DR. Eman Zaher Goda
Lecturer in Department of Spinning and Weaving
Faculty of Applied Arts
Helwan University – Egypt
eman.zaher@a-arts.helwan.edu.eg

DR. Eman Abo Elazm Abd Elmged Elkalshy
   Lecturer in Department of Photography, cinema and Television
     Faculty of Applied Arts
     Helwan University – Egypt
     Imanaboelazm@a-arts.helwan.edu.eg

Title: Capturing the Aesthetics of Light and Shadow in Islamic Architecture from Photography into Woven Jacquard Hangings

ABSTRACT

The world's visual perception is light. It is a key factor in the design of architecture, and the meaning of light and shadow is related to aesthetic perception and has a crucial responsibility in enhancing the quality of the architectural space, especially in Islamic architecture, as light gives the spaces of architectural structures the sense of life. This research paper comes to answer a main question: Studying the aesthetic aspects of light and shadow in Islamic architecture captured through photography and translating these expressions into woven textile hangings using the jacquard technique, with investigating how well the produced fabrics replicate the original photos, and their ability to transfer the same feelings and visual effects. Six woven samples were produced in this research using the jacquard technique, representing the original photographic images that were captured. Then The evaluation of the jacquard samples was conducted using a questionnaire, to measure their ability to simulate the effects of light and shadow in the original photos in terms of depth, texture, and visual impact. The results showed that the research fabrics samples successfully recreated an illusion of depth and the same visual effects through light and shadow like that were felt in the captured photos. This research depends on the descriptive analytical approach methodology in the theoretical study and the experimental and analytical approach in the practical study. This work provides valuable insights into textile design in collaboration with the field of photography, where visual depth and artistic effects are important, like in decorative fabrics or textile hangings.

العنوان: التقاط جماليات الظل والنور في العمارة الإسلامية من التصوير الفوتوغرافي إلى المعلقات المنسوجة بتقنية الجاكارد

الخلاصة: إن الضوء هو الإدراك البصري للعالم، حيث يعتبر عامل أساسي في تصميم العمارة، ومعنى الضوء والظل مرتبط بإدراك جمالي وله مسؤولية حاسمة في تعزيز جودة الفضاء المعماري خاصة في العمارة الإسلامية، حيث يعطي الضوء لمساحات الهياكل المعمارية إحساسًا بالحياة. تتلخص مشكلة البحث في دراسة الجوانب الجمالية للظل والنور في العمارة الإسلامية الملتقطة من خلال التصوير الفوتوغرافي وترجمة هذه التعبيرات إلى معلقات منسوجة بتقنية الجاكارد مع التحقيق في مدى قدرة الأقمشة المنتجة على نقل نفس المشاعر والتأثيرات البصرية. وقد تم إنتاج ست عينات منسوجة في هذا البحث باستخدام تقنية الجاكارد، تمثل الصور الأصلية الفوتوغرافية التي تم التقاطها، ثم تم إجراء تقييم عينات الجاكارد باستخدام استبيان، لقياس قدرتها على محاكاة تأثيرات الضوء والظل في الصور الأصلية من حيث العمق والملمس والتأثير البصري. وقد أظهرت النتائج أن عينات البحث أعادت بنجاح خلق وهم العمق ونفس التأثيرات البصرية من خلال الضوء والظل مثل الذي تم الشعور به في الصور الملتقطة. يعتمد هذا البحث على المنهج الوصفي التحليلي في الدراسة النظرية والمنهج التجريبى التحليلى في الدراسة العملية. يقدم هذا العمل رؤى قيمة في تصميم المنسوجات بالتعاون مع مجال التصوير الفوتوغرافى، حيث يكون العمق البصري والتأثيرات الفنية مهمين، كما هو الحال في الأقمشة الزخرفية أو المعلقات النسيجية.

Introduction

Since photography literally means "drawing with light," and since light cannot exist without shadow, photography cannot function without both light and shadow.

We should not overlook the important role of light in photography. Especially in light and shadow photography, where we may produce gorgeous shots by toying with light. This style of photography is noted for its ability to convert a normal image into something amazing.

Shadows can be used to create a flamboyant mood or dramatic shots by adding elements of drama that work well in colorful moods in Islamic architecture. When deciding how much light to let into your shot, you can experiment with exposing only a portion of the subject. This could be only a portion of the details of the building, adding excitement to the image. Repeating patterns, lines, or shapes can produce a design. Shadows change with lighting conditions, becoming darker, lighter, sharper, softer, longer, and shorter, which affects the viewer's attitude towards it. A shadow can be looked at, or looked through, depending on the differences in the perception of the brightness constancy of an image.

However, our perception of shadows remains somewhat unexplored, with no clear final conclusions. state that a hard shadow is seen to be more visible than a soft shadow, so this creative tonal variation is responsible for the feeling of a deeper illusion *(Shunhua and others 2017)*. We perceive a specific area in an image as a shadow and extract information about the scene as a whole before focusing only on the object. Minor mistakes in shadow projections are frequently overlooked once past the recognition point. We live in a three-dimensional world; shadows are an everyday phenomenon.

Since shadows, as captured through photography, play a vital role in calling up moods and creating dramatic compositions, especially in the context of Islamic architecture, where patterns, lines, and light transitions express aesthetic appeal, similarly, jacquard weaving serves as a powerful medium for translating such intricate visual elements into textile forms, offering supreme freedom in design to replicate natural scenes and complex patterns. Together, these two artistic expressions, photography and Jacquard weaving merge to preserve and re-explain the beauty of Islamic art in a tangible and textured format.

Jacquard fabrics enable designers to generate intricate patterns. The relationship of up and down between the warp and weft yarns can be defined freely in the jacquard technique. Only jacquard fabric provides the kind of freedom required to capture visual motifs of a natural scene or subjects needing complicated patterns. Because of its wide selection of aesthetics, jacquard fabric can be frequently used in women's apparel, neckties, curtains, hangings, and other items that call for intricate designs. *(M. Toyoura and others 2019)*

Research Problem

The research problem answers the following questions; How can the detailed visual characteristics and emotional spirit of Islamic art, especially the effects of light and shadow, be faithfully translated from photographic images into textile hangings using the jacquard weaving techniques? What are the technical and artistic challenges involved in this translation, and how can they be addressed to preserve the integrity and impact of the original art in the woven hanging?

Research Objectives

- To investigate the principles and aesthetics of lighting and shading in photography and to apply it in woven textile hanging.
- To produce woven fabrics using the jacquard technique that replicates the intricate visual details and elements of Islamic art captured in photographic images.
- To evaluate the fidelity of the produced fabrics from various aspects such as color toning, texture and depth, and aesthetic appeal as compared with the original photographs.

Research Importance

The study highlights the aesthetic and technical capabilities of the jacquard technique in replicating intricate visual elements, such as light transitions and architectural details of Islamic art captured through photography, and translating these details into woven textile hangings. This research not only emphasizes the feasibility of using jacquard weaving for artistic interpretations but also releases green potential for its application in decorative textiles and cultural art preservation. Furthermore, it provides valuable insights into interdisciplinary collaboration between textile design and photography, paving the way for original applications in both fields.

Research Hypothesis: Woven textile hangings produced using the jacquard technique can effectively replicate the intricate visual details of light and shadow in Islamic art captured through photography and can provide high fidelity of colors, textures, depth, and overall aesthetic aspects.

Research Limitations:

1. Light and shadow in Islamic architecture
2. Jacquard weaving technique
3. Woven textile hangings

Implementation Method Used: Double Cloth.

Research Methodology: This research depends on the descriptive analytical approach methodology in the theoretical study and the applied approach in the practical study.

1- Theoretical Framework

1-1 Light and Shadow in Islamic Architecture

Since the beginning of human civilizations, light and shadow have played a fundamental role in the design and understanding of architecture and interior spaces, particularly in sacred buildings, Because of their symbolic significance in relation to religious beliefs, light and architecture have interacted since the dawn of time.

Islamic architecture is renowned for its intricate designs, geometric patterns, and ornate calligraphy. However, one often overlooked element that contributes significantly to its aesthetic appeal and spiritual significance is the interplay of light and shadow. *(Saadat and others 2015)*

Light plays an important role in Islamic architecture as we can describe light as an ethereal building material in Islamic architecture as we find that architectural structures compose spaces and light gives these spaces life sense, as we find that architecture, lines, decoration and colors have no meaning and can't be recognized without light, so generally Islamic architecture is luminous architecture as light and shadow play a basic role in making functional, aesthetic and psychological effects more strong in architectural spaces. Mosques were the more generous architectural spaces in using light as they are related directly to God so light supports the feeling with sacred attributes in this space and gives the people inside a strong feeling with the presence of God.

The Symbolism of Light and Shadow in Islamic culture, light is often associated with God. It represents knowledge, guidance, and truth. Shadows can symbolize ignorance, doubt, and the transient nature of earthly existence. The interplay of light and shadow creates a dynamic tension that reflects the human experience, with its moments of joy and sorrow, certainty and uncertainty. *(J. MahdiNejad and others 2016)*

Figure (1) Many architects analyze how light changes during the day when creating their designs. This is why practicing light and shadow photography with buildings such as mosques is a great idea.

Islamic architects employed various techniques to manipulate light and shadow within their structures: Central courtyards were common features in Islamic mosques and palaces. These spaces provided natural light and ventilation, while also creating a feeling of calm and openness. Islamic architecture's elaborate arches and domes were used for purposes other than just structural support, also as conduits for light. They could be designed to cast specific patterns of shadow and light, enhancing the overall aesthetic effect. *(Shokrpour & Fakherian 2015)*

Figure (2) Emphasize dimensions, shadow creates depth in a 2-dimensional photograph.

When sunlight fell over intricate and striking geometric patterns and calligraphy carved into stone or wood, it created a visually spectacular effect. The function of shadows is more readily comprehended when objects project shadows onto the floor or surfaces, creating lines that complete the geometry in a specific shot.

In other cases, enormous, bulky objects cast a shadow in the form of a shape, obscuring a significant portion of the frame. Light, on the other hand, usually appears as negative space, filling up the gaps left by shadows. *(Brenton 2007)*

Finally, beyond its aesthetic appeal, the use of shadow and light in Islamic architecture has profound spiritual significance. It can evoke a sense of reverence, contemplation, and connection to the divine. By carefully controlling the flow of shadow and light within their structures, Islamic architects created environments that were both visually stunning and spiritually uplifting. Even though you often cannot control the light in outdoor architectural photography, understanding the fundamentals of shadow and light photography will help you create more successful compositions. *(Babakhani 2017)*

1-2 What is Shadow Photography?

Shadow photography can be defined as any type of photography in which a shadow is used to emphasize an image. A shadow can be defined as an object's shape formed When a source of light is obscured. Another name for shadow photography is light source manipulation, or shadow exposure to add or subtract darkness from an image. *(Tversky 2018)*

As a result, when designing images, consider both the absence and presence of light. Some might say that you should focus on improving the shadows in your photo as much as the light. When light and shadow combine harmoniously, amazing creations can form.

Types of Shadows: Shadows can take various forms, each with unique characteristics. Below are a few basic forms of shadows that photographers frequently encounter: *(Kaufmann 1975)*

A. **Cast Shadows**: These occur when an object obstructs a path of light, casting Shadows on a surface. Near an object, cast shadows seem to be sharper and darker, while farther away, shadows become softer and lighter.

B. **Form Shadows**: Form shadows, also known as core shadows, are areas of an object that do not receive direct light. They occur on the opposite side of the source of light and help define the object's three-dimensional form.

C. **Reflected Shadows**: Light bounces from one surface and onto another, creating secondary shadows. These shadows usually look softer and lighter than cast shadows, and they add depth to the whole composition.

1-3 Shadow and its Form

Shadow casting is a technique used to create shadows. Light rays from a source, like a sun or a lamp, can be partially absorbed, reflected, or refracted when they come into contact with an item. The part of light that does not get absorbed or reflected keeps going until it encounters a surface. In the case that this surface is opaque, light is blocked and a shadow is created on the object's other side. The shadow is formed by a combination of the object's size and shape, the angle and intensity of the light source, and all of this.

The shadow cast by a light source change with its shape, size, amount, and distance from the object. The complexity of the shadow depends on the surface on which it is cast. Flat surfaces show the simplest projection of the shadow, but curved surfaces show very complex geometric shapes. *(Forsyth & Ponce 2003)*

The occluder blocks light, causing the shadow. Figs. 3a and 3b demonstrate how the source of light influences the sort of shadow formed. A uniform shadow with clear projection and object boundaries is produced by an isotropic point light source. The rays emanating from the occluder will have a variable direction at each light source position if you use a non-point light source to illuminate it. As a result, the projection becomes more complicated and even somewhat resembles illumination with several light sources. As a result, we can distinguish between an umbra and a penumbra in the cast shadow.

The latter describes the parts of the shadow that are illuminated with part of the emitted light rays (Fig. 3b). Although these regions appear brighter, it is frequently challenging to distinguish between umbra and penumbra. *(Akenine-Möller and others 2018)*
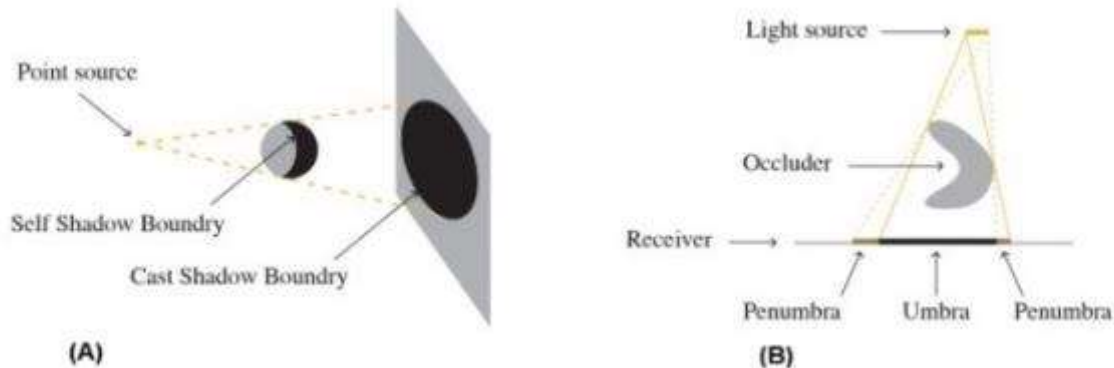
Figure (3) (a) Self-shadow and a cast shadow of a sphere lit with a point source and projected on a flat surface. (b) Describing shadows with a light source, occluder, receiver, shadow, umbra and penumbras.
The penumbra can be caused not only by a non-point light source, but also by the diffraction of light rays by the occlude. Depending on the quality of light, shadows can be either soft or hard. The shadow's outside edges appear softer and more blurry in soft light. The same effect is achieved when the occluder is further away from the surface of the cast shadow. This can be easily observed when we look at our own shadow on the floor while standing. It dissipates toward the upper part of the body. *(Arbel & Hel-Or 2001)*

1-4 Lighting Contrast Ratio

Contrast ratio plays an important role because it helps tell the story by developing a mood.
In photography, the lighting ratio refers to the balance between the intensities of different light sources within an image. Specifically, it is the proportion of the key light, which serves as the main light source, to the fill light, which helps soften shadows and bring out details. *(Pereira 2011)*
- A higher lighting ratio results in greater image contrast, whereas a lower lighting ratio produces less contrast.
 - The lighting contrast ratio is the difference in stops between the key and the shadow. High key occurs when the background is either overexposed or properly exposed to match the foreground. When a scene has high key lighting, there is little contrast between its brightest and darkest areas, but the scene is still cheery and bright., (fig 2).
- Low key happens when the background is underexposed or black, regardless of what the subject looks like. Low Key Lighting means that the difference between brightest and darkest portions of an entire scene is high, (fig 9).
- Silhouette considers a specific case in which the background is correctly exposed or overexposed while the foreground is underexposed or black, (fig 10).
- Everything else is normal lighting, which means it doesn't do much to modify the mood. *(Weiss 2022)*

1:1
(Equal lighting)
- The intensity of key light, fill light, and backlight are all equal
- Minimal contrast between the highlights and shadows.
- Used often in portrait photography

1:2
(Soft lighting)
- The intensity of fill light is twice that of key light
- Gentle shadows and smooth transitions between the highlights and shadow.
- Still life, Product or Portrait photography

2:1
(Moderate contrast)
- The intensity of key light is twice that of fill light.
- Moderate contrast between the highlights and shadows.
- Landscape and architecture photography

4:1
(High contrast)
- The intensity of the key light is four times that of the fill light
- Creates very dramatic photos.
- Fashion photography

8:1
(Very high contrast)
- Creates a highly dramatic look by maximizing the contrast between the key light and the fill light.
- creates a bold and striking image, such as in black and white photography

Figure (4) Understanding the Different Lightning Ratios.

1-5 Hard, Soft, and Silhouettes

As the object moves closer to the surface, a shadow becomes larger and more defined. Similarly, as the separation between the light source and the object increases, the shadow becomes more diffuse and less defined. *(Miller 2016)*

Hard shadows, also known as crisp shadows, occur when the source of light is small and direct, resulting in sharp edges. These shadows frequently have high contrast and sharp lines, emphasizing the subject's shape and form. On a sunny day, a hard shadow cast by a tree branch can produce interesting patterns on the ground, giving a dynamic element to the whole composition. Hard shadows are frequently visible in midday sunlight or when using a focused light source, such as a spotlight. (fig 8).

In contrast, **Soft shadows** have delicate, diffused edges. They appear when a source of light is larger or more indirect, allowing the shadows to merge more smoothly with their surroundings. Soft shadows may establish a feeling of mystery and harmony since they are less hard and more forgiving. Imagine a portrait taken at golden hour, when the setting sun creates soft, extended shadows on the subject's face, adding a warm and ethereal quality to the photos *(Elkalshy and others 2019)*, (fig 12).

The most recognizable kind of shadows are probably **silhouettes**, When the subject is backlit, a black outline appears against a brighter background, (fig10).

What kind of shadow is the best choice? In the end, the response depends on the desired result and the message you want to convey through your composition. In order to emphasize texture and shape and create a dramatic and graphic image, hard shadows can be perfect. However, soft shadows may add subtlety and elegance, leading to a more serene mood. Because of their dramatic contrast, silhouettes may evoke intrigue and mystery while leaving the details up to the viewer's imagination. *(Shunhua and others 2017)*

It's necessary to experiment with many types of shadows to find what works best for your specific subject and artistic vision. To get the right shadow effect, do not be afraid of playing with the lighting, angles, and subject position. Remember that shadows are effective tools that can improve the visual impact of your photos or artwork rather than just being an absence of light (fig.5).

Hard, Soft, and Silhouettes

Shadows are an intriguing element of photography and art, as they can add depth, drama, and visual interest to a composition

Hard shadows, also known as crisp shadows, are created when the light source is small and direct, resulting in well-defined edges

Soft shadows, on the other hand, are characterized by their gentle, diffused edges

Silhouettes, perhaps the most recognizable type of shadow, occur when the subject is backlit, resulting in a dark outline against a brighter background

So, which type of shadow is the best option? The answer ultimately depends on the desired effect and the message you want to convey through your composition

It's important to experiment with different types of shadows to find what works best for your specific subject and artistic vision

Figure (5) Perspective: Hard, Soft, and Silhouettes

1-6 HDR: Capturing more Light and Shade

The ratio of the brightest and darkest areas of an image, from pure black to brightest white, is known as dynamic range. Both bright highlights and dark shadows are present in a high-contrast image. The human eye can see twice as far as even the greatest digital cameras can. In this case, the image's dynamic range is greater than that of the camera, forcing you to choose between focusing on t he dark subject or the highlight. *(Pereira 2011)*

- Experiment with your camera's limits to find the perfect balance between light and dark for great photos. Try to record details of highlights and shadows under various lighting scenarios. Check the luminosity histogram on your camera's LCD for help. It graphs the pixels you capture at different intensities. If there is a valley in the center of the graph and spikes on the left and right, the image surpasses your camera's dynamic range *(Correll 2017)*.

- Use neutral-density filters (ND) to reduce the intensity of the light, with less light passing through your camera lens, you may adjust the shutter speed to lengthen exposure time, raise the image sensor of the camera, or widen the aperture with less risk of washing out the image. When you add a neutral-density filter to your lens, your overexposed sky gains detail, but your shadows do not become dark. A neutral-density filter improves cloud definition and sharpness while also capturing motion blur and shallow depth of field in bright light.

In HDR photography, you take several exposures of the same image while adjusting your camera's f-stop (The f-stop regulates the amount of light that enters your lens).To ensure that the image composition is the same in every photo, using a tripod is recommended. Take a picture with your f-stop set to normal, then take another with one or more stops underexposed and another with one or more stops overexposed. *(Elkalshy and others 2019)*

1-7 Tips for Photographing Shadows in Mosques

A. Embrace golden hour

Understand light direction and quality, Experiment with photography at different times of day to see how the angle and intensity of light change. During golden hour, soft, diffused light can create a warm and dreamy atmosphere, while hard, direct light can cast bold and dramatic shadows.

The ideal time to take photos of shadows and silhouettes is around golden hour. When you are taking a picture of something and the sun is right behind it, it is known as backlighting. As a result, a contrast it creates erases the details of the subject and gives it a dark appearance.

B. Shoot in broad sunlight

In general, most photographers recommend against taking photos with the sun directly overhead. The sharp contrasts and extreme brightness of broad daylight sometimes result in undesirable effects. But these two items are exactly what you need to create amazing light and shadow photography results. *(Shunhua and others 2017)*

Capture photos ideally, before or after 12 p.m For shadow photographs, 10 a.m or 3 p.m are usually suitable times.

As much as possible, avoid midday when sun shines directly overhead. It usually casts unpleasant shadows to look at.
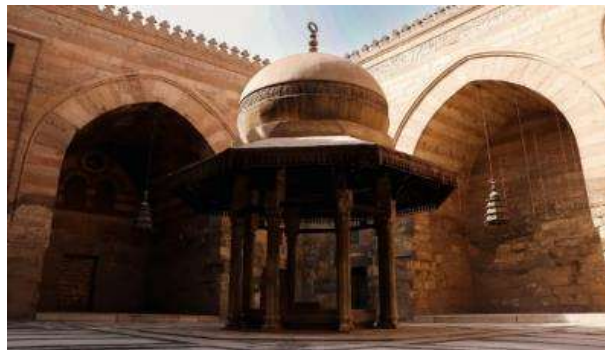
Figure (6) Amazing shadows can be created by the dramatic lines and shapes seen in many mosques' forms.

C. Experiment with high-contrast scenes

High-contrast scenes, where there are extreme differences between light and shadow areas, can produce visually striking images. This can be created by photographing subjects in direct sunlight or by using artificial lighting to cast dramatic shadows. By carefully exposing for highlights and allowing shadows to fall into deep darkness, you may create a sense of mystery and interest in your images. However, be careful of losing details in the blacks or blowing out highlights and use post-processing techniques to balance the exposure as needed.

D. Use reflectors and diffusers to adjust light and shadows in your photos.

Reflectors and diffusers are extremely useful tools for adapting light and shadows in photos. Reflectors reflect the light again onto your subject, filling in shadows and giving a soft, nice glow.

Diffusers soften hard light by scattering it, resulting in more even and attractive illumination. To obtain the desired look, experiment with different reflector and diffuser sizes and colors. A gold reflector, for example, can warm up a photo, while a white diffuser softens the light in a still-life shot.

E. Experiment with artificial lighting

You can also create interesting shadows at night with artificial lights. indoor lighting found in mosques is one of the most interesting light sources available for shadow photography. They may look unnoticed, but occasionally they can take on a magical look, particularly when it is misty or foggy outdoors.

F. Look for distinct shadows

Human make attractive shadows, especially with their arms and legs extended. With the proper light, any subject may cast shadows.

G. Enhance shadows during editing

With the advancement of AI technology, editing and enhancing your images becomes a lot simpler. If you have some light and shadow photos that do not appeal to you, retouching could make an incredible difference. Simple Photoshop or Lightroom techniques may be all that is needed to make an unforgettable photo in your portfolio.

Black-and-white editing shows the contrast between bright and dark. Shades of white, grey, and black are easier to distinguish than a large variety of colors. As a result, employing a black-and-white preset for your light and shadow photos can significantly improve their visual impact.

Using Adobe Lightroom, adjusting the light and shade is simple. To get an ideal image composition, just move individual sliders to darken or lighten your highlights and shadows. *(Ohnsman 2022)*

1-8 Shadow Photography Techniques

The shape of a shadow changes according to the position of the object and the light source. Because shadows can take on varied shapes and sizes, they can be employed to produce a variety of visual effects. These effects include silhouettes, the formation of things in and of themselves, the addition of texture to the subject, and the formation of sub-frames, ... others. Depending on the angle, distance, size of the light source and your subject, you will decide the form, scale and intensity of your shadow. *(Avdić and others 2017)*

Photographers prefer early morning and late afternoon/evening times for low light and dramatic shadows, in addition to the golden hour. Always position yourself as a photographer to be facing the light so that you are on the right side of any shadows that are forming. There will be shadows and light areas in every shot, but the shadow area can be used as a component on its own. The shadow of the subject is the main focus, especially in natural lighting photography. Moving yourself will help you see the shadows more clearly. On the other hand, if you can use artificial lighting in inside shots at mosques as an example, change the light source to create a variety of shadow effects. *(Akenine-Möller and others 2018)* The harder the shadows are, the more we associate them with the midday heat and warm environment. The time of day also has a significant impact on that. Softer light, such as that seen on a cloudy day, is preferable when photographing people and buildings.
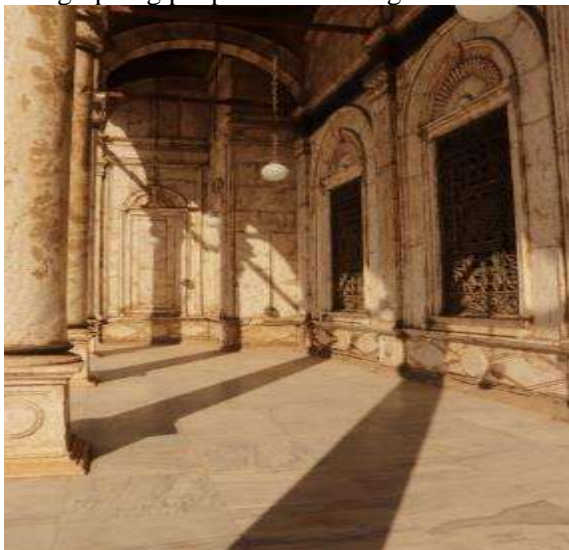
Figure (7) In the image on the left and right, the shadows enhance the subjects, adding depth.

1-8-1 Forming Objects

Shadows often move in close range to objects and appear to be partially attached to them. However, under some situations - more especially when the light source is low and intense—the shadow lengthens and makes little contact with the subject. The photographer would be able to isolate the shadow and produce an image where the shadow serves as the primary focal point by positioning himself at appropriate angles relative to the object. *(Wright 2004)*

Sometimes shadows can be so interesting you may choose to focus on just the shadow and it then becomes the subject (fig.8).

Figure (8) In the image on the left and right, Shadows are the subject.

1-8-2 Create Sub-Framing

Sub-framing is a photographic technique wherein the photographer selectively makes a smaller frame inside the image to highlight some details and subtly create a separation of it from other elements of the image. Among the methods for creating sub-frames are light and shadows. In fact, using light and shadows is perhaps the most straightforward method to do this. Brighter areas of an image naturally capture the attention of the human eye. The highlights are made to stand out even more by the deep shadows, which further intensify this (fig.9). *(Ohnsman 2024)*
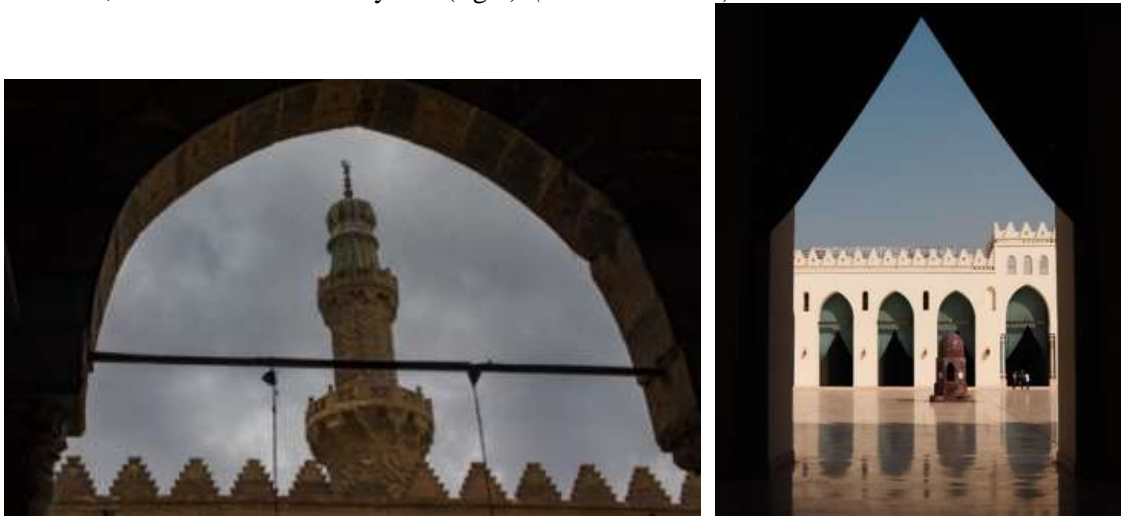
Figure (9) A Frame Within A Frame, the purpose of sub-framing is to guide the viewer's eye to the main point of interest

1-8-3 Add Texture

We frequently wish to control the texture that a subject appears in our photos. We might want to draw attention to the texture as much as possible for specific subjects. By producing both illuminated and

shadow areas, hard light raking the subject from the side, behind, above, or below will enhance the appearance of texture. Occasionally, we may prefer a smooth texture, especially when creating portraits. Large light sources will minimize texture and soften shadows, such as softboxes or nature's lightbox and the sky on a cloudy day. *(Santos and others 2018)*

1-8-4 Silhouettes

Silhouettes are easily formed in high-contrast lighting conditions. Cameras having a relatively narrow dynamic range, especially, can only expose for the brightest or shadowy / darkest regions. Where the photographer chooses to expose the highlights, the shadows fall into deep shadows, and in extreme cases, blacks. The impression of silhouettes can also be increased in post-production by reducing shadow exposure. This will remove even more details from those shadows, resulting in near-black (fig.10). Silhouettes are often used in storytelling or to create a sense of mystery and drama. (Wright 2004)

Figure (10) Silhouettes can be extremely strong and create a range of emotions since they often remove details and focus only on the subject's shape.

Figure (11) Emphasize focus on a subject. Incorporating shadows in your photographs strategically and effectively may help you portray drama and emotion, add a sense of depth, and create a natural contrast

Shadows can operate as a blocker, separating the shot into two different areas: the dark and the brighter. When a subject gets placed in a luminous area of the scene, it gets more focus, as if a spotlight

has been beamed on them. This emphasis attracts viewers' attention to your subject, creating a stronger image. *(Foster 2014)*

Light and dark are opposed to one another, creating contrast. Contrast in an image pulls viewers' attention to the areas of contrast, resulting in a stronger image.

1-9 The Power of Shadows in Visual Composition

Shadows can provide additional information about a scene or help with focus detection in a photograph. While the colors are enjoyable to look at, it is the shadows that attract the spectator in and capture their attention visually. The optical rule states that the larger the light source, the softer the edge of the shadow.

When discussing the quality of light, we use terms like soft and hard, but what we are actually describing is the line between light and shadow. Hard light is defined as a sharp delineation between light and shadow. A very gradual transition between the two—that's soft light. To comprehend completely, we should look at both light and shadow. *(Akenine-Möller and othera 2018)*

A. Shadows have an important effect on visual composition. They direct the viewer's attention and add depth and dimension to an image. The artistic use of shadows in photography, painting, or any other visual art form can enhance the overall effect of a composition. Shadows can be utilized to anchor the subject, provide drama, or elicit emotions in the spectator. Recognizing how shadows affect visual composition is critical for artists and photographers seeking to produce attractive and engaging pictures.

B. Shadows serve several tasks in visual composition, including anchoring the subject within the frame. By casting a well-defined shadow beneath the subject, it is grounded and related to its surroundings. This anchoring action contributes to the composition's overall stability and balance (fig.11). *(Jackman 2020)*

Figure (12) shadows establish a sense of stability and balance in the composition.

C. Shadows play an important function in generating depth and dimension in a composition. Artists can create a three-dimensional illusion by carefully adjusting the direction, intensity, and size of shadows. This method is especially visible in paintings, where painters manipulate light and shadow to give the appearance of depth and form. For example, in a still life painting, casting shadows on the objects helps to clarify their shape and position in space, making them appear more genuine and solid. *(Akenine-Möller and othera 2018)*

D. Another feature of shadows in visual composition is their power to elicit emotions and set the mood of an image. The interplay of light and shadow may create a variety of atmospheres, from warm and inviting to mysterious and sinister. Artists and photographers can use the emotive power of shadows to create specific ideas or storylines. *(Avdić and others 2017)*

E. Photographers generally have multiple alternatives for shadow placement and quality in their compositions. These variables may include light direction, shadow angle, light source intensity, and the size and shape of the objects casting shadows. Each selection can have a significant impact on the overall visual composition and message being conveyed.

F. When comparing various options, it is common to discover that the most efficient usage of shadows is determined by the desired outcome and subject matter. For example, a low angle of light throwing lengthy and dramatic shadows may be suitable for a portrait, giving depth and creating a sense of mystery. A quiet landscape, on the other hand, may benefit from a soft and diffused light source with few shadows, accentuating the tranquility and natural beauty. *(Wright 2004)*

G.   In conclusion, the power of shadows in visual composition should not be overlooked. Shadows help to anchor the subject, add depth and dimension, and elicit emotions in the spectator. Understanding and efficiently managing shadows allows painters and photographers to improve the overall impact and message of their work. Shadow direction, angle, intensity, and size can all have a significant impact on visual composition and outcome. photographers may create captivating and engaging images by using shadows strategically, creatively and thoughtfully.

1-10 Woven Fabrics

One of the most widely used textile types in the world is woven fabric. A warp, which runs down the length of the fabric, and a weft, which runs across the cloth, make up woven fabrics. In other words, the method of weaving involves interlacing thread at correct angles to produce fabric. The warp is the yarn that is orientated vertically, while the weft is the yarn that is orientated horizontally. This interlacing technique produces a durable and stable fabric that is widely used for a variety of purposes, such as household textiles (curtains, beds, tablecloths), technical textiles (filters, geotextiles), upholstery, bags, accessories, and clothing (dresses, shirts, trousers).(Rajesh, n.d.), (*Dobby-vs-Jacquard-a-Tale-of-Two-Looms*, 2023) Among these woven fabrics, jacquard weaving stands out for its ability to create intricate and visually stunning designs.

1-11 Jacquard Fabrics

Typically, jacquard designs combine smaller scale weaves onto a larger scale repeating pattern. (Redmore, 2011) There are countless ways to create patterns with jacquard shedding. The greatest degree of warp yarn control is provided by its machines. Each warp end or set of warp ends that interlace similarly within the pattern repeat across the width of the fabric is independently controlled, which accounts for this versatility. They make it possible for the woven cloth to generate the most complex patterns, like pictures. *(Sabit Adanur, 2002)* Figure 13 indicates ornamented jacquard fabric. (*PALERMO Peacock Blue Gold Floral Damask Brocade Jacquard Fabric*, n.d.)

Figure (13) Ornamented Jacquard Fabric

1-12 Jacquard Weaving Development

Weaving jacquard is a long-standing traditional technique. The manufacture of jacquard textiles was managed by hand prior to 1804, when Joseph Jacquard created punch cards to run the Jacquard machine. TPattern "treadle loom" was initially used to describe the original loom, followed by "pattern loom" and "draw loom." The jacquard machine has now evolved into an electronic device that is controlled by a computer, and jacquard weaving sheds frequently use network communication. In the meantime, the electronic Jacquard machine now has 20,000 hooks, and the patterning scope has also significantly expanded. *(F. M. C. Ng & Zhou, 2006)*

1-13 Design of Digital Jacquard

The design of conventional jacquard has always been a passive process for mechanical replication due to the limitations of freehand workmanship, and the pattern and color of jacquard fabric are easily pirated by others. The efficiency of designing jacquard fabrics has increased recently thanks to the use of CAD software.

Building on this advancement, digital jacquard technology comprises digital production technology, which is represented by electronic jacquard machines and new-generation weaving looms, as well as aided-design technology, which is represented by the jacquard CAD system.

A technological foundation for innovating the classic plane design mode of jacquard fabric is provided by the complete digital management of both the design and production processes. *(NG, M. C. F.1 and ZHOU, n.d.)*

1-14 Double-Face Jacquard Fabric

A distinct format of jacquard fabrics is double faced textiles, that is similarly recognized as two ply fabrics. There is no other way to mimic its aesthetic feeling. *(F. Ng & Zhou, 2013)* It is a manner of a multi layered fabric that can be implemented by a conventional weaving loom. In double cloth, a two-layered textile is created by connecting two or more sets of warps, and, one or more sets of wefts. *(Akter, 2018)* Regarding fabric effect, double-face fabric can be separated into two categories: figured effect fabric and plain effect fabric. While figured double-faced fabric has a separate coloring and patterning effects on both sides and must be made on a weaving loom with the assistance of a jacquard machine, plain effect double-face fabric has a simple weave texture. *(M. C. F. Ng & Zhou, 2009)* Moreover, the types of raw materials and yarn employed have an impact on the double-faced fabric's performance and appearance. Various aesthetic designs can be produced by combining distinct yarn structures, weave varieties, yarn colors, raw materials, and settings on the front and back of the cloth. (*Heba* Tolla El Sayed Abo El Naga, 2022) Figure 14 shows double-faced fabric stitched by cloth intersection.
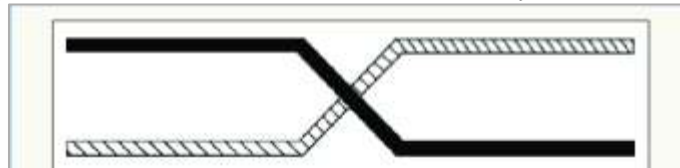
Figure (14) Double-Faced Fabric Stitched by Cloth Intersection

- **Principle of Construction for Double-Cloth**

Double cloth is a fabric that comprises two sets of yarns, which are woven one exceeding the other and stitched together. A double faced fabric has a minimum of two warp series and two weft series, that is face, and back. Double-cloth fabric is generally identified as two-ply fabric. The face weft and the face warp yarns are interwoven to create the upper layer, while the back weft and the back warp yarns are interlaced to create the layer below. The two layers can be so tightly stitched or knotted together that they seem to form a complicated single structure, or they can be just loosely connected, making each easily identifiable as a separate layer. *(Akter, 2018)*

2- Practical Framework

The present work aims to use the jacquard technique for production of woven fabrics that simulate the original photos with their effects of light and shadow.

2-1 Technical Specifications Used in the Research

The research samples were woven at T.D.C (Textile Design Center), Faculty of Applied Arts, Helwan University. The specifications of the loom used for weaving are shown in Table (1).

Table (1) Loom Specifications Used for the Production

No.	Item	Specifications
1	Loom Model / Type	ITEMA R9500
3	Year of Manufacturing	٢٠١٤
4	Country of Manufacturing	Italy
5	Speed of Machine	300 Picks/ Min.
6	Width of Reed	190 cm
7	Weft Selector	8 Fingers
8	Method of Weft Insertion	Rapier
9	Denting	4 Ends/ Dent
10	Reed Used (Dents/ cm)	9 Dents/ cm
11	Warp Threads Arrangement	Yellow, Green, Blue, Red

The specifications of the jacquard used for production of the research samples are illustrated in Table (2).

Table (2) The Jacquard Specifications Used in Production of Research Samples

No.	Item	Specifications
1	Model of the Jacquard	BONAS
2	Hooks Number	6144 Hooks
3	Number of Design Hooks	2560
4	Number of Repeats	1
5	Repeat Width	161.1 cm

The specifications of the produced fabrics are presented in Table (3).

Table (3) Research Samples Specifications

No.	Property	Specifications
1	Material of Warp Yarn	Polyester
2	Material of Weft Yarn	Polyester
3	Count of Warp Yarns	150 Denier
4	Weft Yarns Count	150 Denier
5	Warp Sett	36
6	Weft Sett	60

2-2 The Technique of Implementation

Six woven samples were implemented according to the predetermined specifications. All fabrics were produced using a double-cloth structure with a consistent weave pattern; weft satin 4. The effect of light and dark areas was achieved by varying the colors of weft threads. In other words, in dark areas; the

dark colors were used like burnt brown or black, while lighter areas used corresponding lighter shades. The shades between light and dark were obtained by blending warp and weft colors according to the design requirement. The colors of the warp threads were yellow, green, blue and red respectively, while the weft colors varied based on each design, however, in general, it was in shades of beige, brown and related tones.

The selected photographs were imported into the NedGraphics software, where their colors were reduced. Each color appearing on the fabric's surface was represented by a corresponding weave structure with equivalent warp and weft threads.

The colors of the weft threads used in the weft selectors were derived from the reduced color palette of each design. Each sample was produced using four to five distinct weft colors, and the remaining colors in the palette were achieved by blending the corresponding warp and weft threads.

2-3 The Colors and Arrangement of Warp Threads on the Loom

The warp color arrangement on the loom is indicated in Figure 15. Yellow, green, blue and red are ordered respectively.
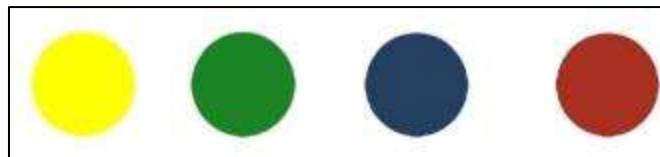
Figure (15) Colors and Arrangement of Warp Threads

2-4 The Selected Photographs after Color Reduction

The following figures present selected designs after color reduction. On the left side of each figure is the weft color guide, while the right side displays the color statistics for each color in the design. Figure 16 shows Design 1 after reducing its color with a total number of thirteen colors, each converted into a specific weave structure. Colors number 1, 4, 7 and 13 were chosen as weft selectors on the loom, corresponding to weft fingers 1 through 4, respectively.

0	0.0%	9	7.1%
1	19.3%	10	1.4%
2	6.7%	11	6.9%
3	7.4%	12	8.0%
4	6.1%	13	5.2%
5	12.7%	14	0.0%
6	7.4%	15	0.0%
7	5.0%	16	0.0%
8	7.0%	17	0.0%

Figure (16) Design 1 after Color Reduction and Statistics of Reduced Colors

Design 2 after color reduction is illustrated in Figure 17. The total number of colors is fifteen. The number of weft colors on the loom is five, chosen from colors number 1, 3, 10, 12 and 15.

Figure (17) Design 2 after Color Reduction and Statistics of Reduced Colors

Design 3 pictured in Figure 18 was reduced into fourteen colors. Colors chosen for weft selectors were 1, 3, 6, 9 and 14.

Figure (18) Design 3 after Color Reduction and Statistics of Reduced Colors

Figure 19 displays Design 4 after color reduction, with total number of ten colors. Colors number 1, 4, 5 and 10 were chosen as the weft colors on the selector.

Figure (19) Design 4 after Color Reduction and Statistics of Reduced Colors

Figure 20 shows Design 5 after color reduction resulting in twelve colors that correspond to specific weave structures. Colors number 1, 4, 7, 8 and 12 were selected as weft colors on the loom respectively.

Figure (20) Design 5 after Color Reduction and Statistics of Reduced Colors

Figure 21 shows the total number of colors after reduction for Design 6, resulting in nine colors, each with a specific weave structure. Colors 1, 4, 7 and 9 were selected as weft colors on the loom.

Figure (21) Design 6 after Color Reduction and Statistics of Reduced Colors

2-5 Weave Structures of the Produced Samples

Figures from 22 to 94 show the specific weave structures assigned for the implemented Designs 1 through 6.

- **Design 1**
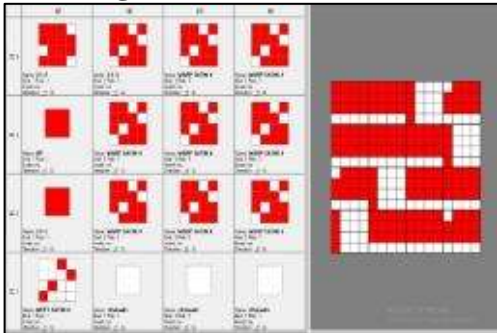
Figure (22) Weave Structure of Color 1 in Design 1
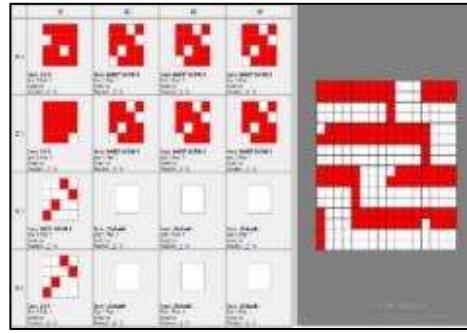
Figure (23) Weave Structure of Color 2 in Design 1
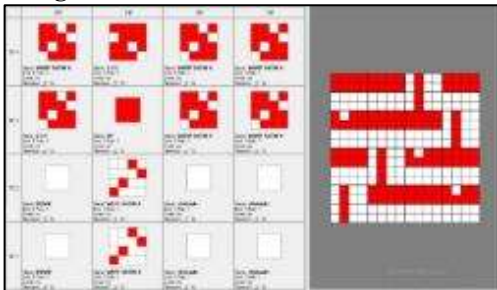
Figure (24) Weave Structure of Color 3 in Design 1
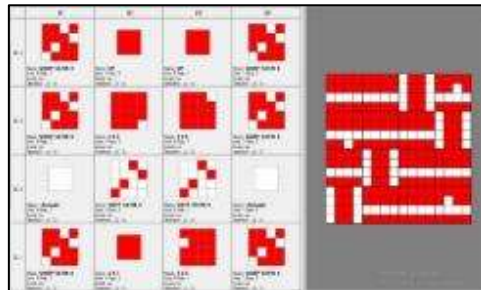
Figure (25) Weave Structure of Color 4 in Design 1
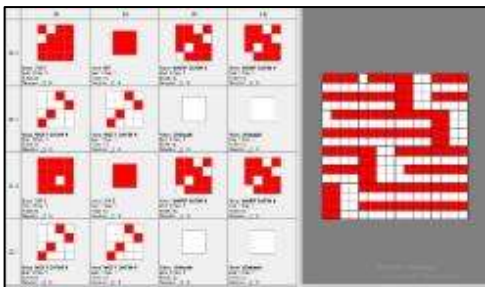
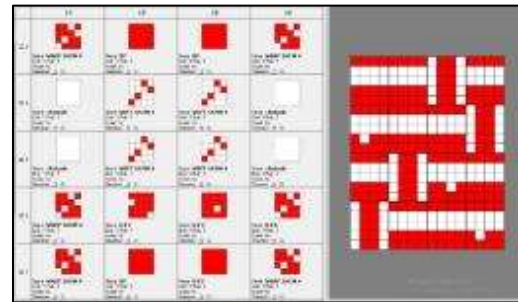*Figure (26) Weave Structure of Color 5 in Design 1*
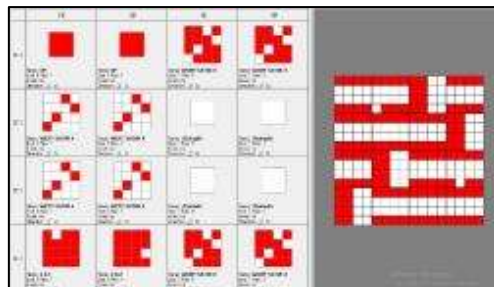
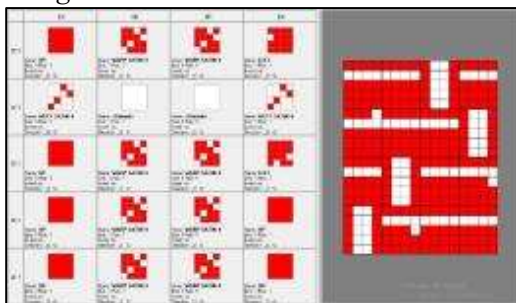*Figure (27) Weave Structure of Color 6 in Design 1*
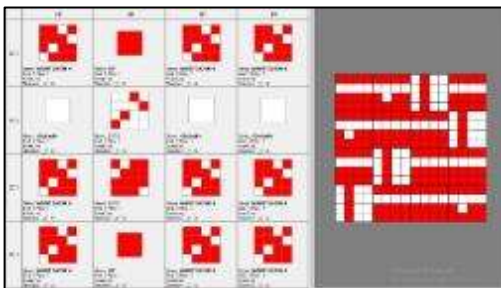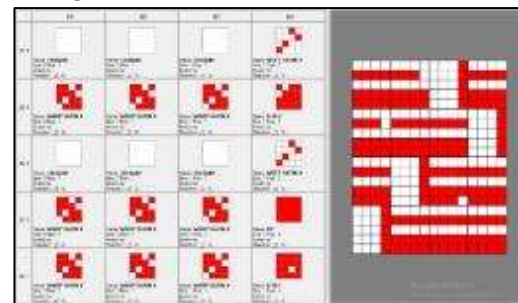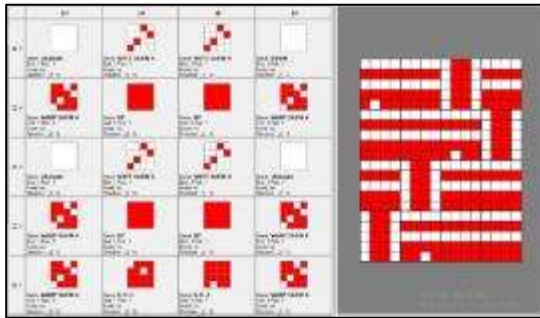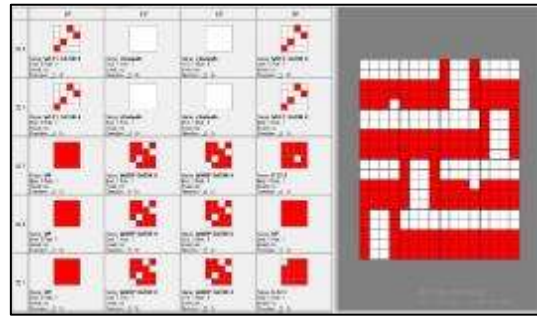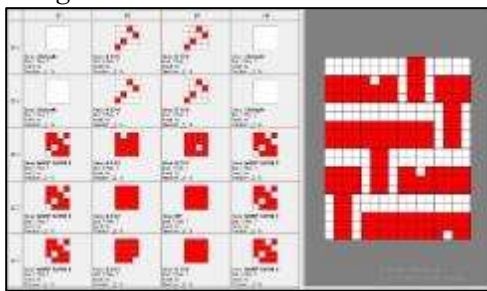

Figure (28) Weave Structure of Color 7 in Design 1
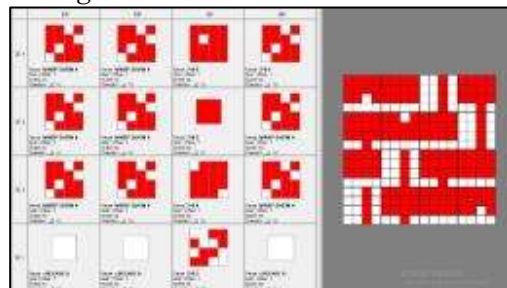
Figure (29) Weave Structure of Color 8 in Design 1
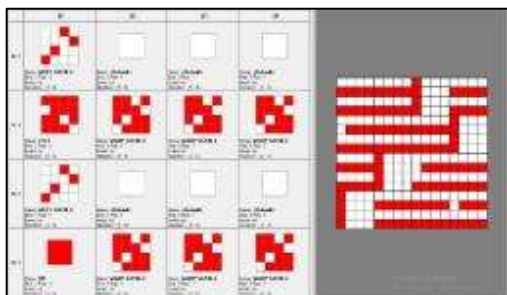
Figure (30) Weave Structure of Color 9 in Design 1
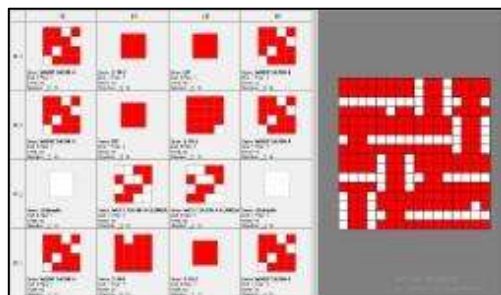
Figure (31) Weave Structure of Color 10 in Design 1
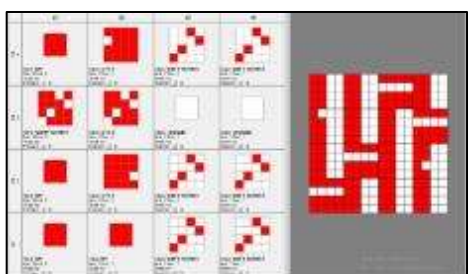
Figure (32) Weave Structure of Color 11 in Design 1
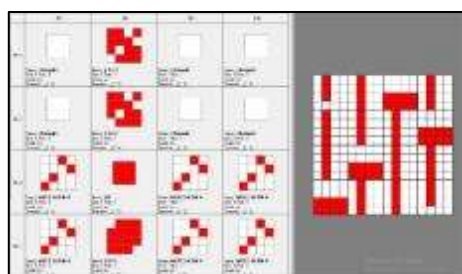
Figure (33) Weave Structure of Color 12 in Design 1
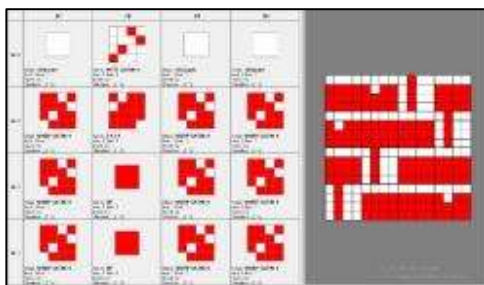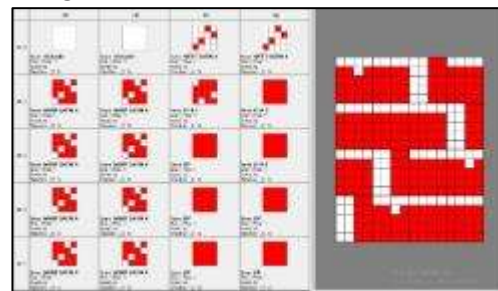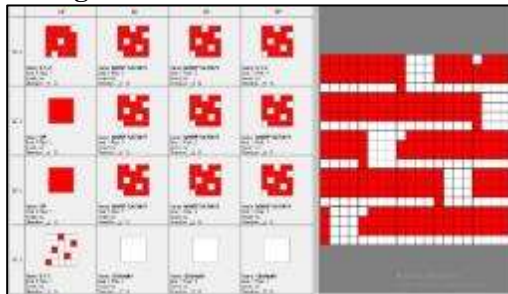

Figure (34) Weave Structure of Color 13 in Design 1

- **Design 2**
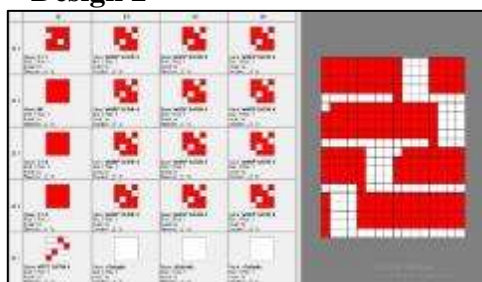
Figure (35) Weave Structure of Color 1 in Design 2
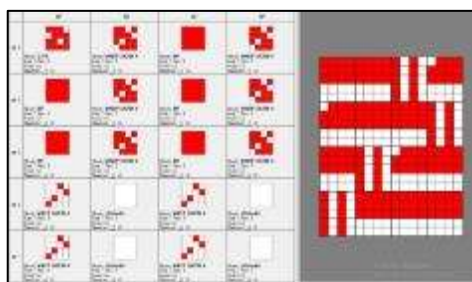
Figure (36) Weave Structure of Color 2 in Design 2
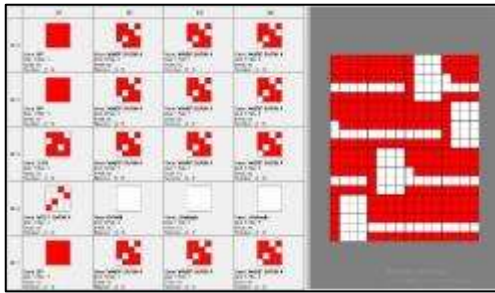
Figure (37) Weave Structure of Color 3 in Design 2
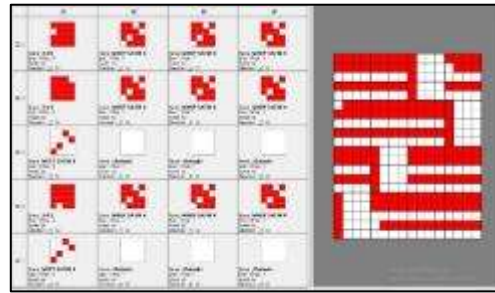
Figure (38) Weave Structure of Color 4 in Design 2
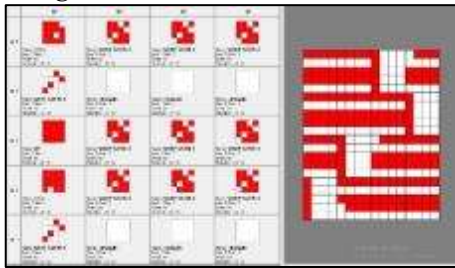
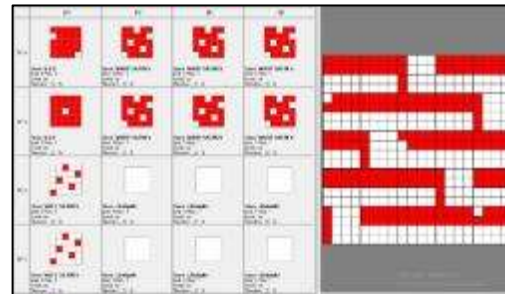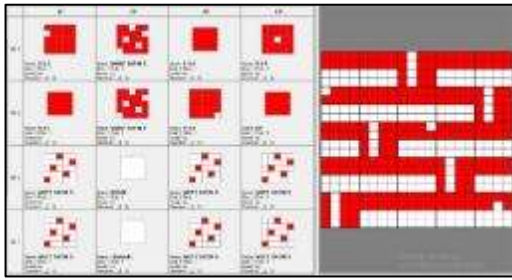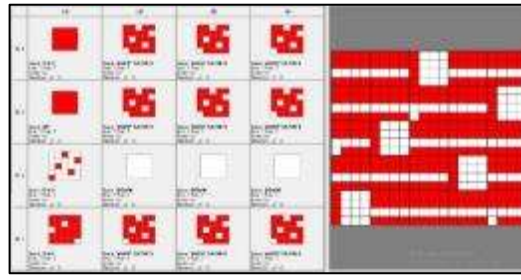*Figure (39) Weave Structure of Color 5 in Design 2*
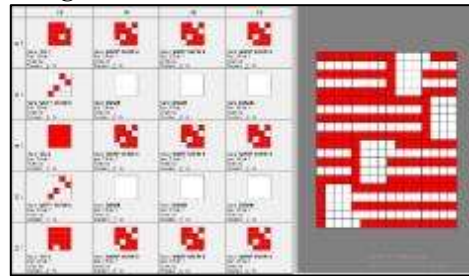
Figure (40) Weave Structure of Color 6 in Design 2
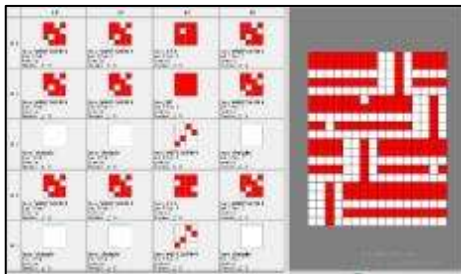
Figure (41) Weave Structure of Color 7 in Design 2
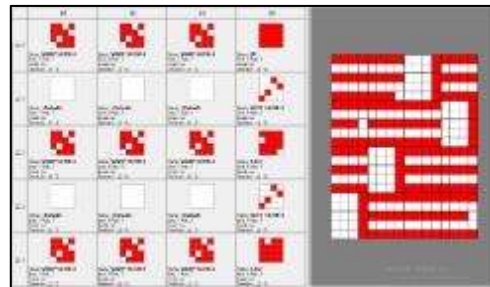
Figure(42) Weave Structure of Color 8 in Design 2
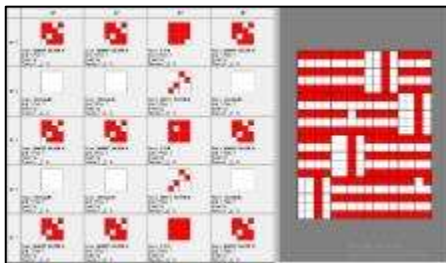
Figure (43) Weave Structure of Color 9 in Design 2
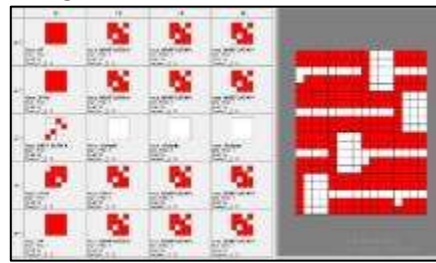
Figure (44) Weave Structure of Color 10 in Design 2
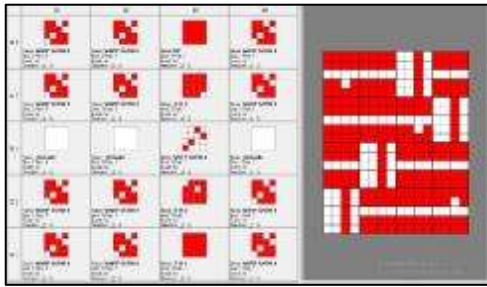
Figure (45) Weave Structure of Color 11 in Design 2
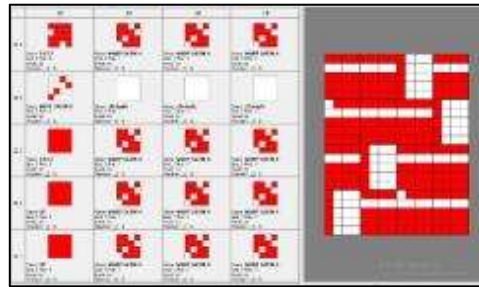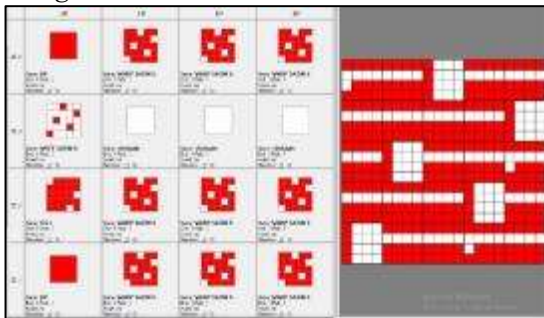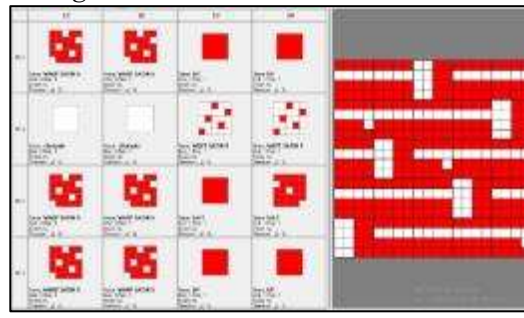

Figure (46) Weave Structure of Color 12 in Design 2
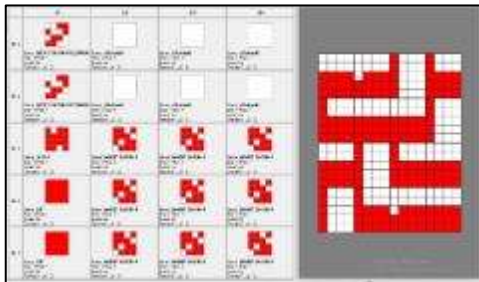
Figure (47) Weave Structure of Color 13 in Design 2
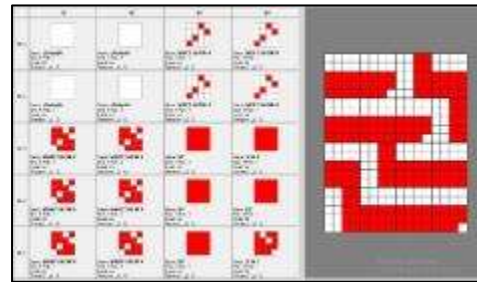
Figure (48) Weave Structure of Color 13 in Design 2
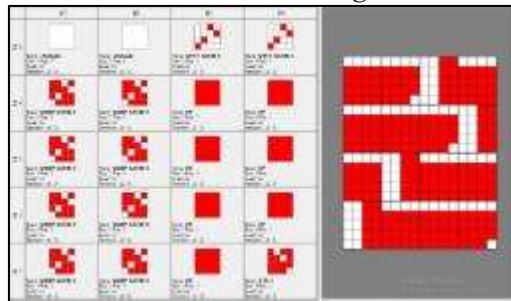
Figure (49) Weave Structure of Color 15 in Design 2

- **Design 3**
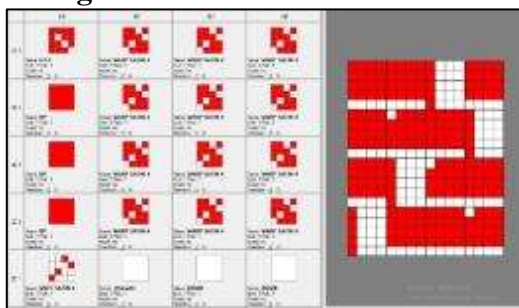
Figure (50) Weave Structure of Color 1 in Design 5
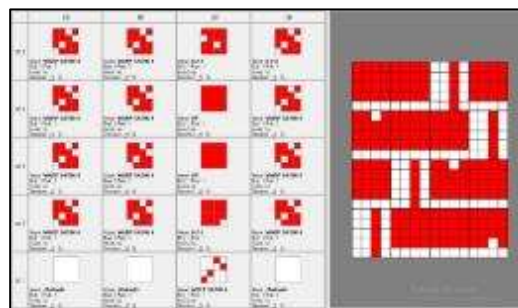
Figure (51) Weave Structure of Color 2 in Design 5
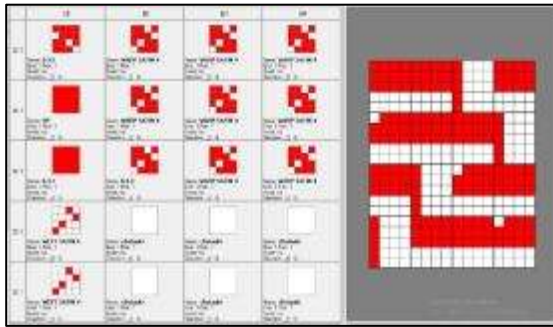
Figure (52) Weave Structure of Color 3 in Design 5
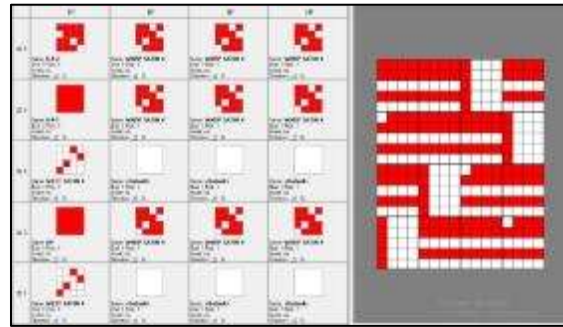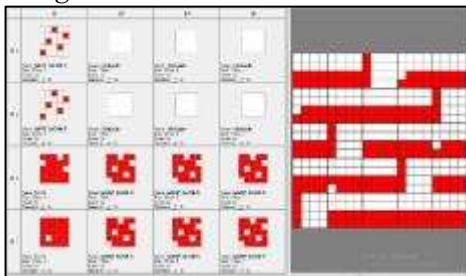

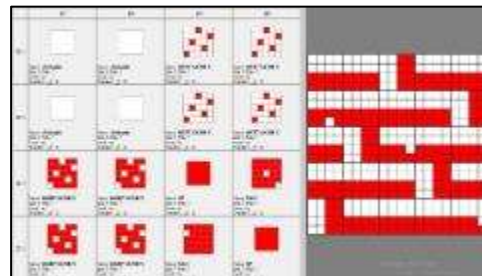*Figure (53) Weave Structure of Color 4 in Design 5*
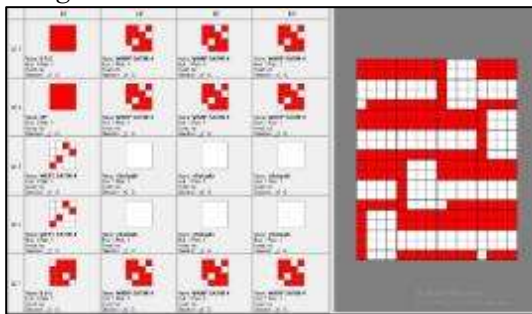
Figure (54) Weave Structure of Color 5 in Design 5
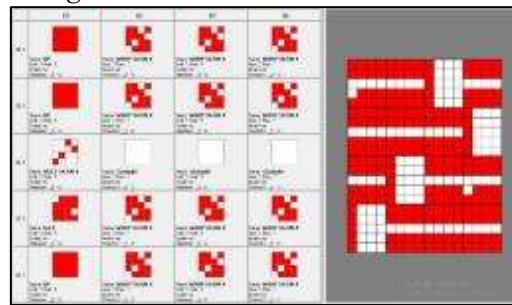
Figure (55) Weave Structure of Color 6 in Design 5
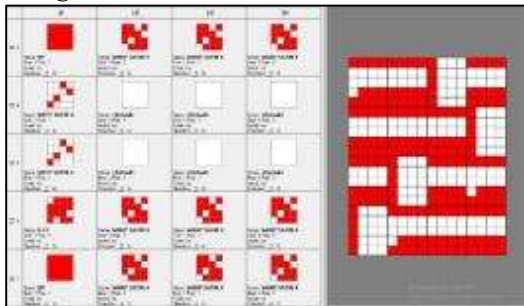
Figure (56) Weave Structure of Color 7 in Design 5

Figure (57) Weave Structure of Color 8 in Design 5

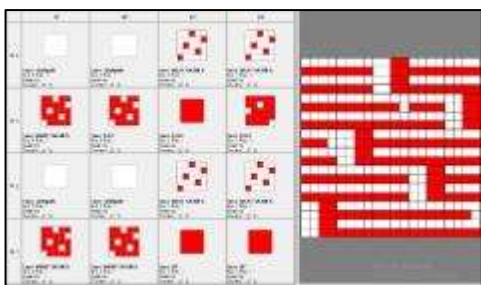*Figure (58) Weave Structure of Color 9 in Design 5*

Figure (59) Weave Structure of Color 10 in Design 5

Figure (60) Weave Structure of Color 11 in Design 5

Figure (61) Weave Structure of Color 12 in Design 5

Figure (62) Weave Structure of Color 13 in Design 5

Figure (63) Weave Structure of Color 14 in Design 5

- **Design 4**

Figure(64) Weave Structure of Color 1 in Design 4

Figure (65) Weave Structure of Color 2 in Design 4

(Figure 66) Weave Structure of Color 3 in Design 4

(Figure 67) Weave Structure of Color 4 in Design 4

(Figure 68) Weave Structure of Color 5 in Design 4

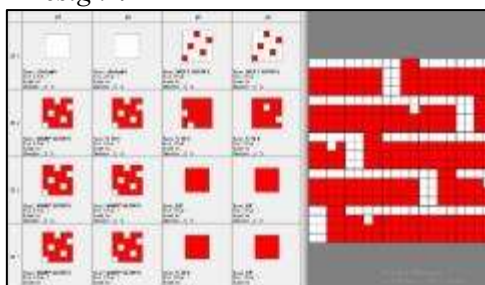*(Figure 69) Weave Structure of Color 6 in Design 4*

Figure (70) Weave Structure of Color 7 in Design 4

Figure (71) Weave Structure of Color 8 in Design 4

Figure (72) Weave Structure of Color 9 in Design 4

Figure (73) Weave Structure of Color 10 in Design 4
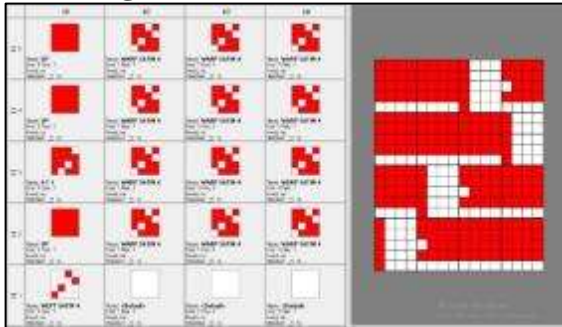
- **Design 5**

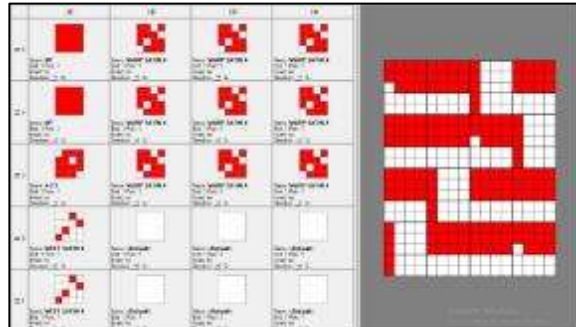*Figure (74) Weave Structure of Color 1 in Design 5*

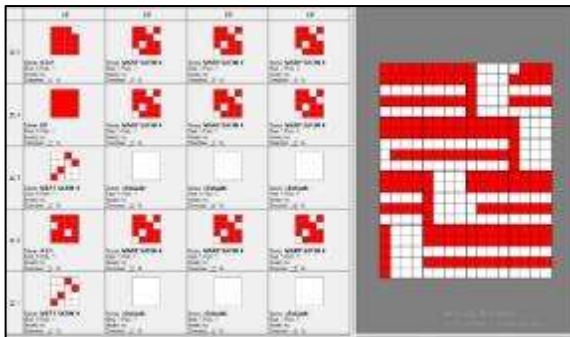*Figure (75) Weave Structure of Color 2 in Design 5*

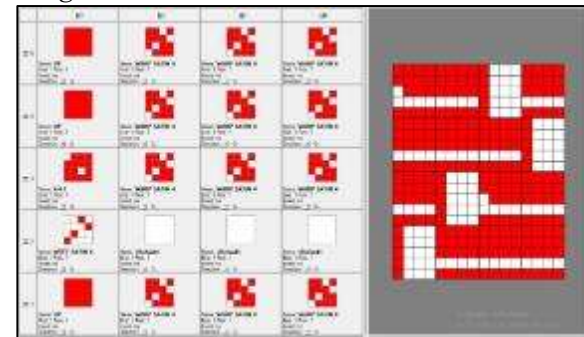*Figure (76) Weave Structure of Color 3 in Design 5*

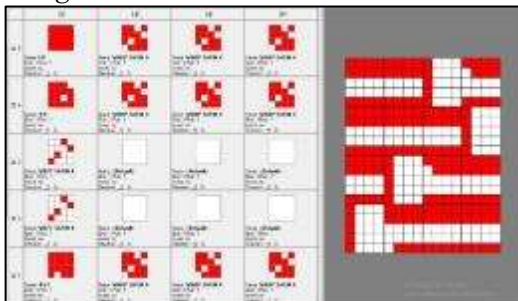*Figure (77) Weave Structure of Color 4 in Design 5*

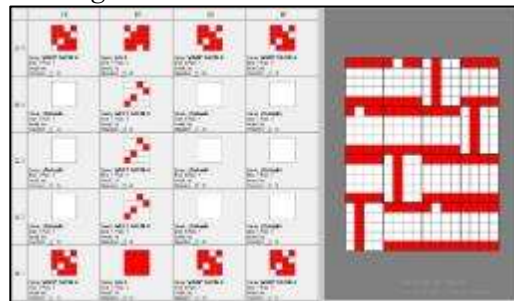*Figure (78) Weave Structure of Color 5 in Design 5*

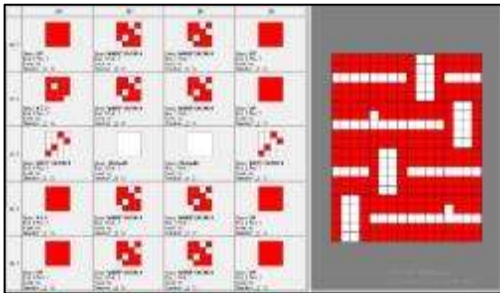*Figure (79) Weave Structure of Color 6 in Design 5*

Figure (80) Weave Structure of Color 7 in Design 5

Figure (81) Weave Structure of Color 8 in Design 5

Figure (82) Weave Structure of Color 9 in Design 5

Figure (83) Weave Structure of Color 10 in Design 5

Figure (84) Weave Structure of Color 11 in Design 5
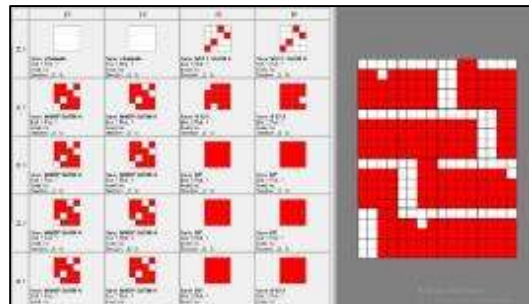
Figure (85) Weave Structure of Color 12 in Design 5

- **Design 6**
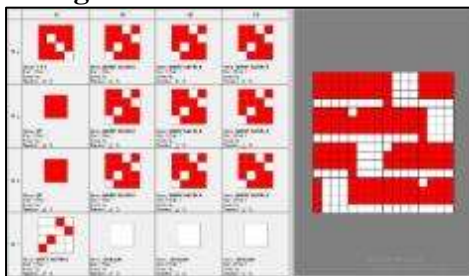
Figure (86) Weave Structure of Color 1 in Design 6
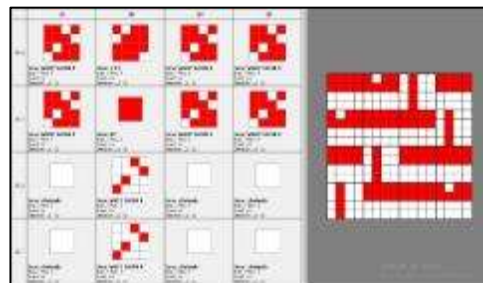
Figure (87) Weave Structure of Color 2 in Design 6
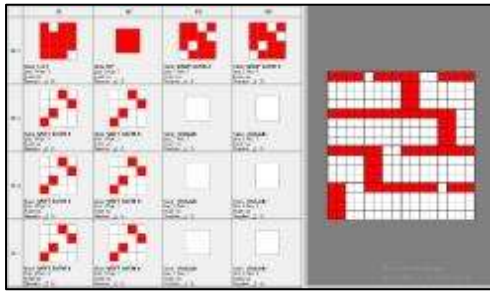
Figure (88) Weave Structure of Color 3 in Design 6
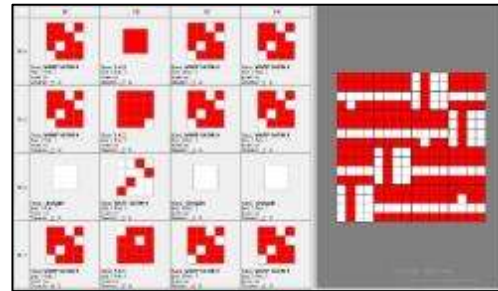
Figure (89) Weave Structure of Color 4 in Design 6
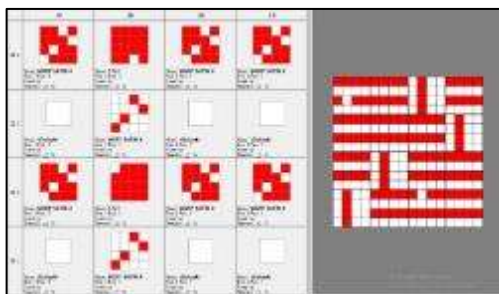
Figure (90) Weave Structure of Color 5 in Design 6
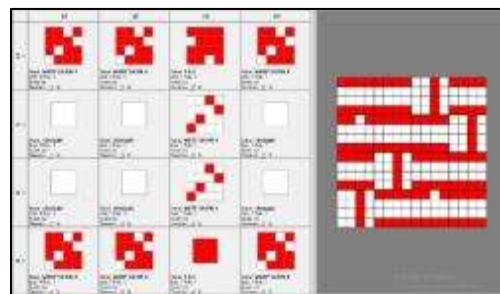
Figure (91) Weave Structure of Color 6 in Design 6
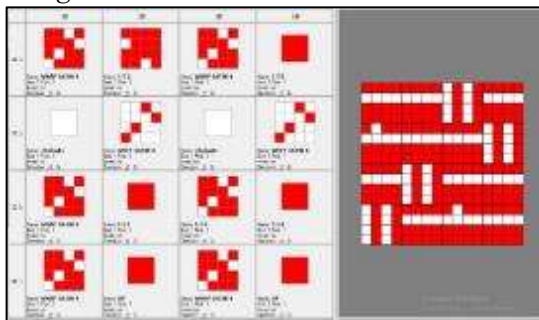
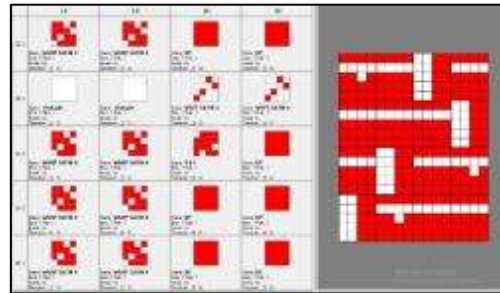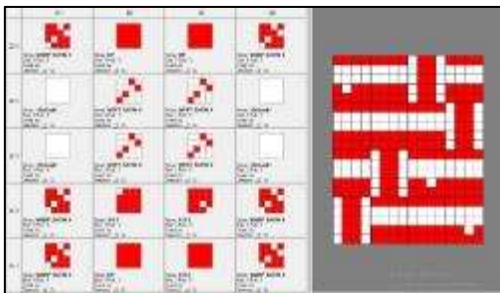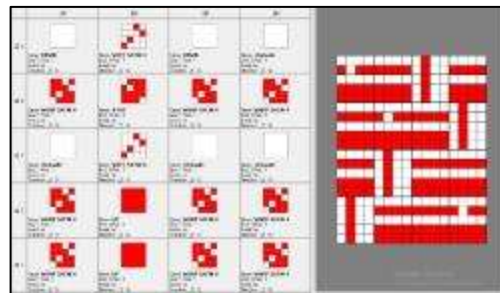*Figure (92) Weave Structure of Color 7 in Design 6*

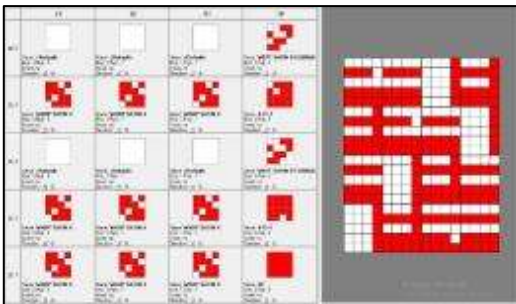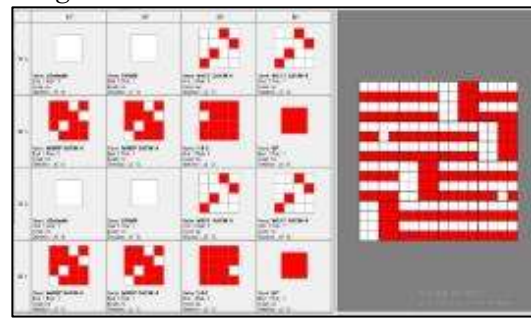*Figure (93) Weave Structure of Color 8 in Design 6*
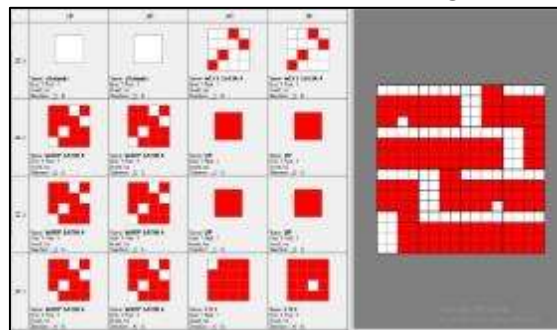
Figure (94) Weave Structure of Color 9 in Design 6

2-6 The Implemented Fabrics

Figures from 95 to 105 depict the produced samples and the weaving process.

Figure (95) Produced Sample of Design 1

Figure (96) Produced Sample of Design 2

(Figure 97) Produced Sample of Design 3

(Figure 98) Produced Sample of Design 4

Design 6 illustrated in Figure 100 was implemented twice. Sample 6-A represents the initial trial, woven at width of 40 cm. For the final samples, the width increased to 80 cm to enhance the visual impact of the design.

(Figure 99) Produced Sample of Design 5

(Figure 100) Produced Sample of Design 6-A

(Figure 101) Produced Sample of Design 6-B

(Figure 102) Research Samples during Implementation (A)

(Figure 103) Research Samples during Implementation (B)

(Figure 104) Research Samples during Implementation (C)

(Figure 105) Research Samples during Implementation (D)

2-7 Employment Proposals for Textile Pendant Designs

Different designs have been employed on a group of different hangings for the use in interior design. Figures from 106 to 112 show the 3-D presentation of the produced designs.

Figure (106) Employing Hanging of Design 1

Figure (107) Employing Hanging of Design 2

Figure (108) Employing Hanging of Design 3

Figure (109) Employing Hanging of Design 4

Figure (110) Employing Hanging of Design 5

Figure (111) Employing Hanging of Design 6A

Figure (112) Employing Hanging of Design 6B

3- Results and Interpretation

3-1 Story Board and Technical Analysis of the Implemented Designs

3-1-1 Design 1

Story Board

The design captures the square of Al-Hakim Mosque, with its architectural beauty that is emphasized by its iconic arches and the elegant draping of curtains along their sides.

Technical Analysis

- The shadows add contrast and bring out the three-dimensional aspects.
- The semicircular arches create a rhythmic flow that leads the viewer's eye across the square and framing the central courtyard.
- A sense of movement and elegance is added through the contrast between the soft, flowing nature of the curtains and the rigidity of the stones.
- The scene evokes a sense of tranquility and reverence that reflects the spiritual ambiance of the mosque.
- The falling shadow on the floor emphasizes space.

3-1-2 Design 2

Story Board

The design portrays Ahmed Ibn Tulun Mosque, with its central courtyard and fountain that is surrounded by arcades and arches.

Technical Analysis

- The interplay of light and shadow in the courtyard's architecture enhances the three-dimensional impact.
- The symmetrical arrangements and intricate patterns represented in the architectural features highlight the geometric harmony and balance of the mosque.
- The design focal point of the ablution fountain (Sabil) provides a balance between simplicity and grandeur.
- The soft blue hues in the sky evoke feelings of serenity and peace.

3-1-3 Design 3
Story Board
The design depicts the intricately carved details of the courtyard of Al-Zahir Barquq Mosque in Al-Muizz Street.
Technical Analysis
- A rhythmic aesthetic -that guides the eye across the structure- is created by the arches that frame light and shadow.
- The use of dome and arches, highlights the traditional Islamic architectural principles.
- The wooden elements add warmth and contrast to the stone architecture.
- The earthy tones of the mosque's palette symbolize spirituality.
- The contrast between light and shadow adds a layer of visual complexity to the space.

3-1-4 Design 4
Story Board
The design stands out the Minaret of Mohammed Ali Pasha Mosque.
Technical Analysis
- A dynamic pattern of light and shadow, that enhancing its texture, is created to the minaret by the interplay of sunlight and the vertical grooves.
- The height of the minaret emphasizes verticality and draws the viewer's eyes upward.
- The layered arrangement of the balconies adds to the visual rhythm and aesthetic appeal.
- The interplay of light and shadow emphasizes the minaret as a focal point.

3-1-5 Design 5
Story Board
The design pictures the interior of Ahmed Ibn Tulun Mosque along with the ornate lamps.
Technical Analysis
- The interplay of light and shadow offers a harmonious blend of aesthetic and practical elements.
- The repetitive arrangement of the arches creates a rhythmic design.
- A visually striking symmetric corridor is created by the arches that are meticulously aligned. The perspective leads the viewer's eye toward a vanishing point, emphasizing the depth and majesty of the space.
- The robust design of the arches rest on the sturdy columns ensures durability and stability.

3-1-6 Design 6
Story Board
The design pictures Mohammed Ali Pasha Mosque with its high pillars casting shadows and windows illuminating sunlight.
Technical Analysis
- The grand and robust pillars create a sense of verticality and grandeur.

- A sense of motion depth is added by the dynamic interplay between light and darkness that is created by the tall pillars which cast intricate shadows on the marble floor**.**
- The mosque's height and scale are emphasized by the interaction of light and shadow, showcasing its architectural brilliance.
- A dramatic visual effect that evokes a sense of reverence is created by the juxtaposition of the sunlight filtering through the windows and the shadows cast by the pillars

3-2 The Survey Study

A survey study was conducted using a questionnaire as the primary data collection tool to evaluate the influence of light and shadow in the produced samples from several aspects.

3-2-1 Participants Included in the Questionnaire

The questionnaire encompassed two categories of participants: academic staff in textile and photography, and industry experts. These groups were selected because they offer distinct complementary perspectives, which provide a balanced evaluation of the woven fabrics compared to the original photographs.

- **Academic Staff Members in Textile and Photography:** This category combines strong theoretical and practical understanding for the principles in both fields.
- **Experts in Photography and Textile:** This group was selected for their professional experience that allowing evaluate from an industry perspective.

3-2-2 The Questionnaire Questions

Seven questions were conducted for the questionnaire covering several aspects such as visual and color accuracy, depth and texture, aesthetic appeal and quality. Table 4 indicates the questions of the survey.

Table (4) Survey Questions

No.	
1	How well does the color accuracy in the woven sample match the original photograph?
2	How well does the contrast between dark and light areas in the woven sample conform the original photograph?
3	How well does the woven sample achieve texture and depth compared to the original photograph?
4	How well does the woven sample achieve aesthetic value compared to the original photograph?
5	How well does the woven sample evoke the same emotions as the original photograph?
6	How well does the woven sample maintain details of the original photograph?
7	Any comments or suggestions for enhancement.

3-2-3 Results of the Questionnaire

Table 5 displays the responses of the questionnaire participants in percentages. Forty-two participants contributed to the questionnaire, and their responses varied in different categories; strongly agree, agree, neutral and disagree.

(Table 5) Questionnaire Results

	Sample No.	Strongly Agree	Agree	Neutral	Disagree
1. **How well does the color accuracy in the woven sample match the original photograph?**	1	38	38	17	7
	2	31	36	26	7
	3	45	26	21	7
	4	24	40	29	7
	5	29	40	19	12
	6	45	31	14	10
2. **How well does the contrast**	1	43	33	21	2

between dark and light areas in the woven sample conform the original photograph?	2	36	31	24	10
	3	45	31	19	5
	4	38	33	24	5
	5	38	40	14	7
	6	40	31	19	10
3. How well does the woven sample achieve texture and depth compared to the original photograph?	1	50	29	17	5
	2	38	33	21	7
	3	55	31	10	5
	4	33	45	14	7
	5	45	33	12	10
	6	48	33	12	7
4. How well does the woven sample achieve aesthetic value compared to the original photograph?	1	48	31	12	10
	2	38	38	14	10
	3	48	36	10	7
	4	36	33	26	5
	5	45	29	10	17
	6	45	33	14	7
5. How well does the woven sample evoke the same emotions as the original photograph?	1	55	24	12	10
	2	38	33	21	7
	3	50	31	10	10
	4	43	31	21	5
	5	45	26	17	12
	6	48	31	10	12
6. How well does the woven sample maintain details of the original photograph?	1	43	38	12	7
	2	43	33	17	7
	3	36	48	7	10
	4	36	38	19	7
	5	36	38	19	7
	6	43	40	10	7

3-2-4 Discussion of Data
Figures from 113 to 118 illustrate the charts that represent respondents' percentages.
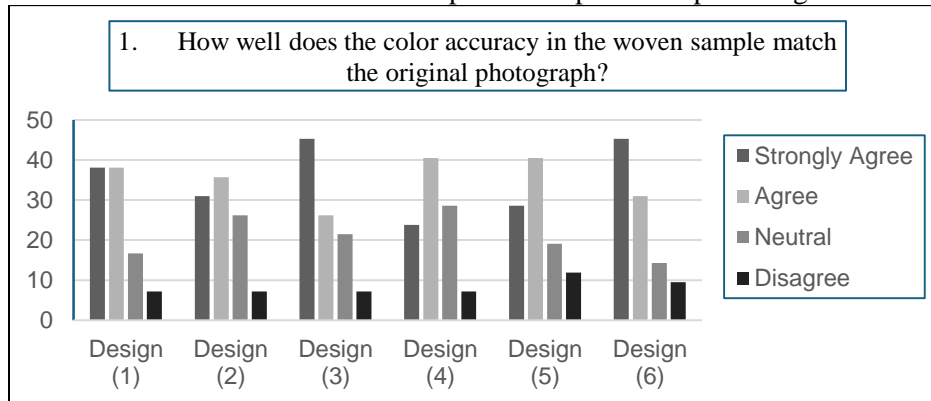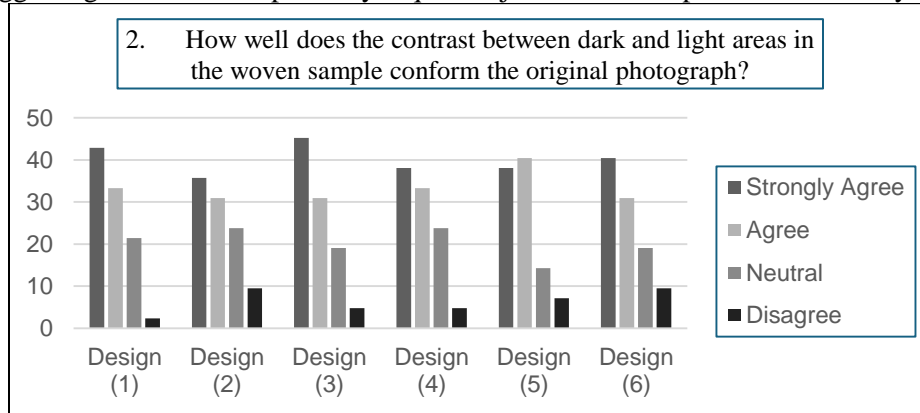

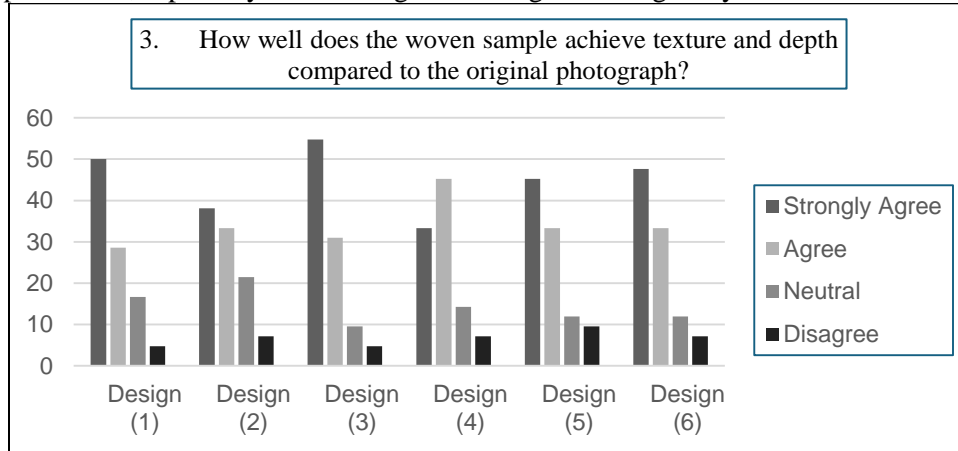*Figure (113) Responses of Participants to Question One*

Figure 113 indicates that Designs 3 and 6 scored the highest ratings, with participants strongly agreeing that these woven samples closely match the original photographs. This reveals a strong accuracy between

the woven colors and the photographic hues. On the other hand, in Designs 4 and 5 there were neutral responses, suggesting that these samples may require adjustments to improve color fidelity.

Figure (114)) Responses of Participants to Question Two

It can be seen from Figure 114 that Designs 1 and 3 received the highest ratings of "Strongly Agree" in terms of maintaining the contrast between dark and light areas, followed by Designs 6 and 5 with high "Agree" ratings between participants. These assessments indicate that participants found Designs 1 and 3 most faithfully match the contrast of the original photograph, while Designs 6 and 5 achieved good but may be less in contrast conformity. On the other hand, there is some variability in Designs 2 and 6 with room for improvement, especially with the highest "Disagree" ratings they received.

Figure (115) Responses of Participants to Question Three

Figure 115 reveals that Designs 3, 1 and 6 received the highest rating, with 55% of participants strongly agree followed by 50% and 48%, respectively. This hints that these designs most successfully captured the depth and texture of the original photographs. Design 4 also performed well, with score of 45% "Agree" between participants. However, some participants felt that Designs 2 and 5 did not fully replicate the texture and depth of the original photographs and needed some enhancements.
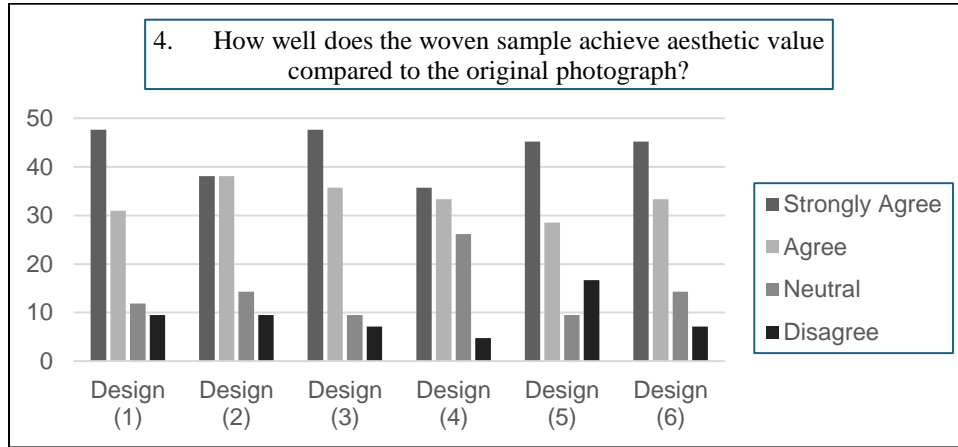
Figure (116) Responses of Participants to Question Four

Regarding the question of "How well does the woven sample achieve aesthetic value compared to the original photograph?", Figure 116 shows that most designs were well-received among participants in terms of aesthetic value, with Designs 1, 3, 5, and 6 standing out as the most effective, Meanwhile, a notable portion of participants felt that Design 5 needed most room for improvement with the highest "Disagree" percentage 17%.
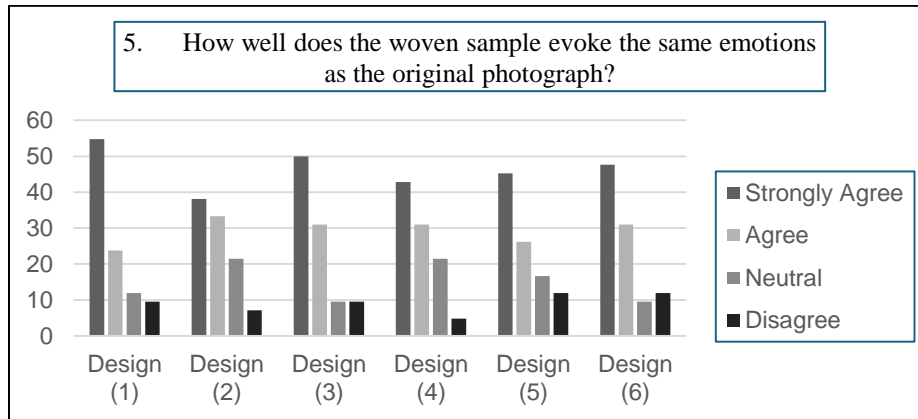
Figure (117) Responses of Participants to Question Five

As illustrated in Figure 117, Design 1 stands out as the most emotionally resonant, followed by Designs 3 and 6 respectively, with 50% and 48% of participants strongly agreeing that these designs also successfully conveyed emotional resonance. However, there was more balanced feedback in Designs 2, 4 and 5, with a noticeable proportion of participants choosing "Agree" or "Neutral".
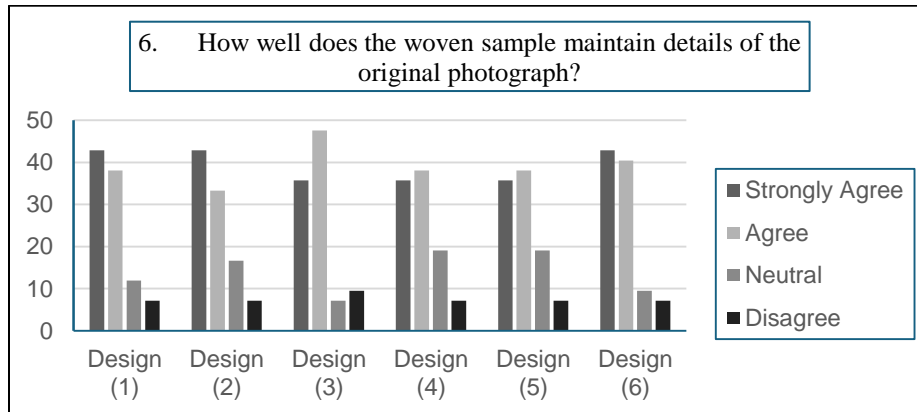
Figure (118) Responses of Participants to Question Six

Figure 118 indicates the responses to the question of how well the woven samples maintained the details of the original photographs. It can be noticed that Designs 1, 2, and 6 successfully maintain details, with 43% of participants strongly agreeing for each design. Alo, Design 3 followed closely, with 36% strongly agreeing and 48% agreeing. Designs 4 and 5 scored the same feedback, with 36% strongly agreeing and 38% agreeing for both. In general, the woven samples succeeded in preserving the details of the original photographs.

Conclusion

The research study demonstrated a successful conversion of light and shadow effects in the captured photographs of Islamic architecture into woven textile hangings by using the jacquard technique. Six woven samples were produced in this paper and evaluated throughout a questionnaire. Various aspects such as color and visual accuracy, texture and depth, and aesthetic appeal were all assessed in the produced fabrics. The results revealed a high level of satisfaction between participants. The "Strongly Agree" and "Agree" categories got the highest ratings, which implies that the woven samples faithfully captured the intricate interplay of light and shadow, along with the aesthetic and emotional assets of the original photographs. Designs 1, 3, and 6 stood out as the best-performing samples in key areas of assessment such as color accuracy, contrast, depth, texture, aesthetic value, and emotional impact. The preservation of details and the ability of the woven samples to evoke the same emotions as the original photographs were particularly appreciated by participants. The present work emphasizes the feasibility of the jacquard technique to replicate sophisticated visual elements, while also pointing to minor areas for adjustments.

Remember that lighting is an art form that requires practice and experimentation to develop your own unique style. The higher the lighting ratio, the higher the contrast of the image. The lower the lighting ratio, the lower the contrast of the image. And also understanding lighting ratios is a necessary ability. Understanding how different ratios can be used to generate outstanding and visually engaging images, capturing the essence of your subjects in more powerful ways.

Recommendations

- Using the research outcomes for textile and design courses as case studies to inspire students to combine art and technology in innovative approaches.
- Looking over market possibilities of woven textiles as decorative fabrics that used for interior design, galleries, or cultural exhibitions with highlighting their visual and functional appeal.
- Exploring advanced color-matching technologies to enhance the precision of color translation from photographs to woven fabrics, and to ensure accurate association with the original photos.

References

1. Shunhua, L., Zibang, Z., Xiao, M., & Jingjang, Z. (2017). Shadow-free single-pixel imaging. Optics Communications, 403, 257-261. https://doi.org/10.1016/j.optcom.2017.07.058
2. M. Toyoura, T. Igarashi, and X. Mao (2019) "Generating Jacquard Fabric Pattern With Visual Impressions," *IEEE Trans. Ind. Informatics*, vol. 15, no. 8, pp. 4536–4544, doi: 10.1109/TII.2018.2886795.
3. Davud Saadat, Mehdi Siamak, Hassan Rezai, & Arezoo Bahari (2015). The Investigation of Light Role in Islamic-Iranian Architecture Case Study: Sheikh Lotf Allah Mosque. International Conference on Architecture, Structure and Civil Engineering, 110:115.
4. J. MahdiNejad, E. Zarghami, & A. Sadeghi HabibAbad (2016). A Study on the concepts and themes of color and light in the exquisite islamic architecture. Journal of Fundamental and Applied Sciences, 8(3). Retrieved from https://www.ajol.info/index.php/jfas/issue/view
5. Shokrpour, M., Mahboubi, G., & Fakherian, P. (2015). The importance and beauty of light in mosques. Cumhuriyet University Faculty of Science Science Journal, 36(4), 1625-1629.
6. Brenton, J. (2007). Photorealism in interior architectural images. Texas Tech University.
7. Babakhani, R. (2017). Color and light in architecture and its effects on spirits of space users in a psychological view. Journal of Architectural Engineering Technology, 6, 184. https://doi.org/10.4172/2168-9717.1000184
8. Tversky, B. (2018). Shadow play. Spatial Cognition & Computation, 18(2), 86-96. https://doi.org/10.1080/13875868.2017.1331442
9. Kaufmann, T. (1975). The perspective of shadows: The history of the theory of shadow projection. Journal of the Warburg and Courtauld Institutes, 38(1), 258-287. https://doi.org/10.2307/750956
10. Forsyth, D. A., & Ponce, J. (2003). Computer vision: A modern approach. USA: Prentice Hall.
11. Akenine-Möller, T., Haines, E., Hoffman, N., Pesce, A., Iwanicki, M., & Hillaire, S. (2018). Real-time rendering (4th ed.). USA: Taylor & Francis Group, LLC. https://doi.org/10.1201/b22086
12. Arbel, E., & Hel-Or, H. (2011). Shadow removal using intensity surfaces and texture anchor points. IEEE Transactions on Pattern Analysis and Machine Intelligence, 33(6). https://doi.org/10.1109/TPAMI.2010.157
13. Pereira, D. (2011). The art of HDR photography. (n.p.): David Pereira. ISBN 9781937367022
14. Weiss, S. (2022). Handbook of forensic photography. England: Taylor & Francis Group. ISBN 9781000300161, 1937367029
15. Miller Jr., W. B. (2016). Cognition, information fields and hologenomic entanglement: Evolution in light and shadow. Biology, 5(2), 21.
16. Elkalshy, E, Anany, W, & Abu Tawila, S. (2019). The visual language for dramas expressing psychological reality and the emotional aspects. Journal of Architecture, Arts and Humanities, 4(17), 302-334. doi: 10.21608/mjaf.2019.11596.1088.
17. Correll, R. (2017). Digital SLR Photography All-in-One For Dummies. England: Wiley. ISBN 9781119291398, 1119291399.
18. Ohnsman, R. (2022, September 17). Shadows in photography – How seeing the shadows helps you understand the light. Digital Photography School. Retrieved from https://digital-photography-school.com/shadows-in-photography/
19. Avdić, D., Rančić, D., Spalević, P., Avdić, A., & Dolićanin, E. (2017). Real-time shadows in OpenGL caused by the presence of multiple light sources. Tehnički vjesnik - Technical Gazette, 24, 495-501. https://doi.org/10.17559/TV-20140324202037
20. Wright, T. (2004). The Photography Handbook (2nd ed.). London: Routledge. https://doi.org/10.4324/9781315013046.
21. Santos, P. E., Casati, R., & Cavanagh, P. (2018). Perception, cognition and reasoning about shadows. Spatial Cognition & Computation, 18(2), 78-85. **

22. Foster, J. (2014). Color: A Photographer's Guide to Directing the Eye, Creating Visual Depth, and Conveying Emotion. USA: Peachpit Press.

23. Jackman, J. (2020). *Lighting for Digital Video and Television* (4th ed.). Routledge. https://doi.org/10.4324/9781315676005

24. Rajesh, K. (n.d.). Learner guide on woven fabrics. Retrieved from https://www.academia.edu/105140234/Woven_fabric_industrial_information_vol?uc-sb-sw=6471164

25. Redmore, N. (2011). Textile design: Principles, advances and applications. University of Huddersfield Repository.

26. Adanur, S. (2002). Handbook of weaving. CRC Press.

27. Classic Modern Fabrics. (n.d.). Palermo peacock blue gold floral damask brocade jacquard fabric. Retrieved from https://classicmodernfabrics.com

28. Ng, F. M. C., & Zhou, J. (2006). Digital jacquard textile design in a colorless mode. Research Journal of Textile and Apparel, 10(2), 36–42. https://doi.org/10.1108/RJTA-10-02-2006-B005

29. Ng, J. M. C. F., & Zhou, J. (2007). Merging digitization technology into jacquard fabric creation. Textile Research Journal, 77(10), 1–13.

30. Ng, F., & Zhou, J. (2013). Innovative jacquard textile design using digital technologies. Woodhead Publishing. https://doi.org/10.1533/9780857098702

31. Akter, S. (2018). The construction principle of double cloth and its properties. Trends in Textile Engineering & Fashion Technology, 4(4). https://doi.org/10.31031/tteft.2018.04.000595

32. Ng, M. C. F., & Zhou, J. (2009). A study on figured double-face jacquard fabric with full-color effect. Textile Research Journal, 79(10), 930–936. https://doi.org/10.1177/0040517508095603

33. Abo El Naga, H. T. (2022). Production of bamboo children's garment fabrics using figured double-sided jacquard technique. International Design Journal, 12(6), 343–355. https://doi.org/10.21608/idj.2022.267386