Model Development Standard Size Madura Batik Clothing Based On Local Wisdom That is Relevant to The Concept of Ergonomics Anthropometry Madura Case Study

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A B S T R A C T

Indonesia has many emerging industries, including the textile industry. Textile and Textile Products. Industries becomes an industry that absorbs a considerable workforce of 1.55 million in TPT and 570 thousand in the garment industry. The garment industry is one of the biggest foreign exchange contributors of US $7.3 billion. Director-General of small and medium-sized industries stated that from 750 thousand is available in Indonesia, 30% is an industry that is engaged in the fashion ethnic batik clothing. The size of the clothes that are not standard will lead to a lack of confidence in consumer clothes on the size of the clothes label. Similarly, ethnic Batik clothing products Madura, have the same problem related to a lack of standard clothes size. Therefore, the study is related to the standardization of the size of this Madura batik ethnic dress. Standard sizes are done with appropriate body anthropometry measurements. Data retrieval was conducted against 450 Madura residents aged 5-12 years, 13-18 years, and 19-30 years. From the results of processing using the principal component analysis and analysis, cluster obtained three classifications of clothing sizes i.e. S, M, and L with an aggregate loss value smaller than the ideal aggregate value. Obtained three sizes classification S, M, and L with an aggregate loss value smaller than the ideal aggregate then the results of the size examined according to the actual size and can be used

Keywords: Standard size, ethnic Batik garments, anthropometry, principal component analysis, cluster analysis

1. Intoduction

Indonesia has many emerging industries, including the textile industry. Textile and Textile Products Industry (TPT) becomes an industry that absorbs a considerable workforce of 1.55 million in TPT and 570 thousand in the garment industry. The garment industry is one of the biggest foreign exchange contributors of US $7.3 billion [1]. Director-General of IKM (small and medium-sized industries) stated that from 750 thousand IKM is available in Indonesia, 30% is an industry that is engaged in the fashion ethnic batik clothing [2].

Batik ethnic fashion industry in Indonesia experienced a good development. It is supported by the increasing interest of the designer in making batik ethnic fashion design. The development of ethnic batik fashion began to be seen outside countries, so it can open the opportunity for Indonesia especially the textile industry.

Positive trends are not encouraged by the convenience of consumers to choose the appropriate size of ethnic batik clothing. Batik ethnic clothing circulating in the market today has different sizes in each manufacturer so that it can confuse consumers in determining the appropriate size, so it is required the same size standard. That the standard size of clothing in

Indonesia varies in each store because the size of the interval is not under the circumstances anthropometry [3].

In the planning of ethnic batik fashion based on anthropometry, there are things to be considered. Generally, every human being has the difference in body shape and size. Factors are affecting the difference in gender, age, ethnicity, and occupation. Generally, the dimensions of the male body are larger than women, the dimensions of the human body change with increasing age [4][5].

2. Literature Review

2.1. Ergonomics

Ergonomics come from the word ergos which means work and nomos which means natural law [6]. The word "work" in a narrow sense is an activity done to live while a broad meaning, the word work can be used in all aspects of human activity involving skills, planned ventures, and objectives. In interpreting ergonomics, the word "work" is in a broad sense. So it can be interpreted the ergonomics of science that learns the human aspect and its working environment that discusses who is who does a job and how to do it with the tools and equipment they use in the workplace

seen from the psychosocial aspects, physiology, anatomy, management, design, and psychology of the work situation.

2.2. Anthropometry

Anthropometry derived from the Greek Anthropos meaning humans and metron which means measuring so that it can be interpreted anthropometry is the measurement of the body in humans[7]. In ergonomics, the anthropometry data is used to determine the dimensions of a work facility, equipment, and human clothing. Anthropometry is used to view the suitability between dimensions of work facilities and users. In general, every human has a difference in body shape and size. Some factors affect these differences, some

The sources that cause such differences, age, gender, ethnicity and ethnic and occupations.

2.3. Body Dimensions

Based on ISO 8559/1989 Garment Construction and Anthropometry survey, There are 52 dimensions of the human body that divided into two parts, namely horizontal and vertical dimensions [8].

2.4. Stratified sampling

Stratified sampling is one of the ways to acquire elements or samples of a population consisting of groups, which will be selected samples of each group [9]. The steps to take in the sample selection are the determination of clear strata or group of the population. Then selected samples for each group.

2.5. Principal Component Analysis (PCA)

The principal component analysis is a statistical technique in detail developed for data reduction [10]. The principal component analysis is not only used for data reduction but also used as a data processing phase which is further used for applications other Multivaris statistical methods such as ANOVA or regression analysis. In general, the PCA is used to reduce the complicated reciprocal relationship between the number of large observational variables into a relatively small amount of the second linear combination, which is referred to as the main component. The special purpose of PCA in the study is describing the main components [11].

Cluster Analysis

The cluster analysis is a method used to find the data stack of the research group into clusters [12]. The main purpose of cluster analysis is to classify observations or objects in a group that has an equation, but each group is formed differently from other groups. It is hoped that this grouping obtained groups that have homogeneous data so that the data can facilitate researchers. Many techniques can be used to classify the observation results in a similar cluster. The cluster analysis is divided into two namely hierarchical clustering and nonhierarchical method.

3. METHOD

The types of research conducted are quantitative research and surveys. Survey research is a type of research where researchers do not do anything that can change the variables researched [13]. In the study, dimensional measurements of the human body used in the design of batik fashion according to Anthropometry.

Variable used is 29 dimensions of the upper body based on ISO 8559/1989 Garment construction and Anthropometry survey.

Table 1. Variable Research

Horizontal dimensions	vertical dimensions
1. Head circumference	1. Torso length
2. Circumference of neck	2. Height increase in body
3. Neck base Circumference	3. Height of body Sitting position
4. Shoulder length	4. Body length into
5. Shoulder width	5. Waist-length
6. Width of back	6. Nape length until knee freeze
7. Chest circumference	7. High neck standing position
8. Bust Circumference	8. Length of nape to breast
9. Upper arm circumference	9. Length of neck to waist
10. Circumference of elbow	10. Long shoulder point to breast point
11. Circumference	11. Waist-length to the shoulder point
12. Hand circumference	12. Sleeve circumference length
13. Hand length	13. Upper arm length
	14. Sleeve length
	15. Wrist to Nape length
	16. Long Forearm

Data retrieval conducted in Bangkalan, Sampang, Pamekasan, and Sumenep with sample determination using stratified sampling.

Table 2. Total samples of children.

Gender	Bangkalan	Sampang	Pamekasan	Sumenep
Male	14	14	11	12
Female	13	13	10	12

Table 3. Total samples of teens.

Gender	Bangkalan	Sampang	Pamekasan	Sumenep
Male	19	19	16	16
Female	19	19	16	17

Table 4. Total samples of adults.

Gender	Bangkalan	Sampang	Pamekasan	Sumenep
Male	24	25	23	26
Female	27	28	25	30

RESULT AND DISCUSSION

3.1. Uniformity test

Data uniformity data is used to view outlier data using SPSS 16.0.

Table 4. Total samples of adults.

Gender	Bangkalan	Sampang	Pamekasan	Sumenep
D1	55.399	50.294	45.190	Uniform
D2	31.631	25.941	20.252	Uniform
D3	35.078	28.059	21.040	Uniform
D4	13.484	9.922	6.359	Uniform
D5	34.839	29.628	24.416	Uniform
D6	37.070	24.255	11.440	Uniform
D7	80.642	65.647	50.652	Uniform
D8	80.809	64.431	48.054	Uniform
D9	32.872	20.961	9.050	Uniform
D10	29.289	20.941	12.593	Uniform
D11	18.200	12.882	7.565	Uniform
D12	19.598	14.706	9.814	Uniform
D13	19.350	14.431	9.513	Uniform
D14	55.997	49.137	42.278	Uniform
D15	28.839	18.471	8.102	Uniform
D16	68.527	60.020	51.512	Uniform
D17	21.391	16.392	11.393	Uniform
D18	36.204	29.824	23.443	Uniform
D19	78.630	69.059	59.488	Uniform
D20	126.724	102.902	79.080	Uniform
D21	28.858	23.647	18.436	Uniform
D22	39.922	34.392	28.862	Uniform
D23	26.737	17.804	8.871	Uniform
D24	35.972	26.294	16.617	Uniform
D25	47.598	32.922	18.246	Uniform
D26	27.630	21.569	15.507	Uniform
D27	49.731	40.373	31.014	Uniform
D28	70.326	59.373	48.419	Uniform
D29	24.185	17.803	11.423	Uniform
D30	55.399	50.294	45.190	Uniform
D31	31.631	25.941	20.252	Uniform
D32	35.078	28.059	21.040	Uniform

In the anthropometry data of girls, adolescents (men and women), and adults (male and female) also carried out test uniformity of data

3.2. Normality Test

Hypothesis
H0: Data dimension anthropometry The body is distribute normally
H1: Data dimension anthropometry The body does not distribute normally
Decision :
If the sig is < 0.05 then reject H0 if sig $\geqslant 0.05$ then receive H0 in this research all body dimension data is used with normal distribution with the value of sig > 0.05

3.3. Principal Component Analysis (PCA)

KMO Test and Barlett Test
Based on the results of the KMO test and Barlett test of shepericity obtained KMO value of 0.807 greater than 0.5 so that the variable used is adequate for further analysis

3.4. Key dimension

At the PCA stage is used to determine the key dimension that can be known from the rotated component matrix results with the largest factor loading value. The following are the grouping dimensions and key dimension determination results.References must be listed at the end of the paper. Do not begin them on a new page unless this is absolutely necessary. Authors should ensure that every reference in the text appears in the list of references and vice versa. Indicate references by (Van der Geer, Hanraads, & Lupton, 2000) or (Strunk & White, 1979) in the text.

3.5. Size Validation

Size validation is done using aggregate loss where the value of aggregate loss should be smaller than the allowable aggregate value.

Table 4. Total samples of adults.

	Size		Aggregate Loss	Aggregate Ideal
S		1	0.3134	2.2401
		2	0.9891	
		3	0.2323	
		4	0.1789	
M	0.0098		2.2401	
L		1	0.1301	2.2401
		2	0.1889	
		3	0.2501	
		4	0.3001	

From the result of size validation calculations can be known if the sizes are formed ranging from boys and girls, teenage boys and girls, adult men and

women have an aggregate loss value smaller than the ideal aggregate value then can be concluded if the size is good and can be used

4. CONCLUSION

Obtained three sizes classification S, M, and L with an aggregate loss value smaller than the ideal aggregate then the results of the size examined according to the actual size and can be used

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