Innovative Printed Scarf Designs Utilizing Crochet Motifs

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Abstract:

This work suggests innovative printed scarf designs using crochet motifs as a source of influence and inspiration to add a modern sense to crochet as a traditional craft, keeping up with fashion and creating a competitive product. This work used Adobe Photoshop CS6 software to enhance the images of the original motifs and then saved them in a PNG format with a transparent background and then used them for scarf designs. Eight rectangular and four square scarves were designed in predetermined dimensions. The suggested scarf designs were printed on chiffon and satin fabrics using the sublimation printing method. Finally, the designs have been statistically investigated by specialists in the clothing and textile fields and final printed scarves to evaluate the originality of the idea, quality of the design, and final product according to Likert's five-point scale. There was a statistical significance that the proposed scarf designs created an acceptable competitive product according to the questionnaire.

1. Introduction

The scarf is an old accessory worn by women hundreds of years ago. It is a piece of cloth found in many shapes, square, rectangle, or triangle, used for covering the head, neck, or any other way to enhance the appearance and promote attention (Freer, 2018). In Egypt, women used the scarf to veil or cover the head and the upper body for ideological reasons, identity expression, and the nature of the living conditions. It may be worn for modesty or identity assertions (Islam & Stannard, 2020). They can also be worn alone or with hats (Ricci, 2021), or sunglasses (Chou & Kapadia, 2021). Wearing a scarf changes the outfit's image; it can be worn by many techniques depending on the fabric drape ability feature for different tying and enclosing around the head, neck, and body. The scarf is flexible and as creative as you want to make it. It can make an entire outfit by converting it into sleeveless tops (Dark, 2021) (Madden & Stewart, 2021). It becomes an essential piece in the wardrobe that needs to be chosen carefully to be consistent with the outfits.

Scarves began to be printed in the eighteenth century and became popular in the nineteenth century. Since the printing technologies were developed, the designer's possibilities became limitless. Textile heat-transfer printing, in addition to inkjet printing, allows textile designers to explore graphic design and use the possibilities of computer-aided design (CAD) to achieve advanced visual effects and add computer drawings and

styles, especially for photographed or scanned subjects (Nimkulrat, Kane, & Walton, 2016). Because craft cares about the market (Indrajit & Bikram, 2019), the designers of printed textiles develop images, colors, and patterns essential for aesthetic applications to gain more sales for their products. The digital printing of textiles opened more modern markets than conventional printing methods by generating new images with unlimited colors, sizes, and combinations. Digitally printed scarves have become widespread. Many brands have various designs, sizes, and fabrics to suit a wide range of consumers because of their capability to meet fast fashion demands (Maulik, Nasiruddin, & Begam, 2019). Sublimation transfer printing is the most common way of printing onto fabrics that are synthetic based, 100% polyester, or at least contain 60% polyester content for better results. It is the easiest and more flexible method to introduce designs onto textile materials (Sarkodie, Tawiah, Agbo, & Wizi, 2017).

There have been many attempts to develop and improve the aesthetic aspect of the scarf utilizing different sources such as the lotus flower (Jung, 2006), the Pangudae Petroglyph (Kim & Jeong-Dae, 2007), the art of an 1800s artist, William Morris (Yoon, Sung, & Oh, 2007), Jogakbo Patchwork, and Ddeoksal (rice cake) (Kim S. Y., 2012), the combination of opting art and the geometrical Ddeoksal (Kim S. Y., 2013), flowers, grass, and insects (Jung, 2014), the cube shape (Park, 2020), Gaya Relics (Byun, 2020), comps and

locks from the traditional Korean culture (Wi & Kim, 2019), and achromatic color mixing (Kim & Kown, 2015). These attempts helped create a unique competitive market with innovative designs by combining traditional and contemporary cultures to make modern fashion products (Kim & Jung, 2019).

Digital craft has become increasingly used for textile design, and it is considered the other face of the handmade used in the design process through the virtual realm. It also offers new aesthetic insights into the shape and surface (Bailey & Townsend , 2015). Using computer-aided design (CAD) software facilitates the textile design process. The digital printing of textiles has developed the produced designs; it could efficiently print millions of colors. The hybrid utilization of photography in printed textile design generates a different style of image representation (Nimkulrat, Kane, & Walton, 2016). Connecting the traditional handicraft with digital craft is expected to result in innovative and unexpected design ideas for scarves, which are viable and related to the future (Nimkulrat, 2020).

Crochet is a textile handicraft that can only be produced by hand or by using a needle hook (Sehdev, 2020) (Karp, 2018). People can quickly learn to crochet to make many items, ranging from easy to advance skills (Abou Hashish, 2017). A crochet motif is a piece of crocheted fabric that can be used alone or repeatedly arranged and joined together to create larger patterns for versatile applications (Hatta, 2020). The crochet motif could be found in several geometrical and free shapes; it might be of one color or multiple colors, with one kind of stitch or combining several stitches in a definite order (Eckman, 2008). The crochet motif can be a way to express feelings. It allows working with small amounts of yarn (Eckman, 2012).

This research follows the experimental, and analytical methods; it focuses on crochet motifs to create innovative designs for printed scarves and adds a modern sense to crochet as a traditional craft. The selected crochet motifs were produced manually, as usual, by using the crochet hook and then converted into a digital file by photographing. Editing images to enhance colors and shades for each motif using Adobe Photoshop CS6 and then saved as a PNG file with a transparent background. In this study, every digital motif has been used to create scarf designs by repeating, resizing, distributing, and combining more than one motif in the design space with predetermined dimensions. In this work, 12 scarves have been designed (eight rectangular and four square designs). Designs

considered the well-known design essential elements (shape, line, texture, color, and space) and principles (unity, emphasis, proportion, balance, and rhythm) to be attractive and compete with scarf designs found in the market. The scarf designs were printed onto the fabric using sublimation printing onto two fabrics materials: chiffon fabric for rectangular designs and satin fabric for the square designs. Printed scarves were sewn to add clean embellished edges, and then finally, the designs and final printed scarves surveyed by the specialists were analyzed and discussed.

2. Methodology
2.1. Producing motifs, digital image enhancement, and designs development

This work started by choosing crochet motif patterns from available specialized resources such as books, magazines, and websites. Two types of yarn have been used to produce motifs: Alize Bella ® yarn, 100% cotton, with a 2.75 mm crochet hook size, and Alize Cotton Gold ® yarn, 55% Cotton – 45% acrylic, with a 3.25 mm crochet hook. A digital camera converted the tangible motif into a digital image JPG. Images were exported to the Adobe Photoshop CS6 software to modify and enhance the colors, make a transparent background, and then saved as PNG images. The PNG motifs were used to design scarves by combining solid and gradient colors lines. Sometimes, readymade graphic patterns have been used according to the design demands. The resolution of all designs is 150 pixels per inch, with RGB color mode and 8 bits/channel. This work sequence has been repeated for all motifs in the proposed scarf designs.

Table 1. shows the motif development for rectangular scarf designs. Design (1) based on the ruffled heart motif (Sainio, 2014) in three Bella ® yarn colors (olive green, terra, and pumpkin). The enhanced motifs combined alternately in regular color repetition stripes and then repeated along with the design, as shown in figure 1 (a). This design was 55 cm in width and 200 cm in length, with a dark red background. The design has two lines with a slightly desaturated orange color, emphasizing boundaries and creating symmetrical balance.

Design (2) used a flower quilt motif (Galan, 2009) in four Bella ® yarn colors (Cream, Rose, Red, and Pink). The opacity of the enhanced image decreased to 80% of its original color. The flower motif enlarged to 200% of its original size and was used in an alternative repeat along the design area. This design is 55 cm in width and 200 cm in length, surrounded by a double-colored frame to ensure design unity, as shown in figure 1 (b).

In design (3), a geometric diamond motif (Lodinsky, 2011) has been used. The motif was produced in two Bella ® yarn colors (beige and coffee) using a 2.75 mm crochet hook. The enhanced diamond motifs combined in the two colors in a hexagonal shape create a 3D effect and provide depth to the design. The arrangement of hexagons in the design attracts attention and emphasizes the shape details. Figure 1 (c) shows the final design in 55 cm width and 200 cm length, with a double-line frame decorating and unifying. The gradient color of the background draws the eye along the design.

A multi-colored quatrefoil motif (Lodinsky, 2011) has been used for the design (4). The whole motif (4 rounds pattern) consists of three Cotton Gold ® yarn colors (lemon, khaki, and navy), while the smaller motif (two rounds of the pattern) consists of the lemon Cotton Gold ® yarn color using a 3.25 mm crochet hook. Four complete multi-colored quatrefoil motifs were combined as a larger square. The smaller motifs were arranged regularly around the square to emphasize and highlight the details. This combination was repeated along with the scarf design to ensure harmony and richness in the pattern. Figure 1 (d) shows the design is 55 cm in width and 200 cm in length with a solid pale red color for the background. Longitudinal lines at both sides of the design in a dark red color, between two dark violet lines, define the design and direct the eye along with the scarf.

Table 1. shows a multi-layered flower motif (Galan, 2009) development for scarf design (5). The motif was produced in three Cotton Gold ® yarn colors (ice blue, ocean, and indigo), using a 3.25 mm crochet hook. In this design, two enhanced PNG flower image colors have been obtained by adding a vector mask with a solid hue, #fd0303 Vivid red and #fd03e8 Vivid magenta. Figure 1 (e) shows the three flower colors distribution in the design. Motifs were repeated and combined in different sizes to fill the central design space. The two other groups for corners added a balance to the design. The design was 55 cm in width and 200 cm in length, with a simple thick dark blue line for the border to define the design space and maintain unity. A ready graphic pattern is distributed all over the pale cyan color of the background.

The scarf design (6) was made of two motifs, a floral triangle (Eckman, 2008) and a pinnate leaf motif (Griffiths, 2018). The triangle consists of indigo and orange Cotton Gold ® yarn colors, and the Pinnate Leaf consists of the wine Cotton Gold ® yarn color. The colors of the three enhanced PNG motifs were changed by adding a vector layer mask with a solid color hue of Vivid lime green #08ff0e. The design was 60 cm in width and 200 cm in length, as shown in figure 1 (f). The two triangular patterns repeated interchangeably with the Pinnate Leaf motifs for the two sides of the scarf design to create a balance. The rectangle design started with a simple black line followed by motif repeats to define both edges. The middle of the design was kept blank except for the background's pale green color.

Table 1. shows the motif development of scarf design (7) using the Aztec Sun motif (Morgan, 2013). The motif consisted of four Cotton Gold ® yarn colors (red, yellow, orange, and indigo). This design contains a frame of the square motif repetition along the boundaries, as shown in figure 1 (g). A simple double border surrounds the motifs frame, the inner one with gradient color (from vivid yellow to bright red), and the outside one with a solid dark red color. The central space of the design was filled with gradient colors, from bright red to white, adding depth to the design.

The scarf design (8) consists of the Pointed Arches Octagon motif (Griffiths, 2018) made of brown Cotton Gold ® yarn using a 3.25 mm crochet hook. The color of the enhanced PNG image was changed by adding a vector mask with a solid color, #001fa3 Dark Blue. The design shown in figure 1 (h) is 60 cm in width and 200 cm in length. A wide multi-line border with distinctive dark blue and pure yellow corners harmonizes the octagon motif shape and adds movement to the design. The central design space filled with a side repetition of the motif with the applied color mask fills all the design spaces in a desirable rhythm. The light-yellow color of the background highlights the motifs and creates a strong contrast.

Table 2. shows the motif development for square scarf designs. The scarf design (9) was made of a circular pattern (Internet, 2021). The motif was produced in a green Cotton Gold ® yarn color using a 3.25 mm crochet hook. The color of the enhanced PNG image has been changed by adding a vector mask with a solid color hue of #00696d Dark Cyan. Figure 2 (a) shows the whole 75 cm^2 square design with the enhanced recolored motif in a half-drop repeat on a soft cyan background color. The design border has three frames: dark cyan colors for the outside and inside boundaries and a gradient color for the in-between frame to add depth to the design. The two opposite quarters of this design changed in color by adding a layer mask of #990033 dark pink color hue to create a strong contrast and draw the viewer's eye.

The scarf design (10) was made of the Layers & Loops motif (Linssen, 2016) in three Bella ® yarn colors (beige, blush, and red) using a 2.75 mm crochet hook. This design combined the motif in two sizes to create a triangular form. They then

repeated that combination in a 75 cm^2 square's four corners, as shown in figure 2 (b). An oversized motif middles the design on a pale orange background. The frame in a dark red color unifies and emphasizes the design space.

The scarf design (11) was made of the hot pad motif (Linssen, 2016) for the body of the design and a circle flower motif (Eckman, 2008) for the border. The hot pad motif is double layered, with a plain circle and an octagon flower pattern attached. The plain circle consists of yellow Cotton Gold ® yarn, and the upper octagon flower pattern consists of three Cotton Gold ® yarn colors (indigo, yellow, and grey) using a 3.25 mm crochet hook. The circle flower motif was produced in the indigo Cotton Gold ® yarn color using a 3.25 mm crochet hook. Figure 2 (c) shows the design size of 75 cm^2 square. With the original size, the Hot Pad motifs were distributed regularly in the four corners and the four

sides, followed by another motif in the centre of the design. The circle flower motif resized and repeated in the frame between two borderlines of a dark blue color. The frame background with a light-yellow color contrast with the color of the flower motifs.

The scarf design (12) was made using the Dainty Flower and Post Stitch Triangles (Lodinsky, 2011). The triangles were produced in coral and coffee Bella ® yarn trendy colors using a 3.25 mm crochet hook. The two triangles are repeated interchangeably in the facing lines to create a repeated combination distributed over the 75 cm^2 square design, as shown in figure 2 (d). A graphic curved line was used as a background. The frame was designed with lines of different thicknesses of dark red color to highlight and emphasize the design.

**Table 1.** Motifs development for rectangular scarf designs

Design No.	Pattern	Yarn type and color(s)	Crochet Hook size	Digital image (JPG)	Enhanced image (PNG)	Applied color(s)	Motif combinations	Solid Color Code
Design (1)		Bella ®; – 593 – **olive green,** 89 – **terra,** and 83 – **pumpkin**	2.75 mm			-----		– #380101 | dark red – #c8a46d | slightly desaturated orange
Design (2)		Bella ®; 1 – **cream,** 56 – **red,** 440 – **rose,** and 32 – **pink.**	2.75 mm					– #f1efdf | light greyish yellow – #c8a46d | slightly desaturated orange. – #8a254e | dark pink.
Design (3)		Bella ®; 76 – **beige,** and 222 – **coffee**	2.75 mm			-----		– #fffefe | pale (mostly white) red. – #9b7855 | dark moderate orange. – #332727 | dark greyish red.
Design (4)		Cotton Gold ®; 668 – **lemon,** 29 – **khaki,** and 58 - **navy**	3.25 mm			-----		– #ffcccc | pale red [pink tone] – #6c000a | dark red. – #190438 | dark violet.

Design No.	Pattern	Yarn type and color(s)	Crochet Hook size	Digital image (JPG)	Enhanced image (PNG)	Applied color(s)	Motif combinations	– Solid Color Code
Design (5)		Cotton Gold ®; 514 – **ice blue,** 16 – **ocean,** and 389 – **indigo**	3.25 mm					– #ccffff | pale cyan – #000066 | dark blue
Design (6)		Cotton Gold ®; 389 – **indigo** – 37 – **orange,** and 57 – **wine**	3.25 mm					– #edffcd | pale green – #000000 | black
Design (7)		Cotton Gold ®; 389 – **indigo,** 37 – **orange,** 110 – **yellow,** and 56 – **red**	3.25 mm			-----		– #f8d8cc | light greyish orange – #db4821 | bright red – #f2db1a | vivid yellow – #af1410 | dark red
Design (8)		Cotton Gold ®; 493 – **brown**	3.25 mm					– #ffff99 | light yellow – #ffcc00 | pure yellow – #003366 | dark blue

**Table 2.** Motifs development for square scarf designs

| Design No.	Pattern	Yarn type and color(s)	Crochet Hook size	Digital image (JPG)	Enhanced image (PNG)	Applied color(s)	Motif combinations	Solid Color Code
Design (9)		Cotton Gold ®; 35 – **green**	3.25 mm					– #befafd | soft cyan – #f7caea | light greyish pink – #006666 | dark cyan – #451525 | dark pink
Design (10)		Bella ®; 76 – **beige**, 613 – **blush**, and 56 – **red**	2.75 mm			-----		– #ffe6d1 | pale orange – #660000 | dark red
Design (11)		Cotton Gold ®; 389 – **indigo**, 110 – **yellow**, and 200 – **grey**	3.25 mm			-----		– #ffff99 | light yellow – #000033 | dark blue
Design (12)		Bella ®; 619 – **coral**, and 222 – **coffee**	2.75 mm			-----		– #f8cab3 | soft orange – #660000 | dark red
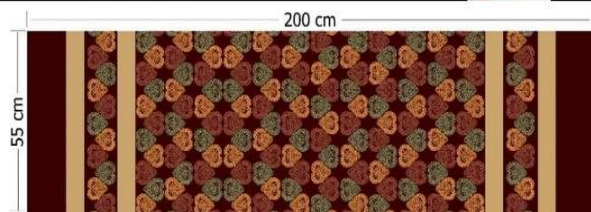
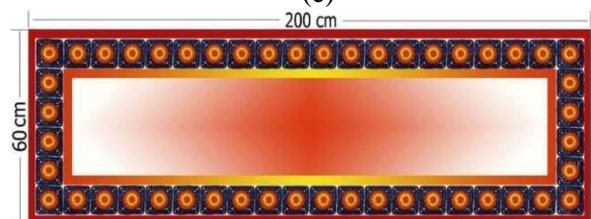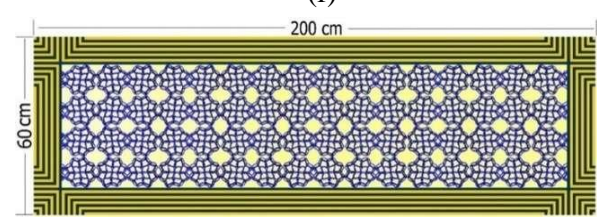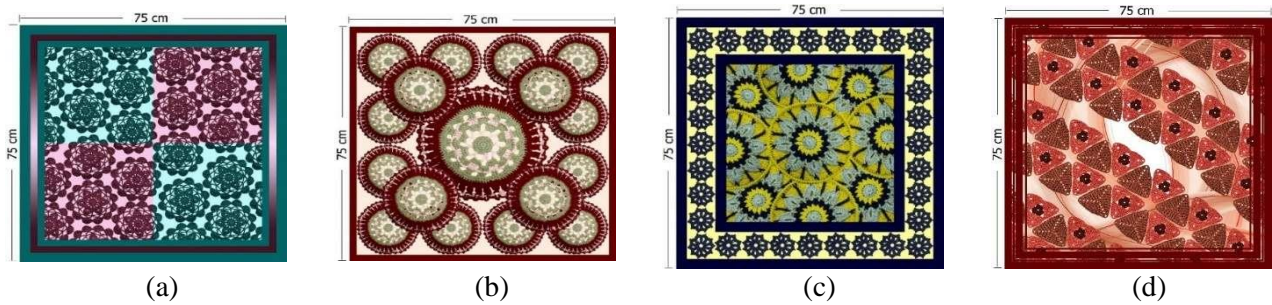(a)
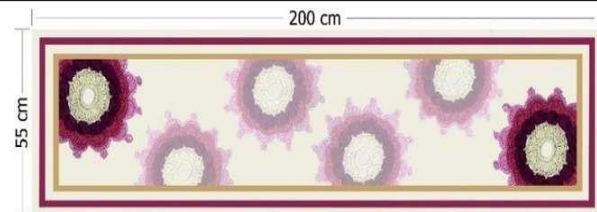
(b)
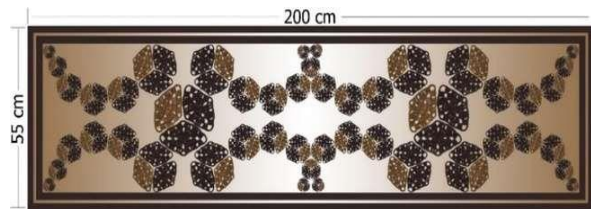
(c)
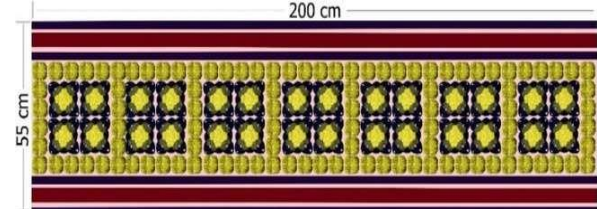
(d)

(e)
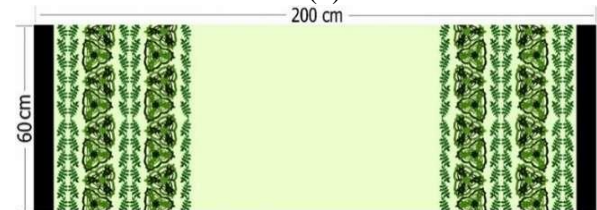
(f)

(g)

(h)

Figure 1. Rectangular scarf designs:
(a) Scarf design (1), (b) Scarf design (2), (c) Scarf design (3), (d) Scarf design (4), (e) Scarf design (5), (f) Scarf design (6), (g) Scarf design (7), and (h) Scarf design (8).

(a)　　　　　　　　(b)　　　　　　　　(c)　　　　　　　　(d)

Figure 2. Square scarf designs:
(a) Scarf design (9), (b) Scarf design (10), (c) Scarf design (11), and (d) Scarf design (12)

2.2. Scarves Printing Method
In this work, the suggested designs were printed onto polyester fabrics using the sublimation printing method.

### 2.3. Scarves hemming
The scarves were finished with a narrow-rolled hem by folding the edge to a narrow width using a straight topstitch. The finishing touches on the hem secure the construction of the piece and provide a clean, functional finished look.

2.4. Final scarves products
This work used 100 % polyester fabrics, Chiffon's fabrics for rectangular designs, and satin fabrics for square designs. The Chiffon fabric features are lightweight, sheer, draped, and soft hand fabric. While the Satin fabric has a lustrous, smooth, and luxurious surface with a soft hand and excellent surface texture. Both types of materials are used to manufacture and produce scarves in the market, and both are acceptable to consumers. The scarves were photographed using a specialized fashion model with her approval to use and publish. In the photo session, the model showed the different ways to wear the final products of the printed scarves. The chosen photos from the photo session are shown in figure 3.

(a)　　　　　　　　(b)　　　　　　　　(c)　　　　　　　　(d)

(e)　　　　　　　　(f)　　　　　　　　(g)　　　　　　　　(h)
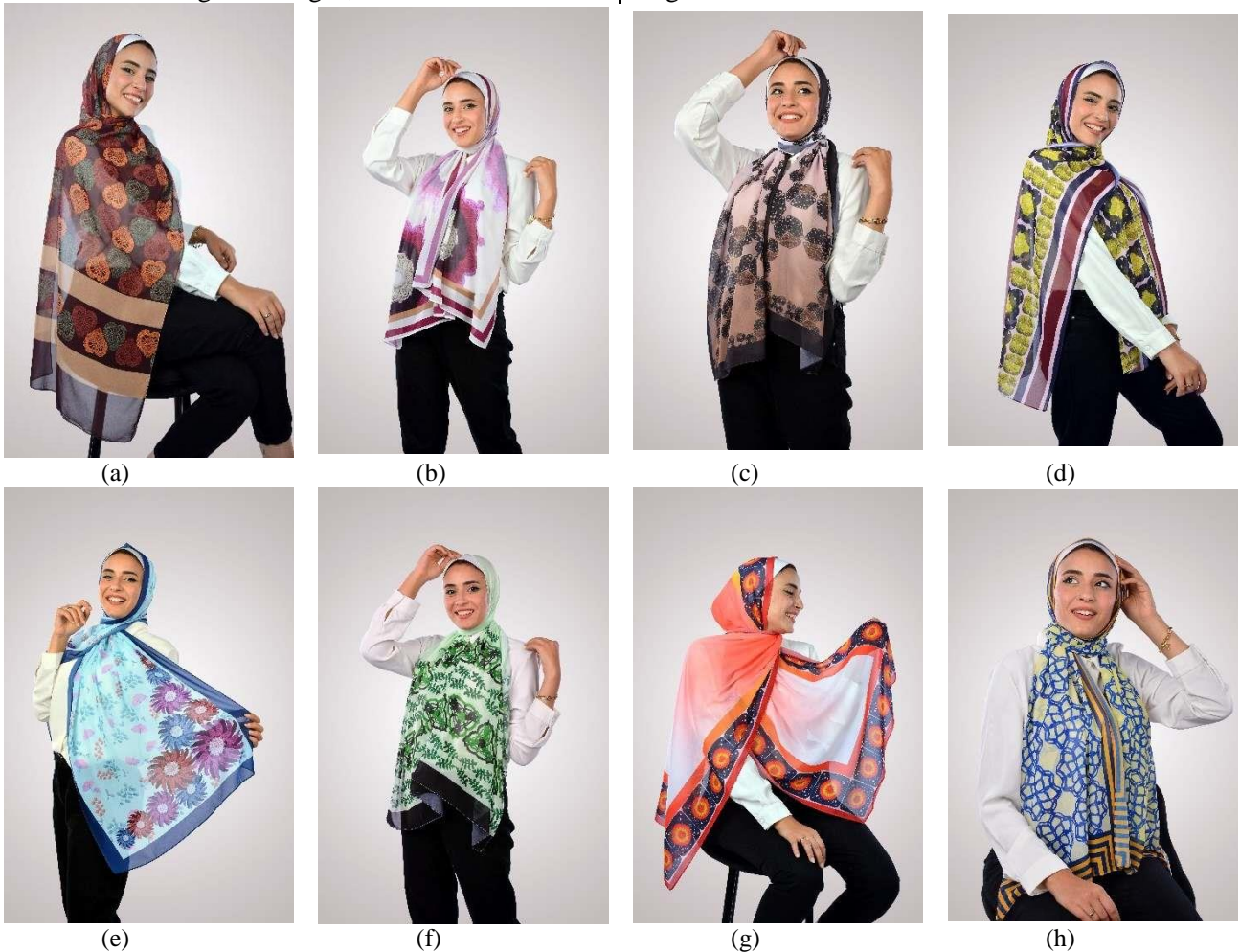
Figure 3a. Final printed scarf designs:
(a) Scarf (1), (b) Scarf (2), (c) Scarf (3), (d) Scarf (4), (e) Scarf (5), (f) Scarf (6), (g) Scarf (7), (h) Scarf (8),

| (i) | (j) | (k) | (l) |
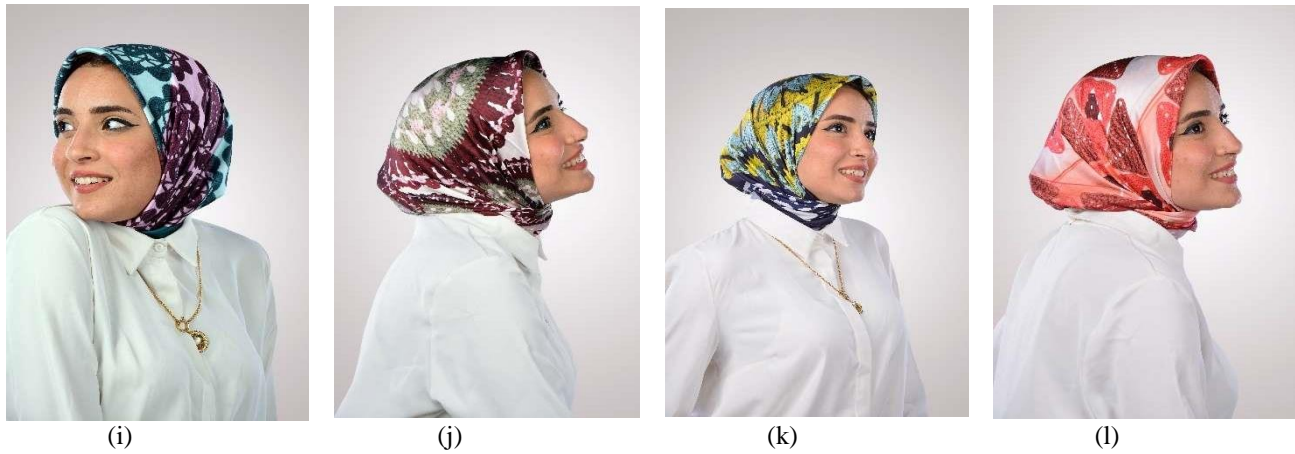
Figure 3b. Final printed scarf designs:
(i) Scarf (9), (j) Scarf (10), (k) Scarf (11), and (l) Scarf (12).

3. Results and discussion

To evaluate the designs and final products in this work, the researchers asked the specialists in clothing and textiles from Egyptian universities, namely Ain Shams and Helwan Universities. Twelve specialists responded to a questionnaire that included ten topics about the design and the final product. The responses to each topic were rated according to Likert's five-point scale as follows: very poor (one score), poor (two scores), fair (three scores), good (four scores), and excellent (five scores).

Table 3. shows the percentages of the responses of each topic for each design according to the specialist's opinions. Figure 4 shows the rates of specialists' evaluations of designs and final products for each topic in the questionnaire. The innovation of using crochet motifs as a source of design, creating a 3D effect, achieving the design elements and principles, and the suitability of the chosen yarn type and thickness in producing motifs have significantly high scores in the design (11). The highest percentage of the uniqueness of designing and creating a competitive, marketable product is achieved by design (11). The suitability of the chosen crochet motifs in the design had the highest percentage of designs (10) and (11). Designs (10), (11), and (12) have the highest scores in fitting contemporary fashion trends, whereas designs (5), (10), and (11) have the highest scores in using the computer capabilities in designing. Figure 2 (b) shows that Design (11) has the highest average of the total percentages of all topics of the questionnaire, followed by designs (12) and (10). At the same time, Design (6) had the lowest average of the total percentages of all questionnaire topics, which was still very good.

Table 3. The percentages for each design according to the specialist's evaluations for the questionnaire topics.

| Topics	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
1. The crochet motifs are an innovative source of design for the printed scarves.	80	90	85	83	88	82	82	80	88	93	95	93
2. Using crochet motifs as an image creates a 3D effect in the design.	78	92	75	83	87	78	80	82	87	92	97	95
3. The design has successfully achieved the design elements (lines – shape – texture – color – space).	85	88	83	87	85	78	80	87	87	88	93	92
4. The design has successfully achieved the design principles (rhythm – compatibility – proportionality – focus – balance).	87	88	83	82	85	78	82	87	85	88	93	92
5. The yarn type and thickness of the original motif are suitable for the design.	77	88	78	82	88	78	83	83	92	90	95	93
6. The suitability of the original crochet motif to the design	82	90	85	87	88	82	85	87	88	92	92	87
7. The uniqueness and innovation of the scarf design	83	88	82	83	87	78	80	82	85	90	92	88
8. The design fits the contemporary fashion trends	80	87	85	82	88	82	78	83	87	90	90	90
9. The success in using the computer capabilities in design	82	87	85	87	88	80	82	85	83	88	88	87
10. The final product is competitive and marketable	85	90	87	87	87	80	83	85	87	93	95	92
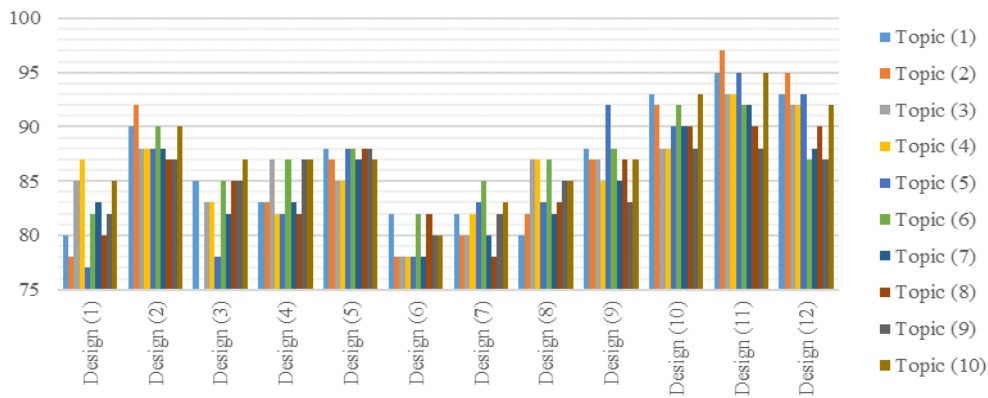
Figure 4. The percentages of the specialist's evaluation for the questionnaire topics

Table 4. lists the standard deviation of the questionnaire topics according to the specialist's evaluations. The standard deviation results have statistical significance; the lower the standard deviation, the more it indicates a consensus on the topic of the questionnaire and vice versa. Figure 6 shows the standard deviation according to the specialist's evaluations of the questionnaire topics. There was a noticeable consensus on achieving design number (11) for most questionnaire topics. In contrast, design (1) achieved the highest consensus among specialists regarding its suitability to contemporary fashion trends. Moreover, designs (9), (10), and (11) also achieved the proper use of crochet motifs in the design. Figure 7 shows that Design (11) has the lowest average of total standard deviations, which indicates the consensus of specialists on the success of the design in achieving the highest levels of acceptance for the subjects of the questionnaire, followed by designs (9) and (2), respectively.

Table 4. The standard deviation for each design according to the specialist's evaluations for the questionnaire topics.

Topics	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
1. The crochet motifs are an innovative source of design for the printed scarves.	0.74	0.80	0.87	0.94	0.79	0.90	1.00	0.74	0.67	0.65	0.45	0.65
2. Using crochet motifs as an image creates a 3D effect in the design.	0.90	0.51	0.87	0.72	0.78	0.90	0.95	0.67	0.65	0.79	0.39	0.62
3. The design has successfully achieved the design elements (lines - shape - texture - color - space).	0.62	0.79	0.58	0.78	0.87	0.67	1.04	0.65	0.65	0.67	0.49	0.67
4. The design has successfully achieved the design principles (rhythm - compatibility - proportionality - focus - balance).	0.65	0.67	0.83	0.79	0.75	0.67	0.90	0.65	0.75	0.67	0.49	0.67
5. The yarn type and thickness of the original motif are suitable for the design.	0.72	0.67	0.79	1.08	0.79	0.90	0.94	0.83	0.51	0.80	0.45	0.78
6. The suitability of the original crochet motif to the design	0.67	0.52	0.75	0.89	0.79	0.90	0.87	0.65	0.51	0.51	0.51	0.89
7. The uniqueness and innovation of the scarf design	0.83	0.67	0.79	0.94	0.89	0.79	1.04	0.79	0.62	0.67	0.51	0.90
8. The design fits the contemporary fashion trends	0.60	0.65	0.62	1.08	0.79	0.90	1.08	0.83	0.65	0.67	0.67	0.80
9. The success in using the computer capabilities in design	0.79	0.78	0.75	0.89	0.79	0.85	1.00	0.75	0.83	0.79	0.67	0.89
10. The final product is competitive and marketable	0.62	0.67	0.78	0.89	0.89	0.74	0.94	0.75	0.78	0.49	0.45	0.67
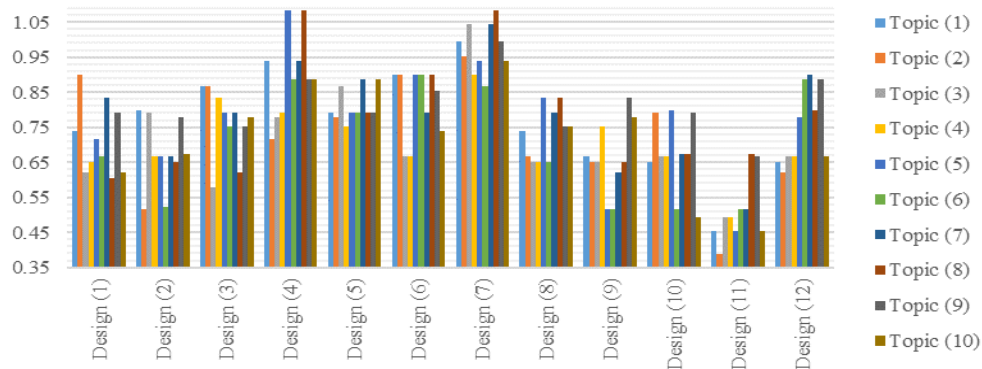
Figure 5. The standard deviation of the specialist's evaluation for the questionnaire topics

Table 5. shows the average of the total percentages and standard deviations of the questionnaire topics for each design. It also shows the design levels, which vary from good to excellent. The design ranks were arranged in ascending order according to the average rates obtained.

Table 5. The mean, standard deviation, average of total percentages, level, and rank for each design according to the specialist's evaluations for the questionnaire topics.

Design No.	Mean	Standard Deviation	Percentage (%)	Level	Rank
Design (1)	4.09	0.72	81.90	Good	10
Design (2)	4.44	0.67	88.80	Excellent	4
Design (3)	4.14	0.76	82.80	Good	9
Design (4)	4.21	0.90	84.30	Excellent	7
Design (5)	4.36	0.81	87.10	Excellent	5
Design (6)	3.98	0.82	79.60	Good	12
Design (7)	4.08	0.98	81.50	Good	11
Design (8)	4.20	0.76	84.10	Excellent	8
Design (9)	4.34	0.66	86.90	Excellent	6
Design (10)	4.53	0.67	90.40	Excellent	3
Design (11)	4.65	0.51	93.00	Excellent	1
Design (12)	4.54	0.75	90.90	Excellent	2
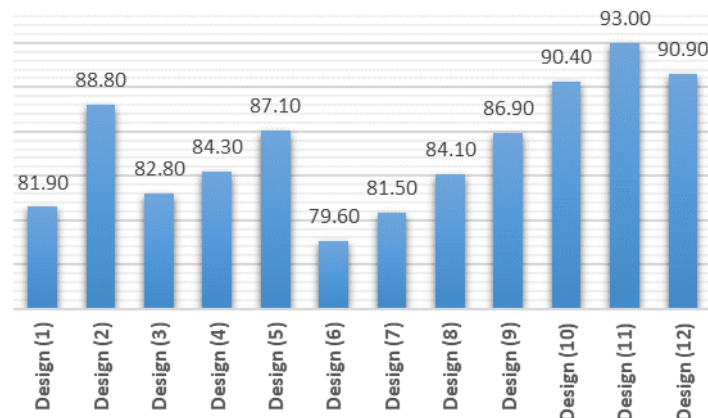
Figure 6. The percentages average of the questionnaire topics for each design
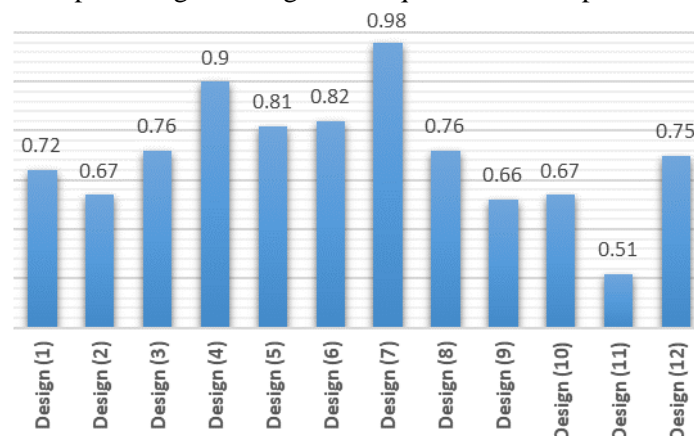
Figure 7. The standard deviation average of the questionnaire topics for each design

4. Conclusion

This work succeeded in creating new scarf designs inspired by crochet motifs using computer capabilities in the design process. Merging handicrafts and digital crafts resulted in innovative designs accepted by specialists in the clothing and textile fields. The use of crochet motifs as a digital file creates a three-dimensional effect that is easily visible in most designs. Scarf designs achieve uniqueness, innovation, and fit contemporary fashion trends. According to the specialists' responses to the questionnaire, the final scarf product is competitive and marketable.

Design (11) received the highest approval ratings and consensus regarding the rest of the designs.

That is likely due to a larger crochet motif size, which boosts the three-dimensional effect. The overlap of the distributed motifs provided depth to the design. In addition, using complementary colors provides contrasting and striking visual effects. The yarn type and thickness used for producing motifs were suitable for the design and helped display the motifs very well. Professional computer capabilities resulted in an innovative and unique scarf design that convenient contemporary fashion trends and produced a competitive, marketable product.

It is possible that printing some designs on satin fabrics has a better effect on the appearance of the design, and this explains why designs (9), (10), (11), and (12) have the highest acceptance rates according to the opinions of specialists. That does not negate that; designs (2) and (5) obtain the highest ratings for scarves printed on chiffon fabric. The size of the digital motifs may also affect the design's success. The larger the digital motif in the design, the clearer the three-dimensional effect and motif details. That could explain why designs (11), (12), (10), and (2) have higher rates compared to other designs.

The motif color choice is likely to influence the clarity of the motif's details; that is what we can deduct from the designs (3), (6), and (7), which get the lowest ratings in comparison with the rest of the designs. Therefore, it is better to use lighter and brighter colors to help in clearly appearing details of the motifs.

Despite the variation of views on designs, they range from "good" to "excellent" levels, indicating the general success, quality, and acceptance.

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Ethics statement:

There are no human subjects in this research, and informed consent is not applicable.

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