The impact of Internet of things technology on aspects of product design

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Abstract

The past few years have witnessed a surge in technological development in all areas of life and its emergence has led to significant changes in human life from being primitive to controllable through the Internet, each new technology has an impact on the complete change of societies which led to many changes in concepts and practices. One of the most widespread types of technology that influence products of all kinds, which is one of the applications of the fourth industrial revolution, is IOT. It's all connected by communicating and sharing information and by communicating Internet to make all products able to communicate with each other, through four main pillars: (Things - People Users - Connectivity Connection - Data Processing), and therefore it erases the line between the digital and physical world, through IOT the world will become as a smart product in all its aspects, will also be able to make some decisions and this is the result of data stored on its cloud. There are many products that use the IOT concept and are no longer limited to smart cities and smart homes, but also include wearable devices, health care applications, transportation, education, smart retail stores, and mobility. IOT has become a key focus in the product design process and an important factor in bringing about developments at the level of product shape and function and the user aspect that adapts to the needs of the user, and under these changes it became important for the designer to take into account this technology and the extent of its impact on the life cycle of the product and on the process of designing and developing the product.

Key words

Internet of Things IOT, Smart Cities, Smart Homes, Wearable Devices, Health Care application.

Research Problem

The problem with the research is to clarify the concept of IOT technology and provide the knowledge needed to make use of it and apply it in product design.

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Research Aim

The research aims to shed light on the impact of IoT technology on products.

Research hypotheses

The research imposes providing the necessary knowledge of Internet of Things technology to enable the designer to find appropriate designs and solutions to keep pace with the technological development of Internet of Things applications in product design.

The importance of the research

The importance of the research is to clarify the effective role of the application of IoT technology and to reach the highest level in product design and to achieve the maximum efficiency of product performance.

Research methodology

The research follows in this study the method of insatiation.

Introduction

These changes in technology that have emerged in the past years have led to significant changes in human life from being primitive to controllable through the Internet, due to rapid and continuous technological developments, since human beings have been living on earth, they are trying to find ways to adapt to life requirements at the level of daily interaction, and development of products was only a living proof of the diversity of human needs as a result of human change at the individual and social levels. Every new technology has an impact, and there are technologies that will have an impact on the complete change of societies that lead to many changes in concepts and practices, including the processes of using products and receiving services, where previously the user-product communication was made by direct friction, and then it came to remote control of products in the same user environment, until it came to controlling products through the Internet without adhering to the location of the product which is known as internet of things technology (IOT), through the use of sensors and Actuators to transfer data to provide new service and improve product efficiency, and the use of Internet of Things technology until everything in the world has the ability to communicate, and therefore erases the line between the digital and physical world.

First: Product design

Product design concept

Product design is defined as the process of finding an idea for the production of a product, developing, testing and manufacturing this product. The design process itself is repetitive, in which steps are repeated each time to improve product design every time the design is redesigned. Prototypes are called designs that are produced for the product during the design process before getting the finished product. In the industrial field there is a great similarity between product design and industrial design, but product design is more generally used than industrial design because the product does not have to be an industrial product but can go beyond that to include services.

Second: Aspects of product design

1. Functional considerations
2. Usage considerations
3. Aesthetic considerations
4. Economic considerations
5. Environmental considerations

Third: The Internet of Things

1. Internet of things technology concept

Internet of things technology allows access to communication networks, allowing those things to send and receive data. As it is equipped with appropriate sensors, it can be contacted and controlled through the communication network according to specific protocols, to accomplish certain tasks, whether programmed to do so or in the event of a danger that forces it to decision making, the communication process takes place through the main elements of the Internet of Things.

2. The main elements of the Internet of Things

The Internet of Things technology revolves around three main axes. The first of these axes are things (products), which either contain sensors or devices that connect to the Internet, the second axis is the user himself, and the data represents the third axis, and that process becomes the basis of Internet of things technology. Figure (1)

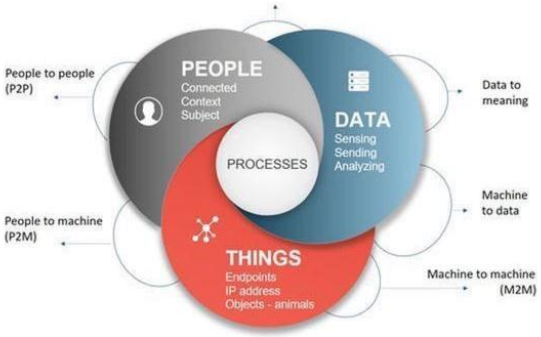

Figure (1) shows the elements of the Internet of Things

3. Defining IoT Products

They are consumer products in which IoT technology is integrated, enabling them to connect to the Internet, network discrimination, and processability through sensors and data processing technology. These products have the ability to perform the function specified for them until they reach the end user. It may be referred to in the market as Smart Connected Product.

4. Characteristics of IoT products

1. Identification
2. Actual localization
3. Sensing
4. Wireless Actuation
5. Data processing

In 2014, Chang et al. classified the characteristics of IoT products under three groups (Communication - Awareness (Perception) - Intelligence) Figure (2)

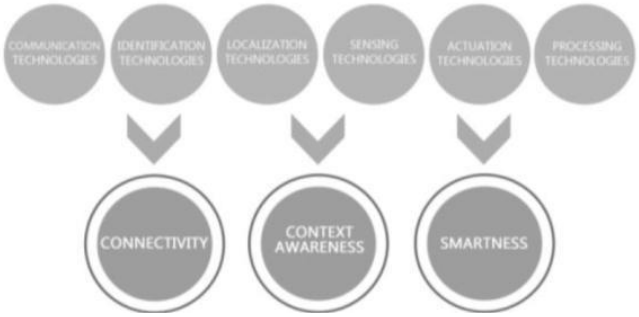

Figure (2) Classify the characteristics of IoT products under three groups

5. IoT applications in different fields

1. Smart home applications

The user can control all the products inside the smart home, even if the user is outside the house, because of his/her connection to the Internet, the user can control the products by (screen - keyboard - touch - sound - movement), whether the control is through applications on the phone or WIFI of wireless network, through smart home applications, control and monitoring are achieved. They interact with the user and inform him of any changes that occur by sending an SMS text message or sending notifications and reminders to the phone through the applications for the products. Figure (3)

Figure (3) smart home applications

2. Health care applications

The Internet of Things was not used in healthcare until after the development of wearable devices. Advances in wearable technologies are expected to lead a paradigm shift in the health sector. The most important contribution of wearable technologies to the health sector, as it enables continuous monitoring of the patient's health status and the collection of realistic information about the patient. Thus clinicians can monitor heart rate, blood pressure, fever and other health indicators at every location and time independently while patients perform their daily routine activities. Wearable technologies can be used to diagnose and treat many diseases. Wearable technologies can be used in (telehealth, telemedicine, telecare, and e-health) Figure (4).

Figure (4) Conducting patient assessments through wearable health technology

Fourth: Results and Recommendation

1. Results

1. Highlight the relationship between IoT technology and its product applications.
2. Reveal a relationship between the physical and digital world, and increase the interactive value of the product after the interaction between the product and the user has been limited.

2. Recommendation

1. The research recommends that the concept of IoT technology be included in product design courses.
2. Take care of the applications of IoT technology and follow up on everything that is new and its impact on the design and development of different products.
3. Industrial organizations in Egypt should be interested in taking advantage of IoT applications in developing their products to compete with similar products in local and international markets.

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