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VISUAL OBSERVATION OF WOMEN'S TRADITIONAL BAJU KURUNG PATTERN GRADING ARRANGEMENT LAYOUT ON EXISTING BATIK FABRIC TO REDUCE FABRIC WASTE IN MALAYSIA

[1]Mohamad Shukri Che Ya, [2]Nazlina Shaari, [3]Noranita Mansor
[1,2]Department of Industrial Design, Faculty of Design and Architecture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia.
[3]Department of Architecture, Faculty of Design and Architecture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia.

Corresponding author: shukricy@gmail.com

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ABSTRACT

The most common garments made by customers utilizing existing batik fabric are traditional baju kurung and modern baju kurung. However, difficulties have occurred in adjusting to the fact that there is excess and waste of batik fabric happens throughout the process of arranging and cutting pattern designs. In addition, there is also a situation where the arrangement of the motif is not balanced on the clothing pattern and it also cause the batik motif being cut and not joined when sewing. Besides that, there is a lot of excess batik fabric if the user is a small size such as S and M size, because of that, there is a waste of fabric on the existing batik fabric. Meanwhile, occasionally the batik fabric is insufficient for large sizes such as L and XL, necessitating the addition of more fabric to complete a garment. The purpose of this study is to identify the visual observation analysis of the pattern grading arrangement layout of women's traditional baju kurung on existing batik fabric. The experiment of visual observation was employed as a data collection method for this investigation. This experiment created pattern measurement calculation, pattern arrangement, and visual illustration of women's traditional baju kurung utilizing existing batik fabric. The study's findings indicate that existing batik fabric should be evolved into a new pattern grading arrangement that adheres to modern techniques and technology while minimizing the quantity of extra fabric discarded.

Keywords: visual observation, pattern grading, pattern layout, existing batik fabric, women's baju kurung

INTRODUCTION

The baju kurung, a traditional Malay clothing, is considered to have originated with Arab, Indian, and Chinese traders (Hussin, 2009). Baju Kurung is a popular attire worn by both men and women in general (Ismail, 2019; Aris et al., 2015). The form of the Baju Kurung is long and loose, and it is classified as tunic clothing since the shirt is worn to the body by sheathing it through the head (Aris et al., 2015). The pattern of long (women's clothes) and short (men's clothes), the number of pockets (men three/women one), and the manner it is worn are the differences a man's baju kurung is believed to be complete when worn with a sarong (sampin), trousers and destar, whereas a woman's is worn with an ombak mengalun skirt and a shawl (Shawal, 1994; Aris et al., 2015; Ismail et al., 2019). The clothing of the Malay community, whether loose or tight, formal or casual, has been processed in terms of patterns, textiles, colours, and styles tailored to the Malay community's identity and taste (Hussin & Md. Nawawi, 2013; Ismail et al., 2019).

The market now offers a wide variety of garments in keeping with the passing of time. However, customers' preferred trend for dressing up is still the traditional baju kurung with kain ombak mengalun. The traditional baju kurung can now be made from a variety of fabrics, including chiffon, cotton, linen, satin, and more (Afiza, 2021). Despite the evolution of baju kurung to align with contemporary times and changing consumer preferences, the fundamental design has retained its essence (Chaniago et al., 2020). While adapting to modern styles, baju kurung continues to embody the humility of eastern girls and showcase the excellence of Malay culture. The enduring appeal of baju kurung lies in its ability to seamlessly blend tradition with comfort and attractiveness. This traditional attire, with its timeless design, not only pays homage to cultural roots but also provides a comfortable and visually appealing wardrobe choice for wearers. Due to this, it is necessary to strengthen the manufacturing of traditional baju kurung, particularly in the creation and drafting of clothing patterns. Besides, because of the traditional baju kurung’s patterns are rectangular in shape, the drafting process is typically sketched directly on the fabric by an experienced pattern drafter and cutter or tailor. For pattern drafter/ cutters and tailors who are new in pattern drafting, drafting process on paper is completed before being arranged on fabric (Aliff, 2021).

However, in mass production scenarios, like Ready To Wear (RTW), the pattern is often drafted on sturdy paper and then meticulously arranged on fabric organized in multiple layers. The arrangement of clothing patterns on these layers is done with precision to optimize fabric usage and streamline large-scale production. This meticulous process not only ensures efficiency in material utilization but also facilitates the seamless reproduction of patterns across numerous garments, contributing to the effectiveness of mass production practices (Ehfan, 2021). The advent of Computer-Aided Design (CAD) tools has significantly enhanced the development of virtual garment designs. Once the garment pattern organization process is completed, the next step involves fabric cutting (Jhanji, 2018). In Ready To Wear (RTW) manufacturing, cutting instruments are employed that can cut through multiple layers simultaneously. The clothing patterns in RTW are typically designed in conventional sizes such as S, M, L, XL, etc (Makhanya, 2015). Moreover, Yan (2020) RTW manufacturing often utilizes plain fabrics with various pattern motifs, including both full and random motifs. This approach simplifies the process of arranging the pattern on the fabric and enables the production of large quantities without the need for meticulous consideration of motif placement on each individual cloth (Townsend, 2003). The use of CAD tools and advanced cutting instruments in conjunction with standardized sizes and fabric choices contributes to the efficiency and scalability of the RTW manufacturing process (Gill, 2015).

Meanwhile, there is a minor difference in the arrangement of pattern clothing when compared to the manufacture of traditional baju kurung using existing batik fabric, which normally creates fabric with a standard size of 4 metres long and 45 inches width. This is due to the pattern cutter's requirement to cut the garment pattern in 4 metres of cloth divided into two portions in one cloth, 2 metres for shirts and 2 metres for skirts. Therefore, the process of arranging and cutting clothing patterns becomes a limit because it is necessary to follow the existing placement motifs on the batik cloth which sometimes the motifs are not arranged well. The surplus and wastage of batik fabric that results from the arrangement and cutting of pattern designs, however, has proven to be difficult to accept. Furthermore, there is an instance when the motif arrangement on the garment pattern is unbalanced, which results in the batik motif being cut instead of attached throughout the sewing process. In addition, if the user wears a tiny size, like a S or M, there is a lot of extra batik fabric that is wasted on the batik fabric that already exists. However, sometimes there's not enough batik fabric for big sizes like L and XL, therefore extra fabric needs to be added to finish a garment.

Hence, the study's state-of-the-art is to experiment visual observation on pattern of traditional baju kurung clothing design based on pattern grading arrangement, focusing on where the rate and wastage area happenned towards existing batik fabric using CAD application. Therefore, this study will investigate “how are the visual observation and wastage fabric on existing batik fabric that need to be reduce fabric waste by using pattern grading arrangement layout technique?”. Consequently, this study identified the arrangement of clothing patterns and the amount of excess fabric for traditional baju kurung on existing batik fabric. Which is pattern grading can potentially be applied to batik fabric to reduce fabric waste to increase optimization in the design process and utilized in the traditional baju kurung clothing industry. In this study, CAD application (Adobe Illustrator (AI)) was used to create a clothing pattern layout on the layout of 4 meters of existing batik fabric. While, Microsoft Excel are used for calculation on pattern measurement. This study will analyze the standard pattern grading arrangement on existing batik fabric, calculation of pattern measurement, visual observation on pattern grading arrangement layout and visual fashion illustration. In addition, this study takes into account the physical and psychological demands of children's clothing. Therefore, it can help as a guideline for researchers, batik designers, pattern makers and to encourage the development of new innovative designs in the manufacture of batik fabric especially according to the pattern grading arrangement technique. In addition, it can be used in various clothing manufacturing to help in reducing environmental pollution and resource shortage issues related to the clothing industry towards making profits and a good image in the clothing market, especially traditional baju kurung.

Pattern Grading Arrangement- Existing Batik Fabric

Pattern grading is a technique used by garment designers to generate designs for ready-to-wear apparel in a variety of sizes. When a pattern clothing increase or decrease is applied to a certain design, each new pattern in another size larger or smaller is graded (Schofield, 2007). Pattern grading is typically done in the garment business using a medium size (M) since it makes it easy to maximize the pattern to giant (L) sizes or minimize it to small (S). This grading pattern has two goals: (1) operational management to ensure efficient and effective production, and (2) pattern methods to ensure that the correct pattern is achieved fast (Cooklin, 2003; Marniati, 2020). Additionally, grading is widely acknowledged in the clothing manufacturing industry as the technique of systematically adjusting a specific size pattern section from one size to another while ensuring the preservation of its original shape (Jalil & Hosseini, 2020). Exploring pattern grading in this context presents an opportunity to develop innovative pattern grading

arrangements, catering to consumers seeking unique and stylish clothing options (Rissanen, 2013). There is no defined pattern grading design size such as S, M, or L in the batik industry; instead, it follows the free size and in terms of arranging the pattern design on the batik cloth is similar to a regular pattern arrangement and full pattern (Ya et al., 2022). The existing batik fabric manufacturer in Malaysia was produced in 4 meters length for women's clothes (typically for the Baju Kurung or Kebaya) and 2 ½ metres for men's shirts (Chik & Lokman, 2006; Ismail et al., 2013; Ya et al., 2022). In terms of motif design placement is similar to a regular pattern arrangement and full pattern (Ya et al., 2022). At the same time, the bulk of hand-drawn silk items for women's clothes had a length of four metres (4.5 yards). They are designed to be tailored into traditional Malay attire (Yunus, 2011). Existing batik fabric (Baju Kurung or Kebaya) for women is divided into five main pattern arrangement parts: one for the bodice front, one for the bodice back, two sleeves (right and left), one for a skirt, and one more part that is not normally used other than a little for the neck lining (Ya et al., 2022).

Figure 1

Sample of women's existing batik fabric (Blok Stamping Technique) (Ya et al., 2022).

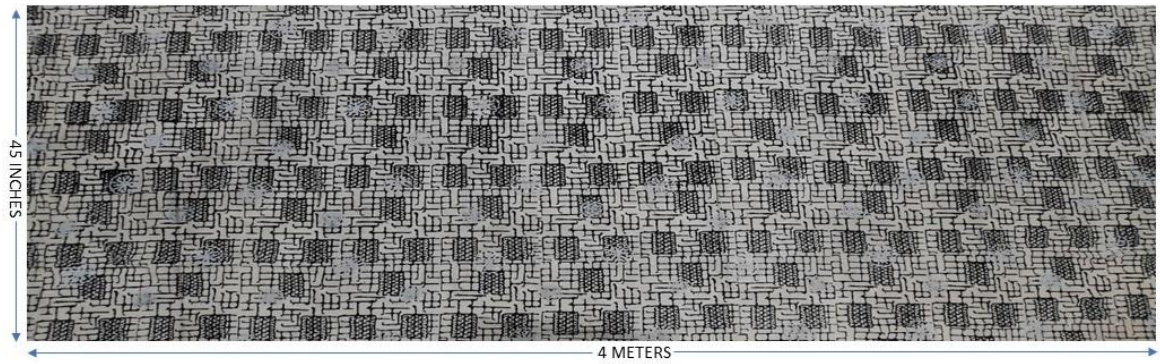


Figure 2

Sample of women's existing batik fabric (Canting Technique) (Ya et al., 2022).

Figure 1 is an example of women's contemporary batik fabric (Blok Stamping method) on cotton poplin materials that is presently available on the market. This batik fabric sample is 4 meters long and 45 inches wide. It also features a grading design arrangement with full pattern. Figure 2 depicts a commercial sample of women's existing batik fabric (Canting Technique) on cotton viscose material. This batik fabric sample is 4 meters long and 45 inches wide. It is separated into two sections: one for the shirt, which has two front and back bodies as well as right and left sleeves, and one for the skirt.\

Computer Aided Design (CAD) Batik Pattern Grading and Motif Placement

Previous study has extensively investigated the benefits and effectiveness of employing CAD software in apparel and textile production, encompassing areas such as pattern grading, pattern arrangement layout, pattern clothing design, motif placement, and garment construction (Mulyanto et al., 2019, 2021; Marniati, 2020; Datta et al., 2022). The incorporation of AI-powered software represents a significant advancement that enhances user capabilities by streamlining operations. Features such as pattern grading, motif placement, and pattern repetition are seamlessly facilitated through AI technology (Wibawanto et al. 2020). This integration not only simplifies intricate tasks associated with garment design but also contributes to increased efficiency and precision in the overall design and manufacturing process. The utilization of AI in these functionalities reflects a transformative shift in the fashion industry, embracing technology to empower designers and manufacturers with tools that optimize creativity and productivity.

In a related context, Syed Shaharuddin et al. (2021) concluded that the incorporation of Third Industrial Revolution technology (IR3.0), particularly through computer-aided design and computer-aided manufacturing, has the potential to enhance existing batik fabric production processes. These recent studies shed light on the promising prospects and effectiveness of CAD applications. CAD possesses the capability to expedite garment manufacturing, streamline the batik design process, and empower consumers to engage in innovative and diverse pattern-related tasks, including drafting, clothing design, grading, arrangement layout, motif placements, and the creation of various batik motifs (Senanayake, 2013). This integration of CAD technology not only accelerates production timelines but also enhances the creative possibilities available to designers and consumers alike. The multifaceted applications of CAD in the realm of fashion and batik design underscore its transformative impact, offering a dynamic and efficient platform for bringing innovative and varied designs to fruition (McKelvey & Munslow, 2011).

The use of computers in the fashion and textile industries has opened up significant opportunities for novel designs and increased efficiency in response to shifting lead times (Singh et al., 2017). The use of computers, particularly CAD software, is critical in the pattern grading process. CAD is more favorable in terms of quick design changes, and it is feasible to apply more pattern grading applications for garments and textiles. Furthermore, because pattern grading design of various sizes and creating arrangements prior to marker-making need more personnel and time, it is desired and vital for CAD systems to be beneficial in all of these processes, which may minimize manpower and time (Tabraz, 2017). Ya et al., (2022) recommended using CAD programs to develop a novel strategy for pattern grading design in order to improve batik patterns while minimizing the cost of raw materials and the amount of superfluous fabric that must be discarded. Pattern grading is a fantastic notion for improving the production of batik patterns since it may minimize the cost of raw material consumption, save manufacturing time, and provide other benefits. This pattern grading design approach may also benefit entrepreneurs by pushing them to review their designs early on before making batiks, in addition to assisting the zero-waste endeavor, Ya et al., (2022) in addition it can also help consumers choose the appropriate fabric length for their body size.

Referring to previous study in Indonesia, pattern clothing design and motif placement has been produced, such as of short sleeve and long sleeve style in the shape of a rectangle (Mulyanto et al., 2019, 2021). However, the study on exploration pattern grading method and motif placement for batik fabric production especially for women's baju kurung in Malaysia is less explored. Therefore, the pattern grading method can be used on women's batik fabric

production as a value-added product. The lack of use of current technology in the exploration of batik manufacturing and innovations especially the existing batik fabric for women's clothing do not follow the grading size, and there is fabric waste on the existing batik fabric because it does not follow the user's size is one factor that provides the potential for developing a batik fabric using pattern grading method as a new application in producing batik design fabric.

Figure 3
An example of traditional baju kurung using existing batik fabric. (Yunus, 2012, p. 67 & 68)

Figure 3 depicts a traditional baju kurung constructed from existing batik fabric in complete motif design arrangement. In general, the figure does not display any flaws in the motif pattern design, but there are some flaws in the details, such as motif placement that is not properly ordered and the batik motif at the side section that is not attached.

Moreover, Ya et al., (2022) showed no more visual observation and investigation in pattern grading toward batik fabric with the utilization of CAD-based software, especially in the traditional baju kurung clothing sector. Hence, the visual observation and development of traditional baju kurung pattern grading arrangement layout can be utilized in mass-production since technology, grading concept and CAD features are essential in this study. Therefore, the goal of this study is to examine and analyze a visual observation on women's traditional baju kurung pattern layouts before using a pattern grading technique to existing batik fabric for women.

This study seeks to discover the visual observation analysis of the application of pattern grading arrangement layout for women's traditional baju kurung utilizing existing batik fabric to fill

this gap. This result would provide a preliminary visual observation of the deficiencies in existing batik fabric, particularly on pattern grading arrangement, which needs to be improved on existing batik fabric in order to produce a new pattern grading arrangement on batik design fabric manufacture, which can help reduce the use of fabric based on size measurement and the disposal of excess existing batik fabric.

METHODOLOGY

This study employs visual observation and the experimental method was used. The initial part of the experiment was to examine the visual appearance of pattern grading arrangement layout on standard arrangement of 4 metres (2 metres for top blouse and 2 metres for skirt) existing batik fabric. Besides, medium (M) size of the Malaysian standards traditional baju kurung was used for measurement of ready-made clothes with a 38 cm shoulder, a 96 cm bust circumference, a 56 cm sleeve length, a 89 cm shirt length, 104 cm hip circumference and a 86 cm waist circumference, and the 99 cm skirt height because the average women's body size in Malaysia is M.

Figure 4
Visual observation and analysis procedures.

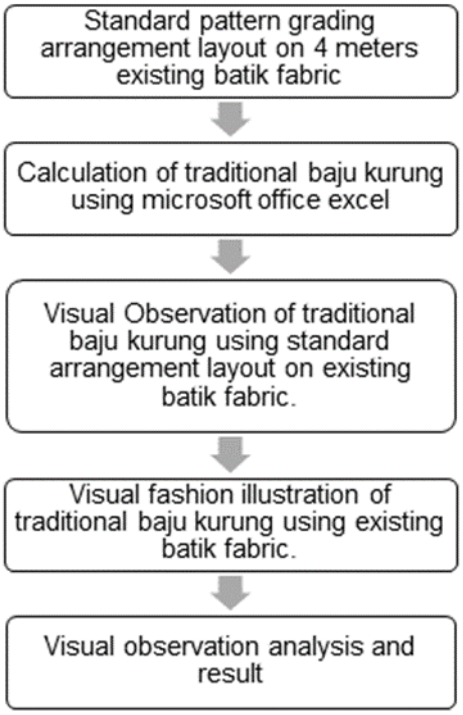


Figure 4 shows a visual observation and analysis procedures. In this experiment included the visual observation on standard pattern arrangement layout, calculation of pattern measurement (Microsoft Excel), visual observation of pattern arrangement and visual fashion illustration of traditional baju kurung on a standard pattern arrangement of existing batik design fabric using Adobe Illustrator (AI) for drawing and layout. This comprehensive approach aimed to encompass the various facets of the experimental methodology, combining visual observation and assessments with precise calculations and digital tools to ensure a thorough analysis of the traditional baju kurung on the existing batik design fabric. For the calculation to be conducted, researchers need to initially establish the standard body measurements for Ready To Wear

(RTW) clothing. Subsequently, they must meticulously ascertain the measurements for each section of the traditional baju kurung pattern. This involves a comprehensive analysis of dimensions to ensure accurate alignment with both industry standards for ready-to-wear apparel and the specific requirements of the traditional baju kurung design. By detailing the measurements for each pattern section, researchers can lay the groundwork for a precise and systematic approach to pattern grading and arrangement in the context of the traditional baju kurung. In order to calculate the amount of fabric waste using the common pattern arrangements of traditional baju kurung on the standard arrangement of existing batik fabric, as well as the common measurement of every part on the layout of existing batik fabric, this experiment was designed. Additionally, when traditional baju kurung are manufactured and attached to an existing batik fabric, it will reveal the weak points in the arrangement and joining parts of the batik fabric. The findings from this data analysis will serve as a crucial reference and prospective guide for enhancing and implementing pattern grading techniques in a new batik fabric pattern arrangement layout. The insights gained from the analysis will inform adjustments and refinements in the pattern grading process, allowing for a more efficient and resource-conscious approach in the creation of batik fabric patterns and to contribute to the development of more effective and sustainable practices in the realm of batik fabric pattern design.

ANALYSIS AND RESULTS

Standard Pattern Arrangement Layout on Existing Batik Fabric

Based on observation, the researcher observed that the current batik textiles manufactured are 4 metres and 4 metres and a half wide, with the width of the cloth being 45 inches (114 cm). Ya et al., (2022) discovered an image of women's pre-existing batik fabric layout (standard pattern arrangement) that batik makers use to manufacture 4 metres of batik fabric, as illustrated in Figure 5. The front of the bodice, the back, two sleeves (on the right and left), and the skirt are the five main pattern arrangement sections of batik fabric. The yellow section (approximately 15% of the plan) is the surplus fabric that is not generally used, except for a little amount for the neck lining.

Figure 5

The illustration of women's pre-existing batik fabric layout (standard pattern arrangement) (Ya et al., 2022).

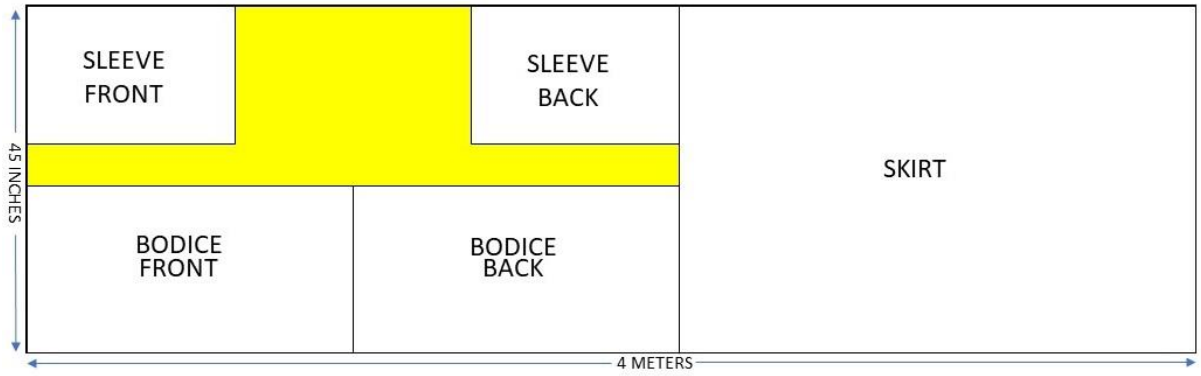
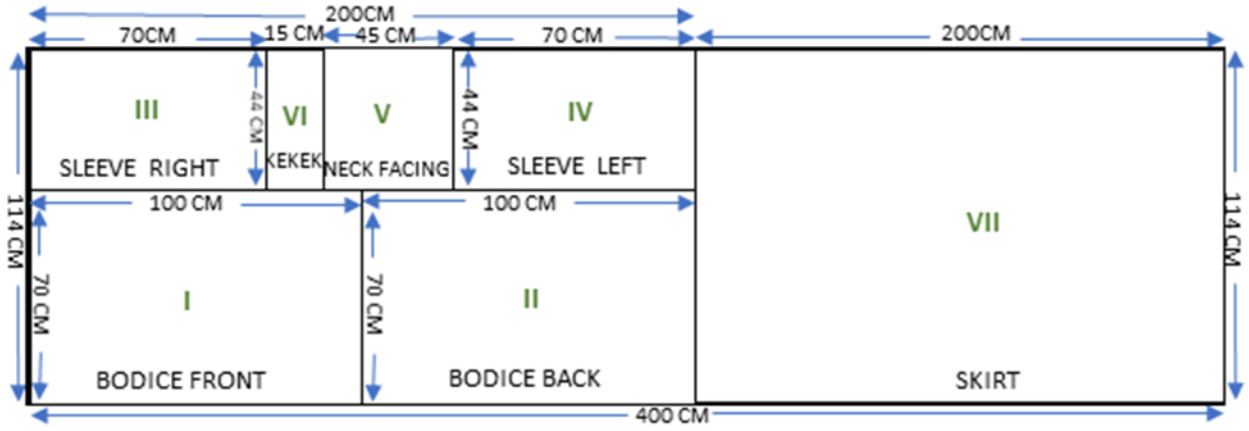


Figure 6

The Illustration of standard pattern arrangement layout of women's traditional baju kurung and kain ombak mengalun on existing batik fabric.



In addition, Figure 5 depicts a conventional pattern arrangement layout of women's traditional baju kurung and *kain ombak mengalun* on existing batik cloth. The basic pattern arrangement consists of seven components. Bodice (front and back), sleeves (right and left), neck facing, *kekek*, and skirt section are some examples. In the side bodice portion arrangement, there are two *pesak* patterns for the front side and two *pesak* patterns for the back side. Figure 6 depicts the detailed arrangement of pattern grading arrangement illustration of women's traditional baju kurung and *kain ombak mengalun* layout.

Calculation of Pattern Measurement

The calculated measurement focuses on the M size since it is the average standard women's body size in Malaysia. It is also a medium size, making it easy to minimize the pattern to S size and maximize the pattern to L and XL size. M size measurements are 38 cm shoulder, 96 cm breast circumference, 56 cm sleeve length, 89 cm shirt length, 104 cm hip circumference, 86 cm waist circumference, and 99 cm skirt height.

Table 1

The calculation measurement of pattern arrangement of traditional baju kurung in M size

Code	Pattern Parts	Pattern	Hem	M size (cm)		
				Body	Total	Remains
	A	B	C	D	E=C+D	F=B-E
I	Half body circumference (Front)	70	9	54.5	63.5	6.5
	Length of shirt (front)	100	4.5	89.5	94	6
II	Half body circumference (Back)	70	9	54.5	63.5	6.5
	Length of shirt (back)	100	4.5	89.5	94	6
III	Arm circumference (Right)	44	3	38	41	3
	Sleeve length (Right)	70	4.5	56	60.5	9.5

IV	Arm circumference (Left)	44	3	38	41	3
	Sleeve length (Left)	70	4.5	56	60.5	9.5
V	Neck facing width	44	0	28	28	16
	Neck Facing length	45	0	33	33	12
VI	2 Kekek length	15	3	7.5	10.5	4.5
	2 kekek width	44	6	15	21	23
VII	Skirt length	114	8	99	107	7
	Skirt Circumference	200	3	166	169	31

Table 1 shows that the measurement of half body circumference (front/back) in Code I and II is 70 cm and the length of shirt (front/back) is 100 cm. The tailor only requires 63.5 cm and 94 cm to construct a traditional baju kurung, therefore it will retain 6.5 cm and 6 cm. Arm circumference (right/left) is 44 cm and sleeve length (right/left) is 70 cm in Code III and IV. However, just 41 cm and 60.5 cm are required, leaving 3 cm and 9.5 cm. Furthermore, the neck facing width in Code V is 44 cm and the neck facing length is 45 cm. Meanwhile, just 28 cm and 33 cm are required, leaving the pattern at 16 cm and 12 cm. In Code VI, 2 *kekek* length is 15 cm and 2 *kekek* width is 44 cm, although only 10.5 cm and 21 cm are required. As a result, it stays 4.5 cm and 23 cm. Finally, the Code VII specifies 114 cm for skirt length and 200 cm for skirt circumference. However, just 107 cm and 169 cm are required, leaving 7 cm and 31 cm to construct a *kain ombak mengalun*.

Visual Illustration on Pattern Grading Arrangement Layout

The visual illustration on pattern grading arrangement is investigated in the pattern traditional baju kurung in M size on the 4 metres length and 114 cm breadth as measurement of standard pattern arrangement of women's current batik fabric. This experiment was carried out with the development of the real pattern drafting measurement M size with seam allowance using Adobe Illustrator (AI) for all 13 parts of the pattern. After that, put the pattern on existing batik cloth according to the standard pattern arrangement of traditional baju kurung.

Figure 7

The illustration of pattern grading arrangement of women's traditional baju kurung layout

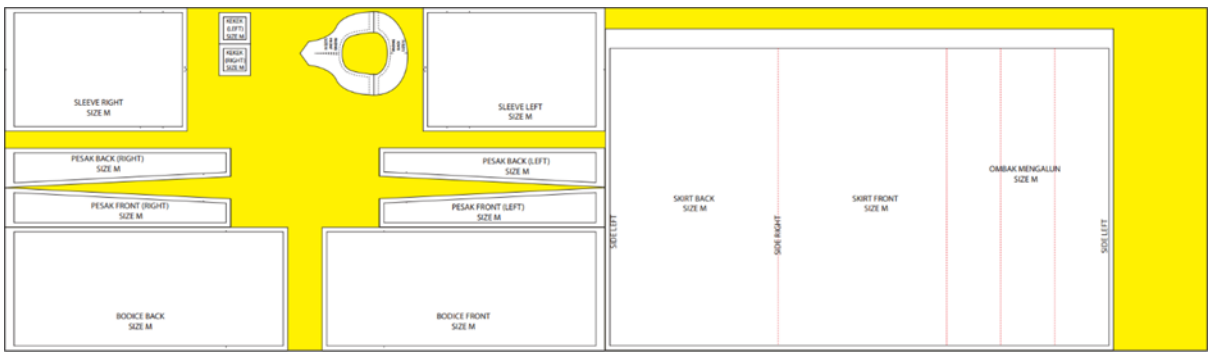


Figure 8
The pattern grading arrangement of women's traditional baju kurung fabric layout.

Figure 9
The excess and wastage batik fabric of women's traditional baju kurung.

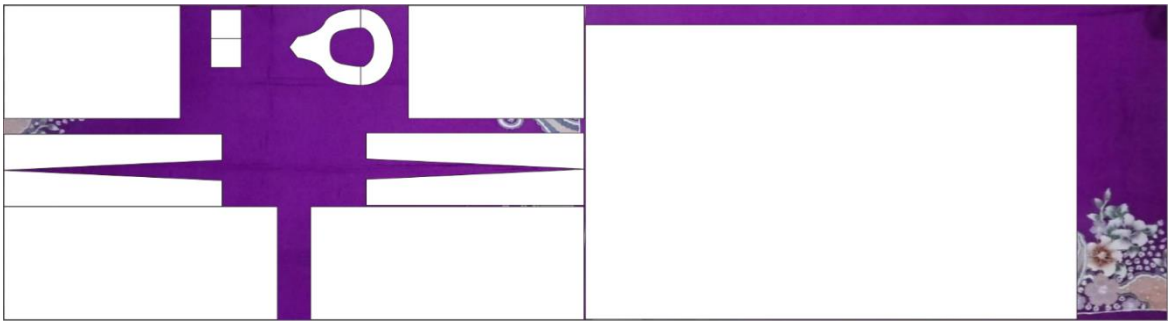


Figure 7 depicts the pattern grading arrangement of women's traditional baju kurung layout, which has 13 parts in M size: 2 bodice patterns (front and back), 2 sleeve patterns (right and left), 2 pesak patterns (front and back), 2 kekek patterns (right and left), 1 neck facing pattern, and 1 skirt pattern. The yellow section (approximately 25% of the plan) is the surplus fabric that is not generally used, save for a little amount for the pocket. Figure 8 shows the pattern grading arrangement of women's traditional baju kurung batik fabric layout. This layout is a visual representation of the pattern arrangement of women's traditional baju that will be cut and ready for sewing. Figure 9 visually represents the excess and wastage batik fabric of women's traditional baju kurung. Through observation, it is estimated that around 25% of the batik fabric designated for M size women's traditional baju kurung is not utilized and goes to waste. This observation underscores the significance of addressing fabric wastage in the manufacturing process, highlighting potential areas for improvement in order to optimize resource utilization and reduce overall material wastage in the production of traditional baju kurung.

Visual Fashion Illustration

Figure 10
Visual fashion illustration of women's traditional baju kurung using the existing batik fabric.

Figure 10 is a visual fashion image of women's traditional baju kurung made with existing batik cloth. As a consequence, the motif placement in the round section is not joined and poorly arranged. this is most noticeable at the intersection of the bodice pattern and the pesak pattern on the front and back sides. On the front part, can see in the round section on the right side that there is no continuity of motifs between the bodice and pesak sections. On the front bodice, the motifs are full, but suddenly, there are empty areas with no motifs on the pesak section. On the left side, there is a slight issue where some leaf motifs are slightly cut off.

Similarly, on the back section, in the round section on the right side that there is no continuity of motifs between the bodice and pesak sections. On the back bodice, the motifs are full, but suddenly, there are empty areas with no motifs on the pesak section. On the left side, there is a slight issue where some leaf and flower motifs are slightly cut off at the bottom of the clothing. On the left side, in the round section, there is a noticeable discontinuity in the seam junction at the bottom of the skirt. Therefore, there is a clear need for in-depth research to explore various crucial aspects within the realm of batik fabric design. One of the primary areas that warrant investigation is the seam junction where the patterns of the bodice and the skirt. Achieving a seamless and aesthetically pleasing connection between these components is crucial for producing high-quality batik garments.

Furthermore, another critical aspect to explore is the precise placement of motifs on the fabric. Ideally, motif placement should adhere to a level and consistent pattern while maintaining

proper continuity. This not only contributes to the overall visual appeal of the batik fabric but also ensures that the design flows harmoniously. Lastly, comprehensive research is required to experiment with how motifs are strategically arranged within the layout of batik fabric. Understanding the principles and techniques behind motif placement is essential for producing innovative and visually engaging batik designs. In essence, this study aims to enhance the craftsmanship and artistry of batik fabric production.

CONCLUSION

As a conclusion, this study offered a visual observation of the pattern grading arrangement layout of women's traditional baju kurung on existing batik cloth. Existing batik textiles are available in lengths of 4 metres and 4 metres and a half, with a width of 45 inches (114 cm) in full design and standard pattern arrangements. As a consequence, the calculating measurement of pattern arrangement of traditional baju kurung in M size shows that the numbers in general measurement are consistent throughout the pattern. In addition, there are 13 pattern grading arrangement elements in M size: 2 bodice patterns (front and back), 2 sleeve patterns (right and left), 2 *pesak* patterns (front and back), 2 *kekek* patterns (right and left), 1 neck facing pattern, and 1 skirt pattern. As a result, approximately 25% of the batik fabric for M size women's traditional baju kurung is wasted. Furthermore, the motif location is not consistent with the design and is poorly organized. It is most evident at the intersection of the bodice design and the *pesak* pattern on the front and back sides. Furthermore, there was a major discontinuity on the left side of the skirt section. This study demonstrated the visual detection of flaws in existing batik fabric pattern grading arrangement and motif placement. As a result, the common pattern arrangement on existing batik fabric must be improved and a new arrangement developed that is suited for certain size and types of cloth. Furthermore, the proper pattern grading arrangement and motif placement might potentially eliminate the problem of poorly arranged motif and batik fabric waste. The layout of pattern grading in batik design will assist reduce raw material consumption costs and shorten the production process. Furthermore, it might encourage businesses to leverage contemporary technology, particularly CAD tools, to create batik design approaches. It can also help consumers choose the appropriate fabric length for their body size. The batik motifs and patterns will be applied on the garment in a lovely and attractive manner.

In the future, there is potential for extending this study by creating and refining an innovative pattern arrangement through the application of pattern grading techniques in the realm of women's apparel, encompassing traditional garments like baju kurung and baju kebaya, as well as modern baju kurung. The aim is to minimize fabric waste in response to the growing market demand for women's batik attire. Beidese, this endeavor is to minimize fabric waste, a crucial consideration in response to the escalating market demand for women's batik attire. Applying pattern grading techniques offers a systematic and efficient approach to ensuring that fabric is utilized optimally, leaving minimal scraps. This not only aligns with sustainable fashion practices but also addresses the environmental concerns associated with textile waste. Furthermore, the research holds the potential to contribute significantly to the preservation of batik fabrics and motifs. By developing precise pattern grading arrangements, the study aims to guarantee the proper placement of motifs in clothing, eliminating the need to discard any intricate designs. In essence, this proposed research not only responds to the increasing market demand for women's batik attire but also aligns with broader sustainability goals. By addressing fabric waste through innovative pattern grading, it not only meets the needs of fashion-conscious consumers but also contributes to the preservation of traditional artistry and motifs, ensuring the longevity and relevance of batik in the evolving landscape of fashion.

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