Integrating the Concept of Modular Design and Dart Manipulation Technique for the Innovation of Fashion Design for Women

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Abstract:

Fashion designers are presented with a range of different principles for pattern cutting, and interest in this area has grown rapidly over the past few years, due to both the publication of a number of works dealing with the subject in different ways, and the fact that a growing number of designers emphasize experimental pattern cutting in their practices. Although a range of principles and concepts for pattern cutting are presented from different perspectives, the main body of these systems, traditional as well as contemporary, is predominantly based on a quantified approximation of the body. As a consequence, the connection between existing theories for pattern construction and the dynamic expression and biomechanical function of the body are problematic. While designing and making patterns for women's garments it is important to know the principles of dart manipulation. Dart Manipulation aims to develop bodices with different dart placement through dart manipulation and test fit the same. In terms of clothing, modular is a dressing system that contains several detachable small components. Each component can be adjusted independently and separately without affecting other components. This system can maximize the possibility of each garment by rearranging or transforming components into different combinations. The research aims to that, modular design concept and the dart manipulation technique work well together. Modular design concept and the dart manipulation technique provide us with fashion designs characterized by unique style lines. Modular design concept meets the user's needs. Access the best techniques that can be applied for designing women's clothes. According to the evaluation of designs, the best designs that took the highest scores were designs no. (1, 5 and 7), according to that, the style lines used in these designs are unique. Using striped fabric emphasized these lines. Dart manipulation technique and modular design can work well together in fashion designs. Snaps are an appropriate fastener tool to remove and/or add modular pieces to the designs and help consumer to change the final appearance of garments which meets his needs. The slash and spread technique and panels based modular system are suitable for achieving the research objectives. Dart manipulation technique and modular design added aesthetic values to the designs. The designs (4, 6) had the lowest scores.

Keywords:

Modular design
dart manipulation
fashion design

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1. Introduction

Putting the body at the centre of attention may sound obvious when talking about and working with the creation of garments. However, most of the methods and techniques related to pattern cutting presented in the educational literature merely deal with the shapes of patterns, how to alter them in order to achieve a certain familiar garment, or how various two dimensional shapes can be turned into three-dimensional ones, which may then be used to create garments. This is essential knowledge for anyone who aims to use cutting as a method for fashion design. (Lindqvist, R. 2014)

Dart manipulation is the most creative and flexible part of pattern cutting. The possibilities are endless and the designer's imagination is the only limitation. Darts can be turned into pleats, gathers or style lines. Their positioning on the body is very important; not only do these techniques crate fit, shape and volume; they also change the style and design of the garment. (Fischer, A. 2009)

Modularity, in the context of design, refers to the degree to which a product's components may be reconfigured, removed and/or added and the rules that enable or prohibit this. An important strategy for many designers employing the principles of modularity is that of eco-efficiency in production and embodied emphatic experience in product consumption. Modular design enables the creation of products with a second "life" through its capacity to reinvent and reconfigure a product through use of a flexible core with adaptable and removable sections, which allow growth and

change over time. (Hur, E.& Thomas, B. 2011)

Problem Statement

1. Can the modular design concept be combined with the dart manipulation technique for creating fashion designs for women?
2. To what extent modular design concept and the dart manipulation technique provide us with fashion designs characterized by unique style lines?
3. Does a modular design concept provide varieties to the consumer in the final appearance of the design?
4. What are the best suggested techniques that have been used?

Research objectives

1- Modular design concept and the dart manipulation technique work well together.
2- Modular design concept and the dart manipulation technique provide us with fashion designs characterized by unique style lines.
3- Modular design concept meets the user's needs.
4- Access the best techniques that can be applied for designing women's clothes.

Research limitations

Using the modular design concept and the dart manipulation technique in designing and producing women's clothes for age group (20-30 years old).

Research methodology

Research follows the descriptive analytical method and application study.

1.1 Dart manipulation

1.1.1 Darts

Darts are folds sewn into fabric to help provide a three-dimensional shape to a garment. They are frequently used in women's clothing to tailor the garment to the wearer's shape. (Calderin, J. 2009), darts are one of the most efficient ways to eliminate unwanted fullness and contour the shape of a garment. They are usually triangular or diamond shaped and sewn right sides together so that excess fabric can be folded or trimmed away. (Calderin, J. 2011)

There are two darts in the front in order to shape the fabric successfully over the bust; they are the darts most often manipulated, although any dart may be moved if required. It is not very often that a garment is required with the darts in their original positions as there are so many alternatives.

1.1.2 Dart manipulation definition

'Dart manipulation' is the term used for the art of moving the dart by folding up and closing the unwanted dart area and slashing open where the new dart is required. The same result can be more quickly obtained by carefully pivoting from the bust point. If the dart manipulation is carried out correctly the previous good fir is maintained. (Campbell, H. 2014)

1.1.3 Dart manipulation techniques

There are two Techniques to achieve dart manipulation, as follows:

1.1.3.1 Pivot technique

A flat-pattern method technique that utilizes a master sloper that is pivoted at the apex and traced clockwise in various ways to achieve a desired style. (Bush, T. 2009)

An existing bust or waist dart can be pivoted on its pivoting point to other positions on the pattern, providing the amount of control remains constant and it originates from an outside seam. Although the fit of the bodice remains the same a new design is created. (Stanley, H. 1991)

1.1.3.2 Slash &spread technique

A flat-pattern method technique in which the sloper is manipulated by slashing and spreading to achieve a desired style. (Bush, T. 2009)

Bust darts can be moved from one part of the body to another by closing the original dart to the bust point and slashing to the bust point on the new dart line. The slash will open and form the new dart. (Stanley, H. 1991)

Dart manipulation techniques have been used in this research to manipulate darts into seams, which goes through darts points, Fig. (1)

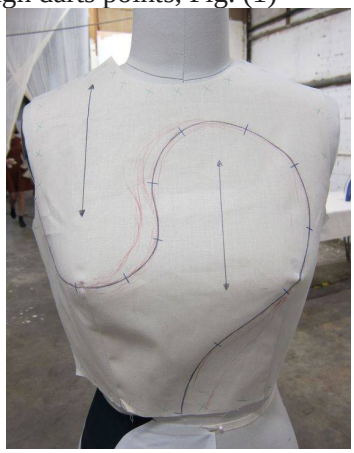


Fig. (1) Manipulate bust dart into seams
www.pinterest.com/

1.2 Modular design

It is one of the transformable designs. It implements the highest flexibility and versatility of garments among the existing types of transformable design. In order to meet the individual styles and preferences of wearers, modular design allows wearers customize the garment into any possible combinations by modifying the modules. This conceptual framework of adjustable clothing offers a wider

range of wardrobe options and gives an infinite number of creations to a garment. (Hazel, Y. 2013)

An important strategy for many designers employing the principles of modularity is that of eco efficiency in production and embodied emphatic experience in product consumption. Modular design enables the creation of products with a second "life" through its capacity to reinvent and reconfigure a product through use of a flexible core with adaptable and removable sections, which allow growth and change over time. The modular designs are characterized by their co-creative nature and their ability to be personalized to meet the needs of the user. This flexibility in design is created through a structural order founded on the principles of symmetry, tessellations and the adaptation of geometric shapes. (Hur, E. S., & Thomas, B. G. 2011)

There are two kinds of modular system, as follows:

1.2.1 Garment Panels Based Modular System

In this modular system, a garment will be divided into several garment parts which are removable and able to exchange with other parts. Sacha Drake introduced a new modular fashion line 'Blessus' in 2011,Fig. 2, which was designed for business women who require different looks in one day. In her modular designs, one dress can offer a wide range fashion styles from smart office look to formal evening look. (Hazel, Y. 2013)

Fig. (2) Sacha Drake, modular fashion line 'Blessus', 2011 (Hazel, Y. 2013)

1.2.2 Lego-Like Modular System

The entire structure of garments is changed in Lego-like modular system. The shape and structure of the garment is formed by one pattern of repeating Lego-like components. (Hazel, Y. 2013)

Eunsuk Hur, a textile designer who created Nomadic Wonderland in 2008, Fig. 3, a, developed an equilateral triangle inscribed within a circle. The triangular region forms the underlying structural tessellation while the three regions created by the circumscribed circle form tabs. Carefully positioned slots at two edges of the triangle enable the tab of another module to be threaded through to interlock. Combining two of these triangular modules creates a rhombic unit and interlocking three of these rhombi (or six of the individual triangular modules) create a hexagonal unit as shown in Fig. 3, b Further experimentation considered the addition of differently colored modules that added a further textural quality when combined. A variety of materials were explored for use in the modular system considering their suitability to potential end uses in both interior and fashion design. These included leather, bonded e-leather with cashmere, wool felt, and wood, combined with laser cutting and printing techniques, such as sublimation printing on wood, acid printing on wool felt and laser etching on leather. (Hur, E. S., & Thomas, B. G. 2011)

Fig. 3, a Eunsuk Hur, 'Nomadic Wonderland' fashion collection, 2008
(Hur, E. S., & Thomas, B. G. 2011)

Fig. 3, b Process for interlocking modular units (Hur, E. S., & Thomas, B. G. 2011)

Garment Panels Based Modular System was used in this research by adding one or more pieces (components) to get different styles for the designs and get the user's needs.

2. Materials and Method

The present research used dart manipulation technique to stunningly unique style lines. This technique allows new style lines to be created in 3D on a dress form, by beginning with a muslin shell (top-skirt-dress) of the silhouette that has already been sewn using typical sloper darts. From the muslin, style lines have been drawn using a marker pen to pass through darts points. Then cutting these style lines into new pattern pieces and stitching resulting pattern pieces using striped cotton fabric to emphasize the style lines. The finished garment seems a mystery in that no means of fitting is visible.

The patterns of style lines have been applied again on cotton fabric in color matching with the color of striped cotton fabric that removed and/or added to the main design using snaps to provide varieties to the consumer in the final appearance of the design.

For evaluation of designs, the researcher designed and constructed a questionnaire includes 10 items as follows:

1- Modular design concept and the dart manipulation technique work well together.
2- The style line in the design is unique.
3- Using striped fabric emphasizes the style line in the design.
4- There is no mean of fitting is visible in the design.
5- The appearance of the design is better without using the basic dart (bust-waist) lines.
6- Snaps are an appropriate fastener tool to remove and/or add modular pieces to the design.
7- Modularity in the design provides varieties to the consumer to change the final appearance of the design.
8- The slash and spread technique is suitable for applying dart manipulation technique in the design.
9- Panels based modular system is suitable for applying modularity in the design.
10- Modular design concept and the dart manipulation technique add aesthetic values to the design.

Each item was assessed on a 5-degree (5= strongly agree, 1= strongly disagree).

The researcher asked ten professors and assistant professors in the field of fashion design and apparel production technology, to evaluate the designs through a questionnaire, each participant viewed the designs and was instructed to read the items of the questionnaire and place a degree for each item through a personal interview.

3. Results

Dart is a triangular fold of fabric stitched on the wrong side of the garment which responsible for fit of the garment. Dart manipulation is changing the location of a dart within the pattern frame. There are many rules for creating, combining, dividing the darts and transferring dart at different places on a pattern piece. In doing so it is possible to shift and relocate the dart into other parts without changing the fit of the garment but helps in creating interesting designs. Darts can be placed into style lines seams if the seam goes through the dart point instead of true darts.

In order to meet user's needs, Modular design concept discussed within this paper, which utilize the principles of modularity to combine the advantages of standardization with the benefits of flexible, customizable and co-creative products, allowing the opportunity for individual personalization.

The following is an overview of ten outfits (top-skirt-dress), they all start with a good basic pattern which you can accomplish by drafting by hand on the flat paper pattern. The basic pattern which is sewn from unbleached cotton will become a new pattern after the style lines have been added on a dress form. Deconstruct these style lines into new pattern pieces. Reconstruct resulting pattern pieces into a new, completely different outfit using striped cotton fabric. To achieve modularity in designs, matching cotton fabric is used as a modular piece taking the shape of the style lines, and removes and/or adds to the outfit by using snaps.

Basic bodice pattern in muslin and style lines have been drawn

Final fitted bodice in striped fabric, using style lines instead of basic bust and waist darts

Final fitted bodice with matching fabric, which was added by using snaps

Design (1)

Basic bodice pattern in muslin and style lines have been drawn

Final fitted bodice in striped fabric, using style lines instead of basic bust and waist darts

Final fitted bodice with matching fabric, which was added by using snaps

Design (2)

Basic skirt pattern in muslin and style lines have been drawn

Final fitted bodice in striped fabric, using style lines instead of basic bust and waist darts

Final fitted bodice with matching fabric, which was added by using snaps

Design (3)

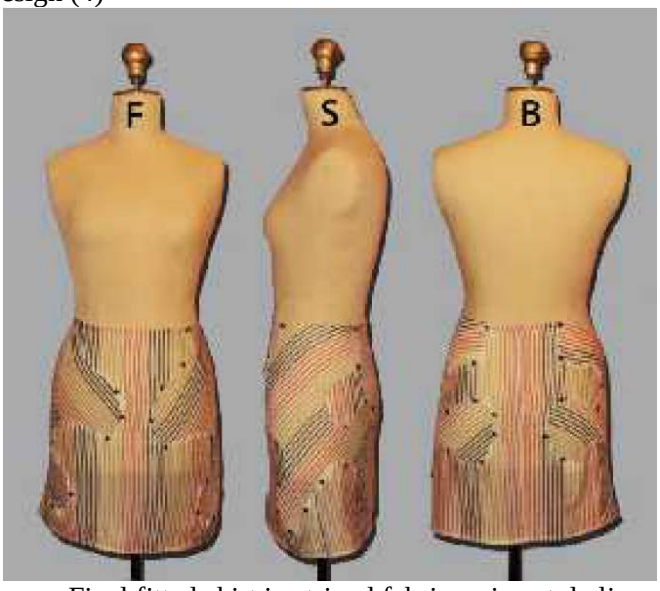
Basic skirt pattern in muslin and style lines have been drawn

Final fitted skirt with matching fabric, which was removed and/or added by using snaps

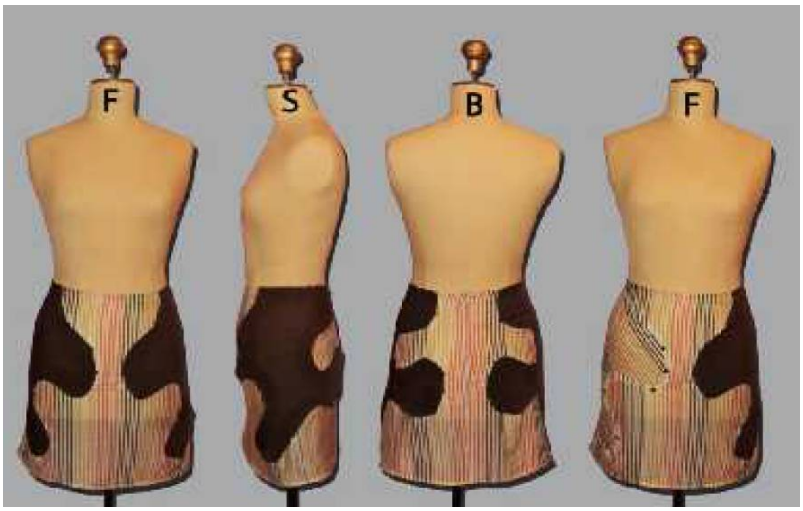
Final skirt garment with matching fabric, which was added by using snaps

Design (4)

Basic skirt pattern in muslin and style lines have been drawn



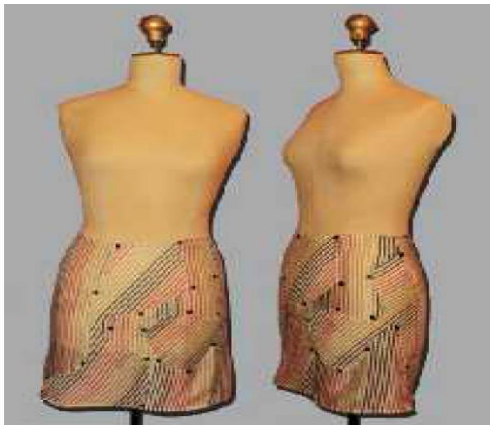
Final fitted skirt in striped fabric, using style lines instead of basic waist dart



Final fitted skirt with matching fabric, which was removed and/or added by using snaps

Design (5)

Basic skirt pattern in muslin and style lines have been drawn

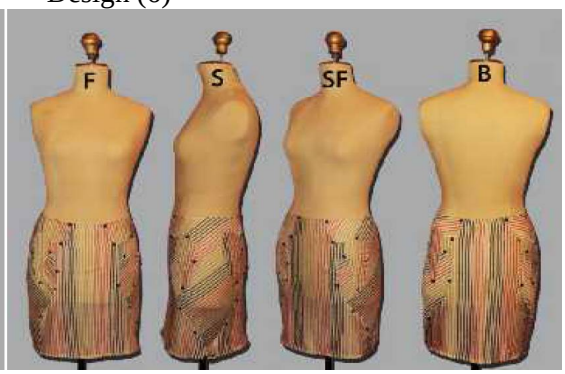


Final fitted skirt in striped fabric, using style lines instead of basic waist dart

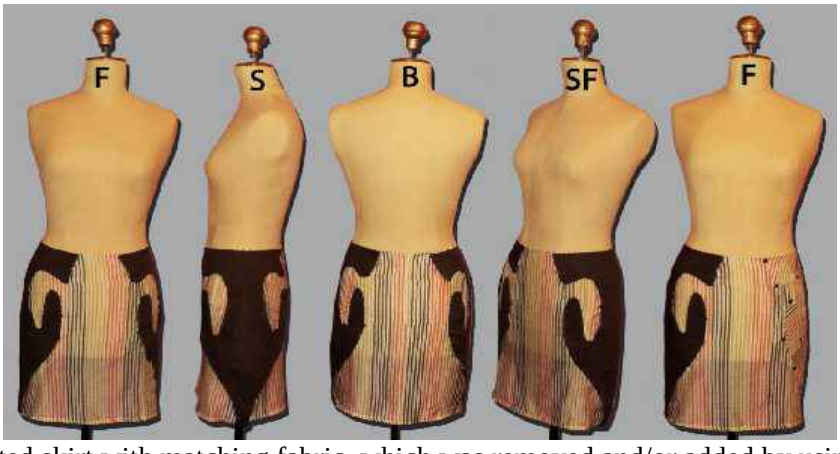
Final fitted skirt with matching fabric, which was removed and/or added by using snaps

Design (6)

Basic skirt pattern in muslin and style lines have been drawn



Final fitted skirt in striped fabric, using style lines instead of basic waist dart



Final fitted skirt with matching fabric, which was removed and/or added by using snaps

Design No. 7

Basic dress pattern in muslin and style lines have been drawn

Final fitted dress in striped fabric, using style lines instead of basic bust and waist dart

Final fitted dress with matching fabric, which was added by using snaps

Design No 8

Basic dress pattern in muslin and style lines have been drawn

Final fitted dress in striped fabric, using style lines instead of basic bust and waist dart

Final fitted dress with matching fabric, which was removed and/or added by using snaps

Design No 9

Basic dress pattern in muslin and style lines have been drawn

Final fitted dress in striped fabric, using style lines instead of basic bust and waist dart Design No 10

Final fitted dress with matching fabric, which was added by using snaps

Referee comparison

Table (1) the average results of a questionnaire for evaluating designs

referee	Designs numbers									
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Ref 1	50	35	39	28	48	34	48	46	40	39
Ref 2	50	41	40	29	47	29	47	46	43	33
Ref 3	50	42	39	27	46	29	47	43	43	35
Ref 4	48	38	39	30	49	30	48	44	44	35
Ref 5	49	38	40	29	50	30	50	45	45	37
Ref 6	50	39	39	33	48	34	48	45	43	35
Ref 7	49	41	41	29	47	35	48	44	45	35
Ref 8	50	37	37	26	46	36	48	44	45	37
Ref 9	49	41	39	30	48	33	46	46	46	34
Ref 10	47	42	39	31	48	28	46	46	47	35
Average	49.2	39.4	39.2	29.2	47.7	31.8	47.6	44.9	44.1	35.5

It is evident from Table (1) that the first design came first with an average of 49.2, followed by the fifth design in the second with an average 47.7, then the seventh design came third with an average 47.6, the eighth design came in the fourth position with an average 44.9, the ninth design came in the fifth position with an average 44.1, the second design in the sixth position with an average 39.4, then the third design came in the seventh position with an average 39.2, the tenth design came in the eighth position with an average 35.5, the sixth design came in the ninth position with an average 31.8, finally the fourth design came in the tenth position with an average 29.2.

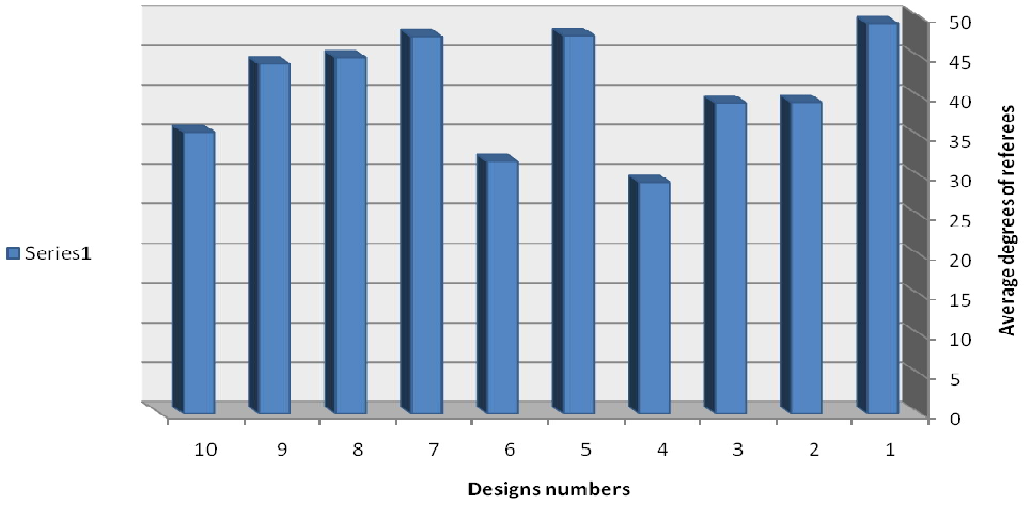


Figure (1) the average degrees of the ten items in the questionnaire for each design

Table (2) significant differences between the Designs produced

Designs produced	Mean "m"	Standard Deviation "SD"	Number of Sample "n"	Confidence Level (95.0%)
D1	49.2	1.032	10	0.738
D2	39.4	2.366	10	1.692
D3	39.2	1.302	10	0.738
D4	29.2	1.988	10	1.422
D5	47.7	1.251	10	0.895
D6	31.8	2.898	10	2.073
D7	47.6	1.173	10	0.895
D8	44.9	1.101	10	0.787
D9	44.1	1.969	10	1.408
D10	35.5	1.715	10	1.227

Table (2) shows the average degrees of the referees for each design (Mean), the standard deviation (SD) between the average degrees of the referees, which ranged from 1.032% as the lowest value and 2.898% as the highest value, and the confidence level (95.0%) which shows that the moral calculated is greater than 0.05 and this indicates that there is no significant difference between the results of the referees for each design, which indicates that the representation and judgment on these results are correct according to the statistical analysis.

4. Discussion

Darts can be little dictators, threatening to limit the way you can creatively manipulate a pattern they can be rotated, combined and divided, but they never disappear. This research introduces and demonstrates an alternative technique of pattern making for new possible expressions of body and dress. The technique of 'dart manipulation' is explained and clarified through a new theoretical framework; a qualitative approximation of the body, in contrast to the traditional quantitative theory based on the horizontal and vertical measurement grid, is presented. This new technique opens up for innovative expressions in dress. The modular design concept described within this research was based on one or two modular pieces that remove and/or add to the product by using snaps that enable the creation of products with a second "life" through the system's capacity for reinvention.

To get idea about designs that best or worth indications we review the next:

Designs (1), (5) and (7) had the highest scores in the evaluation due to the following: The style lines used in these designs are unique. Using striped fabric emphasized these lines. Dart manipulation technique and modular design can work well together in fashion designs. Snaps are an appropriate fastener tool to remove and/or add modular pieces to the designs and help consumer to change the final appearance of garments which meets his needs. The slash and spread technique and panels based modular system are suitable for achieving the research objectives. Dart manipulation technique and modular design added aesthetic values to the designs.

Designs (4) and (6) had the lowest scores in the evaluation may be due to the following: The style lines used in these designs were not unique enough. Modularity that using in these design may be didn't provide the consumer with varieties to change the final appearance of the garment.

5. Conclusion

- Modular design concept and the dart manipulation technique work well together.
- Modular design concept and the dart manipulation technique provide us with fashion designs characterized by unique style lines.
- Modular design concept meets the user's needs.
- The slash and spread technique and panels based modular system are the best techniques that can be applied for designing women's clothes.
- According to the evaluation of designs, the best designs that took the highest scores in evaluating were designs no. (1, 5 and 7). The designs (4, 6) had the lowest scores.

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