Benefitting from Red Sea Elements in Creating Printed Designs for Tourist Furnishings Fabrics

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Abstract:
Red Sea is one of the most fascinating areas in the world. Egypt's Red Sea has abundant tourism infrastructure, which attracts tourists from around the world. A rare coral reef and kinds of multi-colored elements underwater is a testament to the work of Mother Nature that could not be replicated by mankind. The main aim of this work is to innovate new modern designs for fabric printing of touristic products, by selecting the artistic elements of the marine nature and cultural life in the Red Sea, then creating textile designs inspired from them. The researcher used the analytical descriptive method in explaining cultural and natural features of the Red Sea to identify their characteristics and come up with innovative designs using computer programs, analyze the design and evaluate the degree of agreement on each design.

Keywords:
Red sea, Textile design, Tourism

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Introduction:
Areas near the Red Sea coast provide an opportunity to observe natural marine life earning special tourism position by its aquatic treasures. Egypt's Red Sea aboriginal culture and unique nature, as well as being a tourism destination, offers a great potential for enhancing design value. Design and culture are oddly similar, where both are fundamental results of human existence and activity.

Problems of the study:
The problem can be formulated in the following question: How can we benefit from the cultural and natural elements of the Red Sea in Egypt to create printed designs suitable to be used in interior furnishing in touristic institutions to serve tourism in Egypt.

Objectives of the study:
1- The possibility to benefit from the aesthetics of natural and cultural marine environment of the Red Sea to innovate printable designs for curtains and wall-hangings suitable for the purpose of interior furnishing to serve tourism in Egypt.
2- Benefit from specialized computer programs to develop the values of innovative designs to reach the required level of quality and raise the aesthetic and functional values of the products.

Postulates of the study:
1- The cultural and/or marine natural elements in the Red Sea have an aesthetic highly values assist in the development of innovation, especially in the field of textile printing design.
2- It is possible to use of the cultural and/or marine natural elements in the Red Sea in creating designs suitable for wall hangings and curtains to be used in interior furnishing in touristic institutions to serve tourism in Egypt.
3- The possibility to take advantage of specialized computer programs in making the innovative designs to serve the aesthetic and applied aspects of the research.

Hypothesis of the study:
1- The study assumes that the innovative compositions express the cultural and/ or marine natural elements in the Red Sea with the aesthetic values that inspired from them.
2- The ability of the designer to use computer design programs to show the innovative compositions and visual appearance of the suggested applications.

3- The functional purpose of the innovative designs can serve tourism in Egypt.

Limitations of the study:

The objective limits:

1- A theoretically study for what specializes the Red Sea region touristically, also cultural and natural features of the Red Sea.
2- The use of computer programs to redraw and color the innovative compositions, make repetitions (for curtains), select different color palettes, and visualize suggested applications for the designs.
3- Evaluate the artistic and aesthetic values of the innovative compositions.

Location limits: Cultural and marine natural elements in the Red Sea region in Arab Republic of Egypt.

Methodology of the study:

The study based on:

1- The analytical descriptive method in explaining cultural and natural features of the Red Sea to identify their characteristics and come up with innovative designs and analyzing them.
2- The experimental method in innovating designs inspired from cultural and natural elements of the Red Sea that consist of different stages aiming to make designs suitable for textile printing to furnish tourist institutions.

Tools of the study:

- A number of diverse sources including books, scientific research, International Information Network (the Internet), Adobe graphic programs (Photoshop & Illustrator), and evaluation sheet (questionnaire).

1. Theoretical Framework:

Egypt is a prominent travel destination worldwide that attracts a large number of tourists. The tourism sector has played a significant role in boosting the Egyptian economy (27) and it is a main source of foreign currency. The Central Bank of Egypt reported that Egypt's tourism revenues hit a record high of $13.6 billion in 2022/2023, up by 26.8 % from $10.7 billion in 2021/2022 (4). In 2022, the travel and tourism sector shared in almost 2.4 million jobs to the Egyptian economy (32). Nature-based tourism is one of the key goals for growing the tourism industry. South Sinai and the Red Sea coast are popular tourist destinations in Egypt because of their nature and abundant marine life (22).

The tourism industry, commonly referred to as the travel industry, is associated with individuals journeying to different destinations, whether inside their own country or abroad, for the purposes of recreation, socialization, or business. It is associated with vital relationships with the transportation, hotel, and hospitality sectors, revolving around making tourists have everything they need while they're away from home, including entertainment, activities, and necessities (28). Red Sea regions in Egypt is a great place to travel because of its year-round sunshine, crystal-clear waters with stunning coral reefs, wilderness deserts, mountains, and natural protectorates (38). The Red Sea regions provide the finest activities in the world. A tourist can partake in environmental and recreational activities including diving, snorkeling, kite surfing, fish hunting, safaris, etc., as well as perform cultural, therapeutic, historical, or religious tourism (23, 38).

1.1. Cultural and natural features of the Red Sea:

Culture is the manner of life, particularly the prevailing practices and beliefs, of a specific group of people at a specific period of time (13). Nature is everything that exists in the world that is not created by humans, including all plants, animals, and other living things as well as all natural processes and events (17).

1.1.1. Cultural features of the Red Sea

Cultural elements are a part of the natural ecology of the Red Sea. We interact with it in several ways, through fishing, Yachting, boating, diving in the coral reef zone and natural entertainment by the land and marine environments that surround us. In order to understand properly the concept of cultural elements in the Red Sea, it is necessary to know the definitions of some terms as the following:

- **Sailing ship:** it is a maritime vessel that utilizes sails affixed to masts to capture the force of wind and drive the vessel (15).
- **Sailing boat:** it is a small boat with sails smaller than a sailing ship (14).
- **Beach umbrella:** it is a large umbrella used to shade part of a beach, patio, or recreation area (19).
- **Anchor:** it is a device often made of metal that is fastened to a ship or boat using a cable and thrown overboard to anchor it in a specific location by way of a fluke that burrows into the seabed(18).
- **Lifebuoy:** typically, it has the form of a ring and is used to rescue someone who has fallen into water by keeping them afloat (20).
- **ship's wheel or boat's wheel** is a device used aboard a water vessel to steer that vessel and control its course (16). Some of the cultural elements in Red Sea are pictured in fig. (1).


Sailing ship


Sailing boat


Umbrellas


Anchor with rope and chain


Lifebuoy with red stripes


Helm steering boat wheel

Fig. (1): Some cultural elements of Red Sea in Egypt

1.1.2 Natural features of the Red Sea:

The aquatic environment of the Red Sea has facilitated the sustenance of over 1200 distinct species of fish, approximately 10% of these species are unique to the Red Sea. Nearly 2,000 kilometers of coral reefs, some of which are 5,000 to 7,000 years old, provide a home for these fish. Dolphins, turtles, and about 44 different kinds of sharks inhabit these reefs as well There is a limited number of species that pose danger to people, while the majority of species are safe (37).

1.1.2.1 Red Sea plants

They are commonly classified into two groups which are flowering plants and algae.

1.1.2.1.1. The Flowering Plants:

Sea grasses: They are special kinds of blooming plants because they have evolved to survive submerged in saltwater. They do pollination, flowering, and seed-producing underwater (2). Offering many important ecological benefits to the marine environment (3).

Mangroves: Mangrove forests consist of tropical trees and woody shrubs that grow in the tidal zone of tropical and subtropical regions, where very productive ecosystems are present. These ecosystems comprise coastal safety, environment, refuge, and reproductive areas for various crustacean species, fish, and other aquatic and land animals [(1)]. Examples of sea grasses and mangroves are shown in fig (2).


Sea grasses


Mangroves.

Fig. (2): Sea grasses & Mangroves

1.1.2.1.2. The Algae:

Marine algae include a wide variety of species, which are typically classified into two main species which are microalgae and macroalgae. Microalgae (like phytoplankton) exist in suspension within water, whilst macroalgae (also known as seaweed) are organisms resembling plants and can vary in length from a few centimeters to several meters. They are commonly classified into three main coloring groups that are red, brown and green algae (33) as shown in fig (3).

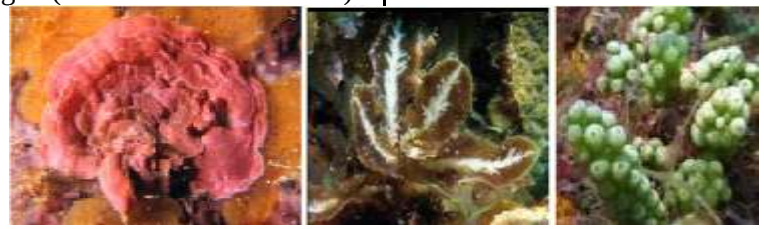


Fig. (3): The main coloring groups of coral reef algae

1.1.2.2. Red Sea animals:

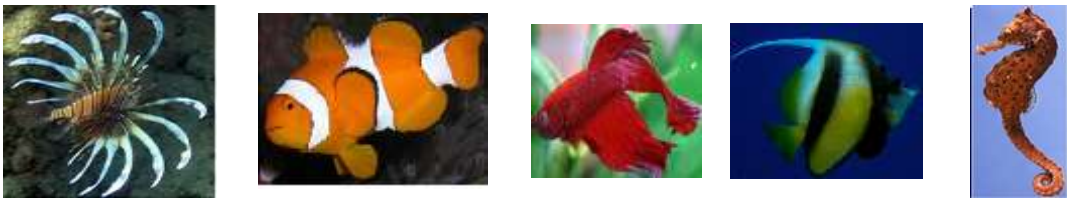
There are two primary categories of species that live in coral reefs: vertebrates, which have backbones, and invertebrates, which do not have backbones (29).

1.1.2.2.1. Vertebrate Animals:

In general, they consist of bony fish, turtles, manatees, and dugongs (39).

1.1.2.2.1.1. Bony Fish:

Fish are one of the most beautiful and colorful creatures in the Red Sea. They are the most abundant, diverse, and essential vertebrate species on coral reefs. The Red Sea fish are recognized for their vibrant and distinctive coloring patterns, which vary significantly from the conventional silvery appearance commonly associated with fish in general (29) as indicated in fig. (4) that shows some of the different species of fish in the Red Sea.



Turkey fish Clown anemone fish Pop-eye Fish Banner fish Sea Horse

Fig. (4): Some of different species of fishes in the Red Sea

1.1.2.2.2. Invertebrate Animals:

Coelenterates, Sponges, Echinoderms, Mollusks, Crustaceans, and Polychaetes are the different categories of invertebrates that live in coral reefs[39].

1.1.2.2.2.1. Coelenterates:

The term "coelenterates" is used to describe their primary distinguishing feature: Hollow internal cavity. They have a basic structure consisting of two layers of cells, external and internal layers, and exhibits radial symmetry. Coelenterates include colonial organisms such as corals and sea anemones, as well as solitary organisms such as hydra and jellyfish. However, there are numerous additional forms too [6].

Anemone:

A sea anemone, usually known as the "flower of the sea," is a visually appealing and diverse creature that, despite its appearance, is classified as an animal. Tropical coastal seas have the biggest and most colorful anemones. Anemones are stinging organisms with a radically symmetric body, they exist in numerous shapes, sizes, and colors (5) as shown in fig.[5]

Closed sea Bubble-tip Sea Mat

Fig. (5): Some of sea anemones in different sizes and colors

Corals:

Corals can be classified into two primary categories: hard corals and soft corals. They usually live in colonies. Hard coral plays a crucial role in the construction of the coral reef. Hard corals produce polyps that exude calcium carbonate skeletons, which finally solidify into rock and make coral reefs. Soft corals are pliable and flexible, frequently resembling plant or tree structures; others have a feathery shape. These corals aren't reef builders, and they don't have stony skeletons. Corals exhibit a spectrum of colors, including red, purple, and blue; however, the most prevalent hues are typically various degrees of brown and green (12, 25). Coral comes in a variety of sizes and shapes, as indicated in fig.[6]

Soft coral Mountain coral Fungia Fire coral

Fig. (6): Some of different shapes of coral in the Red Sea

Jellyfish:

Most jellyfish are free-swimming marine organisms with umbrella-shaped bells and trailing tentacles, but some are tethered to the seafloor by stalks. Large, brightly colored jellyfish are abundant in coastal zones around the world worldwide (34). Figure (7) shows some of different species of jellyfish in the Red Sea.

Moon Jellyfish Lions mane jellyfish Cigar jellyfish

Fig. (7): Some of different species of jellyfish in the Red Sea

1.1.2.2.2.2. Sponges:

The three most common body types seen in coral reef sponges are: a) vase sponges that come from the reef surface as irregular, slightly spherical formations with sizable central cavities, b) Tube sponges that display a branching structure. They are

sometimes very colorful, with several species displaying brilliant shades of orange, red, and yellow, and c) encrusting sponges that create a relatively thin coating that covers a large area on top of reef surfaces. They usually exhibit vibrant colors, presenting a diverse range of shades from yellow to red (39). Examples of these types are illustrated in fig. [8]

Vase sponge Tube sponge Encrusting sponge

Fig. (8): the common three different body forms of sponges in the Red Sea

1.1.2.2.2.3. Echinoderms:

Echinoderms are aquatic animals, including feather stars, sea stars, brittle stars, sea urchins, and sea cucumbers. Echinoderms possess both economic and ecological significance [31]. The Latin name echinoderm means spiny-skinned, referring to their plate-like calcareous skeleton [10]. They have "radial symmetry," which indicates that they possess a center component with additional components distributed around that central axis [35]. Sea stars and sea urchins are the most prevalent and have the greatest impact on reef ecosystems [39]. Sea stars have a diverse range of sizes, vibrant hues, and varied textures, as shown in fig. [9]. Sea urchins are small, spiny, and spherical animals, can be found worldwide in various hues, with the most prevalent being black and subtle shades of green, olive, brown, purple, and red (8), some are shown in fig. (10)

Fig. (9): Different forms and colors of Sea stars in the Red Sea

Variegated urchin Long-Spined urchin Rock-Boring urchin

Fig. (10): The common forms and colors of Sea urchin in the Red Sea

1.1.2.2.2.4. Mollusks:

Mollusks exist in a wide variety of shapes and sizes. They are primarily classified as soft-bodied, non-segmented animals, usually with calcareous external shells (11). Common mollusk species found in coral reef environments include:

Gastropods: Most gastropods possess a single, spiral, coiled shell that can retract the body (snail) (9) as shown in fig. (11), while certain groups have lost or diminished the shell, and these are referred to as slugs, as indicated in fig. (12).

Fig. (11): the common snail

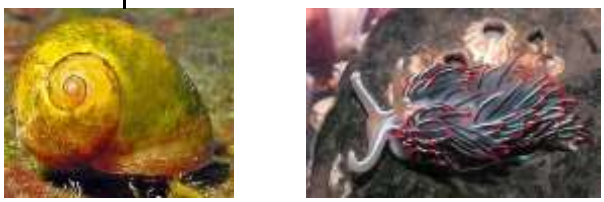


Fig. (12): Sea slug

The shell is a part of the animal body and is often what is recovered in a fossil dig (9). Some types of shells are pictured in fig. (13)

Giant Triton shell Queen Conch shell Wentletrap shell

Fig. (13): Some of sea shells in the Red Sea

Nudibranchs: They are shell-less mollusks. Nudibranch is a Latin word that means 'naked gills'. The term is derived from the fact that many species have a circle of exposed gills on their backs (36). Typically, nudibranchs are rectangular in appearance, can be long or short, thick or flat, and colorful or dull to match their surroundings, as shown in fig. (14). They range in size from a tiny 0.25 inches to a massive 12 inches in length. possess a wide variety of forms, colors, and patterns that are truly fascinating, compared to other animals [30].



Chromodories annulata Phyllidia multifaria

Fig. (14): Some of colorful nudibranchs in the Red Sea

Bivalves: They are the clams, mussels, oysters, and similar mollusks. Bivalves have a modified molluskan body plan. The body is laterally compressed and enclosed in a two-valved shell (21) as shown in fig (15).



Sand-dweller Scallop Giant Clams

Fig. (15): Some of common bivalves

Cephalopods: They possess unique locomotor apparatus and are omnivorous predators. Cuttlefishes, squids, octopuses, and other amazing animals are in this group. A cephalopod means "headfooted" because its head pushed down toward the foot (21). Figure (16) shows some of common cephalopods in the Red Sea.



A squid in the Red Sea Cuttlefish Octopus

Fig. (16): Some of common Cephalopods in the Red Sea

1.1.2.2.2.5. Crustaceans:

Crustaceans, which belong to the subphylum of arthropods, are characterized by their many-jointed legs, as seen in crabs and lobsters. Crustaceans typically possess a head, thorax, and abdomen, at the end of which is a tail piece called a telson. They are distinguished by the presence of two pairs of sensory antennae and at least three pairs of mouthparts (26). Figure (17) shows three of the largest and more common reef crustaceans in the Red Sea.



Lobster Tropical Shrimp Common Crab

Fig. (17): Common reef crustaceans in the Red Sea

1.1.2.2.2.6. Polychaetes:

Polychaetes are worms that have numerous bristles, which are a distinguishing feature. These animals are frequently found on the solid structure of reefs, as well as in seagrass meadows, mangrove forests, and sandy plains (39). They are available in a wide range of colors and patterns, ranging from entirely transparent to iridescent to candy striped. Polychaetes can be found in a wide range of shapes, varying from spherical to sausage-shaped to pencil

thin, and in various sizes, ranging from microscopic to several feet long. Some have a smooth and streamlined appearance, while others have a more elaborate and complex design (24). Some polychaetes are pictured in fig. (18).

Bristle worm Tube worm Christmas tree worm

Fig. (18): Some shapes of polychaete worms in the Red Sea

2. Methods:

2.1. Selecting some of artistic elements from natural marine life and cultural elements in the Red Sea.

The images of elements were collected through an internet search, references and researches that contain images of marine nature and cultural life in the Red Sea.

2.2. Drawing and coloring different decorative designs (compositions) inspired from the selected artistic elements.

The selected elements were analyzed, abstracted and some were modified as shown in table (1, then nine design compositions were relied on the manual techniques of the researcher in drawing lines and shapes of the innovative designs from the selected natural marine life and cultural artistic elements of the Red Sea either in direct or abstracted form. The computer technologies were used in redraw and recolor them.

The innovated designs were divided by the researcher into two groups:

A. A group of designs was innovated their compositions manually using wood, water and gouache colors on papers. Then the compositions were transferred to the computer via the scanner as images which have been redrawn and colored using Adobe Photoshop and Illustrator graphic programs, as indicated in the designs from no.1 to 6.

B. Other group was created by selecting and directly inserting some marine biota photos in the Red Sea to the computer and then stored and retrieved inside the computer to move between Adobe Photoshop and Illustrator graphic programs, the images of elements and units were placed or redrawn for making integrated design, as indicated in the designs from No.7 to 9.

2.3. Putting some of colored compositions in repetition.

The repetition of the innovative design (for curtains) was achieved through the distribution and duplicating the design composition and its ornaments using graphic programs (Adobe Photoshop and Adobe Illustrator).

2.4. Making different color palettes.

First, the final design was flattened by merging all the repeated visible layers together with back ground layer. Then alternative color palettes were selected for each design through the changing of hue and saturation, adjusting the color levels with brightness and contrast.

2.5. Showing some of suggested applications.

The inspired and innovated designs from Red Sea life were placed in textile applications to serve tourism in Egypt.

2.6. Evaluation the artistic and aesthetic values of the innovative compositions:

The innovative design compositions were presented to a group of specialists in the fields of textile printing design (14 members) through a questionnaire for evaluating the artistic and aesthetic values of the innovative compositions. Then collect answers in the questionnaire and calculate the agreement percent of each design.

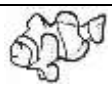
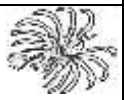
The different stages for each element used in the innovative design were passed out through the steps illustrated in table (1)

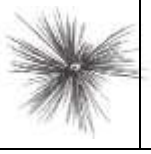
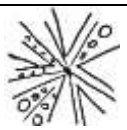
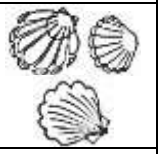
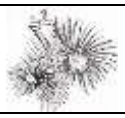
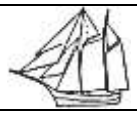
3. Designs and Applications:

4.1. Elements of the created designs:

The selected elements were analyzed, abstracted and some were modified in table (1).

Table (1): Marine Nature and cultural artistic elements of the Red Sea and their analytical lines and abstracted elements

No.	Element name	Natural Resource	Analytical line	Abstracted form
Flowering plants				
1	Sea grasses			
2	Mangroves			
3	Green algae			
Animals (vertebrates)				
Fish				
4	Clown fish			
5	Turkey fish			
6	Sea Horse			
Animals (invertebrates)				
Coelenterata				
7	Mountain coral			
8	Fungia			
9	Soft Coral			
10	Bubbletip anemones			

No.	Element name	Natural Resource	Analytical line	Abstracted form
Echinoderms				
13	Starfish			
14	Starfish			
15	Long Spined Urchin			
Mollusks				
16	Sea snail			
17	Wentletrap shell			
18	Giant Triton shell			
19	Chromo-doris annulata			
20	Chromo-doris annulata			
21	Scallop			
22	Christmas Tree Worm			
Cultural Elements				
23	Sailing ship			
24	Umbrellas			

11	Moon Jellyfish					25	Anchor with rope and chain.			
12	Vase sponge					26	Lifebuoy			
						27	Helm Steering boat wheel			

4.2. The created designs:

The different stages for each design groups passed out as the following:

Design No. 1: It was taken from natural elements No. (1, 2, 3, 8, 10 &11)

The basic, curved and wavy lines were directed up in the upper parts of the used artistic elements (fungia, Mangroves, and bubble- tip anemones) and going down in the lower parts of the used artistic elements (moon jelly fish, and Sea grasses). These lines suggested continuity or following motion, growth progression and harmony of movement and create an emphasis by contrasting orientation in spaces of the innovated design. The fungia element was drawn in diagonal direction with larger size which grabs the viewer's attention to its placement creating the emphasis. A progressive rhythm is shown in a sequence of abstracted bubble- tip anemones artistic element at the right of the design.

The most important characteristic of this innovated design is the scenery radiation rhythm that was obtained by starting the lines of the most artistic elements from a center and flowing out through the whole composition. There is a partially radiation as a texture in the abstracted moon jelly fish at the bottom of the design and fungia at the upper part in the artistic work that looks like plants in nature, so gave the impression of wealth and sophistication. The relationship between the individual elements and the whole composition conveyed a feeling of unity and supports harmony in the innovated design (7).

Distribution and various grading of dark colors or halftone shading of brown, purple, yellow and green in all parts of design gave an illusion of three-dimensional effect for them and achieved the rhythm and harmony in the artistic work.

Analytical line composition form of design 1

Manual colored composition of design 1

Computer colored composition of design 1

Repetition & distribution of design 1


Suggested applications of design 1

Color palettes of design 1

Design No. 2: It was taken from cultural elements No. (25& 27)

The core of this work is central anchor, which fills about two-thirds of the design area and intersects with another two smaller ones in opposite direction and slant on vertical axis. These anchors are the mainstay of the design, on which the other elements were distributed in circles such as the helm steering boat wheel and some ropes. Circle as an element is natural magnification of the point; it achieves a kind of beauty and also represents the meaning of infinity which revolves around its surroundings. Proportionality was achieved by repeating the elements in different sizes with rhythmic repetition of the motifs and diversity of design composition. The means of rhythm in the design were also revealed by divergence and convergence of the decorative shapes and their different areas. Hot and cold colors, lighting and shadows were used in a manner to not distract the receiving mind.

Analytical line composition form of design 2

Manual colored composition of design 2

Computer colored composition of design 2


Repetition & distribution of design 2


Suggested applications of design 2




Color palettes of design 2

Design No .3: It was taken from natural elements No. (13, 14, 15, 17, 18 & 21).

Design composition has semi-circle lines in abstracted scallop element and its distribution and repetition at the all background. These lines found in nature and suggest joyous, growth, progression, harmony of movement and rhythm (7). Wavy lines appeared in abstracted giant triton and wentletrap shells elements. These are the lyric lines of beauty, suggesting fluid, continuity or following motion.

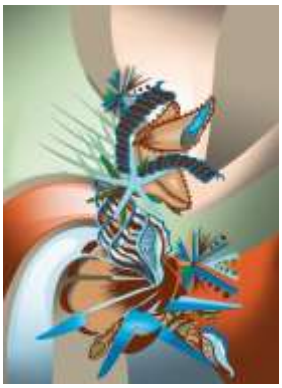
The presence of abstracted giant triton shell and starfish elements in the center of the innovated design led the eye to them first and then to the other parts. This suggests the emphasis to the importance of these artistic elements with subordination of others.

The radiation achieved in different parts in the whole of this innovated design. First the texture effect represented in the lines of abstracted sea urchin element at the top left and the bottom of the right sides of the design; second, the radiation of the background lines starting from a center point at abstracted giant triton shell element and followed out into arcs spaces.

All these diversity of radiation in all parts of this artistic design work together supporting the sense of freedom, movement, rhythm as well as the balance and attraction were obtained. The change in color or shading in the spaces of background with the use of light and halftones in all parts of the design gave an illusion of three-dimensional effect. The colors of this innovated design were interestingly distributed within all parts of the composition which conveys a feeling of unity and harmony.

Analytical line composition form of design 3

Manual colored composition of design 3



Computer colored composition of design 3

Suggested application of design 3

Color palettes of design 3

Design No .4: It was taken from cultural elements No. (23 & 25)

The most important characteristic of this innovated design is the interaction between the abstracted cultural elements represented in sailing ship and anchor with rope, and the background represented in sea waves. This interaction ensured the sense of fascinating marine life as well as created rhythm and harmony in the design. The abstracted elements in this design have wavy and curved lines. These are lines of nature and the lyric of beauty suggesting fluid, dynamic, loftiness, and continuity or following motion (7). The composition has vertical position giving the feeling of tall, strong and springing. But the internal lines of the used abstracted cultural elements were directed in

diagonal to be matchmaking with the direction of sea waves as a background. These carry the eye from side to side in the same direction and draw attention to the design achieving balance. At the same time, they increase the activity and vitality. The emphasis created through the convergence of the unusual or unexpected wooden element with the anchor artistic element to capture and hold the viewer's attention.

Analogous color harmony was achieved through the grades of blue and blue-green colors of sea waves as background, which conveys a feeling of coolness and its repetition in the upper left of sailing ship produced rhythm. The combination and gradation of brown, red, golden, blue, and blue-green colors from lightest to darkest values in the whole parts of this artistic design gave us a distinctive color system and an illusion of three-dimensional effect as well as the dynamic rhythm was achieved by ambient space of sea waves. Also there are a high contrast between the smooth textures of halftones for the used colors and the rough textures of the wooden element, the rope of anchor and the ship body. This contrast makes a work more vibrant, vigorous, and lively and creates asymmetrical balance.

Analytical line composition form of design 4

Manual colored composition of design 4

Computer colored composition of design 4

Suggested application of design 4

Color palettes of design 4

Design No. 5: It was taken from natural elements No. (6 & 16)

The presence of abstracted sea horse element in the center of innovated design led the eye first to it and then by subordination to the other small lines and shapes at the all sides which gave the emphasis to the importance of this artistic element and achieved rhythm by its repetition in small units.

The radiation obtained by the semi circle lines and texture of the abstracted sea snail element in the center of design and the curved lines of background starting from a center point at the sea snail and sea horse abstracted elements and following out into arcs. In addition to the partially radiations of the upwards converging lines at the upper part which suggest loftiness and dynamic as well as the sense of freedom, movement rhythm, and the radial balance were achieved.

The sequance of spiral forms of the sea horse tail with the internal lines and texture of sea snail in the whole innovated design suggested depth and achieved the progressive rhythm. The change and grades of shading in the spaces of background and around the units of the used artistic elements from outside to inside gave highlight to the composition of the design and an illusion of three-dimensional effect in all parts of the design.

The contrasting color harmony was obtained by using light colors represented in pink and light-green with dark colors represented in dark-red and green respectively, these contrasting values attract attention and created the illusion of different size.

In addition to the orange color that gave a distinctive color system and their distribution in the whole parts of composition with the background colors led the eye to move at all the design and conveyed the feeling of unity.

Analytical line composition form of design 5 | Manual colored composition of design 5 | Computer colored composition of design 5

Suggested application of design 5

Color palettes of design 5

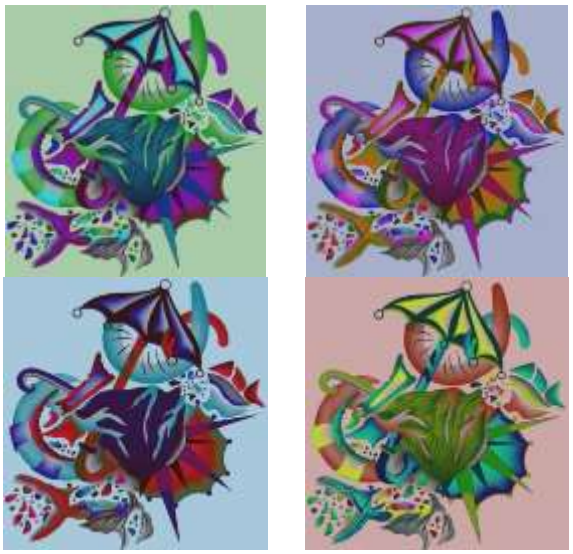
Design No. 6: It was taken from natural and cultural elements No. (7, 24 & 26)

The construction of this design was based on the arrangement of the modular units of the design in order to create a kind of static motion in terms of the confluence of the plastic units. These elements were represented in the umbrella decoration, lifebuoy and mountain coral in successive radiations, providing the wide possibility of plastic interlacing above the design surface, and created a structure with harmonious and aesthetically consistent relationships.

In this design, using of straight and flow lines combined the elements of the work of art with each other in a manner of confidence so that the nature of the relationship between them does not lead to division of the work unity, but they are mixed together to achieve this unity. The researcher also distributed some geometric shapes of lines and circles in the work space, leading to a sense of balance in the form. The colors were used in a way that gives the design a kind of coherence resulting from the color relations of both shape and ground, also the distribution and gradation of hot and cold colors.

Analytical line composition form of design 6 | Manual colored composition of design 6 | Computer colored composition of design 6

Suggested application of design 6



Color palettes of design 6

Design No. 7: It was taken from natural elements No. (5 & 22)

Mastery has been achieved in this design idea by placing the essential element (a Turkey fish) in the foreground and placing the other secondary subjects of sea creatures, water bubbles, and writings at the back. Mastery is one of the important means to reach the unity and attract attention in the art work. As for the writing elements used in the design, it has the same direction of movement of the thorns of the main element, a kind of flow and dialogue between them. Colors varied between darkness and brightness, as well as the use of colors at different degrees of transparency to obtain partial coverage at times and darkness at other times.

Computer composition of design 7

Suggested applications of design 7

Design No .8: It was taken from natural elements No. (4, 19 & 20)

This design has been emphasized in the different sizes of its elements to give priority to the main element to be shown and characterized, which is represented in the element chromodoris annulata, which is the most visible elements in the level design center and attracts the viewer's vision. It also benefited from the presence of slanted lines made of forked marine motifs in a radiant shape at the bottom of the design to provide an atmosphere of stability for the main element mentioned above with its wide curve, giving rise to a sense of calm.

In this design, there is an attempt to use the repetition as one of the aesthetic construction of the design represented in the fish with hot orange color (clown fish). It was used in mutual and falling repetition with different sizes. The overlapping between the clown fish and chromodoris annulata which is the main element, gave a sense of depth to the design.

It has been used a variety of colors that distinguished by its diversity between cold, warm, opaque, light and transparent. The color diversity led to the recognition of certain surfaces and elements as if they were at different levels.

Computer composition of design 8

Suggested applications of design 8

Design No. 9: It was taken from natural elements No. (9 & 12)

This design idea clearly shows that researcher was influenced by some of the concepts and opinions in the design; for example, eyes are attracted to the objects of great size. This is represented in the form of the large central vase sponge, which directs the viewer to the central part that fills the design emptiness making it distinct in location and space from other elements. The proportion of the design has also been shown by repeating the white star shaped of soft coral in different sizes and gradients. This leads to the compatibility between the design elements and the realization of order between them. A kind of composition has been created between each part of the design with other, through the shapes and decorative elements of different shells and surface values, which gives a sense of the continuous link between parts and achieve balance between them in the art work. Color in this idea has contributed to the visual world as an important part of the sensory perception of both hot and cold colors.

Computer composition of design 9

Suggested applications of design 9

4.3 Evaluation the Artistic and aesthetic values of the innovative compositions

The nine innovative design compositions were presented to a group of specialists in the field of printing textile design (14 numbers) for evaluating the artistic and aesthetic values of the innovative compositions through the questionnaire as seen in table (2). as it received a light on the acceptance of specialists and their admiration of design ideas by collecting answers in the questionnaire and the calculation of frequencies and the percentage obtained by each item of it and the results were as in the following:

4.3.1. The percent of agreement on the artistic and aesthetic values of the innovative compositions

Table (2): Percent of agreement on artistic and aesthetic values of the innovative design compositions

No. of design Comp.	The innovative composition express the cultural and/ or marine natural elements in the Red Sea		The Compatibility in fundamentals and structural elements of the composition		The harmony and compatibility between textural and colorimetric values		The extent of creating a novel plastic formulation	
	Degree	Percent	Degree	Percent	Degree	Percent	Degree	Percent
1	67	95.71	69	98.57	68	97.14	66	94.29
2	68	97.14	69	98.57	67	95.71	70	100
3	67	95.71	68	97.14	67	95.71	69	98.57
4	69	98.57	69	98.57	69	98.57	69	98.57
5	67	95.71	68	97.14	67	95.71	67	95.71
6	64	91.42	64	91.42	63	90	62	88.57
7	67	95.71	62	88.57	62	88.57	60	85.71
8	67	95.71	66	94.28	65	92.85	64	91.43
9	66	94.28	62	88.57	62	88.57	61	87.14
Total %	602	95.56	597	94.76	590	93.65	588	93.33

No. of design Comp.	Achieving rhythm in creating a design relationships of lines and spaces in the composition		Achieving Fantastically balance and its role in creating a state of dynamic within the composition		The role of shadow and light in visual appearance of composition		The success of the designer in use of the possibilities of computers in design	
	Degree	Percent	Degree	Percent	Degree	Percent	Degree	Percent
1	67	95.71	66	94.29	64	91.43	68	97.14
2	68	97.14	68	97.14	65	92.86	70	100
3	67	95.71	70	100	66	94.29	69	98.57
4	68	97.14	70	100	70	100	70	100
5	68	97.14	69	98.57	67	95.71	67	95.71
6	62	88.57	62	88.57	61	87.14	65	92.86
7	60	85.71	61	87.14	63	90	65	92.86
8	67	95.71	65	92.86	68	97.14	67	95.71
9	60	85.71	60	85.71	62	88.57	66	94.29
Total %	587	93.17	591	93.81	586	93.02	6.7	96.35

No. of design Comp.	suitability of the design with the functional purpose to serve tourism		The degree of achievement of design uniqueness and originality.		Total %		Degree of agreement
	Degree	Percent	Degree	Percent	Degree	Percent	
1	64	91.43	66	94.29	665	95	5
2	67	95.71	67	95.71	679	97	2
3	63	90	65	92.86	671	95.86	4
4	66	94.29	67	95.71	690	98.57	1
5	65	92.86	68	97.14	673	96.14	3
6	62	88.57	62	88.57	627	89.57	7
7	59	84.29	61	87.14	620	88.57	8
8	64	91.43	65	92.86	658	94	6
9	61	87.14	59	84.29	619	88.43	9
Total %	571	90.63	580	92.06			

It is clear from table (2) that percent of agreement on the innovative compositions express the cultural and/ or marine natural elements in the Red Sea is 95.56 %, this achieves the hypothesis no.1 of the study. The Compatibility in fundamentals and structural elements of the innovative compositions is 94.76%, and percent of its harmony and compatibility between textural and colorimetric values is 93.65 %. The percent of agreement on the innovative compositions is 93.33% for creating a novel plastic formulation, 93.17 % for achieving rhythm between its lines and spaces, and 93.81 % for achieving fantastically balance and creating a state of dynamic. The role of shadow and light in visual appearance of innovative compositions is 93.02, and the percent of designer success in using the possibilities of computers is 96.35 % and this achieves hypothesis no. 2. The suitability of the design with the functional purpose to serve tourism is 90.63 % achieving hypothesis no. 3, and the degree of achievement of design uniqueness and originality for the total innovative compositions is 92.06 %.

It obvious in table (2) that total percent of the innovative compositions success is ranging from 88.43 % to 98.57 % and the design composition No. 4 has the highest degree and percent.

Results of the study:

- At the end of the research, the study hypotheses have been achieved and the most important results of the study can be summarized as follows:
- Benefit from the aesthetics of natural and cultural marine environment of the Red Sea in innovating printable designs for fabrics suitable for the purpose of tourism.
- The use of computer programs techniques develops the values of innovative designs to reach the degree of required quality and raise the aesthetic and functional values of the products
- The researcher took advantage of the questionnaires to evaluate the created designs and the Innovative designs have achieved a high success rate.

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