

The role of advanced materials in industrial product design in view of The Disruptive Technology

Assist. Prof. Dr. Ahmed Kamal Ali

**Assistant Professor, at industrial design dpt, faculty of applied arts- Helwan University-
Head of Product Design Department - faculty of applied arts- 6th of October University**

draka1974@gmail.com

Abstract

Experts participating in the World Government Summit 2017, stated that new waves of technology will continue to change every aspect of our lives, gradually becoming the dominant standard in the twenty-first century and beyond. They stressed the need for governments to make the most of these waves, and that disruptive technology) can accelerate any country's transition towards new paths of growth and prosperity.

Disruptive technology is used to describe innovations that design and improve a product or service in ways that neither the market nor consumers expect, but which are highly attractive to both.

Industrial design is not far from this accelerating explosion of knowledge in what modern sciences and advanced technologies have created in various fields, which in turn led to changing consumer purchasing habits, so the consumer always needs to replace the product and acquire the latest technology from it without a productive exit from the market or the end of its lifespan, but because the product The new one works with new and different technological techniques and carries new formal efficiencies and new engineering and use functions resulting from the use of advanced materials that are completely different from traditional materials.

Advanced materials are materials with advanced properties in terms of physical, chemical, mechanical, thermal and metallurgical thanks to nanotechnology, where scientists were able to develop and discover a range of methods for the production of materials with distinctive characteristics such as shape memory alloys, liquid metal, structural colors

The research believes that the industrial designer must identify these advanced materials and study their characteristics, advantages, strengths and weaknesses so that he can use them in creating his designs for the industrial product and provide new functional, usable and formal solutions that are unfamiliar to the products.

Keywords:

disruptive technology - advanced materials - industrial design

Introduction:-

Peoples advance and civilizations are built on strong foundations of science with roots in research and experience stemming from a mutual interaction between the natural environment and human needs. We may be in a stage of human development where the science fiction of the twentieth century has become the reality of the twenty-first century. There is no industrial renaissance without technology being one of its leading foundations. Huge facilities and large production projects are only indications of the progress of technological sciences. Therefore,

technology is considered one of the basic pillars of the renaissance of industrial products. In various branches, and in recent times, beginning from the twenty-first century and beyond, disruptive technology has gradually replaced traditional technology in various fields, which has contributed to increasing the volume of production, creating new markets, and increasing the fierce competition between industrial organizations, which are always constantly searching for New technologies to develop their products to be able to compete in these markets, otherwise they will be doomed to collapse, disappear and disappear from the markets. One of the forms of replacement technology that can be relied upon in designing the product and giving it new formal features and functional characteristics that are distinctive and competitive in the markets is advanced materials resulting from scientific research. Raw materials: Engineering raw materials research has become of a high degree of importance. The technological revolution in the field of product design is a direct result of the progress of applied research in the field of engineering raw materials, as scientists and researchers have been able to access raw materials that meet every development and every new thing to achieve the requirements and needs of the consumer and the markets.

With the advent of nanotechnology, there has been a huge breakthrough in the science of engineering materials, which has resulted in advanced industrial materials that have advanced properties and features in terms of physical, chemical, mechanical, thermal, and metallurgical aspects that enable them to self-heal, self-clean, shape memory alloys, liquid metal, and structural colors. Which helped designers to constantly develop and update their products New advanced industrial materials are often a source of inspiration for designing a new product. The optimal choice of materials at the beginning of the design process is considered the starting point for solving many problems related to product functions, product performance and use, and building the shape of the product, which plays an important role in conveying a message to the consumer that creates an impression that he may like the product. Or repulsed by it.

Research problem :-

- The lack of knowledge among design practitioners and students about advanced materials and their properties, capabilities, and uses in current and future applications, and the consequences of not using these materials in designing products despite the positives they can achieve.
- The restrictions imposed by the capabilities of current raw materials on the creative imagination of the designer, as well as on the functional performance of the products, and from here the importance of the need for new raw materials with different properties emerges.
- Design practitioners and students often choose the materials used in implementing the designed product at a late stage after completing the selection of the design idea, but with the emergence of advanced materials, the situation has changed and it has become necessary for them to choose the material before developing the design idea because these materials have amazing capabilities that make the design The new product is completely different in terms of function and form from the traditional product

Research objective:-

Shedding light on advanced materials in terms of concept, properties, types, and current and future uses, while mentioning some applied examples of how to benefit from these materials in

designing innovative products (functionally - formally) that are completely different from the current traditional products.

Search hypothesis:-

The research assumes that the designer's use of advanced materials in industrial product design improves the functional and usable performance of the product and allows the product designer to create new formal formulations that satisfy the designer's imagination, satisfy the user's desires, and attract him to it.

- **Disruptive technology** is technology that leads to changes in products or services to become easier to use and more efficient compared to products or services already existing in the market.
- **Advanced Materials** is a group of materials designed to have a set of distinctive properties such as strength, weight, conductivity and distinct functions
- **Industrial design** is a creative activity that aims to create formal and functional characteristics of products, services, and systems to serve humans, taking into account several factors such as safety, economics, manufacturing, and the environment...etc.

Results

- 1- Advanced materials make the user feel sensory pleasure while using the product and that the product's performance of its function is a beautiful thing that always attracts him to use the product. The industrial designer demonstrated the beauty and power of technology and made it felt and perceived.
- 2- Displacement technology will inevitably replace traditional technology.
- 3- Design is in a constant race with technological development in general, and since the rate of this development is very fast, the designer must quickly keep pace with this development.
- 4- The tremendous development in the field of product design during the past period was in fact a direct result of the progress of applied research in the field of engineering materials.
- 5- Each material has characteristics that determine its areas of use and the selection of appropriate operating methods for it. The designer must know these characteristics so that he can employ them well in designing products.
- 6- The process of selecting the materials used in designing products directly affects the quality of the functional performance of those products and the limits of their formal formulations.
- 7- There are two properties that are the most important features of shape memory alloys and on which most applications of these alloys depend: they are: the shape memory effect and superior flexibility.
- 8- The process of reversible change in the crystal structure of shape memory alloys between the martensite and austenite phases under the influence of heat or pressure is the reason for the ability of these alloys to restore their original shape and superior flexibility.
- 9- Regarding the super-elastic property of shape memory alloys, if the end temperature of the austenite (Af) is below the temperature of the surrounding environment, we will obtain a flexible alloy that acts like a spring, and this alloy is currently used in making flexible metal frames for eyeglasses.

10- The military and medical fields are among the most applied fields for advanced materials, but scientists expect them to replace traditional raw materials in the products of the present and the future, without exception, due to their distinctive properties and commercial availability.

11- The liquid metal is a candidate for use in an infinite number of applications, from the manufacture of watches, golf clubs and electronic device bodies to applications in industry, medicine and defense.

12- The necessity of providing design students with knowledge about the importance of using advanced materials in design and asking them to include them as an input into the design process.

Recommendations

1 - Emphasizing the importance of the pivotal role of materials (especially new ones) in product design.

It directly links the quality of the functional performance of these products and the limits of their formal formulations

The properties of these raw materials

2- The need for designers to keep pace with the tremendous technological development in advanced materials, and try

Benefiting from the outcomes of this development in designing products that are advanced in form and function.

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