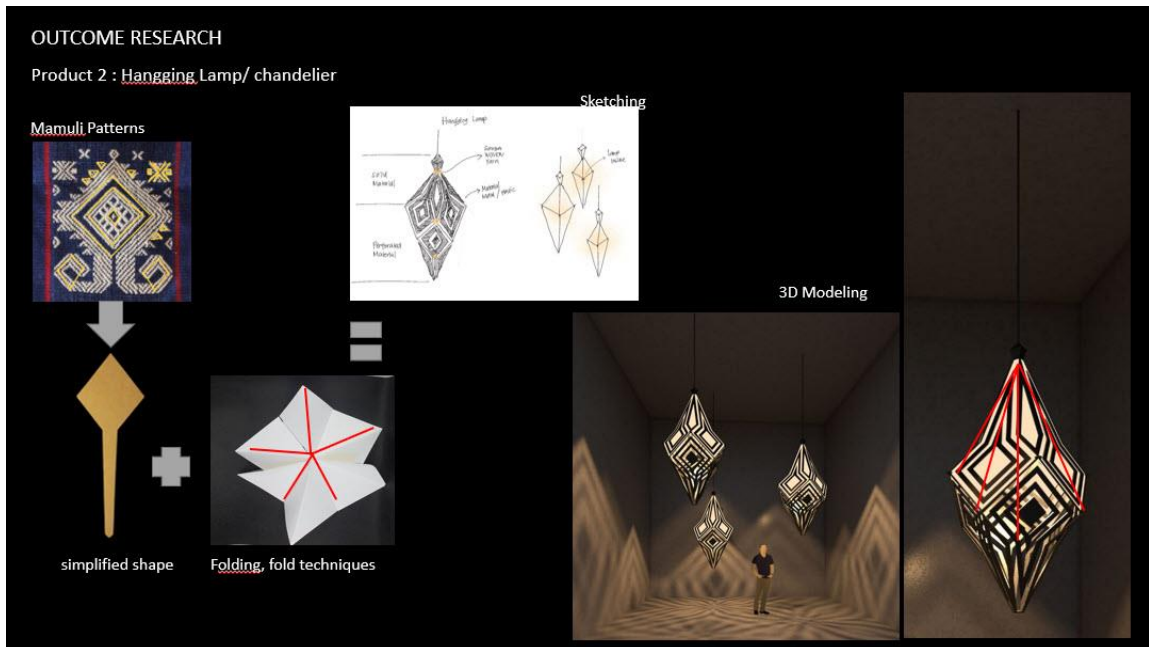


Figure 52. First Hanging Lamp

This chandelier is designed with the transformation of Mamuli patterns with a rhombus shape and a system of repeated modules (repetitions) according to the characteristics of the patterns on the woven cloth of East Sumba and in the folding, folding paper experiment - The novelty of this chandelier is seen in its large shape with repetition. The shape of a modern pattern that is arranged to enlarge and shrink, this chandelier will create a dramatic shadow by placing 3 chandeliers.

3.4 Questionnaire Expert, Designer and Student Arts and Design



"Interesting research,
and
new knowledge for me".



"Hopefully more and more designers will make Sumba ikat weaving as a derivative product, whether for fashion, interior design, etc. Without having to eliminate the main function of Sumba ikat weaving which is a local cultural heritage. My hope is that Teta will be consistent in using natural dyes."

Figure 53. left: Mrs. Chandra Kirana - Founder Sekar Kawung, Right Mr. Kornelis Ndapakamang - Maestro Woven Fabric Sumba

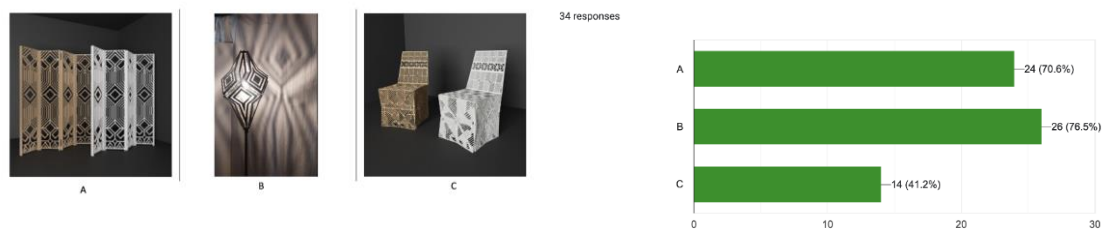


Figure 54 Questionnaires respondent's results

This questionnaire was distributed using Google Forms, and 34 respondents completed this questionnaire that we distributed in Sumba to specific respondent experts, designers, and student in art and design. The purpose of this questionnaire is to collect information about respondents' knowledge about Pattern Sumba in general and their opinion about the innovation of furniture products from this contemporary Pattern Sumba. The questionnaire is divided into four parts with explanations and questions: (1). Identity, (2). East Sumba Woven Fabric Pattern, (3) Transformation of East Sumba Woven Fabric Patterns into Design Products (Floor lamps, Chairs and Room Partitions).

This questionnaire suggests that the respondents are interested in knowing and learning more about batik. However, more than 76.5% of the respondents indicated that the floor lamp is most likely to reflect the patterns of East Sumba woven fabric and 70.6% of partitions were ranked second most likely to reflect the patterns of East Sumba weaves. Based on the results of the questionnaire, it is clear that the transforming Pattern Sumba into light, shadow, and shade is of great value to contemporary lamp design and warrants its further continuation and development. However, the development process still needs to consider the applicable meaning of Pattern Sumba.

Chapter 4

RESEARCH RESULT

4.1 Introduction

In this chapter, we will discuss the strategy and continuation of the design process explained in chapter three. In this phase, the researcher will use the Transforming Pattern Sumba to create contemporary lamp designs that play with light, shadow, and shade. This design process will be divided into three parts, each featuring three different types of lamps. Each part consists of three design phases: concept, process, and final design.

Designing contemporary product designs requires thorough observation and research. In this study, an ancient culture is included, which comes from the East Sumba woven cloth patterns, which have deep meaning in each pattern. The design of this product design is designed using contemporary materials and forms in accordance with the research results accompanied by paper folding experiments and movement innovations:

Contemporary Lamp Design Series:

1. *Kandunnu* Floor Lamp
2. *Karihu* Hanging Lamp
3. *NJara* Floor Lamp
4. *Habak* Table Lamp

The main focus of this study is on the lamp series as the primary product. The primary aim is to create a well-designed lamp that can produce light, shadow, and shade. The secondary goal is to fill the space with light, shadow, and shade, creating a unique atmosphere for users. The lamp's aesthetic value is twofold, encompassing both the physical form of the product and the light it produces.

This product design approach is a contemporary product in both form and material used, without eliminating the meaning of the East Sumba woven fabric pattern. Therefore, this product will have shapes, geometric patterns and also

innovative mechanical systems, the following is a description for each product designed:

4.2 Design Strategy

In this phase, the design and results are discussed on the basis of new concepts and knowledge. The strategy is to divide the design process into three parts. The aim is to prove that the results of this research not only have new value but are also flexible and applicable enough to be applied to different types of product and interior designs that are cultural, sophisticated, experimental, and contemporary. In this study the design will only focus on collections.

The first part is the transformation of the traditional Sumba pattern into the modern Sumba pattern from the results of exact geometry mathematics into a lamp collection inspired by the meaning of the philosophy contained in the traditional Sumba pattern, because the Sumba Pattern has a very deep meaning. Therefore, we consider it very important to apply contemporary Sumba patterns in light, shadow, and shade to contemporary lamp designs.

In the second part, an experimental approach was taken to the design of this series, focusing on light, shadow, shade, and modern technology in the form of luminaries. Light, shadow, shade, and technology in this lamp series aim to represent the form and meaning of a more modern Sumba pattern and the sustainability of preserving the Sumba pattern. This design shows that the Sumba pattern can be experimentally applied not only to fabric but also to artwork in three-dimensional form.

Part three focuses on the design of the lamp. To get rid of the impression that the Sumba pattern can only be used on woven fabrics and is only two-dimensional, it is necessary to design a lamp collection that looks more modern and aesthetic. This contemporary lamp series will show the target audience, namely the younger generation and professional designers as well as design students, that the Sumba pattern is actually flexible and can be applied in three dimensions. It is also ready to continue to follow trends and meet the needs of the creative industry, especially the product design and interior design industries.

4.3 Design Process for Transforming of the Sumba Pattern into Light, Shadow, and Shade for Contemporary Lamp Design

This section describes the proposed design process of making light, Shadow, and Shade for Contemporary Lamp Design from beginning to end which is divided into 6 stages as follows:

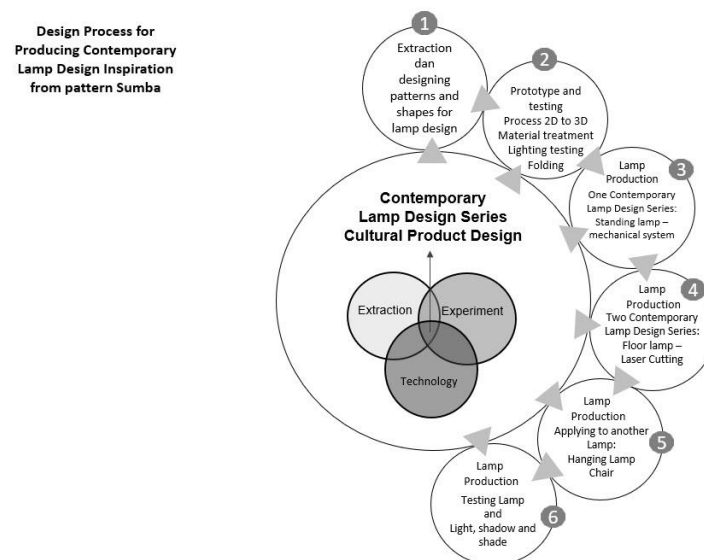


Figure 55. Design Process for Producing Contemporary Lamp Design Inspiration from pattern Sumba First phase

The first phase includes the introduction of patterns in Sumba woven fabrics and the exploration of the meaning and shape of Sumba fabric patterns, which are two-dimensional in one piece of fabric. The lamp design is inspired by basic geometric shapes that have been researched and extracted using the ethnomathematical method. At this stage, the pattern and three-dimensional shape of the lamp are designed based on traditional Sumba pattern research.

Second phase

In this phase, the shapes are explored with manual sketches and the cut are transferred to the digital plane with the help of Sketchup and AutoCAD. After designing modern patterns applied to different types of lamps, this modern pattern is kept as the main work as artifact documentation and becomes the prima donna in the creation of artworks.

Third, Fourth, Fifth phase

In this phase, relative modern patterns are created, which are then evaluated by using laser cutting with cardboard material. After the prototype is successful; we conduct research on the materials to be used for the final product. After the research and the decision we have made, we propose the use of stainless steel to give this work a contemporary and sophisticated impression.

Sixth and final phase

Modern shapes and patterns inspired by the Sumba Pattern and three-dimensional patterns are ready to be designed in different types of lamps according to the designer's creativity. The final result of this Sumba pattern is the Contemporary Lamp Design Series.

This design process was prepared based on the results of questionnaires with experts in Sumba woven fabric makers, observers of Sumba woven fabric preservation, and designers in Indonesia. 50% of the respondents stated that the product under the lamp best reflects the traditional Sumba pattern and also the light, as the shadow created a different atmosphere when it touches certain areas and reminds them of beautiful nature of Sumba.

4.4 Light, Shadow dan Shade Experiment into Lamp Design, and Questioner outcomes

The outcomes serve as the foundation for the design process of planning lighting products, the development of the Sumba traditional pattern experimental results from two-dimensional to three-dimensional using computer technology.

4.5 Contemporary Lamp Design Series

4.5.1 Color and Material Palette

The color palette and materials in this collection are inspired by contemporary colors that are popular and in demand today in the creative industry and among young people, namely the clean material style in the form of stainless steel with natural colors of stainless steel, other colors used are contemporary colors such as yellow, pink, and bright orange. As a dramatic accent we used a color temperature of 2700K (warm) which comes from the light generated by the spotlight.

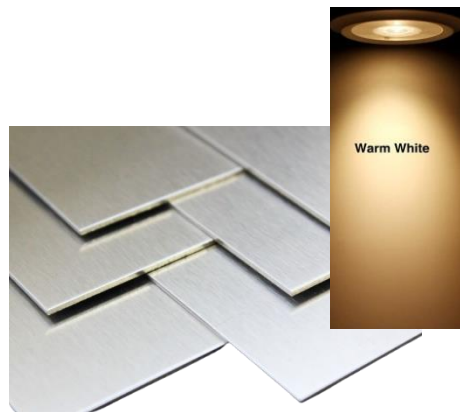


Figure 56. Color and material palette inspired by Contemporary style

The design process is divided into three parts to achieve different results or new possibilities by using three different lamp styles. It can be proven that the new Sumba pattern in lamp design can be flexibly applied to various types of designs, creating beautiful and dramatic lights and shadows.

4.5.2 Artworks One: *Kandunnu* Floor lamp

Contemporary Floor lamp is based on the *Mamuli* of Pattern Sumba. Artworks One design aims to design floor lamp by applying the light, shadow, and shade into contemporary lamp design.

4.5.2.1 Design Concept

Kandunnu is the name of a pattern that is woven in East Sumba and is a symbol of hope and star. It is designed by transforming the *mamuli* patterns, with a rhombus shape and repeated modules that are characteristic of the woven cloth patterns of East Sumba. The chandelier is a unique design that is created by experimenting with folding paper, and it is characterized by its large shape with repeated modern patterns arranged to enlarge and shrink. When used as a floor lamp, it creates a dramatic shadow.

The jewelry's fundamental design is inspired by *Mamuli* patterns, which are typical of Sumba Island. The shape of the jewelry resembles the uterus or female genitalia, symbolizing femininity, fertility, and honoring the status of women. In the traditional marriage customs of Sumba, *Mamuli* plays a crucial role as it serves as the

primary dowry and symbolizes reconciliation between men and women.. This pattern has a significant impact on the harmonious relationship between the bride and groom's families and signifies the highest respect for Sumbanese women. The metal jewelry is considered sacred and believed to be of celestial origin. Therefore, it is kept in places believed to possess divine power. (Kaka & Hidayat, 2021).

4.5.2.2 Design Process

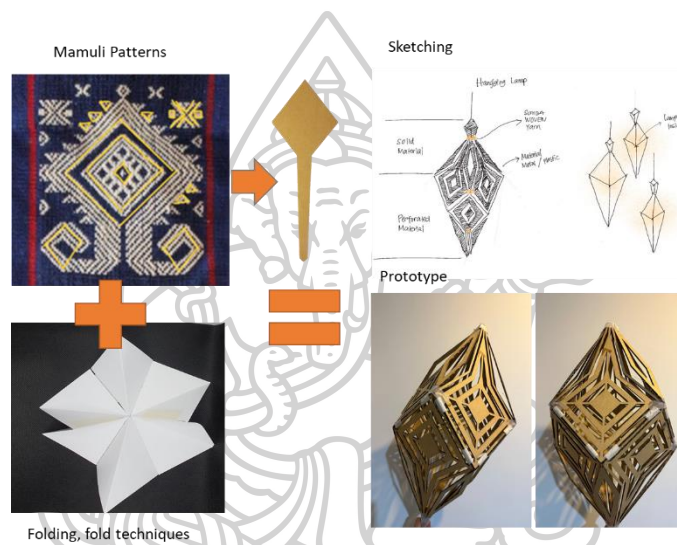


Figure 57. Design Process Modern Pattern Kandunnu Floor lamp


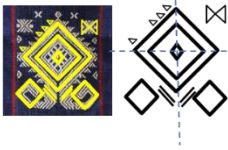
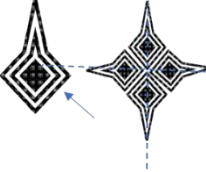
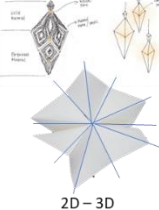
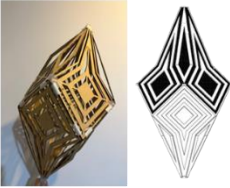
Original Patterns	Extracting Patterns	Redesign Patterns	Folding paper technique	3D Design
			 <p style="text-align: center;">2D - 3D</p>	

Figure 58. Design Process Kandunnu Lamp

The modeling above is a series of journeys in the process of forming works that refer to the mamuli pattern. The first stage is to find the basic pattern form with ethnomathematics and retain the rhombus shape. Then the rhombus shape is simplified and made contemporary with mathematical systems such as rotation,

mirroring, scaling, and repetition. In the next stage, the previous results are combined with folding techniques in a centralized form that is divided into several error planes to form a geometric rhombus pattern. The final stage is the final stage by combining the shape of the new pattern is combined with the 3-dimensional form, so that it becomes a new three-dimensional form through the composition of new patterns.

4.5.2.3 The Process Production of Kandunnu Lamp

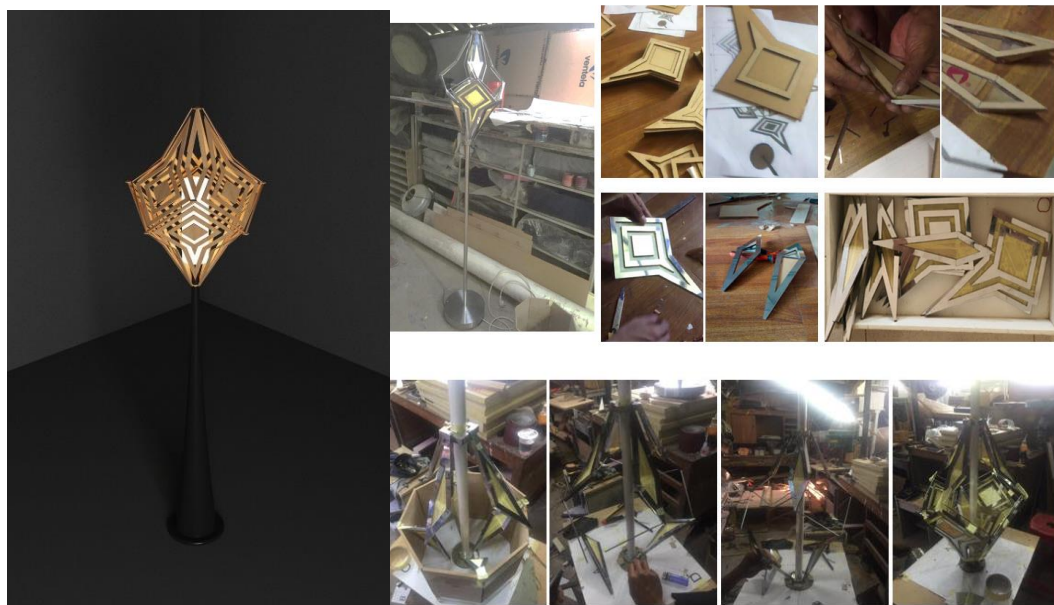


Figure 59. The Process production of Kandunnu Floor lamp

Techniques:

Create working drawings in the correct size and proportions.

Overlay MDF with a stainless steel plate.

Clamping acrylic with both pattern elements.

Making a frame with an iron frame so that the pattern elements can unite to form a diamond shape combining them into one piece.

The design, size and choice of materials for this lamp product create a contemporary innovative product design in the form of a floor lamp. Kandunnu Lamp (floor lamp) is very suitable for the living room, the workspace and as a supporting element of the room, giving the room its own characteristics and meaning.

4.5.2.4 Special Features

The Kandunnu floor lamp has a mathematical geometric light, shadow and shade with an elongated axis spreading out like a star shining into the universe. Light, shadow and shade have a continuity with one of the philosophical concepts called Sacred Geometry in the Three of Life category.

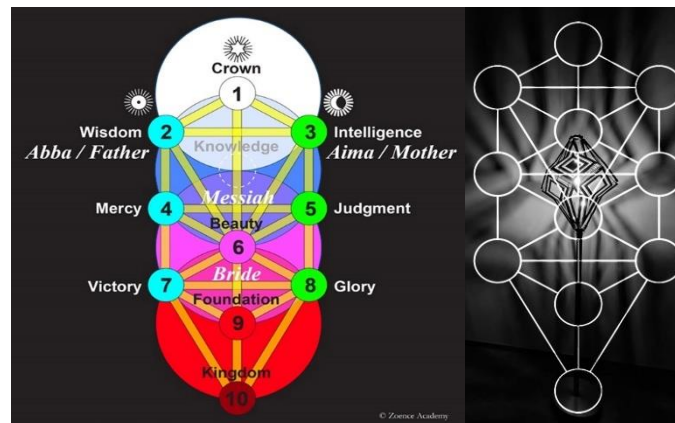


Figure 60. Special Features Sacred Geometry

Another feature of the Kandunnu Floor lamp is a technology called Blooming Flower System, in which the upper part of the lamp can be opened closed. You can see the Blooming Flower System used here at the following link:

<https://drive.google.com/drive/folders/1o8FbSfWEtKhFCjna2WnkRCpe57NCnr4Z?usp=sharing>

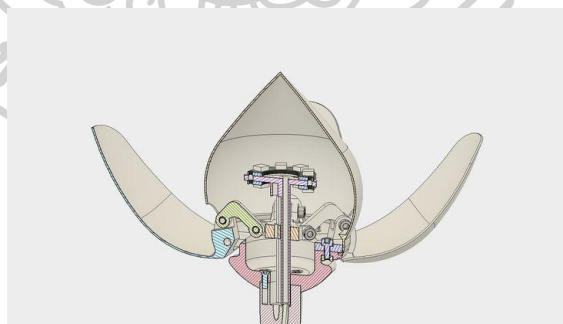


Figure 61. Blooming Flower system lamp

Source : <https://id.pinterest.com/pin/703406035521936268/>, 2023

4.5.2.5 Final Design





Figure 62. Kandunnu Standing in Lamp Light, Shadow, and Shade

4.5.3 Artworks Two: Njara Floor Lamp

The contemporary floor lamp is based on the crocodile patterns from Pattern Sumba. Artworks two design aims to design a floor lamp by introducing the light, shadow and shade into the contemporary lamp design.

4.5.3.1 Design Concept

The Njara pattern is a significant symbol of Horse and Greatness that is woven in East Sumba. It is based on the transformation of Crocodile patterns with a rhombus shape and a system of repeating modules or repetitions, which are characteristic of the patterns found on the woven cloth of East Sumba. The folding paper experiment adds novelty to this partition, and the crocodile-inspired pattern is simplified to suit modern tastes. The folding system in this partition enhances the value of the product.

This floor lamp draws inspiration from crocodile patterns (Wuya) that are regarded as symbols of magic, greatness, and influence. The Sumba people chose crocodile motifs for kings and queens as a royal symbol that represents courage (Australia, 2019)

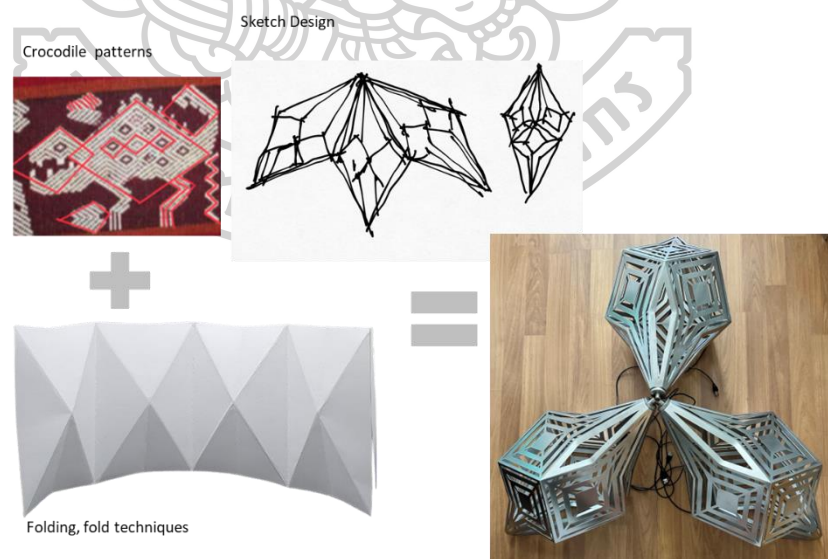


Figure 63. Design Process Modern Pattern Njara Floor Lamp

4.5.3.2 Design Process


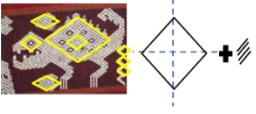
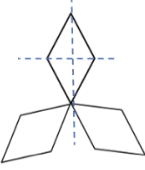
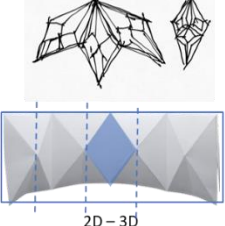

Original Patterns	Extracting Patterns	Redesign Patterns	Folding paper technique	3D Design
				

Figure 64. Design Process Njara Floor Lamp

The modeling above is a series of journeys in the process of forming works that refer to the Crocodile pattern. The first stage is to find the basic pattern form with ethnomathematics and keep the rhombus shape. Then the rhombus shape is simplified and made contemporary with mathematical systems such as rotation, mirroring, scaling, and repetition. In the next stage the previous results are combined with folding techniques in a centralized form that is divided into multiple fault planes to form a geometric rhombus pattern. In the final stage, the shape of the new pattern is combined with the 3-dimensional form, so that it becomes a new three-dimensional form through the composition of new patterns.

4.5.3.3 The Process Production of Njara Floor Lamp

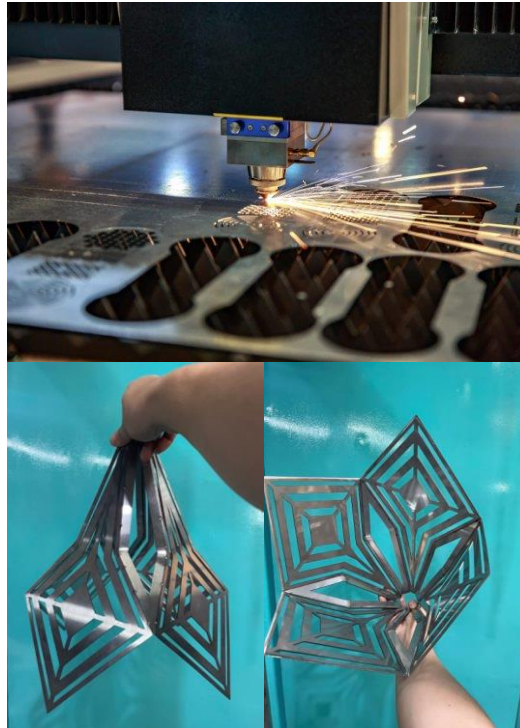


Figure 65. The Process Production of Njara Floor Lamp

The concept of the Njara floor lamp was inspired by the Crocodile Pattern, which has been simplified to make it more contemporary. The lampshade consists of a folding system that is folded to create a diamond-like shape (see image above). The combination of MDF wood and stainless sheet metal creates a new and modern design.

Techniques:

Create working drawings in the correct size with the correct proportions.

Laser cutting with stainless steel sheet.

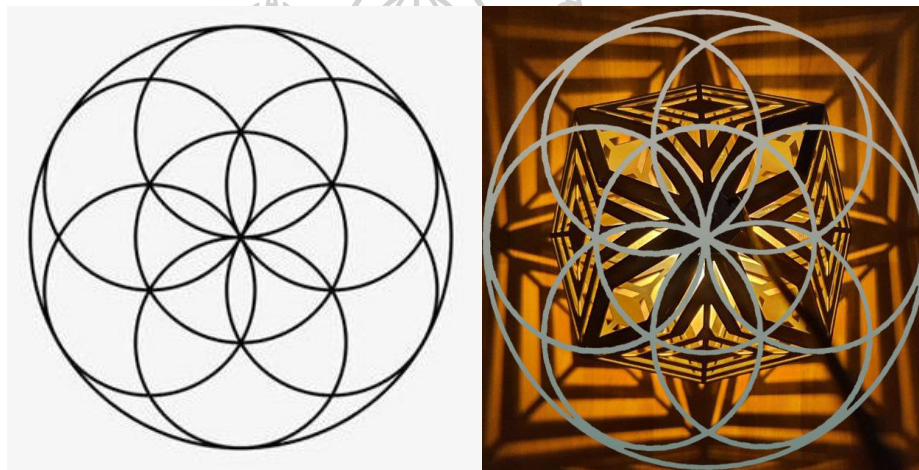
Installing a joint.

Making a frame with an iron frame so that the pattern elements can unite to form a diamond shape. Combining them into one piece.

4.5.3.4 Special Features

The Njara Floor Lamp has a mathematical geometric light, shadow and shade whose arrangement is inspired by folding paper and also the sacred geometry called the flower of life represents creation, interconnectedness, unity, oneness, and duality. Looking at the position of the lamp, which we can move manually, and the light, shadow, and shade created by the lamp light, which reflects different geometric patterns, with the same composition as the sacred geometry of the flower of life, it is hoped that the Njara Floor lamp can create a good atmosphere for every user.

Figure



66.

Special Features Sacred Geometry in Njara Floor Lamp

4.5.3.5 Final Design



Figure 67. Njara Floor Lamp Final Design

Figure 68. Njara Floor in Lamp Light, Shadow, and Shade

4.5.4 Artworks Third : Habak Table Lamp

Contemporary table lamp is based on mixing several Sumba patterns along with enhancer patterns in one table lamp body. Artworks third design aims to design table lamp by applying the light, shadow, and shade into contemporary lamp design.

4.5.4.1 Design Concept

Habak is a name of the pattern woven East Sumba, which is a symbol of Star and Hope with the transformation of Habak pattern with a rhombus shape and a system of repeated modules (repetitions) according to the characteristics of the pattern on the woven cloth of East Sumba and in the folding, folding paper experiment

The novelty of this table lamp is seen in its large shape with repetition The shape of a modern pattern that is arranged to enlarge and shrink, this chandelier will create a dramatic shadow.

The Habak table lamp draws inspiration from Rooster patterns, symbolizing unity and leadership. If the chicken is a rooster, it also represents masculinity. The Rooster motifs are a symbol of alertness, as they crow before sunrise and wake people up in the morning. They are also a symbol of masculinity, signifying life and a protective leader. Roosters are bred for use as sacrificial animals in traditional Marapu rituals (Australia, 2019).

4.5.4.2 Design Process

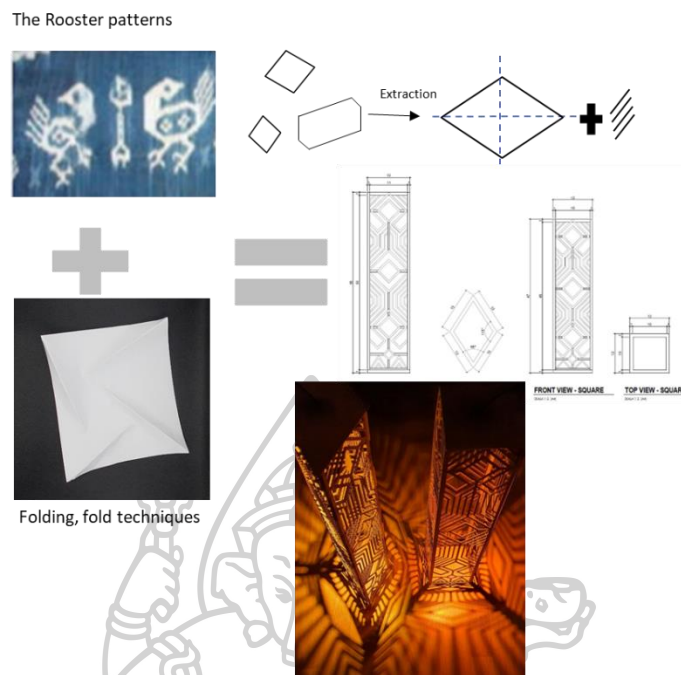


Figure 69. Design Process Modern Pattern Habak Table Lamp



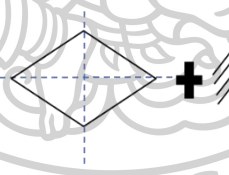


Original Patterns	Extracting Patterns	Redesign Patterns	Folding paper technique	3D Design
			 <p>2D - 3D</p>	

Figure 70. Design Process Habak Table Lamp

The process described above involves creating works that are based on the Rooster pattern. The first step is to identify the basic pattern using Ethnomathematics and maintain its rhombus shape. Then, the rhombus shape is simplified and made contemporary by incorporating mathematical systems like rotation, mirroring, scaling, and repetition. In the next stage, the previous results are combined with folding techniques to create a centralized form that is divided into several fault planes, thereby forming a geometric rhombus pattern. Finally, the shape of the new pattern

is combined with a three-dimensional form to produce a new three-dimensional composition.

4.5.4.3 The Process Production of Habak Table Lamp



Figure 71. The Process Production of Habak Table Lamp

The Habak table lamp was created with inspiration drawn from the Crocodile Pattern. This inspiration has been simplified to give the lamp a more contemporary look. The lampshade has been made using a folding system that creates square fabric shapes (as seen in the image above). The lampshade is composed of stainless sheet metal plates that help give it a new and modern design.

Techniques:

Create working drawings with the correct size and proportions.

Laser Cutting with stainless steel sheet.

Installing a joint.

Making a frame with an iron frame so that the pattern elements can unite to form a diamond shape Combining them into one piece.

4.5.4.4 Special Features

Habak is a table lamp inspired by Sumba patterns located in a field, just like the traditional Sumba pattern, which is made of a fabric. Habak has different sizes and shapes one with the shape of Rhombus, one with a square shape, with the aim of creating different shapes of light and shadow and it turns out that after experimenting, the results produced are very different. Other special features Habak was designed according to the Cosmos theory of traditional Indonesian houses, in where the upper part represents human's relationship with God, the middle represents the human world, and the lower part represents the afterlife.

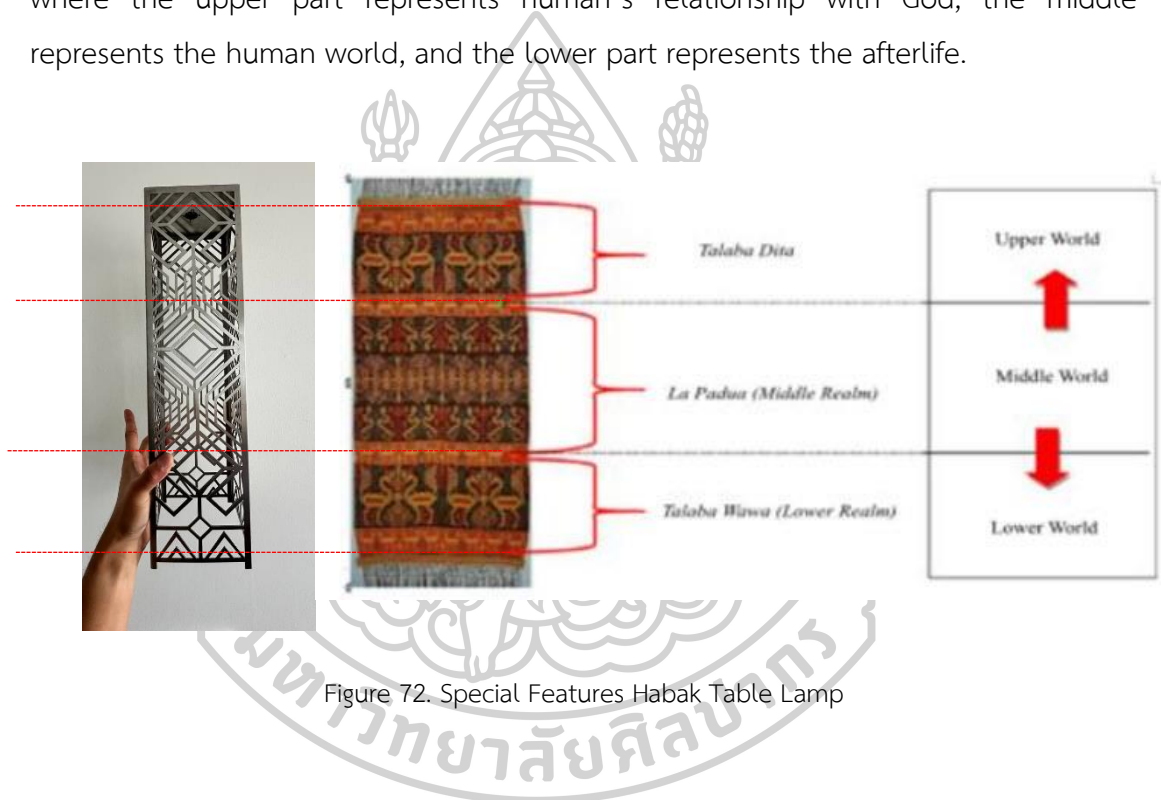
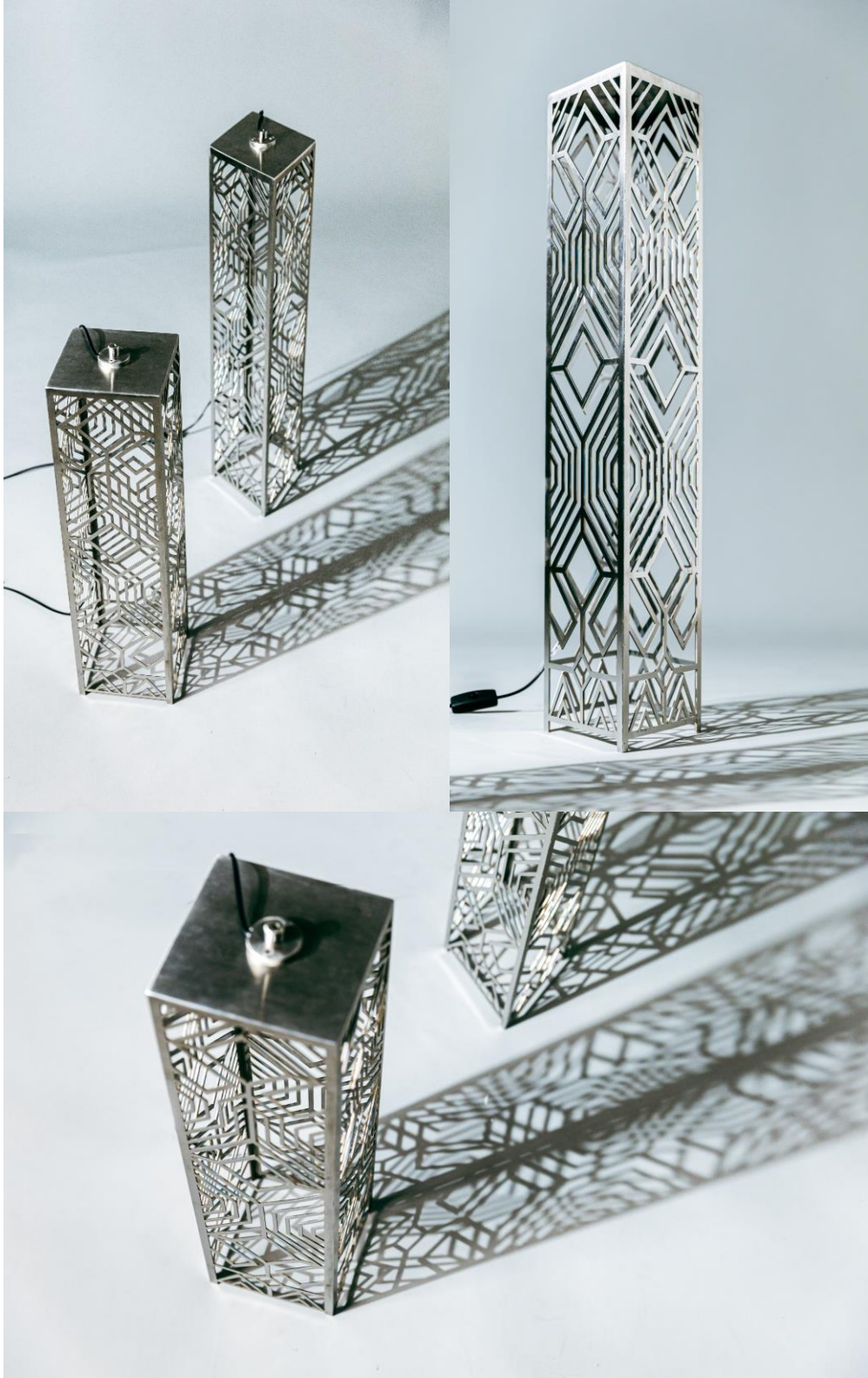


Figure 72. Special Features Habak Table Lamp

4.5.4.5 Final Design





4.5.5 Artworks Fourth: Wuyarara Chair

Contemporary Chair is based on Turtles patterns the of Pattern Sumba. Artworks two design aims to design Chair by applying the light, shadow, and shade into contemporary lamp design.

4.5.5.1 Design Concept

Wuyarara Chair is a seating product that is commonly referred to as a chair. Wuyarara is the name of a region in East Sumba that means Crocodile, which is a symbol of royalty, nobility, and courage (for the King)

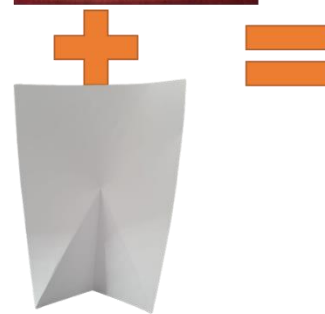
This chair was inspired by the motifs of East Sumba woven fabrics, which were analyzed using the ethnomathematical techniques described in a previous article. The revival of these motifs has shifted from traditional forms to simpler and cleaner contemporary forms. The basic geometric shape of a rhombus is visible in the Wuyarara Chair design, along with the repetition and mirror systems. This pattern reveals the basic principles that are implemented in the East Sumba woven fabric motifs. It can be concluded that the icon element has been revived in its form, but not in its original meaning or system. Turtles Patterns symbol of the queen in the kingdom (Ratu Karawulang). The turtles Patterns (karawulangu) are similar to the crocodile motif in that they both represent wisdom and greatness (Australia, 2019)

4.5.5.2 Design Process

Tortoise patterns



Sketch Design II



Folding, fold techniques



Figure 74. Design Process Modern Pattern Wuyarara Chair

The modeling above is a series of journeys in the process of forming works that refer to the Turtles pattern. The first stage is to find the basic pattern form with ethnomathematics and keep the rhombus shape. Then the rhombus shape is simplified and made contemporary with mathematical systems such as rotation, mirroring, scaling, and repetition. In the next stage, the previous results are combined with folding techniques in a centralized form which is divided into several fault planes to form a geometric rhombus pattern. In the final stage, the shape of the new pattern is combined with the 3-dimensional form, so that it becomes a new three-dimensional form through the composition of new patterns.

4.5.5.3 Special Features

A special feature of the Wuyarara Chair is a technology called Folding Flat System, which allows the chair to be folded flat and transported easily. You can view the Folding Flat System used under the following link:

https://drive.google.com/drive/folders/1909F38zXh5aBsOvfayA-AePg_OHrsIGr?usp=sharing

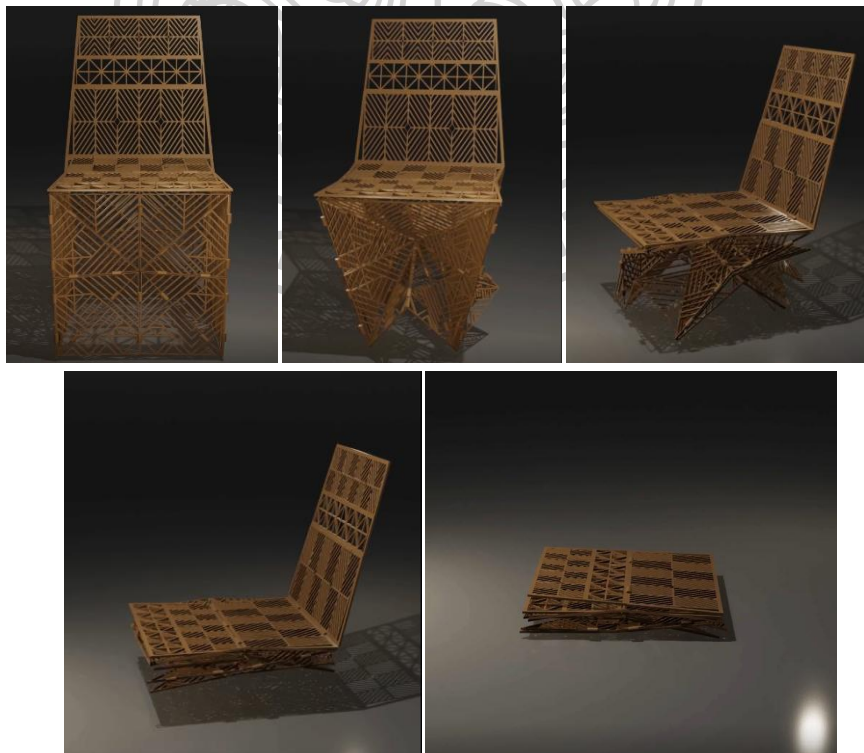
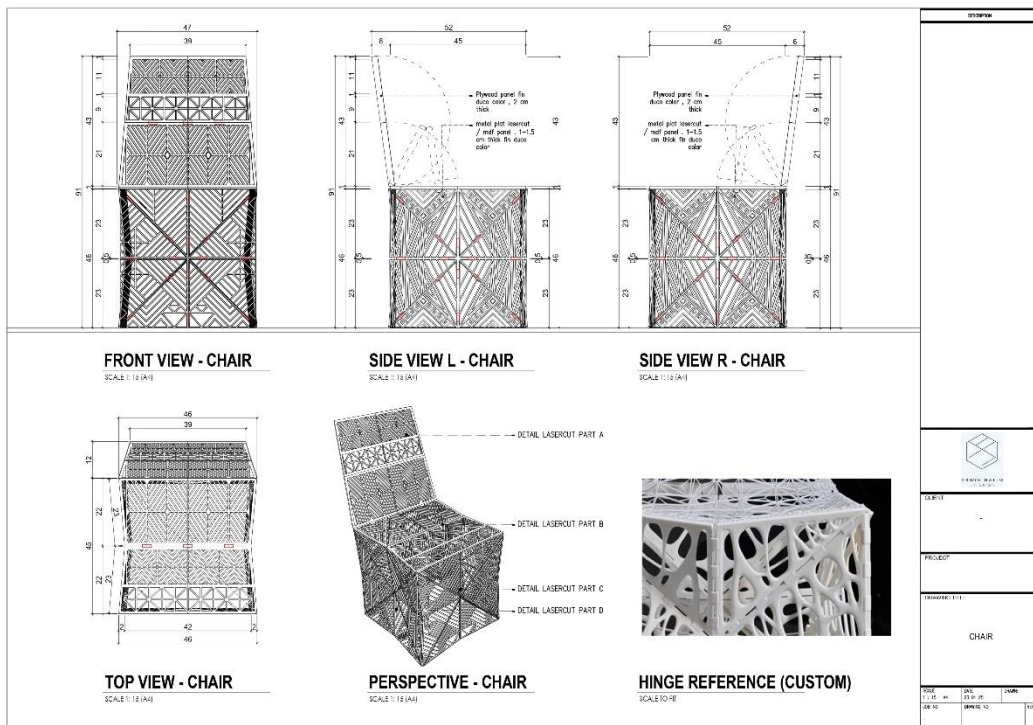


Figure 75. Special Features Wuyarara Chair

4.5.5.4 Final Design



Figure 76. Wuyarara Chair Final Design



Chapter 5

CONCLUSION AND SUGGESTIONS

This research aims to contribute to the history of the Sumba pattern and the creative industries, especially in Sumba, by focusing on the sustainability of Sumba pattern preservation and then developing creative concepts based on traditional Sumba values and culture. Creative concepts are developed to design, transform Sumba patterns into Light, Shadow, and Shade on contemporary lamp designs, both real and unreal values. This practice aims to develop methods to transform cultural values into contemporary works and create new modern patterns for light, shadow, and shade in lighting products. The researchers have been researching pattern, ethnomathematics and Sumba since 2019.

5.1 Research Summary

The purpose of this study led to the following two results:

1. The transforming of East Sumba fabric patterns make a contemporary design product that retains the characteristics of East Sumba woven fabric patterns and create new furniture styles by applying folding techniques combined with motion technology. And the most importantly design product innovations in the form of lamps, tables, partitions, and chairs can provide alternative products to the East Sumba Tribe and maintain the sustainability of East Sumba woven fabric patterns as Indonesia's cultural heritage that can compete in the international world.

2. Propose the IMO Method as the IMOE Method, where this method translates cultural artifacts or cultural traditional products into innovative contemporary design products that are viewed from the Inner, the Middle, the Experiment, and the Outer so that contemporary design products have good selling points without losing the meaning of East Sumba woven fabric patterns.

The following are the responses and research results from the Research Objective, as follows:

5.1.1 Response to research objective 1- To Investigate the Nich of Patterns East Sumba Woven Fabrics

To promote and preserve a sustainable culture of East Sumba woven fabric patterns, the support of various parties; government, community, and academia is needed. Therefore, systematic research and the development of patterns for East Sumba woven fabrics are needed. East Sumba woven fabrics have been widely discussed in the form of fabric products and applied in fashion, but East Sumba fabric patterns have not been researched, so only patterns that are used for contemporary product design are developed, so this research is a real novelty and provides answers to sustainability problems and so that the patterns of East Sumba woven fabrics can be liked by generation Z. According to previous research, besides the pattern in East Sumba fabrics, the fabric has sacred value and a very important philosophy and is closely related to the life and beliefs of the Sumba tribal pattern .

The Hinggi pattern is depicted symmetrically, and is divided into three parts, namely the upper, middle, and lower planes. This follows the principle of mirroring in Sumba woven fabric. A key principle in the composition of the East Sumba Ikat pattern is the division of the fabric surface into three ambivalent fields. This feature demonstrates the relationship between the fields: top, middle, and bottom (Soeriadiredja, 2013). The Cosmos Division in Hinggi Ikat Weaving, East Sumba, is described as follows: Hinggi patterns are figurative groups inspired by the environment and local culture and encompass images of living creatures (humans, fauna and flora) as well as natural objects such as jewelry artifacts. The group of schematic patterns, or patterns with an openwork base, consists of abstract patterns derived from local concepts and influenced by external sources (Indian, Chinese, Portuguese, and Dutch). The category of foreign-influenced themes includes ecocultural patterns from regions outside East Sumba, particularly India, China, Portugal, and the Netherlands. The Patola Ratu pattern, which is meant to cover the surface of the fabric, together with figurative, schematic, and foreign-influenced patterns, reflects the influence of India (Anas, 2007). The Hinggi pattern is classified

into two groups separated by an intermediate geometric pattern path. The central pattern encompasses figurative patterns that shows both local and the foreign-influence patterns replace the central pattern, often in a larger size (Anas, 2007). The study shed the light on the process of transferring traditional patterns of East Sumba woven fabric and the design of contemporary products from a cross-cultural perspective, as a strategy to enhance new designs and products. Ultimately, valuable guidance was also provided for designers who aim to create cross-cultural contemporary products.

The characteristics obtained from the analysis of Sumba woven fabric patterns using Ethnomathematics are as follows:

Characteristic 1:

1. The Dominant Geometric Form is:
2. Rhombus Shape
3. Zigzag Line
4. Connected Line
5. The Dominant System is:
6. Repetition
7. Mirroring

Characteristic 2:

Reflecting eco-cultural pattern from regions beyond East Sumba area, particularly India, China, Portugal, and the Netherlands.

5.1.2 Response to research objective 2- To Experiment with Light, Shadow, and Shade the Patterns Of Woven Fabric East Sumba for Contemporary Lamp Design.

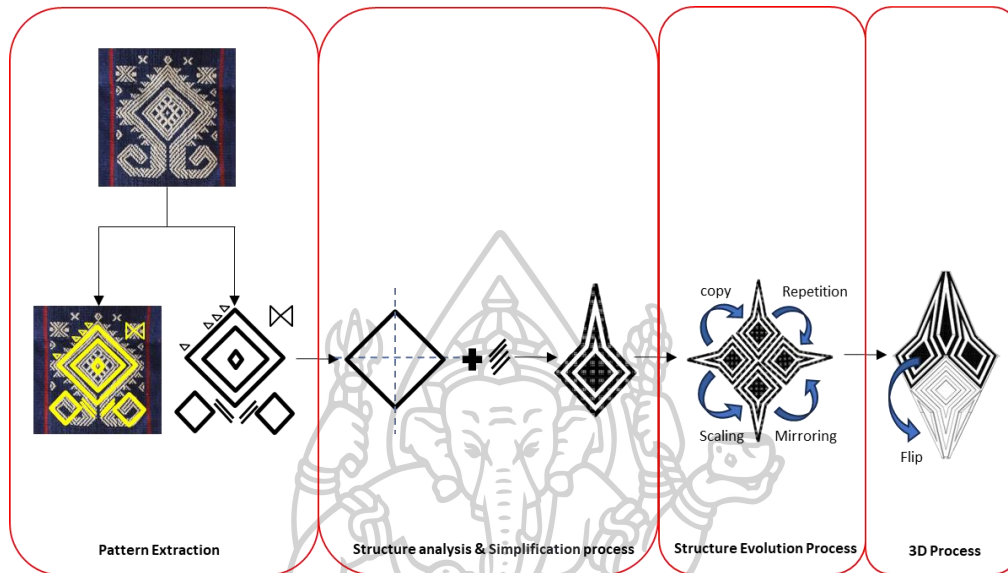


Figure 77. Diagram Transforming two dimension to three dimensions

In previous research, many methods have been used as a reference for the design of modern products inspired by traditional cultural products of a country. Therefore, this research retains the characteristics of the East Sumba woven fabric pattern. This research first uses the ethnomathematical method by using the basic pattern on the East Sumba woven fabric pattern with the basic mathematical pattern is geometry with the results of the resulting analysis is that there are geometric fields such as Rhombus, zigzag lines and connected lines with mathematical systems such as repetition and mirror which are then experimented with folding paper is inseparable from the translation process using the IMO method.

Through this research process, it was found that the results of this study show that the East Sumba woven fabric pattern was obtained from ethnomathematics and folding techniques, so that it not only retains the structural characteristics of traditional woven fabric patterns, but also has innovation and uniqueness that can

not only be applied to fabrics, but can now be applied to contemporary products and provide new ideas for sustainability and innovation design of traditional patterns.

5.1.3 Response to research objective 3 - To Create the Contemporary Lamp

Design Based On Patterns Woven Fabric of East Sumba

The pattern and extraction process of the geometric patterns obtained are 2-dimensional formations that exist in East Sumba woven fabrics to obtain a 3-dimensional impression to achieve innovative contemporary shapes. The research combines folding paper techniques as a tool to transform two-dimensional shapes into contemporary shapes of design products. The East Sumba woven fabric pattern is the basic structure and philosophy in the design of contemporary products. When evaluating the application of the pattern it is known that 76% of respondents agree that the pattern of East Sumba woven fabric can be seen in contemporary products in the form of lamps, partitions, tables, and chairs. In developing the pattern, the design is simplified to make the shape and style simpler and more contemporary so that it can be accepted by society and today's generation Z.

The main methods used in this study are extraction, simplification, and reorganization. Then the second step of the pattern is combined with experimental folding techniques to find new shapes inspired by various existing works, metallic, or silver colors represent contemporary impressions and rapidly developing technology. Geometric shapes especially rhombus, triangles, and repeating systems, mirroring, scaling of fold line and movable folding systems are part of the new patterns designed as contemporary product design structures.

For Patterns Woven Fabric East Sumba, the design processes of transforming 2D patterns into 3d product design models are summarized as follows:

Floor lamp and Table Lamp:

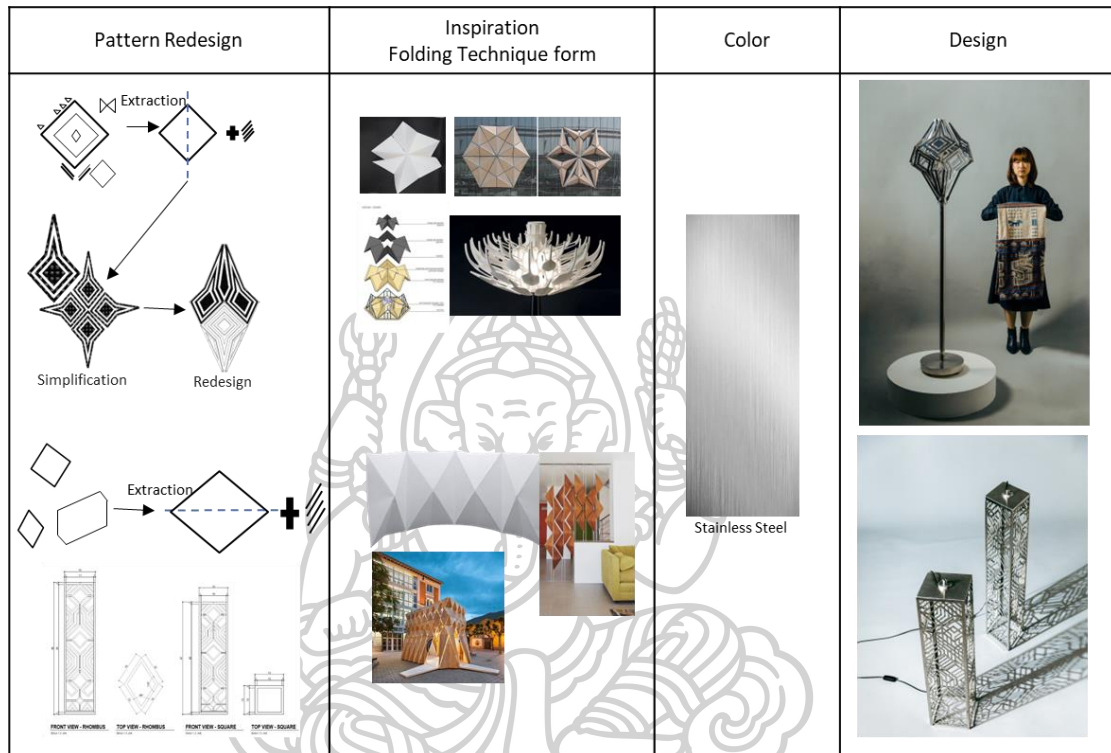


Figure 78. Design processes of transforming from 2D patterns to 3d

After distributing questionnaires to the public and analyzing 34 questionnaires on the public's satisfaction with the effects of applying East Sumba woven fabric patterns on furniture, it was proved that there were 76 respondents (academics and designers) indicated that the East Sumba woven fabric pattern was already used in the 4 products made and were also satisfied with the folding system applied on furniture. This proves that the method proposed in this study is very innovative and unique. Moreover, the IMOIE Method develops students and designers applying cultural artifacts to contemporary products. Applying patterns to contemporary furniture through this method not only helps people to better understand the culture and art of East Sumba woven fabric patterns, but also inspires them to pay more attention to the values of cultural art and add more value to contemporary products.

Chair and Floor Lamp:

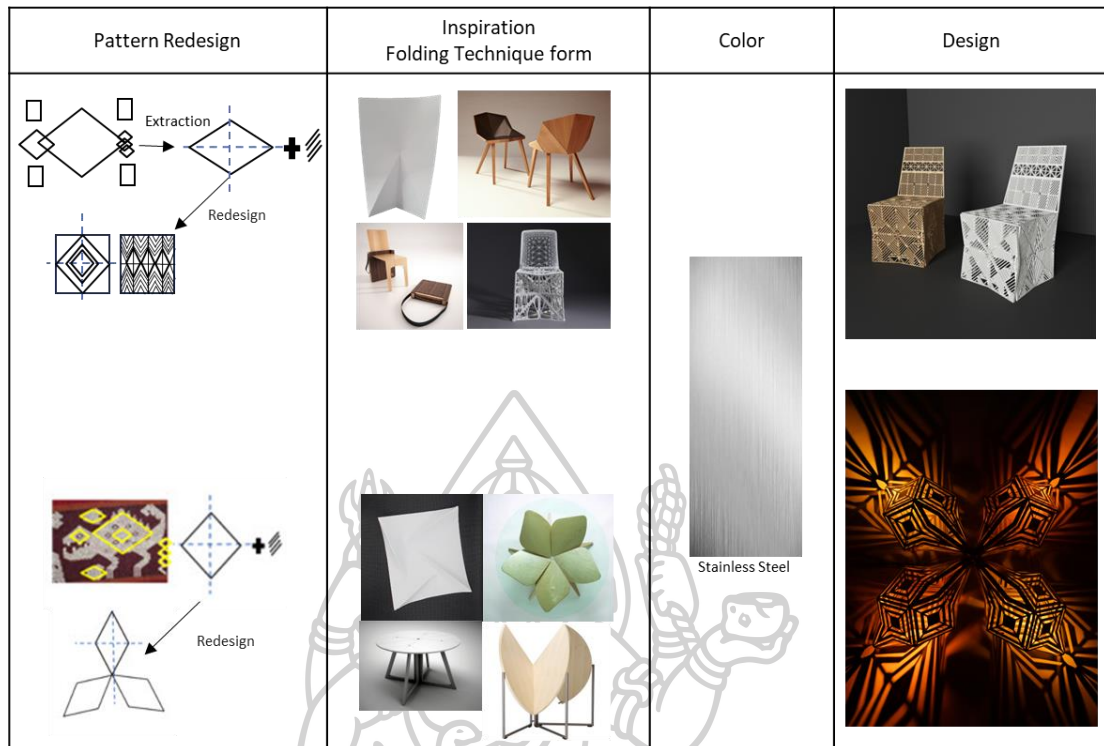


Figure 79. Design processes of transforming from 2D patterns to 3d

It can be concluded that the folding technique method used to convert 2-dimensional patterns into 3-dimensional patterns has succeeded in creating creativity, remaining functional and esthetically well combined.

5.1.3.1 The second result of this research is the development of IMO Method by Leong & Clark (2003) into IMO Method

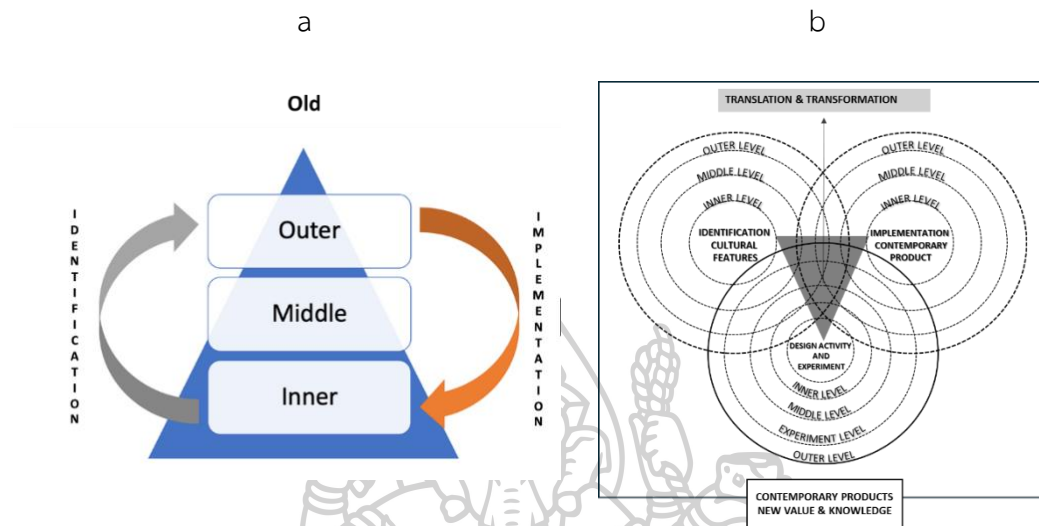


Figure 80. a. Old Diagram IMO Method, b. New Diagram IMO Method

5.1.3.1.1 IMO Method (Old)

The IMO method serves as a means of translating cultural elements into design elements, formulated by Leong & Clark (2003), with an ethnomathematics approach. This method was modified based on an article titled "Transforming Local Culture into Contemporary Product Design using the IMO Method" (Gumulya & Meilani, 2022). The table below presents the concept of IMO within the context of culture and features of contemporary design.

The table above highlights that the inner element represents abstract cultural aspects, and the middle element encompasses broader cultural behaviors, while the outer and experimental elements provide designers with effective flexibility in interpreting cultural elements from the inner and middle layers. CPD is expected to be innovative and create a meaningful connection between local cultural and contemporary design elements that creates uniqueness and significance.

5.1.3.1.2 IMO(E) method (New)

This adaptation required a research framework with the following phases as per previous investigations, in order to enhance the potential for more meaningful and innovative CPD.

- Outer Level: In this study, the focus was on analyzing tangible cultural elements such as form, color, material, pattern, detail, and style. These components were observed in various artifacts, traditional architecture, traditional dances, clothing, textiles, and traditional jewelry. Ethnomathematics was used to analyze patterns during the initial phase of identification..
- Middle Level: The analysis encompassed aspects such as function, use, behavior, and cultural habits related to these elements.
- Inner Level: During this phase, we analyzed elements such as values, beliefs, and cultural philosophies.
- Experimental Level: The designer's contemporary work was created by tracking each step.

5.2 Discussion

5.2.1 Aesthetic and effect of light on perception of beauty

Lighting has both technical and artistic aspects. The artistic aspect of lighting is decisive for the perception of beauty. Aesthetic is a branch of philosophy that deals with concepts such as beauty and ugliness. It helps us to better understand objects and environments and can change our perception of them. For centuries, philosophers and artists have considered Aesthetic to be either natural or geometric (man-made). Since the eighteenth century, philosophers have considered Aesthetic from a more psychological and individual perspective. The esthetic value of an object can be perceived when this object is presented to the viewer as an independent entity and stimulates him to perceive its beauty. Light is a means to this end and ensures visual communication between the viewer and the surroundings. It is light that makes objects visible to people and enables them to

perceive their environment and their elements. This is necessary to perceive the beauty of an object (Volf, 2010).

Based on the definition of beauty in Aesthetic and the effect of light, lighting plays a role in the perception of the beauty and esthetic value of an object and light is a means of visual communication between the viewer and his surroundings. Therefore, every pattern, every three-dimensional shape created from the incorporation of a new pattern and then combined with the technology of the lamp must have and create a real and intangible esthetic meaning and value for the creator, and the viewer.

5.2.2 Aesthetic Arts as Form

Aesthetics is a branch of philosophy that questions art and beauty so that beauty can be interpreted as art having beauty in both form and composition. Thus, in order to successfully create a contemporary lamp design, the design must combine form with cultural meaning; Pattern Sumba conveys spiritual meaning through various forms of symbols, according to aesthetics and effects in Light, which is a communication between the person who sees and the situation around him. The beauty of light, shadows and shades in contemporary lamps results from the arrangement of shapes, patterns and colors deliberately shaped by designers. Therefore, the new shapes and patterns in contemporary lamps must have tangible and intangible meanings for creators and viewers (Ross, 1994).

5.2.3 Aesthetic Arts as Experience

According to Alexander Gottlieb Baumgarten , the renowned German philosopher, aesthetics deals with the concept of beauty and is often referred to as the philosophy of beauty (MAZZOCUT MIS, 2020). Aesthetics can be experienced through both sight and touch. When an individual gazes at or listens to an object and feels content, they can appreciate, perceive, and relish its aesthetics. Therefore, contemporary lamp designs incorporating light, tires, and shades can offer a unique experience and flavor to those who appreciate Sumba patterns and use lamp

products as artistic pieces. This can introduce a new aesthetic experience to someone's life, which is felt and enjoyed through the interplay of light, shadow, and shade of the lamps. These elements form visual and spiritual aesthetics, while the Sumba patterns modernize and take on a complete three-dimensional form (Mirbach, 2009). The research findings indicate a changing pattern in East Sumba.

5.3 Main Findings

The Study results is a transforming pattern of East Sumba woven fabric where this research analyzes the type, characteristics, and culture of the artifacts as into inspiration and creates new contemporary forms, so the ethnomathematical method becomes very useful in moving from tradition to the present.

Based on ethnomathematics and the IMOIE method, this research provides the latest innovations inspired by the Sumba pattern, so that this pattern not only preserves the characteristics and meaning of the East Sumba woven fabric pattern but also creates innovation and uniqueness for contemporary product designs inspired by traditional artifacts.

In this study, experimental paper folding techniques by Paul Jakson was used to transfer patterns into a three-dimensional form. It not only helps to give a three-dimensional shape but also makes contemporary product design more meaningful with case studies of floor lamps, partitions, tables, and chairs, giving a new, constructive shape to product design. It can be concluded that this folding paper succeeded in adding more value to the research process

From the results of this research, the outcome is also come in the form of contemporary design products that are not silent products but furniture that lives with folding techniques and above all, this product is not an ordinary product, but a cultural product (CDP) that is full of cultural values

In conclusion, East Sumba woven fabric can be compared to a painting, in which each fabric sheet is distinctive and holds significant artistic value through its originality and ancestral importance (Prijosusilo, 2017). This study successfully developed the IMOIE design method and the production of Kandunnu lamps, which transformed local culture into contemporary products. The essence of this

innovation lay in incorporating the Experimental Level and supplementary indicators in the design process, encompassing both the Inner and Outer Levels. This integration led to new innovations within the process of designing contemporary products. The methodical approach and process employed in designing the Kandunnu floor lamp could elevate East Sumba woven fabric, particularly the Mamuli pattern, to a global stage. It could also aid the Sumba tribe, not only in fabric production but in crafting various contemporary products in the future. pattern of the East Sumba woven fabric is a unique cultural heritage of Indonesia. This research was carefully designed and developed using the IMO method with inspirations from the Inner, Outer, and essential addition of the Experimental level. The results show that local cultural inspiration can influence design performance and creativity. These various levels play a crucial role in effectively transforming the local cultural features and contemporary product features into new and meaningful work. Therefore, it is imperative to prioritize the comprehensive exploration of cultural features serving as inspiration, and the experimentation process proves to be highly conducive to the creation of cultural products.

5.4 Suggestions and Recommendations

5.4.1 Recommendation for further development

1. This recommendation is aimed at cultural product designers and design education. This study introduced a method that applies to both designers and design education. The results underscored the significance of the Inner, Outer, and Experiment levels in designing contemporary products inspired by local culture and rich in uniqueness and profound meaning. It was equally important for designers and design students to thoroughly examine each feature of the local culture, primarily focusing on the Inner and Outer Levels, before embarking on the design of cultural products. The Experimental Level was important to ensure that the result was not just a replica of the local culture that inspired. The IMO method served as a solution for designers and design education when it comes to the design of cultural products.

2. Further developments in this research will develop into other contemporary products such as contemporary furniture by combining 3d print, parametric, or kinetic art technology such as designer Kourosh Asgar-Irani with his work The Iranian Rugs and also in the ceramic sector into consideration in the development of this research such as the work of ceramic artist MOCA, by Studio Joachim Morineau.
3. Moving forward, the researchers aspire to expand the reach of their lamp product by partnering with local artisans on an industrial and national scale. To achieve this, they intend to incorporate cost-effective materials, easily accessible to all artisans, including recycled fabric and plastic materials. The result will be a more affordable and eco-friendly lamp.

5.5 Research Contribution

This research strengthens the statement that the Sumba pattern which was originally two-dimensional can indeed be applied in three-dimensional form, producing modern patterns and contemporary lamp designs inspired by Sumba patterns. To increase the value of Sumba pattern in Indonesia, the results of this research will enrich the culture of Sumba itself and contribute to Indonesia's creative industry (Sumba woven fabric entrepreneurs, local governments) and more importantly, also contribute to the improvement of domestic socio-economy, as follows:

The knowledge gained can increase the creative ability to develop Sumba patterns and fabrics in various fields and even three-dimensional fields.

Applying the invisible and visible culture to a contemporary product can also create new value in new areas.

Creating and increasing new values for the Sumba pattern and inspiring designers, academics, craftsmen, and the younger generation to develop experiments and lamp designs based on the results of this research.

5.5.1 Production Process of light, Shadow, and Shade to Contemporary Lamp Design

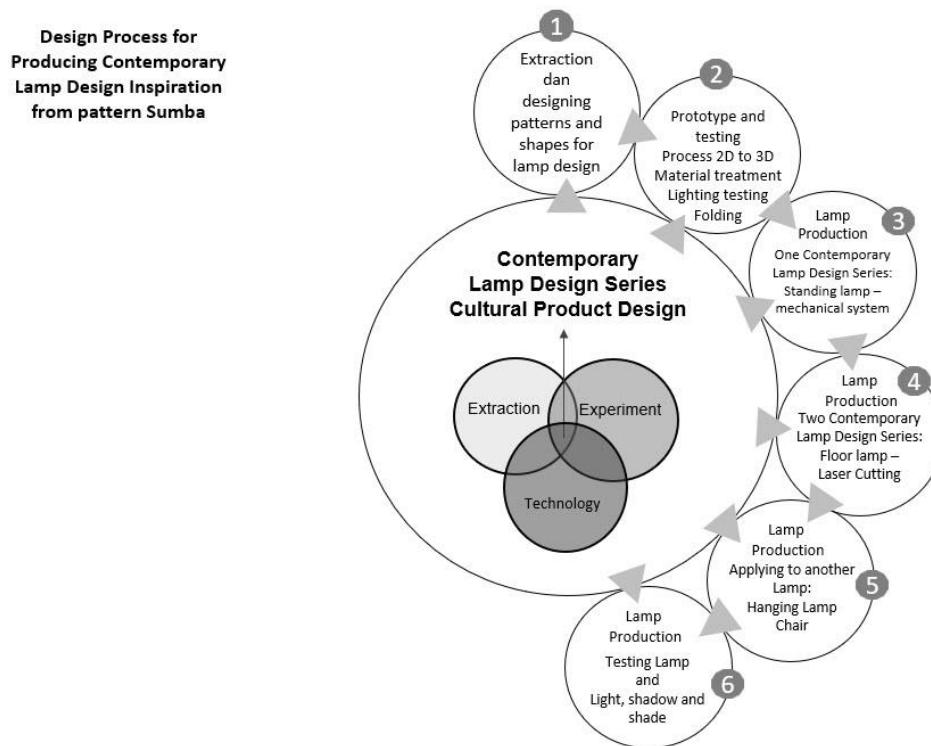


Figure 81. Design displaying Process for Producing Contemporary Lamp Design Inspiration from pattern Sumba

This diagram shows the process of knowledge from the production process of Light, shadow, and shade to contemporary lamp design, which has novelty and modern value

Based on the results of this study, the novelty in the Sumba pattern is the presence of geometric Sumba patterns, the transformation of Sumba patterns into light, shadow and shade as visual communication between connoisseurs and the esthetic value of this lamp series can be felt when the object is used as an independent entity for the viewer and feels its beauty. and the new method of applying this lamp is the use of folded paper, and ethnomathematics and sacred geometry are used value to add in new contemporary works.

5.5.2 For Academic World (Design Arts Program)

The study has generated two results that can have a significant impact on various fields, particularly art and design education. As a result, this research can enhance the teaching materials for interior design and architecture that are based on local culture and incorporate ethnomathematical approaches, supported by the latest software technology.



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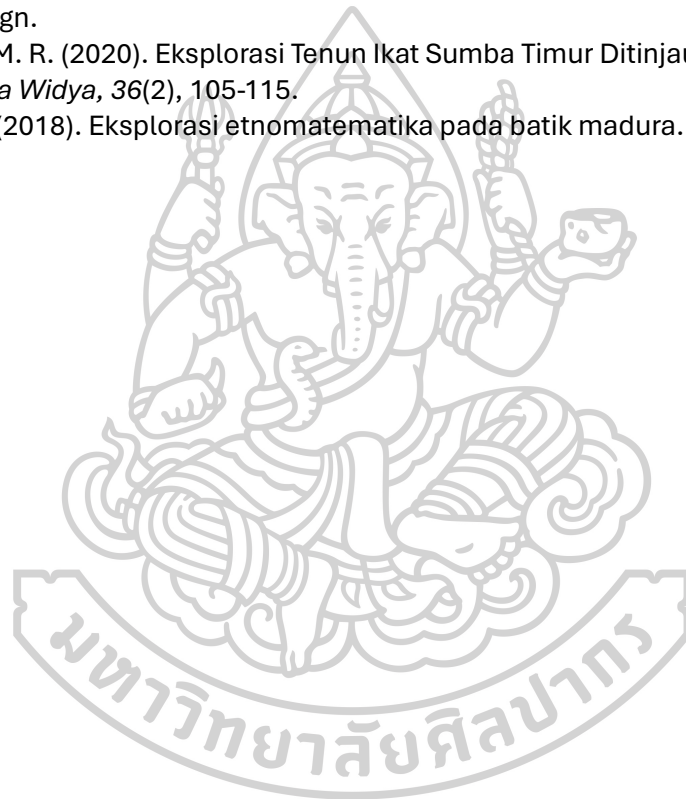
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2 . TCI 1 JCSH (Journal of Contemporary Social Sciences and Humanities)
 Volume 10, Number 1 (January - June), 2023

“A Study of East Sumba Textile Handwoven Animals “Hinggi” Motifs Ikat in terms of Dualism and Triple Patterns“

Erwin Ardianto Halim, Eakachat Joneurairatana, Jirawat Vongphantuset1, Pairoj Jamuni

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 February 16, 2023

Dear Erwin Ardianto Halim
 Faculty of Decorative Arts, Silpakorn University, Bangkok, Thailand; Faculty of Arts and Design, Universitas Kristen Maranatha, Bandung, Indonesia

The Rangsit Journal of Social Sciences and Humanities editors and peer reviewers have completed the reviewing process and are pleased to announce that your article manuscript entitled “A Study of East Sumba Textile Handwoven Animals “Hinggi” Motifs Ikat in terms of Dualism and Triple Patterns” has been accepted for publication on RANGSIT JOURNAL OF SOCIAL SCIENCES AND HUMANITIES (RISH) Volume 10 Number 1 (January - June, 2023)

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 Received: July 19, 2022
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Thank you for your contribution towards RISH.

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3 . TCI 2 The New Viridian Journal of Arts, Humanities and Social Sciences
(May – June 2022) Volume. 2, Number. 3 (2022)

การจ าแนกกลุ่มชาติพันธุ์ในลวดลายผ้าทอของซ้มบาตะวันออก

Identification of Ethnomathematics in East Sumba’s Woven Fabric Motifs

The screenshot shows the Table of Contents for 'The New Viridian Journal of Arts, Humanities and Social Sciences', Vol. 2 No. 3 (2022). The page includes a navigation menu on the right and a list of articles on the left. The article 'Classification of ethnic groups in the weaving patterns of Eastern Sumba...' is highlighted with a red box.

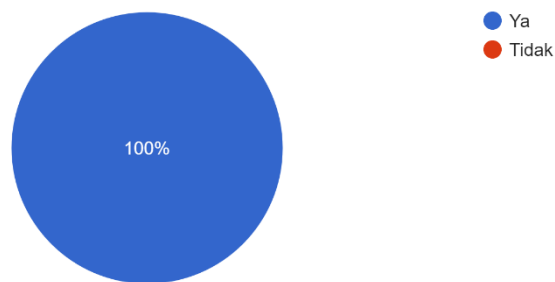
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Student satisfaction with media use and innovation to promote reading (The satisfaction of the students with the use of media and innovation to promote reading)	25-28
Results of teaching using the 5M3 technique to develop reading achievement: The use of the 5M3 teaching technique to develop the reading achievement of the inclusion in the selected literature courses in the textbooks of students in the language department, 3rd year, faculty of education, Chulalongkorn Rajabhat Udonthani	29-33

Questionnaire: The Questions and Results in Indonesian

This questionnaire was conducted online using Google Forms on August 20, 2023, with 34 respondents

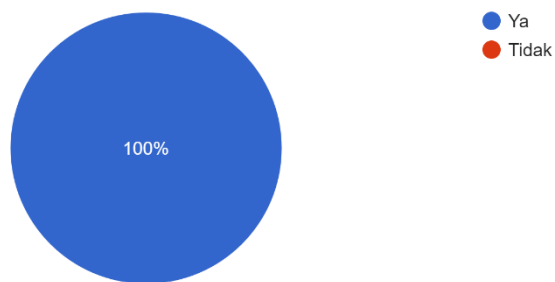
Saya sudah membaca dan memahai informasi survei diatas ini

34 responses



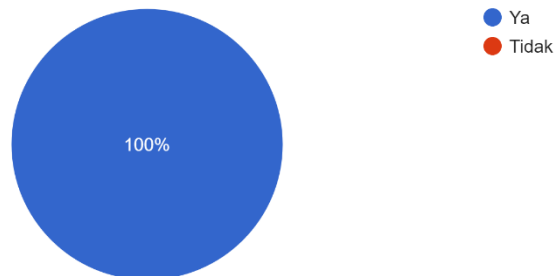
Saya telah setuju untuk berpartisipasi dalam survei ini dan saya setuju dengan penggunaan data yang dikumpulkan

34 responses



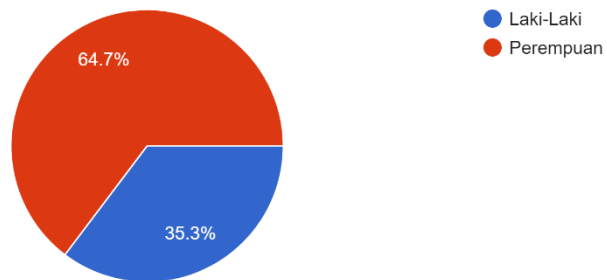
Saya memiliki hak untuk menarik partisipasi saya dari studi ini (tanpa memberikan alasan apapun)

34 responses



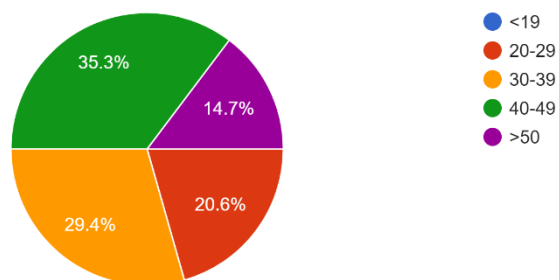
Jenis Kelamin

34 responses



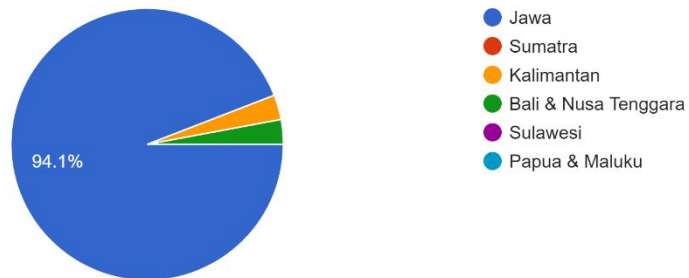
Umur

34 responses



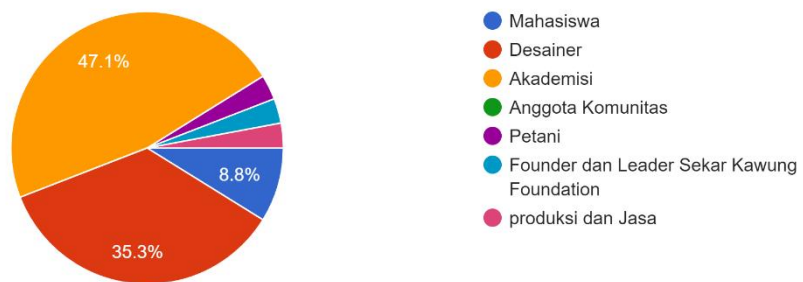
Lokasi Responden

34 responses



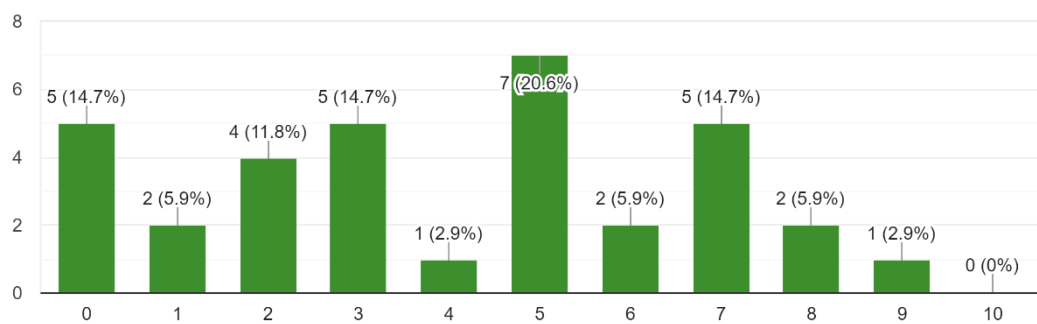
Pekerjaan

34 responses



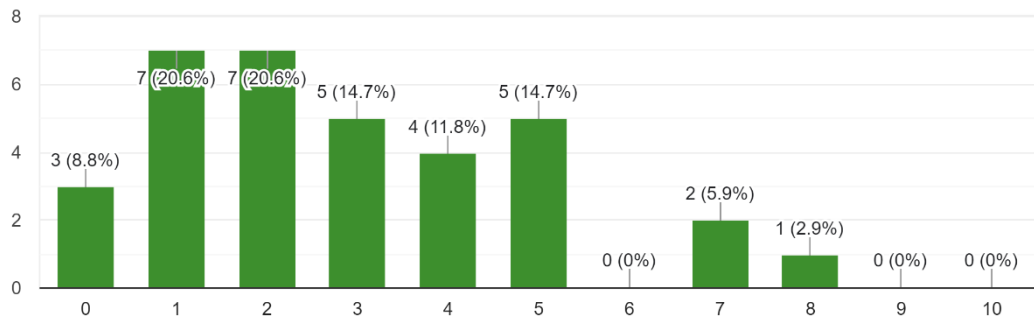
Seberapa banyak anda mengetahui pattern dan jenis pattern dari Kain Tenun Sumba Timur

34 responses



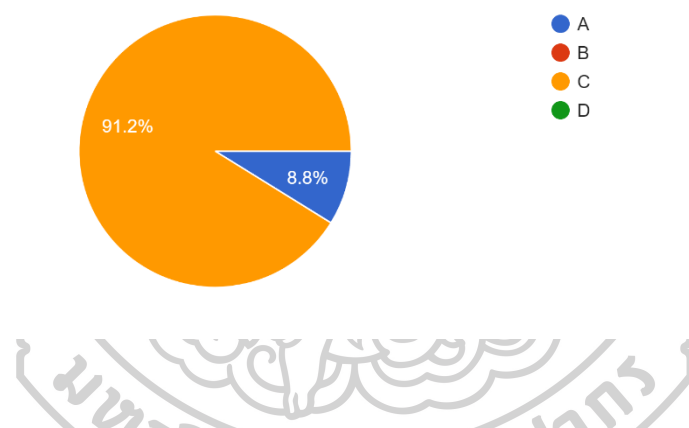
Seberapa banyak anda memiliki pengetahuan mengenai budaya Sumba Timur

34 responses



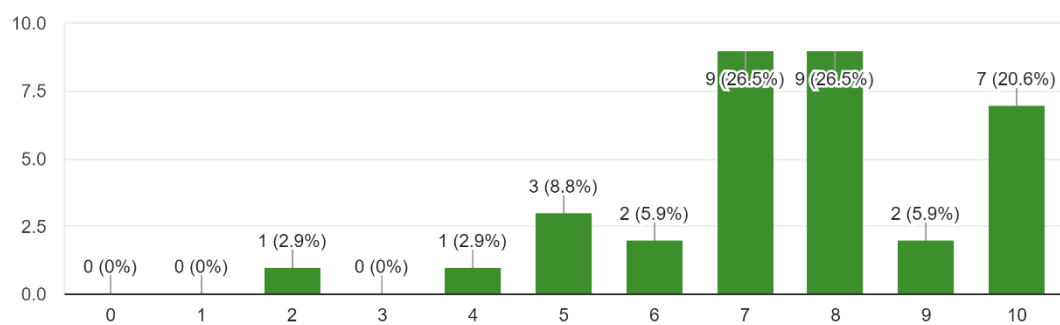
Melalui Gambar Dibawah ini, Mana menurut saudara yang merupakan salah satu pattern kain tenun Sumba Timur

34 responses



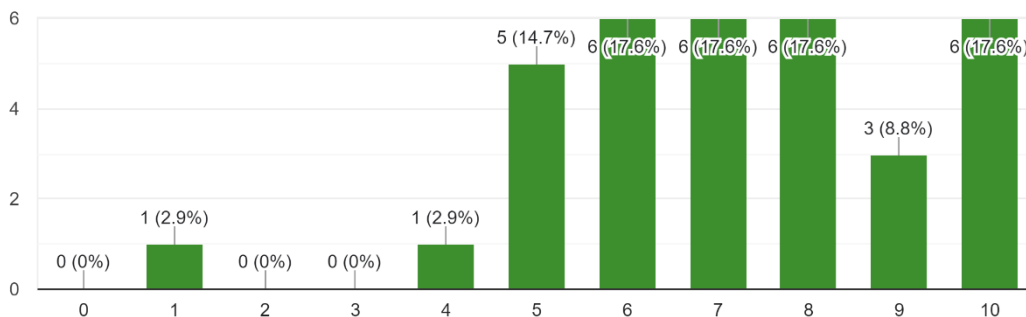
Berdasarkan DESAIN PARTISI RUANG yang ditampilkan seberapa banyak unsur dari elemen desain yang terinspirasi dari pattern kain tenun Sumba Timur ?

34 responses



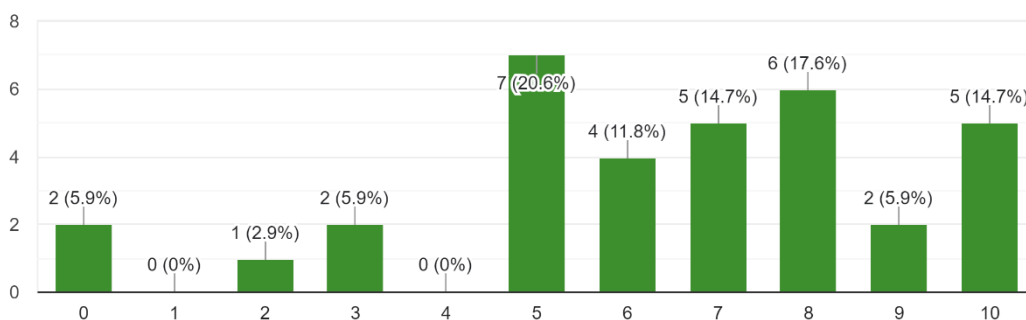
Berdasarkan DESAIN LAMPU BERDIRI yang ditampilkan seberapa banyak unsur dari elemen desain yang terinspirasi dari pattern kain tenun Sumba Timur ?

34 responses



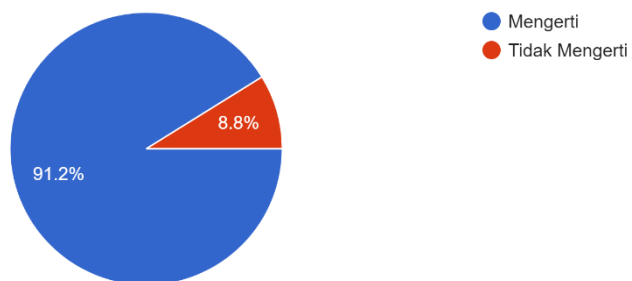
Berdasarkan KURSI yang ditampilkan seberapa banyak unsur dari elemen desain yang terinspirasi dari pattern kain tenun Sumba Timur ?

34 responses

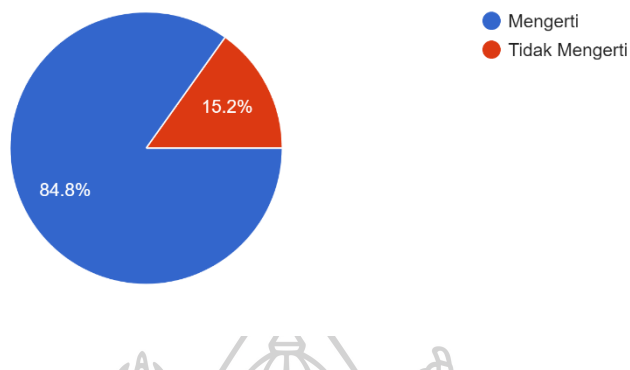


-ANALISIS BENTUK DASAR PATTERN- Struktur Bentuk dari Pattern Kain tenun Sumba Timur merupakan bentuk dasar geometrik, maka untuk me...gunakan teori Etnomatematika, sebagai berikut:

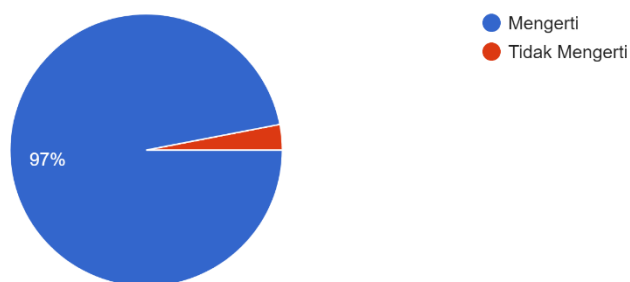
34 responses



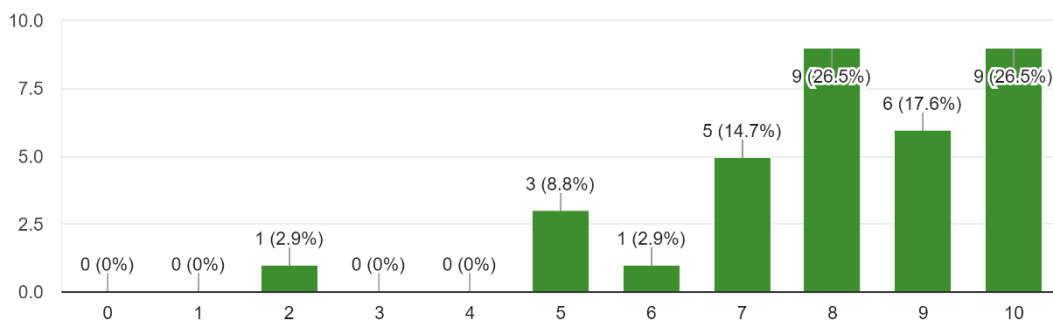
- Development Bentuk Baru (kontemporer)- Setelah tahap analisa bentuk dasar pada pattern ditemukan bahwa bentuk Belah Ketupat yang paling ...ini Paterrn Mamuli yang diambil sebagai contoh):
33 responses



-Implementasi Desain Produk Interior Kontemporer- tahap ini merupakan tahap Implementasi Pattern lama kedalam Produk Desain Kontemporer y...mpu berdiri sebagai contohnya), sebagai berikut:
33 responses

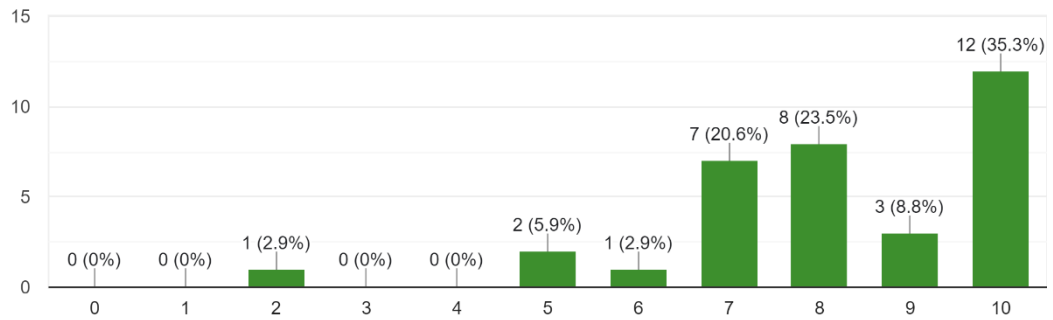


Berdasarkan Produk Kontemporer PARTISI RUANG yang ditampilkan seberapa banyak unsur yang terinspirasi dari pattern kain tenun Sumba timur?
34 responses



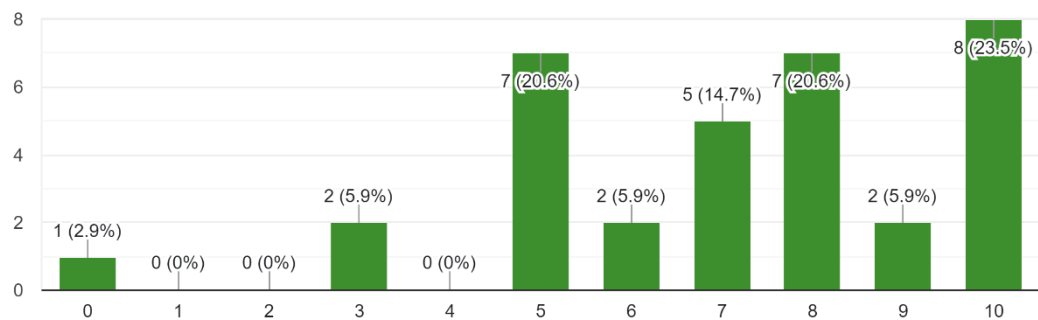
Berdasarkan Produk Kontemporer LAMPU BERDIRI yang ditampilkan seberapa banyak unsur yang terinspirasi dari pattern kain tenun Sumba timur?

34 responses



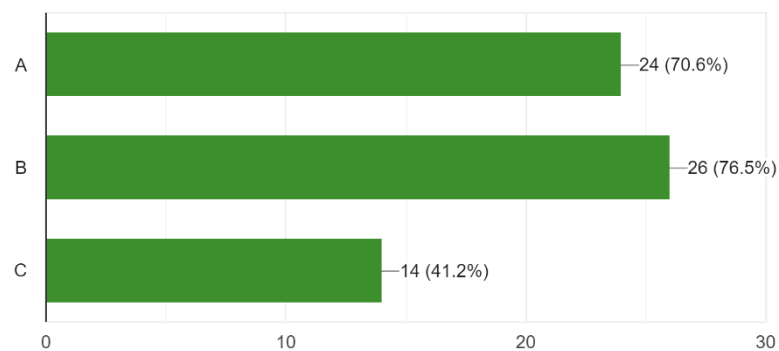
Berdasarkan Produk Kontemporer KURSI yang ditampilkan seberapa banyak unsur yang terinspirasi dari pattern kain tenun Sumba timur?

34 responses



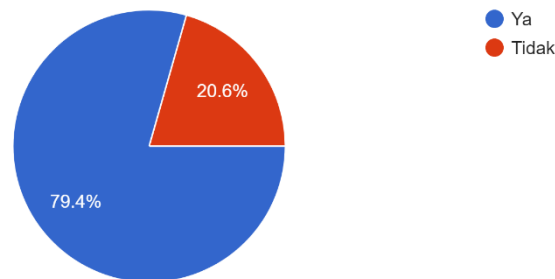
Desain Produk Interior berapakah yang mencerminkan Pattern Kain Tenun Sumba Timur (Boleh lebih dari satu)

34 responses



Apakah dengan ada mengetahui sedikit pengetahuan mengenai Pattern Kain Tenun Sumba Timur, pandangan saudara mengenai Produk Interior kontemporer berubah?

34 responses



Bagaimana pengetahuan atau informasi mengenai Pattern Kain Tenun Sumba Timur mempengaruhi pandangan saudara ?

34 responses

Kain Tenun Sumba selalu menarik diambil utk sebagai inspirasi krn pattern geometrikalnya yg versatile, warna2 alamnya yg memikat.. salah satu ragam hias Indonesia yg bisa sangat mungkin masuk utk ditampilkan secara modern.

Mempengaruhi pandangan secara bentuk dan ritme geometris baik mirroring dan repetisinya

Informasi awal memberikan pemahaman dari mana pattern yg diaplikasikan tersebut berasal

Memperkaya pengetahuan wastra tradisional indonesia

Dengan adanya produk interior seperti ini, saya pikir produk ini bisa menjadi media/jembatan masyarakat umum untuk melihat bahkan mengenal sumba timur terutama artefaknya (Kain Tenun) lebih dekat

Setiap produk budaya seperti kain tenun Sumba Timur (dan yang terdapat di dalamnya seperti motif, warna, simbol, makna) mempunyai potensi untuk dikembangkan. Baik itu tetap sebagai kain tenun atau menjadi produk baru. Dengan adanya pembaruan, maka produk budaya tersebut akan sustain

dengan perkembangan teknologi pattern kain sumba dan terapan nya memiliki bentuk yang unik dan khas

Tuliskan harapan anda untuk Transformasi Pattern Tradisional menjadi Produk Desain kontemporer

34 responses

Banyak sekali potensial Pattern Indonesia yang ketika diolah bs sangat menarik utk jadi Produk Desain Kontemporer.. sangat harap ada produk yg Indo bgt tp dikemas modern dan kontemporer jd bs diterima banyak ma org2. GOOD LUCK!! 😊😊

Lebih banyak diterapkan pada produk2 interior n grafis sehingga semakin dikenal oleh masyarakat dalam maupun luar negeri

Produk yg berasal dari pattern tradisional dapat menjadi identitas jika terdapat detail khasnya. Ada kalanya bentuk pattern khas tdk dapat di sederhanakan. Pattern juga dapat disupport dengan bentuk, warna khas, tekstur, dan material yang representatif.

Harapan saya, semoga produk produk interior yang mengadaptasi dari pattern tradisional indonesia ini semakin banyak, tetapi tidak banyak merombak elemen pattern dari aslinya, agar keasliannya tetap terjaga. Dan masyarakat pun jadi bisa lebih mengenal budaya indonesia lebih kaya lagi.

Transformasi budaya ke dalam bentuk baru (disini kontemporer) sudah membantu agar hal tersebut



15th Thesis Exhibition 2024

1. Promotion Exhibition



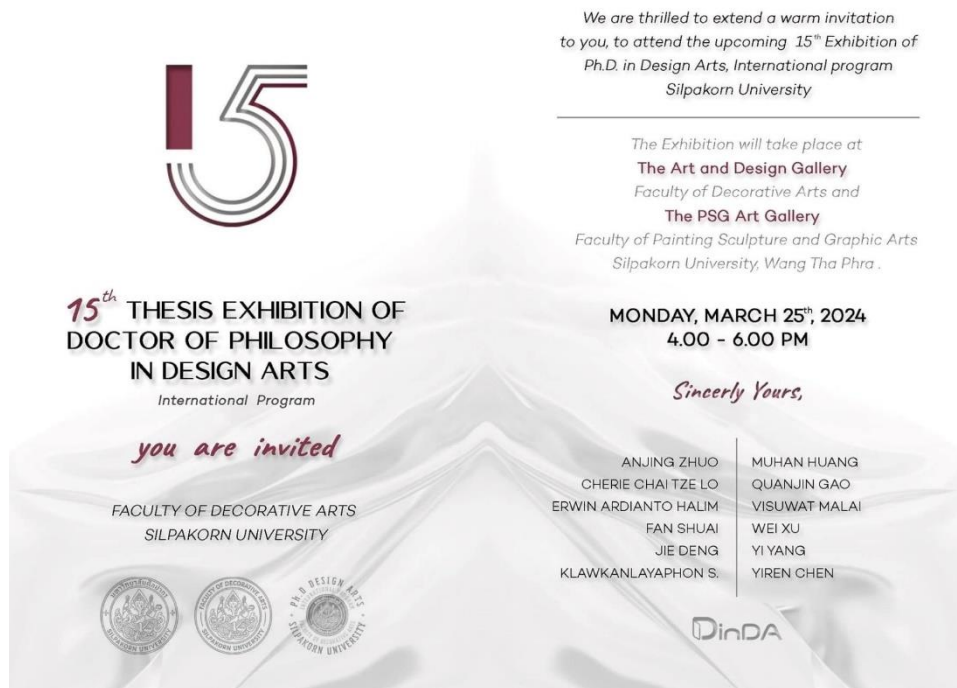
15th THESIS EXHIBITION OF DOCTOR OF PHILOSOPHY IN DESIGN ARTS
(International Program)
 Faculty of Decorative Arts
 Silpakorn University

25-29 MAR 2024
9.00 - 16.00 p.m.

AT DECORATIVE ARTS GALLERY AND PSG FINE ART GALLERY

SILPAKORN UNIVERSITY
 WANG THA PHA CAMPUS
 BANGKOK

ANJING ZHUO
 CHERIE CHAI TZE LO
 ERWIN ARDIANTO HALIM
 FAN SHUAI
 JIE DENG
 KLAWKANLAYAPHON S.
 MUHAN HUANG
 QUANJIN GAO
 VISUWAT MALAI
 WEI XU
 YI YANG



15th THESIS EXHIBITION OF DOCTOR OF PHILOSOPHY IN DESIGN ARTS
International Program

you are invited

FACULTY OF DECORATIVE ARTS
 SILPAKORN UNIVERSITY

We are thrilled to extend a warm invitation to you, to attend the upcoming 15th Exhibition of Ph.D. in Design Arts, International program Silpakorn University

The Exhibition will take place at
The Art and Design Gallery
 Faculty of Decorative Arts and
The PSG Art Gallery
 Faculty of Painting Sculpture and Graphic Arts
 Silpakorn University, Wang Tha Phra .

MONDAY, MARCH 25th, 2024
4.00 - 6.00 PM

Sincerely Yours,

ANJING ZHUO	MUHAN HUANG
CHERIE CHAI TZE LO	QUANJIN GAO
ERWIN ARDIANTO HALIM	VISUWAT MALAI
FAN SHUAI	WEI XU
JIE DENG	YI YANG
KLAWKANLAYAPHON S.	YIREN CHEN

DinDA



PROF.DR. EAKACHAT JONEURAIRATANA
Chairman of Ph.D. Design Arts (International program)
Faculty of Decorative Arts, Silpakorn University

As Silpakorn is "A leading creative University" in Thailand, we create a new generation such as designers, architects, and artists to strengthen their professionals and succeed in their careers for the growth of the creative economy nowadays. Our international program in Art and Design gives the best both theory and practice-based research for Ph.D. graduates.

I wish you the best of luck and looking forward to seeing you highly successful in your career for the future.

Thank you for the support from the Dean of the Faculty of Decorative Arts, Dr.Thanatorn Jiarakun, all the professors, secretary officers, and staff members of the international program. And finally, we would like to express our profound gratitude to Professor Emeritus KhunYing Khaisri Sri - Aroon, President of the Silpakorn University Council, who has always supported our program of the study activities and be the president presiding over the opening ceremony.

The Ph.D. 15th Thesis Exhibition of 12 doctoral candidates are educators in our international program in Design Arts, who we are proud of. They have studied, exchanged many experiences and shared good memories together.

Best Regards,
Professor. Dr. Eakachat Joneurairatana
Chairman of Ph.D. Design Arts (International program),
Faculty of Decorative Arts, Silpakorn University

15th Thesis exhibition Ph.d. in Design Arts

ANJING ZHUO

EMAIL: ANJING_ZH@SILPAKORN.EDU

Zhuo Anjing, from Hubei Province, China. Graduated from Jingdezhen Ceramic University, majoring in ceramic decoration art design. Currently study Ph.D. in Design Art international program at Silpakorn university.

- Ceramic works "Ground Surface" and "Red Change" were collected by the Museum of South Korea University.
- Ceramic works "Cute Chinese Zodiac" and "CHINA+China" were selected into China Ceramic Design Exhibition.
- Ceramic work Impression of Water was selected in 2021 KSBDI-JCI International Art Special Exhibition.
- Ceramic work "Reshap series: Mountains" won the Franz Rising Star Project rookie award.



15th Thesis exhibition Ph.d. in Design Arts

FAN SHUAI

EMAIL: FAN_SH@SILPAKORN.EDU / 45998178@QQ.COM

Shuai Fan, born in 1996. Graduated from Jingdezhen Ceramic University, majoring in Ceramic Art and Design (M.F.A.). She has a deep research interest in the field of ceramic composite materials. Actively participate in various ceramic related competitions and won the Asian Young Designer Sub-Bronze Award and 6th Macau International Design Exhibition etc.



12 doctoral candidates

CHERIE CHAI TZE LO

EMAIL: L.O.CHERIECT@GMAIL.COM

Cherie (MBA) originally from Singapore, her interest in oil painting was inspired by impressionism, leading to explorations of flowers reflected by philosophy.



JIE DENG

EMAIL: DENG.JIE.2009@163.COM

JIE DENG is a senior university lecturer of the Interior Design Program from China. Her research interests focus on Hygienic Public Space Studies, especially in developing transformation strategies ideas on old communities into healthy, peacefulness and contemplation. She is also a professional interior and landscape designer. During her Ph.D. study, she was granted 6 National Design Patents in the year 2022, awarded as "Excellent Faculty Advisor" of CBDA design in the year 2023, etc.



12 doctoral candidates

ERWIN ARDIANTO HALIM

EMAIL: ARDIANTOHALIM_ER@SILPAKORN.EDU

Erwin Ardianto Halim is an Assistant Professor of the Interior Design Program at Maranatha Christian University. His research interests focus on Indonesian Cultural Studies, especially in Developing traditional Indonesian ornaments into contemporary style. He is also a professional interior designer.



KLAWKANLAYAPHON SAWATMONGKHONKUL

EMAIL: SAWATMONGKHONKU_K@SU.AC.TH

Klawkanlayaphon Sawatmongkhonkul is a lecturer in the Interior Design department at Silpakorn University, Thailand. She is also a co-founder of Vimal Studio, specializing in architecture and interior design. Her research interests include algorithms, parametric design, and interior design. Hence, her dissertation focuses on experimenting with creating works through parametric programs to form shapes that can be used appropriately in furniture and interior design.



According to the alphabetical order

According to the alphabetical order

12 Doctoral Candidates : 15th Thesis Exhibition Ph.D. in Design Arts,
International program



According to the alphabetical order

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A new Design Approach in Portraying Chinese KungFu in Animation

According to the alphabetical order

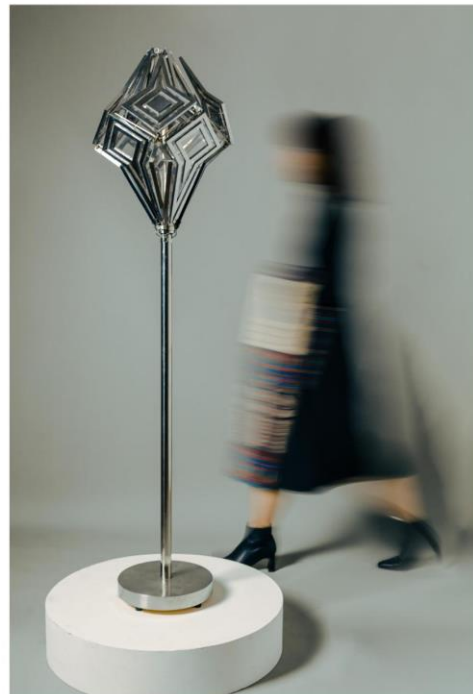
TRANSFORMING OF THE SUMBA PATTERN INTO LIGHT, SHADOW, AND SHADE FOR CONTEMPORARY LAMP DESIGN



ERWIN ARDIANTO HALIM

ADVISORS:
Prof. Dr. Eakachat Joneuraratana,
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This research aims to Transform the Sumba pattern into Light, Shadow, and Shade for Contemporary Lamp Design. The research has three primary goals: (1) to investigate the niches of East Sumba's woven fabric patterns, (2) to experiment with light, shadow, and shade through the patterns for contemporary lamp design, and (3) to create a contemporary lamp design based on East Sumba's woven fabric patterns.



2. Documentation Exhibition





3. Visitor Comments

Erwin, gaje banget, layoutnya & animasi serius, layoutnya & animasi serius, you must be amazing works, you must be super super proud!

Big congratulations for your hard work... Happy face for your praise, and wish you...

My Sincere Congratulation Meo-a-w POMPATI

CONGRATULATIONS! Your end is your new beginning -MUNA-

Congratulations for your wonderful work. Hope you can produce an excellent design and work in the future. Tausiq Hudaib, President of Baskom University

CONGRATULATIONS & GOOD LUCK! FROM HANG BETHESDA

CONGRATULATION BY HONG U. FEEL GOOD FOR NICE TO MEET YOU! Great work, beautiful art. "Congratulations" LUFT & SHARON WERE WERE TO SEE

So nice Congratulations! Lei Qian 2024

25 March 2024 Dear, Congratulation Erwin Your works are so amazing and value for future research. Wish all best for you!!! An (Frankfurt)

Really beautiful artwork! Congrat! from friends Gita Almasi (Feb 19)

Dear... Dr. Erwin! We're so proud of all that you have accomplished. Big congratulations!! and best luck on the future. Thank you so much for a lovely gift. I really love it. *Aji Su* (remember always with love) *see me at home* (Dinda family)

Hey check in Su. It's feeling good coming soon Suie! See you from wrk. school.

Congratulations!!! Very impressive work.

Yi Yang 27 March 2024

Love your artworks no!

Congratulations :)

Congratulations! I love your works. Gid

Congratulations. 26/3/24

Dear Erwin... So proud of you! Such a great great artworks! Can't wait to see more of your nice artworks in the future... See you in Indo! Yopi & Jess

Yopi & Jess

VITA

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2013 Guangxi Normal University, China, Master Degree of Fine Arts
2007 Universitas Kristen Maranatha, Indonesia, Bachelor in Interior Design

PUBLICATION A Study of East Sumba Textile Handwoven Animals “Hinggi” Motifs Ikat in terms of Dualism and Triple Patterns. Journal of Contemporary Social Sciences and Humanities, 10(1), 57-65 (2023).
“Mamuli” Pattern in East Sumba Woven Fabric as Inspiration For “Kandunnu” Standing Lamp Using the IMOIE Method
Halim, E.A., Joneurairatana, E., Vongphantuset, J., Jamuni, P.
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