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DESIGN PROCESSES FOR SUSTAINABLE INDUSTRIAL PRODUCT DESIGN

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Abstract:

Sustainable design is a new design trend that focuses on the importance of the relationship between design and nature and seeks integration and compatibility with the environment. And it is known that any design work is a gathering of the main formative elements of the design work (product) in a way that depends on the skill of the designer and the accuracy of his selection of these elements to reach the main goal of the design. And when the product is designed with a high body and excellent accuracy and achieves a sense of confidence and credibility and communicates the message and goal, as well as forgetting about sustainable design, but in a manner that stems from the essence of the concept of sustainability around which sustainable design revolves in general, and falls under the concept of design dealing with the sustainable environment.

The current research aims to identify the design treatments for sustainable industrial product design.

The current research community consists of designs for the company (NAU) designed in the year (2019), and the researcher chose the designs that are the result of her exploratory study of the company's designs published on the company's website on the Internet. The researcher adopted the non-probabilistic

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(intentional) choice according to the research requirements, and a percentage (33%) was applied to the models of the year (2011), and the number of models extracted was (1) models out of the research community of (3) models,

The research came out with a set of results, the most important of which are:

1- The analyzed model is designed and made of two materials, which are recycled polyester, and from recycled wool felt, and these recycled materials are the most choices in the manufacture of sustainable products, as these raw materials do not require a manufacturing industry to produce them.

2- The design and raw treatments used in designing the model, have achieved to a large extent the functional performance, which is the purpose for which it was designed, aesthetic and use, in addition to the characteristic of sustainability.

Keywords: (industrial product - sustainability - design).

First, the research problem:

The world has recently shown great interest in the environment at various levels, after continuous warnings and warnings about environmental problems, such as environmental pollution, the hole in the ozone layer, and the spread of epidemics, in addition to the depletion of natural resources and waste and exhaustion of energies. Therefore, sustainability today has become a focus of global attention, as it " A humanistic theory that calls for attention to the future of man, his health and his environment, and then preserving the environment that guarantees the continuity of human life. It is an expression of a simple idea to ensure a better quality of life in the present and for future generations.

The modern trends at the present time have added to the term sustainability political, economic, social and environmental concepts, which made it more related to the immediate and future issues that occupy the world" (Steele, 1997, p.5)

As the deterioration of environmental systems continuously and at an increasing speed highlights the urgent need for sustainability and its application according to a specific system as well as methods and tools in all areas of life and environment by both the designer and the consumer, where "the process of sustainability is related to the development of industrial processes in a way to ensure energy efficiency and resource conservation to meet the needs of future generations, safe working conditions that enhance skill, low waste production processes and the use of safe and environmentally compatible materials" (www.hisour. com), meaning that all natural resources It will be efficiently exploited and equipped with sources of energy systems to reach sustainable design. Through the researcher's briefing on the subject of the research, she found that the idea of sustainability, and the design treatments to be followed depend on asking the following question:

How does the idea of sustainability associated with industrial product design become possible, through the right design treatments? What are the factors that make design systems work more like natural systems by designing sustainable products that are balanced and self-renewable? What is the possibility of taking appropriate design changes to improve the quality of the product?

Second: The importance of the research: The importance of the current research is highlighted by the following:

1- It helps in laying the basic foundations of the design treatments on which the design of sustainable industrial products depends, and the statement of design patterns that commensurate with the world's trends about modern environmental design standards.

2 - It can make a clear contribution to the development of the idea of sustainable design because of its value and environmental and economic dimensions.

3- It could be a knowledge addition to libraries, curricula and courses, especially at the level of graduate studies in the field of industrial design.

Third: Research Objective: The current research aims to:

Recognize design treatments for sustainable industrial product design.

Fourth: Limitations of the research:

The current research moves according to the following limits:

Objective limit: Design treatments for sustainable industrial product design.

Spatial limit: - Products of the American company (NAU) for the design of sustainable products (bags, accessories)

Time limit: 2011

Fifth: Defining the terms:-

1- Design Processors:

It is the use of known means to find an unfamiliar and known formation and solution, or a familiar solution by using familiar materials in an unfamiliar way. (Zahran, 1977, p. 68)

Procedural definition of design processors:

They are the design methods that are followed in the design of the sustainable industrial product, to be the product of those treatments and methods, which is to reach the achievement of the main goal of the sustainable product by making it an environmentally friendly product.

2- Sustainability:

Sustainability means "the continuation of interaction between society and the ecosystem. It is an invitation to care about the future of the human being, preserving the environment and society, and allowing others to meet their needs now and in the future."

(Abd al-Rahman, 2019, p. 185)

Procedural definition of sustainability:

Sustainability aims to achieve improvement in the quality of life for each person by reducing waste and pollution, improving people's livelihood, preserving natural resources, working to achieve close links between people, and efficient performance in all societal areas to provide a decent life for people, to ensure a sense of responsibility towards the environment and generations current and future.

Theoretical framework

The first topic: sustainable design:

Art has been associated since antiquity with the environment and with the culture of society, as “each environment has its own characteristics and variables that affect its culture, its customs and traditions, and determine the characteristics of its members and their intellectual trends.

(Atiya, 2005, p. 84)

And sustainable design is a new design trend that “focuses on the importance of the relationship between design and nature and seeks integration and compatibility with the environment. (Waziri, 2007, p. 61)

It is known that any design work is a gathering of the main formative elements of the design work (product) in a way that depends on the skill of the designer and the accuracy of his selection of those elements to reach the main goal of the design, and when the product is designed with a high body and excellent accuracy, and achieves a sense of confidence and credibility, and communicates the message and goal

as well as with regard to sustainable design, but in a manner that stems from the essence of the concept of sustainability, around which sustainable design in general revolves, and falls under the concept of design dealing with the sustainable environment, which are:-

1- (Eco-environmental design), which is a system “the analysis of the ecological footprint is used around the world to support sustainability assessments. It allows people to measure and manage their use of available resources, and it also helps to assess sustainability patterns in public life (individuals, goods, services, institutions, industrial sectors, neighborhoods, cities and countries).” ([en.wikipedia.org/wiki](https://en.wikipedia.org/wiki/Eco-environmental_design))

2- (Green design), which is consistent with the term environmentally friendly, and the term “green” means “the dissemination of all beneficial and environmentally sustainable means to balance the impact of industrial progress and development on humans and their prior damages to environmental degradation.” (Pounder, S. 2008)

All of these concepts fall under one meaning and goal, which is to move the design from one level to a level where the industrial design is a sustainable design that gains its design value from achieving the

goals of sustainability, using design treatments and formulas through which sustainability is achieved in the design of the industrial product, which is clearly reflected on the design relations. and its connections, and the degree of integration of the design system to the principle of sustainability.

Considering that sustainable design is “a design philosophy for physical and environmental things and services to comply with social, economic and environmental principles, and its goal is to eliminate negative environmental impacts, and this needs to integrate between the natural environment and create a long-term relationship between the user and the producer” (Youssef, 2002, p. 65), and from During which the designer always seeks to use and employ new innovations and treatments that make a difference in the nature of products to reach sustainability, as the twentieth century was characterized by a diversity of trends in the field of design, which is in dire need of difference and continuous change, which is a natural feature of development and creativity to reach the best design treatments.

This includes any change and modification of industrial products, even if they existed before, in order to reduce their negative impact on the environment during any stage of the product life cycle.

And that the main feature of sustainable design is, linking between the basic design elements of products and the attribute of sustainability, through realizing the basic meaning of sustainability and trying to create an actual balance between the functional performance of the industrial product, and the basics of sustainability, through appropriate design treatments, and the matter here “requires the necessity of Achieving a balance between what is utilitarian for something, composition or appearance with what is aesthetic in terms of matching psychological, performance and environmental goals together, and thus reveals a new look at design philosophy,

And the system of its work in a way that accepts compatibility and flexibility in ideas, theories and applications, and that it is compatible with the concepts of the times.” (Al-Saadi, 2015, p. 23)



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100% natural sustainable bamboo wood products, biodegradable, recyclable and as shown in Figure (1) and represents a group of personal products, whose design is not only aesthetic and functional, but has been treated in a way that achieves the principle of sustainability, by reducing Its harm to the environment, and the ability of these products to decompose, in addition to being recyclable.

This is to try to achieve a balance between environmental and design considerations together, preserve natural resources and take into account the needs of the ecosystem to reach, integrate natural systems with design patterns, to ensure the continuity of design work, and to switch to product designs that reduce the consumption of natural resources and energy, i.e. switch to designing environmentally friendly products. Completely and “creating an integrated design system to preserve the environment and interact with it to meet the needs” (Abdul Qader, 2007, p. 1), that is, to find an integrated design system to preserve the environment and interact with it to meet the needs, and that modern technologies in design and manufacturing are advanced and future,

It must be developed in a conservative and sustainable manner and try to integrate the rapid changes of these technologies with the new design orientation that preserves the environment so that there is a possibility to subject modern technology to nature.

The process of directing and creating shapes and design bodies for sustainable products is linked to “the aesthetic and functional aspects of design, in order for the works to reach the peak of creativity in the design process” (Al-Saqr, 2009, p. 21) through design treatments that make it completely different from other traditional products. Processes “the innovations resulting from intellectual perceptions of the response to a topic through scientific expertise to translate ideas and achieve harmony with reality and its compatibility with its objectives.”

(Hussain, 1973, p. 133).

The second topic: Design treatments for sustainable industrial product design:

Here, the researcher would like specifically to introduce those treatments through which we can identify the sustainable product, which are:

1- Material design treatments in sustainable product design:

The design of sustainable products depends on the selection of raw materials, which are a key element of sustainable design, and which determine the entire life cycle of the product, and are called environmentally friendly raw materials, which are raw materials whose extraction, manufacture, use, or energy required to complete any of the stages does not harm humans or the environment. surrounding environment, and it also does not provide for the internal environment because it is made of natural raw materials” (Ali, 2012, p. 5).

2- Design treatments for colors in sustainable product design:

Sustainable colors are one of the important sustainability tools at the present time, as we find that most products are distinguished by the phrase, non-toxic colour, as international brands seek and compete in the design and manufacture of various products that contain colors that are not harmful to the

environment and the user, and here comes the role of the designer in choosing his materials Which he uses in the design in order to achieve the principle of sustainability, where dyes and colors of different types are used for many products, such as plastic and wood products and the colors used in coloring and textiles.

3- Design treatments for linkage methods in sustainable product design:

Some of the materials used in the process of linking products are among the environmentally harmful substances such as “industrial and chemical glue and glue, and it is considered one of the chemicals that are suspended in the air. The more sustainable the product, the more it achieves the principles of sustainability.”

(The Seed, 1997, p. 45)

4- Design treatments for packaging in sustainable product design: Sustainable packaging is “the successive stages that goods and their components pass through from production sources to the final consumer, and its advantages are the disposal of unnecessary layers that are used when packaging and packaging green products.” (Gamil, 2004, p. 123)

5-Design treatments for surface output in sustainable product design:

The surface output is of great importance to the processes of creating a sustainable industrial product, as the designer intends in this aspect to “load the surfaces of the body with sustainability patterns of shapes, colors, various textures, semantic and expressive symbols...etc. The individual needs to know the materials used in the surface output of products.” On possession, for the individual to be aware, before choosing the product, and to ensure that the colors and paints used are non-toxic, and do not emit harmful emissions, and it is preferable that they be light to adapt to the environmental characteristics, and not dark,

"According to the aesthetic considerations that are proportional and the function of each part of the body and are compatible with the final function provided by the product, through the formal, color and symbolic that are added on the surfaces of the body using the design elements" (Bahel, Net, p. 42).

6- Environmental Label:

They are certificates placed on products to clarify that the product is a sustainable product and is less polluting to the surrounding environment, by “relying on certain standards that take into account the effects on the environment along the production chain, i.e. from raw materials to final products, With the aim of contributing to the reduction of environmental pollution, they are “cards that provide information about the green product in relation to its environmental characteristics so that the consumer can use this information when choosing between products, and its purpose is to highlight the competitive value of green products and increase the demand for them while highlighting their environmental advantages.”

. (Gamil, 2004, p. 123)

7- Sustainability Techniques:

Technology is the innovation of means in the field of design and industry to achieve appropriate progress for the development taking place in all areas of life, including technical and technological tools and means for environmentally friendly design and manufacturing, which deals with the principles of sustainability to try to reduce the effects of pollution and control the sources of pollution to which the environment is exposed.

Indicators of the theoretical framework:

1- Any design work is a gathering of the main formative elements of the design work (product) in a way that depends on the skill of the designer and the accuracy of his choice of those elements to reach the main goal of the design. As for sustainable design, but in a manner that stems from the essence of the concept of sustainability, the principle of cleaner production, and appropriate design treatments.

2- The main feature of sustainable design is the link between the basic design elements of products and the attribute of sustainability, and that is done by realizing the basic meaning of sustainability and trying to create an actual balance between the functional performance of the industrial product and the basics of sustainability, through appropriate design treatments.

3- Design treatments for sustainable product design are:

A - Material design treatments in sustainable product design.

B - Design treatments for colors in sustainable product design.

C- Design treatments for linkage methods in sustainable product design.

D- Design treatments for packaging in sustainable product design.

E- Design treatments for surface extrusion in designing a sustainable product.

The eco-label.

J- Sustainability Techniques.

Search procedures

1- Research Methodology:

The researcher adopted the descriptive approach, the method of content analysis, for its relevance to the subject of the current study, as it provides the possibility in the procedures of criticism and analysis in order to achieve the goal of the research.

2- Research community:

The current research community consists of designs for the company (nau)* designed in the year (2019).

- Its design peculiarity as being sustainable products, which led to making it one of the designs that follow the principle of cleaner production in its industry, in addition to its aesthetic, functional and utilitarian qualities.

- Design diversity of products.

3- Sample search:

The researcher adopted the non-probabilistic (intentional) choice according to the research requirements, and a percentage (33%) was applied to the models of the year (2011) and the number extracted from the models was (1) models out of the research community of (3) models, which were chosen as models for analysis as they are an intervention Within the scope of the research, the researcher provided justifications for her intentional selection of models, including:

- The suitability of the models to the general research orientation and their representation of the research community.
- Availability of the objective reason for the research title and objective in each design.

4- Methods of collecting information:

In the process of collecting information related to the research, the researcher used the following methods:

- Reliable information published on the international information network (Internet).
- Arab and foreign sources and references.
- Scientific research (Master's - Ph.D.).

5- Search tool:

To achieve the objectives of the research, a questionnaire was used to determine the axes of analysis (Appendix No. 1), which included the main axes addressed by the theoretical framework.

6- Validity of the tool:

Then the form was presented to the experts, to make adjustments and to determine the validity of the tool and its comprehensiveness to achieve the objectives of the research, and some modifications were made to it by them, and thus the form is valid in terms of the inclusion of paragraphs and its validity in determining the research goal and this is what is called apparent sincerity, which represents one of the types of content validity.

7. Sample Analysis

Model(1)



General Description:

Product type: bag (multi-use)

Manufacturer: Nau

Design year: 2019

Model Description:

A multi-use bag designed to keep (mobile, official papers, cards and cash), designed by (nau) company, one of the brands known for its sustainable designs that use natural sustainable materials to make their products.

The bag is designed in a rectangular shape that doubles in size when opened, it contains some pockets on the inside to store some accessories, and it also contains three slots for cards in the back, as well as several places to store the largest number of personal items

Design Processes in Sustainable Product Design.

The model is designed and made of two materials, which are recycled polyester, and recycled wool felt, and these recycled and processed materials are the most sustainable options, as these raw materials do not require a manufacturing industry to produce them, in addition to the advantages of these two materials, the advantages of being durable And good resistance to continuous use.

In general, the design form and the material used have largely achieved the functional performance, which is the purpose for which it was designed, aesthetic and use, in addition to the characteristic of sustainability.

The design treatments of the model and the good organization of the relationships achieved between the elements of the form achieved a fit in terms of proportional to the size of its constituent elements.

The design treatments for texture also achieved the character of diversity for sustainable materials (soft for polyester) (coarse for wool) and added an additional feature to the model.

The color was treated in terms of staying away from loud and luminous colors that distract attention and disturb the eye, in addition to the harm of artificial colors to health and the environment, so these degrees of colors must be avoided in the design of sustainable products.

View results

research results:

1- The analyzed model is designed and made of two materials, which are recycled polyester, and from recycled wool felt, and these recycled materials are the most choices in the manufacture of sustainable products, as these raw materials do not require a manufacturing industry to produce them.

- 2- The design and raw treatments used in designing the model, have achieved to a large extent the functional performance, which is the purpose for which it was designed, aesthetic and use, in addition to the characteristic of sustainability.
- 3- The texture design treatments achieved the diversity characteristic of sustainable materials (soft for polyester) (rough for wool) and added an additional feature to the model.
- 4- The color has been treated in terms of staying away from luminous colors, which distract attention and disturb the eye, in addition to the harm of artificial colors on health and the environment.

Conclusions:

- 1- The twentieth century was characterized by a diversity of trends in the field of design, which is in dire need of difference and continuous change, which is a natural feature of development and creativity to reach the best solutions and design treatments.
- 2- Sustainability is an integrated system that depends on new measures of human achievements in their diversity (industrial, economic, social,...etc).
- 3- The interest of global industrial companies has increased in designing and producing sustainable products and green products, because, the sustainability feature will increase the value of their brand.
- 4- The world looks forward to adopting a healthy integrated ecosystem in the design of industrial products, which places a high value on human life, and the preservation of natural resources and energy consumed.
- 5- Sustainable industrial design is to work within the basic principles of design and within the design principles and treatments, and within the design considerations for the function and objective of the industrial product, but within an integrated system that is intertwined and compatible with nature within the sustainability approach, which takes into account the integration of considerations and systems related to sustainability and environmental requirements.

Recommendations:

- 1- Dealing with the multiple vocabulary in design, and trying to treat and integrate it through the idea first, and adopt the correct and studied design treatments, which are the basis on which the design processes are based to meet the advanced human needs, for industrial products that make human life better and easier, and also considered environmentally friendly.

2- Sustainable products are among the most important contemporary products that embody environmental awareness by both the designer and the consumer and the importance of the environment and natural resources through the product.

Suggestions: the aesthetic of sustainable materials in the design of a sustainable industrial product.

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