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ANALYSIS OF QUALITY CONTROL PROCESS OF SONGKET FABRIC PRODUCTION IN TENUN PUTRI MAS JEMBRANA

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ABSTRACT: This study aims to analyze how the damage to the products produced and the factors that cause damage to the songket woven fabric produced by the TenunPutri Mas Jembrana Group. The method of analysis used in this study is the Statistical Process Control (SPC) method. The population studied was all songket products. The sampling method used was a census, namely the results of songket woven fabric production during 2019. The results showed that product damage during the songket woven fabric production process is still under control, while the factors that cause damage come from human factors, methods, raw materials, and machines in this thing looms. Based on the research results, it is hoped that the Putri Mas Weaving Group will carry out periodic maintenance on the looms used and provide retraining to its members so that the number of defective products produced decreases.
Keywords: *quality control, statistical process control*

I. INTRODUCTION

The increasing competitive pressure and customer demand have made companies focus on meeting the needs of their customers (Ramanathan & Sibanda, 2019). The company's ability to meet customer needs is strongly influenced by the level of quality provided by the company to customers, which includes product quality, price and on time delivery (Santa, 2015). Good quality increases the value of a product or service, builds a brand name, a good reputation for the company, which in turn results in consumer satisfaction, and high sales (Patil et al., 2017). If there is a gap between the level of quality provided by the company with customer needs, there will be customer dissatisfaction problems. Therefore, companies are required to be able to continuously improve their production capabilities in producing products according to customer desires.

In the industrial world, an assessment of the good or bad quality of a product can be determined in 8 (eight) quality dimensions, namely performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality (Andriana et al., 2018). The quality of a product is determined by certain sizes and standards set by the company. If a product that is produced does not match the sizes or standards of the company, the product is damaged.

Even though a company has carried out a good production process, it often still produces products that are not in accordance with company standards (Ratnadi&Suprianto, 2016). Efforts to maintain product quality are by controlling quality because good product quality results from good quality control. Quality control is needed to keep the products produced in accordance with applicable quality standards. The quality standards in question are raw materials, production processes and finished products (Nurholiq et al., 2019).

To measure quality control in order to reduce the occurrence of production defects, so that quality targets are achieved as expected, a quality control method is called Statistical Process Control (SPC) (Bahari et al., 2018). The quality of the production process is controlled from the beginning of production, when the production process lasts until the finished product.

Empirical research from (Julaeha et al., 2020), (Azevedo et al., 2016), (Alriani& Setiawan, 2018), (G et al., 2018), (Reynaldi&Riandadari, 2018), (Elmas, 2017) states that the quality control in the company under study has gone well. The damage that occurs does not exceed the upper limit (Upper Control Limit) and lower limit (Lower Control Limit), which means that the level of damage is still within reasonable limits. Research results from (Andriana et al., 2018), (Hadiat et al., 2020), (Puspita& Sari, 2018), (Saputra&Renilaili, 2019), (Amalia et al., 2019), and (Purnawati& Sari, 2018) states that the quality control implementation process that has been carried out by the company is not well controlled. The damage that occurs exceeds the upper limit (Upper Control Limit) and the lower limit (Lower Control Limit), which means that the company needs repairs to reduce the level of disability so that it reaches the expected value. Product defects are mainly caused by

methods, employees, raw materials, and machines, these factors are the main causes that affect the weaknesses of the production process, causing defects in the final product

The Balinese songket woven cloth is woven from threads that form ornate patterns of various motifs. Gold, silver, silk, and cotton threads are widely used to make songket fabrics. The motifs used for Balinese songket fabrics are usually formed from diagonal lines or floral motifs and Balinese carvings.

Currently songket woven fabrics are not only in demand by local residents but also by the international market. At large exhibitions held in Tokyo and in Sanghai, songket woven fabrics received a positive response by local residents because their cultures and civilizations are similar (Ant, 2015). There are various product innovations made from songket woven fabrics including: dresses, masks, bags, blazers, wallets and shirts. A good songket cloth has criteria such as good connecting, soft and light texture of the motif, color does not fade, and tight woven motifs.

Putri Mas weaving group is a weaving group originating from Jembrana Regency which is an UMKM which is engaged in the production and development of Jembranasongket. The group of 55 weavers has a goal of preserving the cultural heritage of their ancestors, as well as empowering the surrounding community, especially women so that they can become more productive and able to participate in driving the community's economy.

The products of the Putri Mas Weaving Group have been exported to various countries. In an effort to preserve culture, the majority of songket cloths produced by Putri Mas use a distinctive Jembrana motif, namely the moon and star with calm natural colors. Putri Mas innovated songket without a connection by making a loom, namely the cag cag which has a length of one meter where generally the cag cag is only 50 cm long, natural batik songket, and songket with natural coloring using leaf materials such as teak leaves, guava leaves and others.

Songket cloth has a high selling value, so quality is very important for customers. Dye, yarn & loom used, and human resources will affect the quality of the songket cloth. In the initial survey conducted by researchers, the manager of the Putri Mas Weaving Group revealed that product defects were still found, potential customers sometimes complained about the unsymmetrical stitching on the songket cloth. Several times, the resulting songket motif does not match the customer's order. The types of product defects that often occur in songket fabrics are motive errors, less dense threads, and inappropriate colors. The damage is a loss for the company because defective and unqualified production requires repairs that take time or are sold at low prices.

II. METHODS

This research is descriptive with a quantitative approach because it describes the importance of controlling the quality of production to minimize damage during the songket production process in the Tenun Putri Mas Jembrana Group. This research was conducted on Jl. Cendrawasih No.3, Pendem, Jembrana Regency where there is a group of songket weaving craftsmen who have frequently exported their products abroad.

The population in this study were all songket products produced by the Tenun Putri Mas Jembrana Group. The sample in this study was the production of songket cloth from the Putri Mas JembranaTenun Group during 2019. Sampling in this study used census techniques.

This study uses data collection methods by observation and interviews with managers and weavers of the Tenun Putri Mas Jembrana Group. The results of the interview were in the form of a check sheet consisting of the amount of songket production during 2019, the type and amount of damage and the factors causing the damage. Data analysis uses Statistical Process Control to supervise and control a product to comply with predetermined standards. The analysis is done by making a check sheet, histogram, p control chart and causal diagram.

III. RESULTS AND DISCUSSION

Control chart p (p-Chart)

Control chart (p-chart) which functions to see whether the quality control in this company is under control or not. Based on the data that has been collected, namely attribute data, the control chart used is the p control chart (p-chart). The steps in making p control chart are as follows:

1) Calculating the proportion of damage

$$\bar{p} = \frac{X}{n}$$

Information:

$\bar{p}$: average defect rate of the product

X: the number of products damaged

n: number of products observed
Then,
$\bar{p}$ = 68/1802 = 0.04

2) Determine the standard deviation (deviation)

Sp = √ (($\bar{p}$ (1- $\bar{p}$)) / n)
$\bar{p}$: average defect rate of the product
Sp: standard deviation (deviation)
n: number of products observed
Then,
Sp = √ ((0.04 (1- 0.04)) / 130)
Sp = 0.02 (month of January)
Determine the limits of supervision
Upper control limit (UCL)
UCL = $\bar{p}$ + 3 Sp
Then,
UCL = 0.04 + 3 (0.02)
= 0.09 (month of January)
Lower control limit (LCL)
LCL = $\bar{p}$ -3 Sp
Then,
LCL = 0.04 - 3 (0.020)
= - 0.012 (month of January)

The data was processed using Microsoft Excel 2019 to find the percentage of damage from each subgroup (month), the average damage, standard deviation, lower limit and upper limit. The following is a table of data processing results:

Table 1.Calculations of the p control chart for the production of the Putri Mas weaving group for the period of 2019

Month	Total Production	Total Damages	Damages Percentages	p bar	Dev. std	UCL	LCL
January	130	5	0.04	0.04	0.02	0.09	-0.012
February	173	8	0.05	0.04	0.01	0.08	-0.006
March	151	6	0.04	0.04	0.02	0.08	-0.009
April	115	5	0.04	0.04	0.02	0.09	-0.016
May	126	4	0.03	0.04	0.02	0.09	-0.013
June	149	6	0.04	0.04	0.02	0.08	-0.009
July	151	4	0.03	0.04	0.02	0.08	-0.009
August	121	4	0.03	0.04	0.02	0.09	-0.014
September	179	8	0.04	0.04	0.01	0.08	-0.005
October	158	5	0.03	0.04	0.02	0.08	-0.008
November	172	6	0.03	0.04	0.01	0.08	-0.006
December	177	7	0.04	0.04	0.01	0.08	-0.005
Total	**1802**	**68**					
Mean	**150.17**	**5.67**	**0.04**				

Secondary Data, 2020

After the percentage value of damage from each subgroup (month), the average value of damage or central line, standard deviation, UCL (Upper Control Limit) value, and LCL (Lower Control Limit) value are known, the next step is to create a p control chart (P-Chart) using Minitab 18 software. P control chart makes it easy for researchers to see which groups are out of control. The following is an image of the p control chart as a result of data processing using Minitab 18:

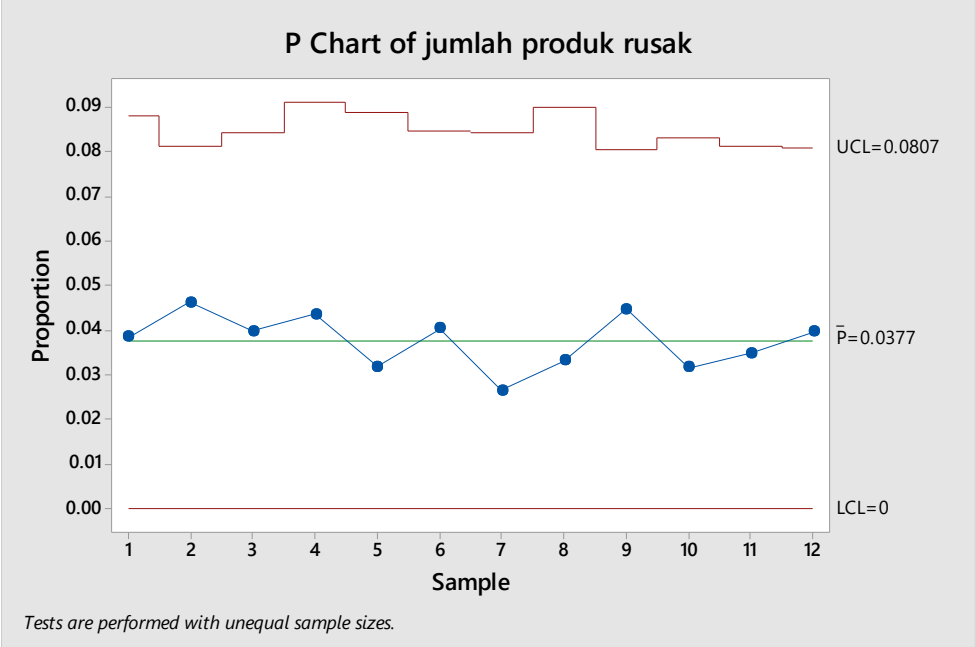

Figure 1.Control map for songket woven defective products in 2019

Based on Figure 1, it can be seen that the percentage points of damage are between the upper limit (UCL) and the lower limit (LCL). So that the data obtained is within the control limits that have been set, and it can be said that the process is under control. This indicates that the quality control of the songket woven fabric in the Tenun Putri Mas JembranaGroupis still under control or does not show that there is no significant deviation in the control of the process.

Causal diagram

To analyze what factors are the causes of product damage can be done using a cause and effect diagram (fishbone). In general, the factors that influence and cause product damage can be classified into 5, namely: people (workers), material (raw materials), machine (machine), method (method), and environment (environment).

In Figure 2, it can be seen on the histogram that there are three types of damage during the production process, namely inappropriate motifs, less dense threads, and inappropriate colors. A cause-and-effect diagram as a tool to trace the causes of damage to each type of damage. The following is an analysis using a causal diagram for unsuitable motifs, less dense threads, and inappropriate colors:

1) Motive does not match

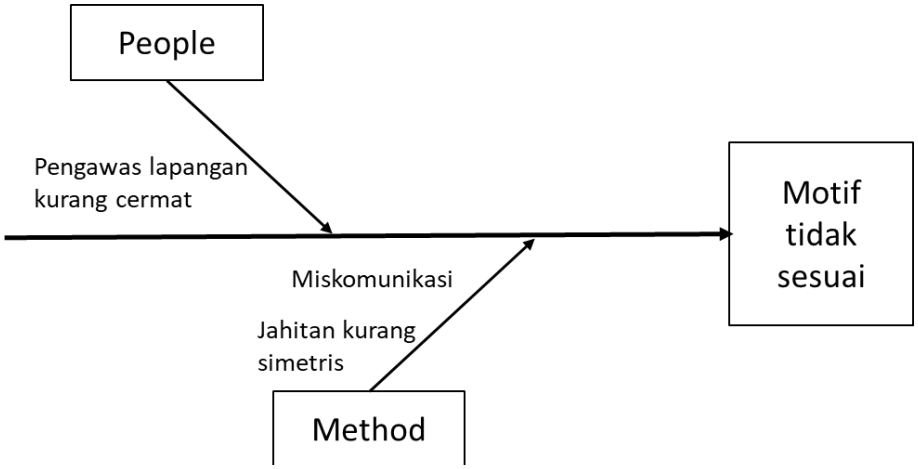

Figure 2. Causal diagram of inappropriate type of motive damage

The mismatch of the motif on the songket woven cloth occurs due to miscommunication between the motive designer (based on customer requests) and the weaver so that the motive produced is different from what is expected. Field supervisors as people who are directly responsible for the production process are less careful

in supervising weavers. Unsuitable motives can also be indicated by the unsymmetry of the motifs. This often occurs in woven songket joints where the stitching as a fabric connector makes the motif less symmetrical.

2) The thread is less dense

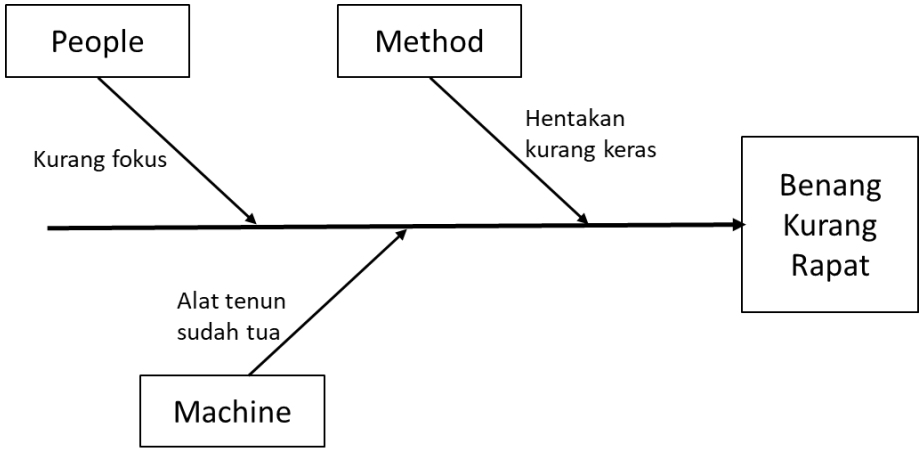

Figure 3. The cause and effect diagram of the type of damage to the thread is less dense

The thread error is not tight enough on the songket woven fabric is indicated by the visible space between the threads. The factor causing this type of damage is the lack of harsh beating issued by the weaver on the loom so that the thread is less tight, another factor is that the loom used is old so that the resulting pressure is less strong even though the weaver has stomped very strongly. Lack of focus in weaving can also be the cause of the lack of tightness of the yarn because a high concentration is required in weaving.

3) Color mismatch

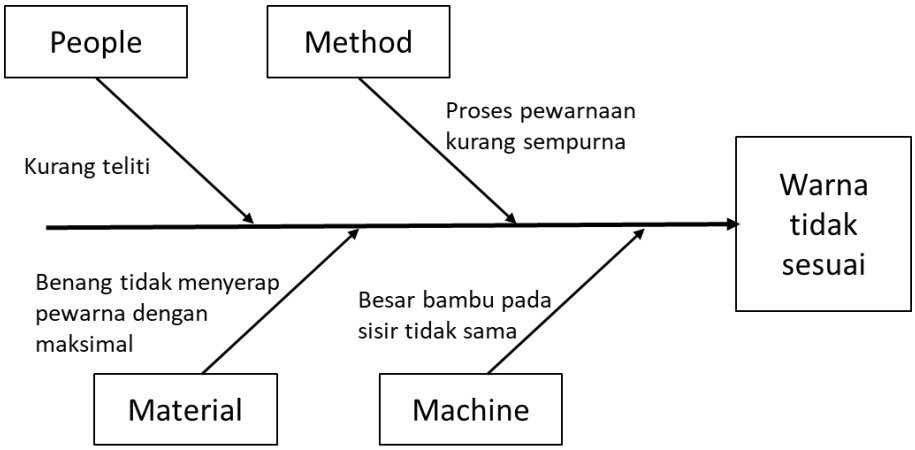

Figure 4.Cause and effect diagram of the color defect type does not match

The discrepancy in the color of the songket woven cloth is caused by the comb on the loom, which has a bamboo that is different in size or slightly larger than the others. This causes white lines to appear on the songket woven fabric. The color fading makes the songket woven fabric not as expected. Color fading occurs because workers are not careful and the dyeing process is not perfect or not in accordance with standards. Another factor is the material, namely the thread used is not able to absorb the dye maximally.

IV. CONCLUSION

The result of the p control chart shows that the point of damage is between the upper control limit and the lower control limit. It can be interpreted that the product damage during the songket woven fabric production process in the Tenun Putri Mas JembranaGroupis still under control or there is no significant deviation.

Based on the results of the analysis of the cause and effect diagram, it can be seen that the factors that cause damage in the songket woven fabric production process are derived from human factors, methods, raw materials, and machines, in this case the weaving tool.

Even though quality control is within control limits, there are still defective products such as less dense yarn which is the type of defect with the highest incidence. To reduce the number of defective products, the

researcher proposes to periodically check the looms used. In addition, the decline in function of the loom caused by the age of use can hinder the production performance of the songket woven cloth. Therefore, maintenance of the loom is highly recommended to be carried out periodically, especially before and after the loom is operated, so as not to hinder the songket woven fabric production process and to optimize production quality by minimizing the presence of non-conforming products.

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