

Disruptive technology and its role in product development: the entrance to renewable energy

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Research Summary

A disruptive technology is one that displaces an established technology and shakes up the industry or a ground-breaking product that creates a completely new industry. Harvard Business School professor Clayton M. Christensen coined the term disruptive technology. In his 1997 best-selling book, "The Innovator's Dilemma," Christensen separates new technology into two categories: sustaining and disruptive. Sustaining technology relies on incremental improvements to an already established technology. Disruptive technology lacks refinement, often has performance problems because it is new, appeals to a limited audience and may not yet have a proven practical application. (Such was the case with Alexander Graham Bell's "electrical speech machine (which we now call the telephone).

In general, energy considered as one of the most important inputs to the design process and one component of the product in everything you do during the operations of products, parts, components, or method of use, and your energy source is determined within the product design at an early stage of the design process. Because determining the energy source is one of the important aspects of the design stage and that is at all stages of the product life cycle, the energy source is related to the product throughout its life-time use period, so the type of energy to do to operate the product must be determined. As the interest in energy sources has increased with the multiplicity of products that are powered by electricity or energy, such as "planes - cars - mobile phones" not only this but to find alternatives to energy to operate the product and find innovative solutions in the use of renewable energies during the early design stages.

The research problem is the process of replacing the old and currently used energy sources with energy sources that radically replace the products and their functional performance in several aspects that will be dealt with in detail, for example, not all types of renewable energy are fit as one of the energy inputs in the product design process in view of each of these conditions and needs. The best types of renewable energies in sustainable product design are solar energy, human energy, and fuel cells, and they are always looking for reason. To increase the production capacity of those energies such as solar cells, generation is energy to run a car that needs a large number of cells and what is difficult for the industrial designer to maintain building the shape of the product on the aesthetic value, they always develop the productive capacity of cells to reduce the exposed surfaces of the sun and this will make it much easier. The industrial designer

takes into account building the shape in an easier way as you are also looking at producing flexible solar cells, but in the reliability there are many types of energy that the product can rely on to generate its own energy.

Research aims:

The research aims to emphasize the importance of substitution technology in industrial design and its role in developing products and making use of substitution technology in improving job performance and improving the shape of industrial products and emphasizing the use of renewable energy as it adds new jobs to some products which gives them better marketing opportunities in addition to enriching the technology knowledge of the industrial designer.

Research imposition:

As it was possible to develop guidelines for the industrial designer within the framework of current technology and the process of replacing traditional energy sources for selecting the renewable energy source in accordance with the product design criteria "functional - aesthetic - engineering - use", this affects the design through two directions, the first of which is the industrial designer as he/she must realize the added value of using renewable energy in the design process, and on the other hand, develop scenarios to build shape that are consistent with the conditions of that energy.

Research Methodology:

Research used the deductive method to study the problem and achieve the research hypotheses.

The first axis: Renewable energy as one of the types of substitution technology

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Here are a few examples of disruptive technologies:

The personal computer (PC) displaced the typewriter and forever changed the way we work and communicate.

The Windows operating system's combination of affordability and a user-friendly interface was instrumental in the rapid development of the personal computing industry in the 1990s. Personal computing disrupted the television industry, as well as a great number of other activities.

Email transformed the way we are communicating, largely displacing letter-writing and disrupting the postal and greeting card industries.

Cell phones made it possible for people to call each other anywhere and disrupted the telecom industry.

The laptop computer and mobile computing made a mobile workforce possible and made it possible for people to connect to corporate networks and collaborate from anywhere. In many organizations, laptops replaced desktops.

Smartphones largely replaced cell phones and PDAs and, because of the available apps, also disrupted: pocket cameras, MP3 players, calculators and GPS devices, among many other possibilities. For some mobile users, smartphones often replace laptops, others prefer tablets. Cloud computing has been a hugely disruptive technology in the world business, displacing many resources that would conventionally have been located in-houses or provided as a traditionally hosted service.

Social networking has had a major impact on the way we communicate and -- especially for personal use – it has disrupted telephone, email, instant messaging and event planning.

In his book, Christensen points out that large corporations are designed to work with sustaining technologies. They excel at knowing their market, staying close to their customers, and having a mechanism in place to develop existing technology. Conversely, they have trouble capitalizing on the potential efficiencies, cost-savings, or new marketing opportunities created by low-margin disruptive technologies. Using real-world examples to illustrate his point, Christensen demonstrates how it is not unusual for a big corporation to dismiss the value of a disruptive technology because it does not reinforce current company goals, only to be blindsided as the technology matures, gains a larger audience and market share and threatens the status quo.

In 1997, the term "technology of substitution" appeared for the first time through the book "The Innovator's Dilemma" by Clayton Christensen.

In 1992, Cristiano Antonelli, Pascal Petit and Gabriel Tahar shed light on Schumpeter's insistence in his work on the importance of the role of men.

In 1982 AD, Dosi presented a set of concepts for the technology model and its different paths in an attempt to explain the continuous and intermittent technological changes.

In 1976, Cooper and Schendel shifted the path in the opposite direction in their analysis of major technological innovations from the viewpoint of operating companies that were created and threatened by such devices.

In 1972, Myers and Marquis presented Project Sappho, which was the first large study on the comparison of successful and unsuccessful innovations.

In 1939, the scientist Joseph Schumpeter considered innovation to be a means of building or destroying entire organizations or industries.

Figure (1) the evolution of the definition of current technology

The second axis: the role of renewable energy in product development:

New and renewable energies can be used either directly or indirectly, as the indirect method is by replacing the power source from the power stations with a solar energy source installed at the top of the homes, and the home appliances are fed with electricity from solar panels directly, while the energy storage units are added necessary to operate the devices at night.

There are also products that can supply the source of energy directly, such as vehicles powered by solar energy or fuel cells, such as mobile phone chargers that operate using human kinetic energy, and like products that depend on themselves to find their energy, in this case the way to use energy is direct.

The energy source or the way it is stored affect the shape of the product from its many aspects. The elements of building the shape are (the line, the shape, the direction, the size, the texture, the color and the color value) so if we discussed the changes on the line then it is certain that a change will occur in the product lines and their direction. Each type of new and renewable energies has its own nature that imposes on the product certain lines such as solar energy.

Solar power lines are straight lines due to the non-forming solar panels, which leaves no room for the industrial designer to make curved lines in the design and even if there are curved lines It will be like segment, a group of broken straight lines.

As for Luigi Kolas, nature is the origin of everything even the design so that he depends on nature for his product design, and there are those who take the product design theory from the inside out to achieve the Argentine rules such as Henry Dreyfus, those different theories in product design are only different schools to manage and arrange the design steps according to the importance, there are those who take the aesthetic factor and some of them take the job and some of them take the ergonomic side and always overlook the other, but there are always four basic considerations for the design and construction of the product (they are ergonomics, the job, the overall, the economic side) and there are other considerations that affect the shape of the product like the energy source, is it an external source or an internal source? or is the product dependent on itself in generating the energy needed for it like the environment? because, accordingly, the energy source will affect the aesthetic form and on the economic side and on the job performance a human powered bag and the presence of tires to divert the movement of the bag to electrical energy, which affected the shape in the direction of the designer to use the circular lines and parts of the circle in the design so that the design is harmonious and consistent with each other as it is the result of an energy source and a source of energy storage, the bag size was affected and increased in the direction. The longitudinal direction and the usage side were affected to increase the tasks of the bag instead of carrying the purposes, so it became a source of energy for charging mobile phones, electrical devices and economic value. Of course, it was affected by an increase in the costs of manufacturing the bag, due to the presence of a functional multiplicity of the bag, but because of the functional multiplicity of the bag, the economic value increased but the multiplicity of the job equals the economic increase.

Applications for renewable energy products:

A - Vehicle design:

Lightyear One (Figure 2) (inhabitat.com) represents a new breakthrough in the world of the car, because it combined elegant design and good functionality as it is completely covered by solar cells and initial samples were made from the car until it is put on the market in 2021 and thus

to be the first car that relies on solar cells to operate it, in addition to maintaining the aesthetic values of the car product, whether from the inside or from the outside, the car will be charged throughout the day to work at night using the electric charge produced throughout the day, and the car has designed an experienced team in the field of design Cell Vehicles Solar Car were equipped with solar cells with an area of 5 meters square, the area is enough to charge the car every hour, also it is enough to walk 12 kilometers as well as being a source of energy, the car was launched in 2021 at a cost of 135,000 US dollars.



Figure (1) car with solar energy

Aesthetic value: The solar cells did not affect the elegant appearance of the car in addition to the additional features that made it possible for it.

Engineering value: There is no impact on the engineering aspects of the boat compared to other cars.

Functional value: We can agree that the performance of the car in shipping has improved completely.

Usage value: The car maintained a good design and is comfortable for the user from the inside with an increase in the characteristics of the car, which allowed him to use value similar to the regular cars.

B – Bikes design:

Hydrogen powered bike (3) (climatenetwork.net) Description of the bike: Electric bike with hydrogen fuel cell of 250 watt hydrogen storage cylinder in solid state with a storage capacity of 900 Sl at 12 bar maximum speed up to 100 km / h at a cost of about 2600 USD .



Figure (1) bike with Hydrogen power

Aesthetic value: The product does not differ much in shape from the regular bicycle, which may facilitate its spread soon.

Engineering value: By virtue of the simple design of the product, changing the power source did not significantly affect the bike's structure taking into account the small size of the cylinders, which gives it the advantage of speed with the absence of obstacles to reach a speed of 100 km / h.

Functional value: The addition of the hydrogen cell had a positive impact on the bike's performance in terms of speed and light weight compared to those with petrol engines.

Usage value: Because its general shape has not changed compared to its counterparts, its usage value has hardly changed.

Research results:

- The industrial designer must define the energy source as one of the design elements in the idea stage.
- The industrial designer should be aware of the types and sources of renewable energies, as they are one of the main elements of design, as renewable energy gives the product a high competitive value.
- The need to emphasize the communication between the industrial designer and technology developers to become familiar with the new technology.
- Knowing and determining the change in the cost of the product when using renewable energy as one type of substitution technology.
- Emphasis on incorporating renewable energies and employing them in the product has helped preserve the environment.
- The need to integrate and employ renewable energies with the product gave it added competitive advantages and increased its ability to compete with similar products in the market as well as its ability to attract large, diverse and new sectors of consumers.
- Employment and the introduction of renewable energies and the stages of design process led to a better understanding of customer needs and the environment with the ability to identify development and modernization product points accurately and bring innovation and creativity and accuracy and speed on the process which led to the arrival of a product that meets the desires of the user and is able to compete markets in a short time.
- Employing renewable energies and the stages of design process has increased the value of the interactive process within design next to it provided a range of information and innovative aspects of the designer to find what suit him/her of tools and capabilities that can strengthened the ability to develop, update and modify ideas with ease.

Conclusion:

Current technology leads to changes in either products or services to make it easier to use and more efficient compared to the products or services already in the market and this is one of the design requirements that the industrial designer must take into account in order to add new values to the products that facilitate the user to use and increase his buying desire and energy source, especially renewable sources, which is an important element of substitution technology in order to provide energy and this is an important economic requirement for the user in addition to more ease of use and adding new value in design and the emergence of new functions for

products such as T M bags equipped with solar energy in order to charge mobile phones, certainly the most recent technology in addition to adding value to the design. The study analyzed the importance of renewable energy in designing products of a kinetic nature in order to add new values to the product economic values and usage values and find new jobs for the product to become a multi-functional product that is in turn increasing Purchasing desire of the user due to the development of the performance of the products.

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