

PATTERN 210 FOR DESIGNING LONG-SLEEVED SHIRTS WITH SANGGIT BATIK MOTIF

Mulyanto¹, Figur Rahman Fuad¹, Endri Sintiana Murni¹, Desy Nurcahyanti²
and Dyah Yuni Kurniawati²

¹Arts Education Department, Faculty of Teacher Training and Education,

²Fine Arts Department, Faculty of Fine Arts and Design,

^{1, 2}Sebelas Maret University, Jl.Ir.Sutami 36A, Surakarta, 57216, INDONESIA

mulyantosr@yahoo.com, mulyanto@staff.uns.ac.id, figurrahmanfuad@staff.uns.ac.id,
endrisintianamurni@staff.uns.ac.id, [idesynurcahyanti@staff.uns.ac.id](mailto:iddesynurcahyanti@staff.uns.ac.id), dyahyunik@staff.uns.ac.id

Abstract. The purpose of this research is to formulate a pattern of batik motifs on cloth measuring 115x210 cm which can be made into long-sleeved shirts of various sizes whose motifs are still sharp. The research was conducted using qualitative descriptive methods and participatory action studies. The descriptive method is to identify and develop a draft pattern, while the participatory follow-up method is to test the draft pattern by actively involving batik entrepreneurs, motif designers and tailors. The research was conducted at the Jalidin batik business, Sragen, and data were collected through observation, interview, FGD and document analysis techniques. The results of the research are a pattern of 210 batik motifs for long-sleeved shirts in the shape of a rectangle, the length of the pattern is 210 cm and the width of the pattern is 115 cm. This pattern is relevant for developing batik motifs with an efficiency of 16%, and the resulting batik fabric can be made into long-sleeved batik shirts in sizes S, M, L, XL and short-sleeved shirts in size XXL with strong motifs. The complexity (kesanggitan) of the motif is located on the front of the shirt, the left side, the right side, the pocket, as well as certain motifs on the cuffs and collar. The shirt motif pattern is very effective and efficient for developing random or a-symmetrical batik motifs.

Keywords: pattern 210, motif, long-sleeved shirt, sanggit batik.

1 INTRODUCTION

Indonesian batik motifs pattern can be broadly divided into three categories based on their feature, namely the long or *jarit* cloth batik pattern, the shirt batik pattern, and the *jarit*-shirt batik pattern. First, the long cloth batik pattern is a rectangular pattern for making a batik motif, and the batik cloth it produces, is used as a whole without cutting or stitching. For instance, batik cloth is used to produce *jarit* for women, sarongs for men, scarves, headbands, kembang, sheets, tablecloths, and other products. Dependent on the design of the position of the motifs, long cloth batik patterns in Indonesia can be divided into at least seven patterns, namely the morning-evening pattern, the one-headed pattern, and the two-headed pattern [1], *parang* pattern, ruffled pattern, upright symmetrical pattern, and random pattern.

Batik cloth is used as a *jarit* for women, a sarong for men, a scarf, headband, kembang, mats, tablecloth, and other objects. Based on the form of the position of the motifs, the types of long cloth batik patterns in Indonesia can be divided into at least seven patterns, namely the morning-evening pattern, the one-headed pattern, and the two-headed pattern. The batik cloth with the long cloth pattern

described above is expected to be used as a *jarit* or sarong for women. If the cloth is used to produce a shirt or blouse, the resulting clothing will have a motif that cannot be *sanggit* in some parts of the *jarit*.

Second, the *jarit*-shirt batik pattern is a pattern for creating batik motifs; the resulting batik can be used for *jarit* as well as made into shirts of different sizes with stick motifs. This *jarit*-shirt has four types of batik patterns: 1) long-sleeved *jarit* shirt pattern, 2) short-sleeved *jarit* shirt pattern, 3) asymmetric long-sleeved *jarit* shirt pattern, and 4) asymmetric long-sleeved *jarit* shirt pattern, asymmetrical short sleeve shirt pattern.

Third, the shirt batik pattern is 1) a rectangular picture that is used as a guide for producing batik motifs; the batik cloth created by the pattern can then be made into shirts or blouses in a variety of sizes (M, L, XL, XXL) while the motive remains *sanggit*. [2], 2) a short-sleeved shirt batik pattern [3], and 3) a jumbo-size shirt batik pattern. The drawback of the three batik shirt patterns is that they can only be used for shirts and not for sewing or sarongs. A shirt is an essential piece of clothing, especially for men. Since the shirt's incremental success in the nineteenth century until today, global market demand for the shirt has been increasing [4].

Specifically for making long-sleeved shirts of various sizes whose motifs remain *sanggit*, based on the above pattern, it can be used 1) batik pattern for long-sleeved shirts with cloth size 250 cm, 2) jumbo shirt batik pattern measuring 270 cm, and 3) batik jarit pattern, long-sleeved shirt 260 cm cloth size. The three patterns listed above, however, have drawbacks. The downside of the long-sleeved shirt batik pattern is that it needs a 250 cm long cloth, the jumbo shirt batik pattern requires a 270 cm long cloth, and the long-sleeved-long-sleeved shirt batik pattern requires a 260 cm long cloth and cannot produce asymmetrical motifs.

This research identified 210 shirt patterns based on the flaws of the three types of patterns. The 210 shirt pattern is a rectangular pattern that uses a fabric 210 cm long x 115 cm wide as a guideline for creating batik motifs, and the resulting batik cloth can be made into a long-sleeved shirt of different sizes with motifs that remain *sanggit*. As compared to existing patterns, this 210 shirt pattern has the potential to increase the cost efficiency of batik production by 16% (250-210/250).

The batik industry, batik motif designers, batik makers, batik dyes, batik patterned clothing fashion designers, the convection industry, and batik consumers will all benefit from this 210 long-sleeved shirt pattern. The advantages for the batik industry include: a) the potential to produce a variety of batik motifs, both symmetrical and asymmetrical, for long-sleeved shirts with *sanggit* motifs; and b) the potential to save up to 16 % of batik production.

Benefits for motif designers include the fact that this pattern makes it easier to work on designing batik motifs for long-sleeved shirts, despite the fact that the motifs produced are of a high level of difficulty. Benefits for batik makers and dyers: this pattern makes it simpler to do batik and color the fabric based on the pair of motifs, even though the position of the motifs spreads out.

The advantage for tailors is that it will be easier for them to determine the broken sections of the long-sleeved shirt design that is produced so that the tailor will find it easier to cut the batik cloth to make it into long-sleeved clothing. The advantage for the consumer community is that by looking at the motive on the back, they would be able to better grasp the batik motifs as a whole if the batik cloth has been sewn into a shirt.

2 REVIEW OF RELATED LITERATURE

There has been a lot of researches conducted on clothing patterns, both men's and women's clothing patterns, however specific research on patterns for producing motifs on clothes, where the patterned cloth produced can be made into clothes with *sanggit* motifs has been uncommon.

One related clothing pattern research, for example [5], examines the making of party dresses for students of Syafi'i Akrom Pekalongan Vocational High School, and he uses combination patterns more effectively than construction patterns. When using hybrid patterns, the resulting clothing is better and the time required is shortened. The disadvantage is that since the *draping* pattern uses the main material directly, certain errors in cutting the fabric would result in an additional cost, it is best to be cautious when creating a combination pattern.

The research results of [6] on the Dotted-Board Model (DBM) and Extended Local Search (ELS) for the optimization of the layout of fashion patterns on patterned materials using pattern harmony rules, the overall average result of the combination of ELS and DBM contributed positively in increasing the computation time, namely the computation time of ELS with DBM. The optimum resolution and Nmo that can be obtained by combining ELS and DBM are 5 and 3, respectively, with an average efficiency of 56% and a computation time of 381 seconds. In this research, the patterned materials used are those with geometric and repetitive motives, making it easier to match the motifs. If the motif is not geometric or even abstract, the situation would be different. According to that research, there are three major items that have been studied in relation to motif patterns, namely fashion patterns, the creation of motifs without paying attention to patterns, and the application of fashion patterns. Combining the three items listed above, namely compiling a pattern on a piece of cloth, a strategy for placing a clothing pattern on the cloth so that the motif can be organized, and a strategy for placing a pattern on a clothing pattern. Thus, the patterned cloth produced by this pattern model is used to make shirts with *sanggit* motifs. To produce a shirt pattern, several factors must be considered, such as the various types of broken shirt patterns, the standard size of the adult body, various standard sizes of fabrics as shirt material, various types of motifs, factors that influence the quality of shirt items, etc. There has been a great deal of research on the development of clothing motifs. For instance, research on coffee and cocoa as a source of inspiration for Jember batik motif creations [7]. Local arts and culture can also be explored and developed to inspire the design of Balinese batik motif designs [8]. Regional icons have also become a source of inspiration for Indonesian batik motif development [9]. Archaeological site elements include elephants, elephant heads, elephant legs, and bones, which were used to create batik motifs as in Sragen region [10].

There are three types of adult shirt patterns used for the manufacturing of long-sleeved shirts: body broken pattern, sleeve broken pattern, and collar broken pattern.

Upper chest circumference, shirt length, long sleeve length, arm circumference, wrist circumference (cuff), neck circumference (collar), and pocket size are all adult body measurements that must be taken. The actual sizes used in the small, medium, big, X-large, and XX-large labels vary depending on the producer's region and target market. Manufacturers whose products are marketed to adult men offer a larger range of clothing sizes than producers whose products are marketed to young men [11]. Examples of the two standard indicators for upper chest circumference proposed by British Standards and widely used by manufacturers in the UK are shown in Figure 1.

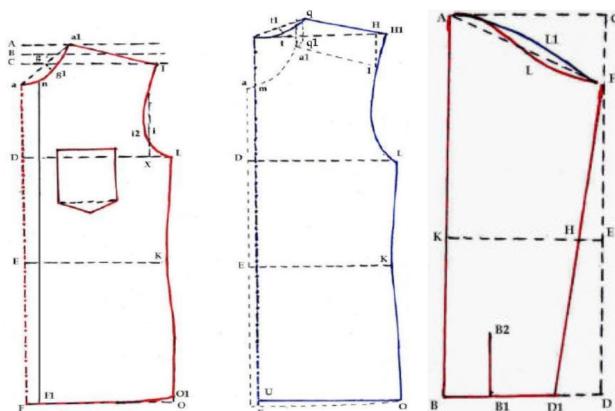


Figure 1 Men's fashion body and long sleeve designs

Table 1 Standard upper chest circumference [cm] according to British Standards

Target consumers	S	M	L	XL	XXL
Young man	<94	97-102	103-109	112-117	119-125
Adult male	94-99	99-107	107-114	114-122	122-130

Table 2 The size [cm] for broken pattern of men's shirts [11]

Target consumers	S	M	L	XL
Upper chest circumference	92	100	108	116
Neck circumference	38	40	42	44
Sleeve length	80	82	84	86
Wrist	17	17.8	18.6	19.4
Half the width of the back	19	20	21	22

Table 3 Size [cm] for broken pattern of the shirt [22]

Description	S	M	L
Low chest	18	22	24
Shirt length	57	66	70
Shoulder width	33	40	46
Half the width of the face	22	25	28
Shoulder width	11	15	16
Short sleeve length	19	21	23
Arm circumference	28	31	34
Neck circumference	30+2	35+2	37+2

Various types of cloths that are commonly used for batik shirts include primissima cotton cloth, prime cotton cloth, and 115 cm wide silk. Batik motifs that

are considered beautiful on a piece of cloth may not be as appealing when made into a shirt or blouse. This is induced by the process of making clothes by cutting and stitching the cloth. For example, a piece of well-patterned batik cloth is then made into a shirt garment by cutting it to the size of the pattern and stitching it. The motifs on the joint of the clothes will no longer be able to connect, so the motif does not appear intact, does not meet, or does not *sanggit*. Thus, the batik cloth, that will serve as quality clothing for the *sanggit* motif, must be designed in such a way that the motif's aesthetic value can be obtained. The motif pattern layout must be designed based on the type of motif, clothing pattern, production techniques and adult body standard size.

There are seven aspects that need to be considered in designing product designs, namely functional, technical, ergonomic, economical, environmental, socio-cultural, and visual aesthetics [12]. In terms of motif pattern, the most important factor to remember is the aesthetic aspect, namely that the motif can still be pitted in various sizes of shirts. Functional aspect is precisely the suitability of motives and their implementations. The economic aspect is specifically the match between the pattern size and the cloth size required for the shirt. In terms of the environment, Fanina and Suaedi [13] claimed that Solo batik products have a significant correlation between consumer willingness to consider environmental conditions and batik sustainability. In term of clothing in general, Algahni and Al-Dabbagh [14] stated that consumers prefer sustainable clothing that is attractively designed, of excellent quality, and reasonably priced. Besides, consumers have emphasized the importance of having sufficient information about clothing trends on social media.

Furthermore, several important factors in the design process of textile products (batik) include products that can be produced, products that can be marketed, products that can be used, and products that are attractive [15]. Shirt pattern design, including design in general, is a creative industry business which is unique amongst cultural industries. Design innovation requires the incorporation of a wide range of expertise, such as the one shared by designers, consumers, and company performance [16].

To create a batik patterned long sleeve shirt pattern, one must first understand the batik manufacturing process that will be used on the long sleeve shirt pattern. The written batik technique, the resin printing technique, the wax printing technique, and the full print technique are the batik textile production techniques that are essential for working on long-sleeved shirt patterns. There are several different types of batik motifs that can be used in long-sleeved shirt patterns, including geometric motifs, symmetrical motifs, asymmetrical motifs, abstract motifs, italic motifs, and random motifs.

3 METHODS

Using a qualitative descriptive approach and participatory action research, this research was conducted in the Jalidin batik industry in Sragen and the tailors of Royal Sukoharjo, Central Java Province, Indonesia. The qualitative descriptive method is used to establish a draft long-sleeved shirt pattern which is standard for adult sizes, and the participatory action testing method is used to evaluate the pattern draft before it becomes a standard shirt pattern. The data sources in this research include participants, documents, and events. Participants consisted of 1 businessman as well as motif designer, 2 batik makers, 1 batik dye, 1 tailor, and 3 batik consumers. The documents used are mainly the 210 batik patterns tested, screen motifs, symmetrical batik motifs, broken long-sleeved shirt patterns, and batik shirts produced from the patterns studied.

All of the processes related to the making of the 210 long sleeve motif pattern, including the pattern design process, motifs design process, batik production process, pattern production, cloth cutting process and shirt sewing process, were observed. The results were presently documented in the research. The data sources were based on purposive techniques, snowball and time sampling.

Then the data were collected through observation techniques [17] on the events and the resulting documents, interviews [18] with participants and informants, focus group discussions [19] with all participants, and literature studies, and further data analysis using a flow model [20].

4 RESULTS AND DISCUSSION

To discuss the pattern of long sleeves with the Sanggit pattern, the standard shirt pattern size for adults (Indonesia) must be determined. Based on several references, such as [21-23], a split component size of the long sleeves shirt pattern for Indonesian adults has been determined as described in Table 4.

Table 4 Size [cm] of broken long sleeve shirt pattern for Indonesian adult

Broken shirt pattern	M	L	XL	XXL
Half rear body circumference	54	56	58	60
A quarter of the circumference of the front	30	32	34	36
Shirt length	76	78	80	82
The circumference of the arm base	48	50	52	54
Long sleeve length	57	58	59	60
Short sleeve length	21	23	24,5	26
Neck circumference/collar	38	40	42	44
Wrist circumference	17	17,8	18,6	19,4
Cuff	23	23,3	23,6	24
Pocket	12x14	12x14	12x14	12x14

The pattern of the 210 long sleeved sanggit shirt (Figure 2a) is used as a reference for developing a batik motif in a sleeve of 115x210 cm where it is possible to produce batik clothes in long-sleeved shirts in size S, M, L & XL, and short-sleeved XXL and the motifs can remain sanggit .The produced sanggit pattern motif lies in the front buttoned shirt, the right side seam, the left side seam, and the upper left chest pocket with the motifs around it.

This 210 long-sleeved shirt pattern is divided into 7 parts, namely the back or back area of A, measuring 73 cm wide and 90 cm long; fields B and C, right chest and left chest area measuring 42 cm wide and 90 cm long, respectively; plane D and E, right and left arm, measuring 60 cm at arm's circumference and 61 cm in arm length, respectively; F area, cuff and collar, measuring 12 cm wide and 120 cm long; G area, the pocket section measures 42 cm by 30 cm.

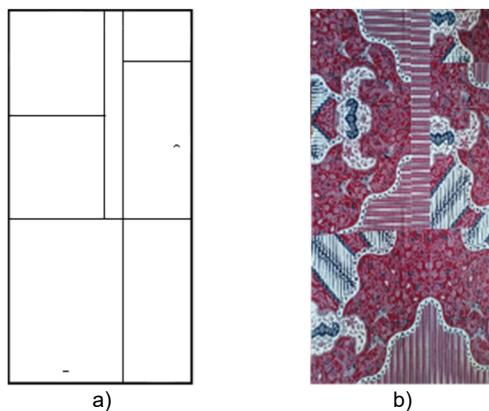


Figure 2 The 210 pattern motif (a) and the batik of 210 pattern (b)

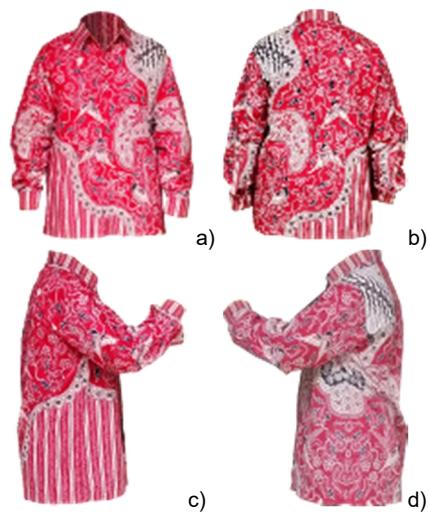


Figure 3 Asymmetrical long-sleeved front sanggit shirt, sides, pockets

Asymmetrical batik motif design (master motif shown in plane A) extended to long sleeve shirt pattern 210. Furthermore, the 210 pattern is batik on cloth which measures 115x210 cm (Figure 2b). Furthermore, the patterned batik cloth is made into a long-sleeved shirt in size M (Figure 3), such that the shirt is visible from the front, behind, left side, and right side. The motif on the front is reversed with the motif on the back. The sanggit is depicted on the front shirt motif, as well as the pocket motif and the surrounding motifs (Figure 3a). The left and right sections of the shirt motif (Figure 3c) are both sanggit (Figure 3d). The motifs on the cuffs and collar are striped in shape, as compared to the main motif, which is in the shape of a machete and an uke/ flower.

Pattern 210 analysis for a long-sleeved shirt

A trial analysis of 210 long-sleeved shirt-patterned batik cloth is produced into a long-sleeved shirt in sizes XXL (Table 5), XL (Table 6) and M (Table 7).

Table 5 shows that:

1. The broken portion of the shirt pattern shown is only the broken shirt pattern linked to the shirt pattern's formulation. Half back body circumference, front body quarter circumference, shirt length, sleeve circumference, long sleeve length, cuffs, collar, and pockets are the pattern's split components.
2. The pattern size and code are the codes for A to H on the pattern, and the size is that which is specified on the pattern.
3. Kampuh is the edge of the cloth which binds one cloth to another. The circumference of the base of the arm, for instance, is given an excess of 3cm for *jarit*, the right and left halves of back are given an excess of 2×2 cm = 4 cm, and the length of the shirt is given an excess of 6 cm for seams and *jarit*.
4. Body, the amount of cloth required to make a shirt in sizes ranging from M to XXL.
5. The total means that the required pattern size plus the size of the camp or seams.
6. Difference, namely the size of the cloth pattern minus the total amount of clothing required to produce the shirt.

According to Table 5, the relationship between the size of the pattern (Table 5) and the required XXL size shirt is as follows. Code A, the size of the back half of the body circumference in the pattern is 73 cm, although it takes 64 cm to make a shirt so that the cloth is only 9 cm wide. The length of the shirt in the pattern is 90 cm, however the length of the shirt required is 88 cm, so there is still 2 cm of cloth remaining. Code B or C, measure a quarter of the circumference of the right or left front of the body in a pattern measuring 42 cm, while a shirt takes 38 cm, so there is still 4 cm of cloth left. Thus, for the entire body circumference there is still cloth remaining as wide as 15 cm ($9+2+4$ cm).

Code D or E, the sleeve circumference pattern size is 60 cm, although it takes 57 cm to produce a shirt, remaining 3 cm of cloth. The length of the pattern's long sleeves is 61 cm, but it takes 63 cm to produce long sleeves, so "the length of the fabric is less than 2 cm" (-2 cm). As a result, this 210 long sleeve shirt patterned batik cloth cannot be used to produce XXL long-sleeved shirts. Meanwhile, when it is used to produce a short-sleeved shirt, it takes 33 cm of the sleeve length, leaving the cloth 28 cm with full body circumference of 149 cm ($73+42+42-8$ cm).

Code F, cuffs and collars in a pattern measuring 12x120 cm, enough to render two cuffs measuring 12x24 cm = 48 cm long and a shirt collar measuring 12x24 cm = 48 cm long (12x44 cm). As a result, the F cloth is 12x20 cm. G code, the upper left chest pocket in the pattern is 42 cm wide x 30 cm high, whereas making the pocket requires a cloth measuring 17x21 cm, so there is a width and height excess of 25 and 9 cm. The excess of the pocket pattern size of 25 cm wide and 9 cm high is used to provide flexibility in positioning the motif on the pocket with the motif on the chest between the sizes M, XL and XXL so that the motif on the pocket size (13x15 cm) can be *sanggit* with motifs around it.

The analysis in Table 5 shows that this 210 pattern cannot be made into a "long-sleeved" XXL size shirt with a *sanggit* motif, but only a "short-sleeved" XXL size shirt with a *sanggit* motif.

Table 5 Comparison of pattern size [cm] for long-sleeved shirt 210 and fabric requirement for long- sleeved shirt size XXL

Part of the broken pattern	Pattern codes	Kampuh (Hem)	Body	Total	Difference
1	2	3	4	$5=4+3$	$6=2-5$
Half rear body circumference	A-73	4	60	64	9
Shirt length	A-90	6	82	88	2
A quarter of the front body circumference	BC-42	2	36	38	4
The base arm circumference	DE-60	3	54	57	3
Long-sleeved length	DE-61	3	60	63	(-2)
Short-sleeved length	DE-61	7	26	33	28
Cuffs and collars	F-120	4; 4	2x24; 44	52; 48	20
Pocket	G-42x30	4+6	13x15	17x21	25-9

Table 6 Size comparison [cm] of 210 long sleeve shirt patterns with a specification for an XL long-sleeved shirt

Parts of the broken pattern	Pattern codes	Kampuh	Body	Total	Difference
1	2	3	4	5=3+4	6=2-5
Half rear body circumference	A-73	4	58	62	11
Shirt length	A-90	6	80	86	4
A quarter of the front body circumference	BC-42	2	34	36	6
The base arm circumference	DE-60	3	52	55	5
Long-sleeved length	DE-61	3	59	62	(-1)
Cuffs and collars	F-120	4; 4	47.2; 41	51.2; 45	23.8
Pocket	G-42x30	4-6	12x14	16x20	26x10

According to Table 6, the relationship between the size of pattern 210 (Table 6 codes) and the required size of the shirt XL size is as follows. Code A, the size of the back half of the body circumference in the pattern is 73 cm, while it takes 62 cm to make a shirt so that the cloth remains 11 cm wide. The length of the shirt in the pattern is 90 cm, however the length needed is 86 cm, leaving 4 cm of cloth. Code B or C, measure a quarter of the circumference of the right or left front of the body in a pattern measuring 42 cm, while a shirt takes 36 cm, leaving 6 cm of cloth.

Code D or E, the sleeve circumference pattern size is 60 cm, but it takes 55 cm to make a shirt, so there is still 5 cm of cloth remaining. The pattern's sleeves are 61 cm in length, but it takes about 62 cm to produce a shirt, so "the length of the fabric is less than 1 cm." The required seam length is 3 cm, but only 2 cm of cloth is available; this 1 cm deficiency can be made up using the cloth from the F (collar) part. As a result, this 210 long sleeve shirt patterned batik cloth can be used to make XL size of long-sleeved shirts.

Code F, cuffs and collars in a pattern measuring 12x120 cm, enough to make 2 cuffs measuring 12x23.6 cm = 47.2 cm long and a shirt collar measuring 12x23.6 cm = 47.2 cm long (12x41 cm). As a result, the fabric element F is 12x23.8 cm. The upper left chest pocket in the pattern is 42 cm wide x 30 cm high, however the pocket includes a cloth measuring 16x20 cm, so there is a width and height excess of 26 and 10 cm.

The conclusion of the analysis in Table 6 is that this 210 batik pattern can be made into an XL size long-sleeved shirt with sanggit motifs.

In addition, Table 7 shows the relationship between the size of the motif pattern 210 and the cloth

required to make a long-sleeved shirt size M. Since the pattern's half-body circumference is 73 cm and the required shirt size is 58 cm, there is still 15 cm of cloth remaining. The pattern's shirt is 90 cm in length; however the required shirt length is 83 cm, so there's still 7 cm of cloth remaining. The remaining 7 cm cloth will be discarded later so that the tailor may select which batik motif to use or discard, the top or bottom motif. It is also possible that the motif chosen is the middle part, in which case the 3.5 cm upper and 3.5 cm lower motifs are discarded.

Codes B and C, measure a quarter of the front body circumference to the left or right in the pattern measuring 42 cm, while a shirt is needed 31 cm, leaving a cloth 11 cm wide. In codes D and E, the size of the cloth at the base sleeve is 60 cm, while the required shirt sleeve circumference is 51 cm, leaving 11 cm on the cloth. The pattern's arm length is 61 cm, thus it takes approximately 60 cm to produce a shirt so that the cloth remains 1 cm.

The pattern's cuffs and collars are 12x120 cm, while the fabric required to produce two cuffs is 12 cm wide, 4 cm long + (2x23 cm) = 50 cm, and the cloth required to produce a shirt collar size M is 12 cm wide and 4 cm + 38 cm long = 42 cm. It takes 92 cm of cloth to produce cufflinks and collars, leaving 28 cm of cloth. The pattern pocket is 42 cm wide x 30 cm high, although making a pocket requires a size of 16x20 cm, then there is still an excess of 26 cm in width and 10 cm height. The pocket pattern's excess size is used to provide flexibility in locating the pocket motif on the pocket with the motifs around it. Eventually, this 210 motif pattern can be modified into M size long-sleeved shirt.

Table 7 Comparison between cloth criteria for long sleeve shirt size M and pattern size [cm] for long-sleeved shirt size 210

Parts of the broken pattern	Pattern codes	Kampuh	Body	Total	Difference
1	2	3	4	5=3+4	6=2-5
Half rear body circumference	A-73	4	54	58	15
Shirt length	A-90	6	76	83	7
A quarter of the front body circumference	BC-42	2	30	31	11
The base arm circumference	DE-60	3	48	51	9
Long-sleeved length	DE-61	3	57	60	1
Cuffs and collars	F-120	4; 4	46.38	50; 42	28
Pocket	G-42x30	4-6	12x14	16x20	26x10

The Efficiency of 210 Pattern

There are currently at least three patterns of batik motifs which can be used to produce long-sleeved shirts in a range of sizes with *sanggit* motifs. These patterns are (1) long-sleeved shirt pattern, (2) long-sleeved shirt pattern and (3) motif 210 long-sleeved shirt pattern. The following is a comparison of the three patterns:

The pattern of a long-sleeved shirt-long rectangular size 115x260 cm, can produce batik cloth with motifs that are used for *jarit* and can be made into long-sleeved shirts of various sizes with *sanggit* motifs (Figure 4).



Figure 4 The results of the pattern can be made into (a) *jarit* and (b, c) long-sleeved shirts with symmetrical *sanggit* motifs



Figure 5 Symmetrical motif (a) and asymmetrical motif (b) of long-sleeved *sanggit* shirt

Long-sleeved shirt pattern in the form of a rectangle measuring 115x250 cm, can produce batik motifs into long-sleeved shirts of various sizes with *sanggit* motifs. This pattern can be used to produce both symmetrical and asymmetrical motifs for shirts, but not *jarit* motifs (Figure 5).

The pattern of 210 long sleeve shirts is rectangular size 115x210n cm, can produce batik motifs to be made into long-sleeved shirts of sizes M, L, and XL, which motifs are *sanggit*, and the XXL size of the short sleeve shirts.

This pattern can only be used to produce symmetrical or asymmetrical motifs for long-sleeved shirts; it cannot be used to produce motifs for *jarit*.

The 210 pattern has an advantage over the previous pattern in that it only needs a 210 cm cloth length. As compared to the long-sleeved shirt pattern, which is 250 cm in length, the 210 pattern has a 16%.

$$\text{Efficiency rate} = (250-210)/250 = 40/250 = 16\%$$

That is, if producing one piece of batik cloth using the previous pattern can cost Rp. 500.000, but using this 210 pattern it will cost only Rp. 420.000, then the efficiency value of the 210 pattern is Rp. 80.000. ($16\% \times \text{Rp. } 500.000$). The limitation of this 210 motif pattern is that it cannot be used to make long-sleeved XXL shirts with *sanggit* motifs, but it can be used to make short-sleeved XXL shirts.

5 CONCLUSION

Based on the discussion above, it can be concluded that if batik producers will produce batik cloth which is projected to only be used as long-sleeved shirts with a *sanggit* pattern, then the right solution is to produce batik using the "sanggit pattern 210 for long-sleeved shirt". The *sanggit* pattern 210 for long sleeve shirt measures 115x210 cm, it can be made into long-sleeved shirts in sizes S, M, L, and XL with *sanggit*, as well as a short-sleeved XXL shirt with *sanggit* motifs.

The advantages of this *sanggit* 210 pattern are as follows:

- 1) It has a batik production cost efficiency of 16%. For instance, if one piece of batik cloth costs Rp. 500.000 to produce, then using this pattern of 210 motifs can result in an efficiency of Rp. 80.000.
- 2) The *sanggit* 210 batik cloth can still be made into long-sleeved shirts in sizes S, M, L, and XL with the *sanggit* motif, as well as short-sleeved shirts in size XXL.
- 3) The 210 motif pattern can be used to produce highly difficult batik *sanggit* motifs, such as asymmetrical motifs, oblique motifs, and abstract motifs. Moreover, shirt motifs on the collar and cuffs may be made with motifs other than the main motif.

To manufacturers of shirt-patterned batik fabrics, it is recommended that when marketing the 210-patterned batik cloth to include guidelines for the broken pattern of 210 design. The pattern image can be used as a reference for consumers and tailors when reading batik motifs while the batik cloth is still in the form of a sheet (raw material), as well as reading parts of the motif based on the broken pattern of long-sleeved shirts. Before purchasing a batik cloth with a long-sleeved shirt pattern, customers should first read and understand the motif so that the batik purchased is in accordance with their desires and needs.

6 REFERENCES

1. Ishwara H., Supriyanto Yahya L.R., Moeis X.: Indonesian Heritage Coastal Batik, Jakarta: Gramedia, 2011, 265 p., ISBN: 979910405X
2. Mulyanto, Prameswari N.S., Suharto M., Afatara N.: Long sleeved shirt pattern as guideline for designing a sanggit motif batik shirt, Vlákna a textile (Fibres and Textiles) 25(4), 2018, pp. 61-70, http://vat.tul.cz/2018/4/VaT_2018_4_12.pdf
3. Mulyanto, Prameswari N.S., Afatara N., Hartono L.: Pattern design and motif placement of batik sanggit in short-sleeved shirt style, Vlákna a textile (Fibres and Textiles) 26(2), 2019, pp. 37-42, http://vat.tul.cz/2019/2/VaT_2019_2_7.pdf
4. Fung F.T., Hes L., Bajzik V.: Reviewof men's shirt pattern development for the last 100 years, Vlákna a textile (Fibres and Textiles) 27(3), pp. 49-58. 2020, http://vat.tul.cz/2020/3/VaT_2020_3_9.pdf
5. Nisa G., Setyowati E, Musdalifah: The effectiveness of the use of combination patterns in making party clothing for students at SMK Syafi'i Akrom Pekalongan (Efektivitas Penggunaan Pola Kombinasi dalam Pembuatan Busana Pesta Siswa Tata Busana SMK Syafi'i Akrom Pekalongan), Jurnal Teknoboga 2(1), 2015, pp. 50-59, <https://journal.unnes.ac.id/nju/index.php/teknobuga/article/view/6421> (in Indonesian)
6. Bimantoro F., Suciati N., Arieshanti I.: Dotted-board model and extended local search for optimizing the layout of clothing patterns on patterned materials by considering the harmony of motifs (Dotted-Board Model dan Extended Local Search untuk Optimalisasi Tata Letak Pola Busana pada Bahan Bermotif dengan Mempertimbangkan Aturan Keserasian Motif), JUTI: Journal Ilmiah Teknologi Informasi 13(1), 2015, pp. 75-85, (in Indonesian) <http://dx.doi.org/10.12962/j24068535.v13i1.a390>
7. Salma I.R., Wibowo A.A., Satria Y.: Coffee and cocoa in typical batik motif creation of Jember (Kopi dan kakao dalam kreasi motif batik khas Jember), Dinamika Kerajinan dan Batik 32(2), 2015, p. 63-72, <http://ejournal.kemenperin.go.id/dkb/article/view/1362> (in Indonesian)
8. Salma I.R., Masiswo, Satria Y., Wibowo A.A.: Development of Balinese batik motifs (Pengembangan motif batik khas Bali), Dinamika Kerajinan dan Batik 32(1), 2015, pp. 23-30, <http://ejournal.kemenperin.go.id/dkb/article/view/1168> (in Indonesian)
9. Sugiarto E., bin Othman A.N., Triyanto, Febriani M.: Region icon motifs: Recent trends in Indonesia's batik fabric development, Vlákna a textile (Fibres and Textiles) 27(1), 2020, pp. 93-98, http://vat.tul.cz/2020/1/VaT_2020_1_14.pdf
10. Mulyanto: Archeological site as the idea source in the motif development of batik Sragen, Mudra: Journal of Art and Culture 33(3), 2018, pp. 334-340, <https://jurnal.isidps.ac.id/index.php/mudra/article/view/521/27011>
11. Aldrich W.: Metric Pattern Cutting for Women's Wear, Wiley, 2015, ISBN: 978-1-119-02828-4
12. Prasetyowibowo B.: Industrial Product Design (Desain Produk Industri), Bandung: Yayasan Delapan Sepuluh, 1998, pp.11-12 (in Indonesian)
13. Fanina J.J., Suaedi F.: Challenges in preserving batik as Indonesia's cultural identity facing global demand of sustainable eco-friendly fabric, Vlákna a textile (Fibres and Textiles) 27(2), 2020, pp. 37-42, http://vat.tul.cz/2020/2/VaT_2020_2_7.pdf
14. Algahni H., Al-Dabbagh M.A.: Assessing the impact of social media in the consumer trend towards sustainable clothing, Vlákna a textile (Fibres and Textiles) 27(3), 2020, pp. 3-7, http://vat.tul.cz/2020/3/VaT_2020_3_1.pdf
15. Rizali N.: Textile Design Review (Tinjauan Desain Tekstil), 2006, Surakarta: LPP UNS (in Indonesian)
16. Sunley P., Pinch S., Reimer S., Macmillen J.: Innovation in a creative production system: the case of design, Journal of Economic Geography 8(5), 2008, pp. 675-698, <https://doi.org/10.1093/jeg/lbn028>
17. Spradley J.P.: Participant Observation, Waveland Press, Inc., 1980, 195 p., ISBN-10: 0030445019
18. Robert C., Biklen S.K.: Qualitative Research for Education: An Introduction to Theory and Methods, 1st ed., USA: Allyn and Bacon, 1982
19. Greenbaum T.L.: The Practical Handbook and Guide to Focus Group Research, USA: D.C. Heath and Company, 1988, ISBN: 9780669147759
20. Miles M.B., Huberman A.M.: Qualitative Data Analysis: A Sourcebook of New Methods, SAGE Publications, Inc, 1984, 264 p., [https://doi.org/10.1016/0149-7189\(96\)88232-2](https://doi.org/10.1016/0149-7189(96)88232-2)
21. Simanjuntak, Bintang E.: Pattern making basics (Dasar-dasar pembuatan pola), Jakarta: Vocational Teacher Upgrading Development Center, 2000 (in Indonesian)
22. Kartini, Ikatan ahli menjahit busana Indonesia (IAMBI): Textbook of Sewing Women's and Children's Clothing (Buku Pelajaran Menjahit Pakaian Wanita dan Anak), 1987 (in Indonesian)
23. Rusli, Kartini, Syahandini.: Pattern construction (Konstruksi pola), Jakarta: Depdikbud. Dikjen Dikdasmen, Dikmenjur, 1984 (in Indonesian)