

The role of industrial design and engineering design as approaches to the product design

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Research problem:

- What is the role of both engineering and industrial design in the product design process and why are they confusing?
- How important are the design entries that emerged as a result of the role of engineering and industrial design in product design?

Research aim:

Reach the relationship between the industrial design and engineering design in the process of product design and its impact upon the product's features.

Research Methodology:

Descriptive analytical methodology.

Keywords:

Industrial Design, Engineering Design, Product Design.

Introduction:

The term "product design" is mentioned when exposure to everything related to product development, for example we find in engineering design books, which are mostly aimed at explaining engineering design that they must be exposed to product design so that it is often called the practitioners of this type of design "product designers")Park, H./2008(

Product development is also defined as "product design", as the meaning of the word product and its concept differ from science to science. For example, we find in engineering products that they contain two parts of the components, including the industrial part and the mechanical part, but these two parts may not be considered essential. In other products, on the other hand, the science of industrial design is that everything that is produced in the hands of man is a product, but this factor is not significant in engineering design science and the reason for this confusion is that the design of the product contains the basics and overlapping entrances, but all these entrances are aiming at one goal which is to develop a new product.

From this point, the science of product design must be studied as a multi-disciplinary science or subject rather than a single science, whatever the type of design, and since each design entry has its own nature, there can also be several ways to design a single product according to the different conditions of each process, for example:

The different types of products that are under the control of the market, and in this we refer to this as the term "design approach.

The researcher can also find a reciprocal relationship between design entrances and different types of products in order to discover which type of design entrances can be achieved and why this entry was used by reviewing the rules, basics and features of different design entrances. When examining this topic, the researcher found the importance of it. It is necessary to define the product design in general and its close relationship to the design behavior of "Design Disciplines". Considering that both engineering design and industrial design are the two main activities in product design, multiple factors must be compared to what they contain in terms, features, and products that are covered in these terms, and their role in product design and build this comparison on the basis of the current product design process and that through exposure to two inputs

- Inside Out Approach,

- Outside in Approach

The term product design causes some confusion in the same way as the term "design" in general. When we talk about product design in one way or another, we will often talk about an engineering and industrial design product for a product where both are applied when designing a product. In many cases it may mean the term "product design" is engineering design (Haik, P146,2003) and in other cases it is treated as the subject of industrial design. The design of the product is known as "the process of creating and preparing the projections and lines necessary to manufacture the product".

On the other hand, it is a science that falls between industrial design and engineering design, whereas these two types of design go into product design, and in this logic industrial design and engineering design become intertwined with product design to a large extent, however industrial design science or engineering design, either one of them cannot fully describe the product design process (Horváth, I./2009).

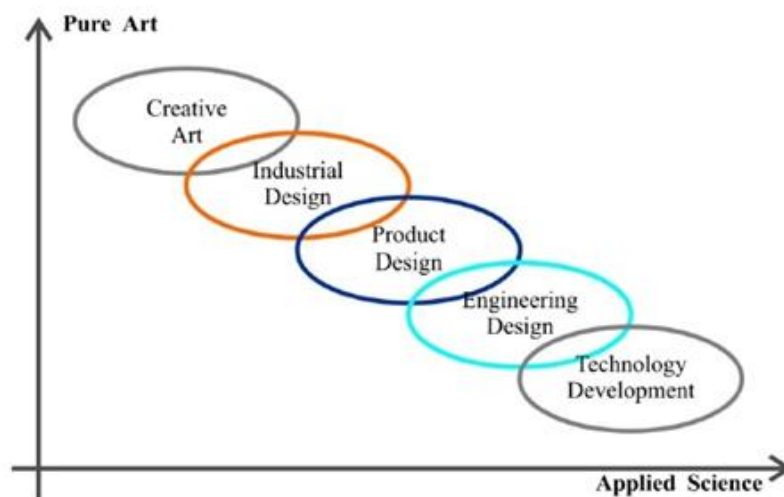


Figure 1. Position of Product design (by Horváth 2004)

From another perspective, product design is not considered an isolated or separate process, but it is an integral part of the product development process, as some design scientists use the term "product design" to refer to "product development" as many different principles and sciences are included in this design. The author states that the primary team for product development is the industrial, engineering, electronic design team, marketing specialists, manufacturing engineers and all the way up to the distribution official (Ulirich & Eppinger, 2008, P66).

Two types of products in product design science:

Historically, engineering design is referred to as product design, and both were also referred to as “mechanical design” (Haik, 2003, P175). In light of this perspective, engineering design is defined as “the process by which the need meets the solution that is to convert it into an actual product” (Lindebeck, 1995, P22). In this process, a system, elements or process is created that overturns this need. Also, that process has controls, limitations, and a proportional mechanical or even mathematical system shape. A standard model that shows engineering design characteristics is the “method of arranging and classifying the quality of job performance”. (Quality Function Deployment Method “QFD”) Which results in transforming the consumer's need for engineering value into the "Axiomatic Theory" product. Which means converting consumer needs into functional requirements and design factors.

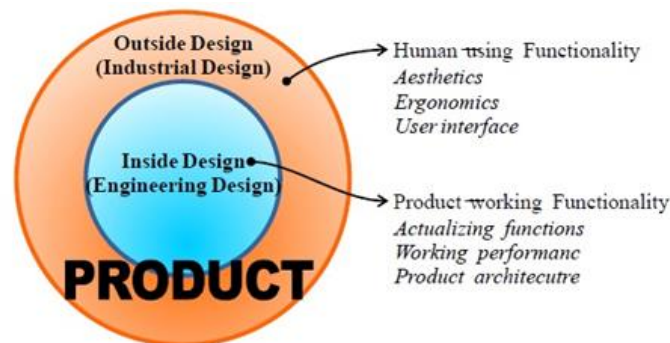


Figure 3. Industrial design and Engineering design in Product design

Product design process

There are many models of product design, including what is industrial, and what is engineering and other different areas of design, but in all these cases, the design is defined as "the process of solving a skin problem" so we find that in all design attributes there are common factors and these factors are the starting point that ends with solutions that have a close relationship to the problem. The problem is turned into a solution through the design process and through a specific system. For example, the engineering designer calculates the effort to build security. As for the industrial designer, he combines many different images to study the user's taste and product model. The following figure shows one of the easiest and simplest model of The design process that has been repeated steps, and this process is carried out by the designer from public to private, i.e. from lines or drawings.

The way the product is handled and transferred to the manufacturing team is also defined. Phal, G. / 1997 / P45)) As for the product development process, it is part of the industrial design process and has six stages.

- 1- Investigation of customer needs.
- 2- Formulization.
- 3- Preliminary refinement.
- 4- Purification to choose further refinement and final concept selection.
- 5- Control Models or drawings.
- 6- Coordination with engineering manufacturing.

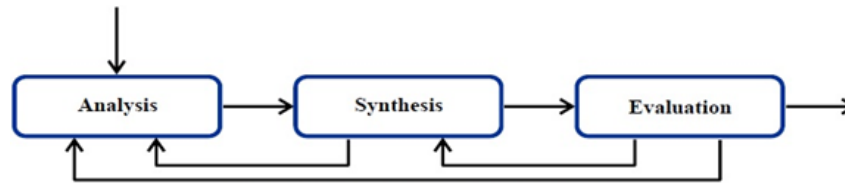


Figure 4. Design process model by Lawson

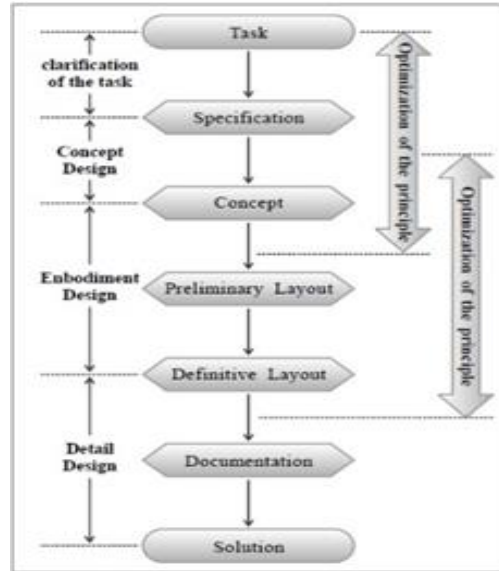


Figure 5. Engineering design process by Phal & Beitz

Inside out approach

In this, the design of the internal parts of the product is determined before the body or its external appearance, with the aim of reducing errors that result from the consumer interaction with the product, and to clarify that we will take the same example and how to apply the two entrances to it, using the development of cars as an example, the change that occurs on the motor affects the car.

The modified engine may affect the properties of the entire car, such as vibration, noise, etc. It could therefore be reported by Toyota that Toyota does not focus on completing the rapid process of exterior designs in the isolation of engineering and mechanical designers, this is because it is looking for how the external design inside the mechanical system interacts in the pre-design stage is completed, that is, it focuses on the compatibility of the entire mechanical system before the design is completed.

Outside-In Approach:

In this way, the external parts or the external body of the product are designed before the internal part of it, and these two terms have been used by design scientists Deryfuss and Lorenz to explain the role of the industrial designer and his work, and they insisted on using a term from the inside to confirm the necessity of defining the external appearance of the product after the internal parts are determined. This entrance has become one of the traditional entrances to industrial design, in which the interior components are given to industrial designers who will rotate them to complete the external appearance, and this in a manner consistent with the principle of the form follows the function (Form Follows Function) As a design model on that entrance, the Cleveland Foundation for Art and Design mentions in 2015 the principle or idea

of designing the most famous Cadillac car, which is a model that proves how large companies in their designs are now heading to this entrance because of its significant impact on the aesthetic value of the product, which in turn affects the purchasing value in the market even in the most complex mechanical and engineering products, such as cars, and in the following figure is a sample of the initial fees announced by the company, which shows how the design team began to put the perceptions of the car's external appearance in complete isolation from the internal parts of it (Net2)

- Results:

We can say that the product design is a product of two branches of engineering design and industrial design, and the engineering design is often referred to, in some products, as mechanical design, and engineering design in product design is the part responsible for interior design or interior parts of the product and results in the initial design Layout Design. As for the industrial design, it is the part responsible for designing the external appearance of the product that results in the external body that the user interacts with.

Because these two types of design are the basis and essence of product design, now all companies are keen on cooperating both industrial designers and engineering designers to develop successful products and based on the different product goals, the appropriate type of design is chosen as a design entrance from the inside-out approach and in which the internal parts are dealt with first before the external body or two outside-in approach, in which the external part that the user deals with is planned before the internal parts. Most of the product design processes were designed through an entrance from the inside to the outside, but recently some companies have demonstrated that using an entrance from the outside to the interior leads to great marketing success, which proves that the design entrance has a close relationship to the type of product, which also contributed to the rapid development of technology that contributed to facilitating production and visualization processes, despite the existence of several classifications of the types of products that I think we need to test design entrances on them and reclassify them again.

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