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IMPLEMENTATION OF ZERO WASTE ON ULAP DOYO FABRIC IN READY TO WEAR FASHION PRODUCT

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Abstract: Ulap Doyo is a traditional cloth made from the leaf fiber of Doyo plant that grows in Kalimantan, Indonesia. The fabric is decorated with motifs that are correlated with the social status and classes whereas the visuals motifs were inspired by various flora, fauna, and the abstraction of human life history. Ulap Doyo has a natural dye base, the coloring is done before Ulap Doyo becomes cloth, which is the fibers that after being obtained from cutting plants, then processed with the preparation based on the motifs that will be formed in the tie technique, colors dyeing is carried out later until finally woven into cloth. Based on the origin and manufacturing process of Ulap Doyo, this cloth can be categorized as a zero-waste product. These uniqueness of Ulap Doyo has become the inspiration to process it into fashion products. This research is consistent with the application of the zero-waste concept to fashion products. The research was carried out by taking direct data (interview) and study from the literature. The data is collected directly by interview with the weavers and the indigenous Dayak Benuaq in Tenggarong, East Kalimantan. Then the data was processed using exploration methodology techniques to put the Ulap Doyo fabrics and motifs as focal points in the design, which was combined and matched with the supporting fabrics in order to make the design looks ethnic and modern as well as visually designed that emphasizes the asymmetrical side. The final result from this study, not only fashion products but also a description of zero waste that carried out in the process of making fashion products, especially in terms of cutting fabric which is expected to minimize waste.

Keywords: Ulap Doyo, zero waste, fabrics, fashion products, ready-to-wear

1. INTRODUCTION

Ulap Doyo is a traditional cloth from Kalimantan, Indonesia, made from the Doyo (Curliglia latifolia) parallel leaf bones. This leaf then processed into fibers, then woven and tie dye with natural dyes. Motifs Ulap Doyo are correlated with the social strata and philosophical meaning of life of the people who wear it, especially for local community. The visual of the motifs are flora, fauna, and the abstraction of human life history.

Ulap Doyo has a natural dye base, such as gelinggam seeds for red, *oter* wood for brown, turmeric for yellow, burning damar for black and many more. In order for last long colored, and not to fade quickly, before and after coloring there is a color binding process from natural materials, such as alum, lime, and coconut sugar. Based on the origin and manufacturing process of Ulap Doyo, this cloth can be categorized as a zero waste product. Zero waste can be interpreted as an act of minimizing waste, related to Ulap Doyo as a fabric that comes from and is processed from natural materials, proving that Ulap Doyo can produce waste, but the waste can be reabsorbed by nature because of its natural. This is the reason why Ulap Doyo is a zero waste product.

It is estimated that 92 million tonnes of textile waste are generated annually, which is equivalent to a garbage truck full of clothes ending up in landfills every second [12]. This proves that textiles are one of the largest contributors to waste in the world. Regarding Ulap Doyo as a fabric which is part of textiles, the uniqueness of Ulap Doyo which is a zero waste product can be a source of inspiration to process Ulap Doyo into fashion products. The zero waste concept of making Ulap Doyo fashion product has never been done. Because of that, this research consistent in applying the zero waste concept to fashion products with the aim of minimizing waste when the production process becomes a fashion product that optimizes the use of Ulap Doyo. Minimizing the cutting of Ulap Doyo is done by draping fabric with other fabrics which are the supporting materials for Ulap Doyo into ready-to-wear type fashion products.

Along with changes in the fashion industry, especially in ready-to-wear clothing, which has increased, causing excess fabric waste. In 2013, one of the designers Timo Risanen created a visionary mindset that can help problems in the fashion sector, namely making a zero waste fashion method as a form to minimize the results of fabric waste and presenting fabric that is wasted during the cutting process of no more than 15 % in each production [8,9]. Zero waste fashion can be said as a sustainable manufacturing product and can create clothes that consider aesthetics and function at the same time. The zero waste fashion method has developed significantly in various countries, especially America, but not in Indonesia because some people, especially fashion fans, do not yet

know the zero waste fashion method as a technique for implementing waste reduction in the production process.

2. MATERIALS AND METHODS

Ulap Doyo taken from Kalimantan was obtained after field surveys in Tenggarong city, East Kalimantan. The selection of Ulap Doyo in this research is the boat motif, which means "cooperation" that has a philosophy of hope of users can give meaning to the life of the Dayak Benuaq customs. Using that fabric, this research using exploration method to get creativity to place Ulap Doyo fabrics and motifs as focal points in the fashion product with ethnic design. Ethnic design as the style used in this study was based of trend forecast data, which is from Indonesian Tren Forecasting book 2022. In this trend forecast, ethnic style is corelated with Spirituality themes, which which prioritizes local wisdom.

(a) **(b)**

Figure 1. (a) Doyo plants cut by craftsmen; **(b)** Dried and sliced Doyo plant.

(a) **(b)**

Figure 2. (a) Doyo threads tied before dyeing color; **(b)** warp thread from Doyo in woven equipment.

Ulap Doyo cloth has a rough texture and stiffness due to natural fibers that are processed into coarse threads. But this is his trademark, so that in its use as a fashion product, Ulap Doyo cloth must be combined with other supporting fabrics that make the lining comfortable to use. The supporting fabrics is linen and cotton. Linen is a cloth originated from the bark of the flax tree, while cotton is coming from the flower of the cotton tree. Both are fabrics that have a background from nature. Based on that, the two supporting fabrics can be combined with Ulap Doyo, for the consistency of the zero-waste concept in this research, which is minimizes waste, especially when the fabrics are decomposed, they can return to nature.

Experiments in exploring the shape of the three materials were carried out on mannequin statues and human body figures so that the fall of the materials could match the character, comfort, aesthetic, especially the focal point of the design image which is the main reference for draping. After this method being used, the next step is to flatten the draping pattern on the statue with a geometric pattern. Geometric patterns are used to minimize waste when cutting materials. The geometric patterns used are rectangles, and trapezoids which are used for linen and cotton. Ulap Doyo cloth on the other hand does not cut, because the main cloth is a focal point design that can be twisted or stiffened.

(a) **(b)**

Figure 3. (a) The Doyo Ulap woven progress; **(b)** Boat motif in Ulap Doyo cloth.

After the material requirements are known, a qualitative method will be used to measure the marker placement of geometric patterns on a piece of cloth, where if there is any remaining material, the remaining material will be calculated from efficiency with zero waste standards that do not allow production residues above 15%.

3. RESULTS

Consistency in the application of zero waste is the basis for the design concept. Therefore, the pre-production process in making moodboard as a medium for direct inspiration is limited to ethnic styles based on the 2022 Spirituality trend forecast, loose fittings shapes, and layering of clothing stacks with asymmetrical designs and prioritizing traditional fabrics, in which case Ulap Doyo is the one which is the focal point. After that, the design drawing is drawn with the imagination in mind of a slight cutting of the material and the fall of the fabric. The design purpose for female and male gender in ready-to-wear variant. The choice of earthy tone colors such as black, brown, cream, and burgundy is intended to make modern look, warm, and serious [4]. The target market for Ulap Doyo's fashion products are adults (21-30 years old) who appreciate the traditional side of Indonesian culture, but prioritize modernization.

(a) (b)

Figure 4. (a) moodboard of Ulap Doyo for Fashion Product; **(b)** Spirituality Indonesian Trend Forecast 2022 Theme.

(a) (b)

Figure 5. (a) Fashion Illustration Design (left female, right male); **(b)** Fashion product draping progress (left female, right male)

Figure 6. Fashion product ethnic style ready-to-wear (left female, right male)

Ethnic style is a fashion that takes or represents a particular culture to celebrate the heritage of their region of origin. Based on that, Ulap Doyo is representative of Dayak Benuaq, ethnic group of Kalimantan. In the design and sample, the plain and motif dark brown Ulap Doyo tried to be highlight it as a focal point by draping the fabric into curves and twists of the fabric. The asymmetrical design is also a accented that makes the observer who sees it curious about what motifs are in the design. From the draped sample, then the fabric flatted and adjusted to the geometric patterns of rectangles and trapezoids. This geometric shape is an experimental method of construction to get loose fitting shape and also placement the geometric shape in the marker, so the marker becomes effective and efficient. This efficiency can be seen in the visual fabric consumption per type of material, and the calculation of material efficiency.

The flattened fabric must have the required shape and material type data per view (one for women, and one for men). Each display has a patterned and plain Ulap Doyo, but for

the supporting fabric each display has different needs. The material requirements per looks are in **Table 1.** below:

Table 1. Material requirements per looks

No.	Fabric	Picture	Female look	Male look
1.	Motif Ulap Doyo		0.345 x 2.00 meters	0.345 x 2.00 meters
2.	Plain Ulap Doyo		0.59 x 2.00 meters	0.345 x 2.00 meters
3.	Linen (burgundy color)		5 x 1.50 meters	
4.	Linen (black color)		0.5 x	
5.	Cotton (black color)		1.50 x 1.50 meters	
6.	Cotton (cream color)		—	1.50 x 2.00 meters

After knowing the fabric needs per looks, which is takes eight separate pieces of cloth from six variant of fabric and colors, the geometric patterns were started in the layout to

be efficient. The size of the geometry can be enlarged beyond the standard size of female and male because the concept of loose-fitting ethnic style is intended. Marker of the geometry shape of the fabric consumption and efficiency calculation shown in **Table 2.** For the calculation of fabric efficiency, the formula used is:

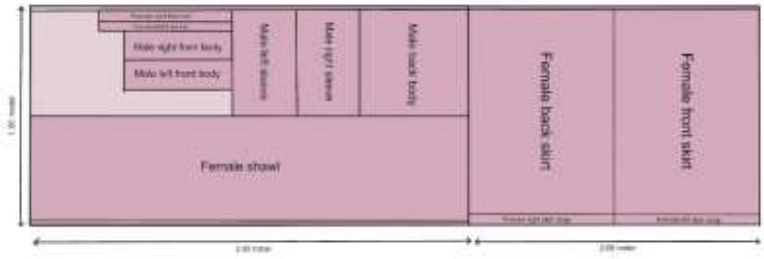
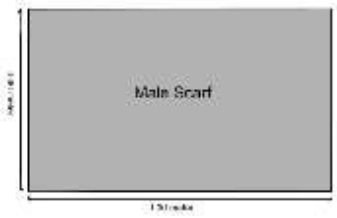
Efiiciency= marker area fabric area x 100%

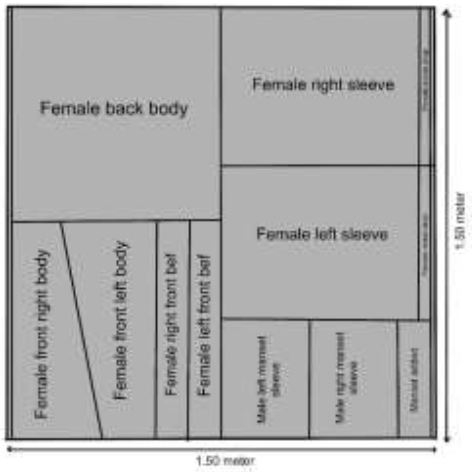
Note:

marker area= marker length x width
fabric area= fabric length x width

Table 1. Marker, fabric consumption and efficiency calculation.

No.	Marker and fabric consumption	Efficiency Calculation
1.	 Marker length x width = 4.39 x 1.48 m Fabric length x width = 5.00 x 1.50 m	Efficiency of motif Ulap Doyo for female: 100%
2.	 Marker length x width = 4.39 x 1.48 m Fabric length x width = 5.00 x 1.50 m	Efficiency of motif Ulap Doyo for male: 100%
3.	 Marker length x width = 4.39 x 1.48 m Fabric length x width = 5.00 x 1.50 m	Efficiency of plain Ulap Doyo for female: 100%

4.	 Marker length x width = 4.39 x 1.48 m Fabric length x width = 5.00 x 1.50 m	Efficiency of plain Ulap Doyo for male: 100%
5.	 Marker length x width = 4.39 x 1.48 m Fabric length x width = 5.00 x 1.50 m	Efficiency of linen (burgundy color) for female and male: 86,6%
6.	 Marker length x width = 4.39 x 1.48 m	Efficiency of linen (black color) for male: 100%

	Fabric length x width = 5.00 x 1.50 m	
7.	 Marker length x width = 4.39 x 1.48 m Fabric length x width = 5.00 x 1.50 m	Efficiency of cotton (black color) for female and male: 98,7%
8.	 Marker length x width = 4.39 x 1.48 m Fabric length x width = 5.00 x 1.50 m	Efficiency of cotton (cream color) for male: 100%

4. DISCUSSION

Based on the objectives of this research, not only fashion products, but also a description of zero waste that carried out in the process of making fashion products, especially in terms of cutting fabric which is expected to minimize waste. This description can be seen from Table 2. where the marker visualizes the layout of the geometric pattern on the Ulap Doyo cloth and the supporting fabrics of linen and cotton. Not only visualization, fabric consumption could be seen and calculated based on marker area compare with fabric area. In the end, efficiency can also be calculated, with a percentage value that can be correlated with the zero-waste concept, which is a zero waste fashion method that minimizes fabric residue in the cutting process by no more than 15% in each production. There are two fabric that has efficiency below 100%, which is 86,6% the burgundy linen, and 98,7% of black cotton fabric. Based on this, when the burgundy linen and black cotton fabrics are added together, the remaining fabric in this production is 13.4% plus 1.3%, equals with 14.7% which is still below the 15% remaining production from standard zero waste concept. This means that this research This means that this research can achieve the concept of zero waste and is suitable to be applied from the beginning of making Ulap Doyo cloth as the main material to its production as a fashion product.

This research can still be developed further by developing product fashion designs in draping levels and more complicated patterns, such as using circles and triangles in making flat patterns and draping with twisting, tying-insert fabric techniques using Ulap Doyo.

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