CREATIVE DESIGN: AN INTEGRAL ASPECT OF INNOVATION IN INDUSTRIAL DESIGN AND TECHNOLOGY

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ABSTRACT

Design and Innovation is a twin words which are most discussed when it comes to creativity in highly competitive markets. Nevertheless, the specific contribution of design and designers in the context of product innovation is insufficiently understood and explored. Mostly, innovation is meant to be the achievement of science and technology, while design as the last element in this chain has the task to introduce the scientific and technological innovation into the life-world of the user. The list of needs include hidden needs, needs that customers may not be aware of or problems they simply accept without question, as well as explicit needs, or needs that will most likely be reported by potential purchasers. Researchers develop the necessary information on which to base the performance, size, weight, service life, and other specifications of the product. Customer needs and product specifications are organized into a hierarchical list with a comparative rating value given to each need and specification.

Keywords: Design, Innovation, Technology, Creative design, Product innovation, Customer.

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INTRODUCTION

One definition stated by designer Richard Seymour during the Design Council's Design in Business Week 2002, is 'making things better for people'. A design doesn't have to be new, different or impressive to be successful in the marketplace, as long as it's fulfilling a need, but design methods do lead to innovative products and services (Design council, 2011).

As a design thinker, the problems you are trying to solve are rarely your own—they are those of a particular group of people; in order to design for them, you must gain empathy for who they are and what is important to them. Observing what people do and how they interact with their environment gives you clues about what they think and feel. It also helps you learn about what they need.

By watching people, you can capture physical manifestations of their experiences – what they do and say. This will allow you to infer the intangible meaning of those experiences in order to uncover insights. These insights give you direction to create innovative solutions. The best solutions come out of the best insights into human behaviour. But learning to recognize those insights is harder than you might think. Why? Because our minds automatically filter out a lot of information without us even realising it; we need to learn to see things "with a fresh set of eyes," and empathizing is what gives us those new eyes.

A number of studies have addressed the importance of designing ability. In recognition of the importance of design, many design educators and institutions have built education programs aimed at enhancing students' designing ability. Many students of design persevere in their efforts to refine their designing ability. If they persist, their endeavours may be rewarded with the results they desire. However, we still do not have a clear picture of what constitutes the essence and character of designing ability.

This is a very vague concept, since the word "design" has various meanings. In order to clarify the notion of ability that is associated with design, we try and sort through the vague meanings previously attributed to the term. The above notion of designing ability should encourage efforts toward addressing the current requirements of society.

Design and innovation

Despite the growing interest on the role of design in the innovation context there has been no clear and proper definition of the term design. A classical and often cited definition of design was proposed by

Krippendorff (1989) who states: "The etymology of design goes back to the latin de + signare and means making something, distinguishing it by a sign, giving it significance, designating its relation to other things, owners, users or gods. Walsh (1996) points out that "the term design (as it is used in English) covers a wide range of activities: architecture, fashion design, interior design, graphic design, industrial design and engineering design." Her classification of design is similar to the one of Borja de Mozota (2003) who distinguishes between four types of design, namely environmental design (architecture, fashion and interior), product design (industrial and engineering), package design and graphic design. All these types of design have in common that they require creative visualisation of ideas aiming at the creation of a product which does not exist in the market (Bruce and Cooper 1997). Intrinsically, design has been linked with innovation and is also seen as the core of innovation (Bruce and Cooper 1997, Aubert 1982).

According to the definition of the OECD Frascati Manual (1993) which frames the methodology for collecting and using statistics about R&D in OECD countries, the term R&D covers three activities: basic research, applied research and experimental development. Swann and Birke (2005), Walsh (1996) and also Utterback et al. (2006) argue that design activities overlap with R&D activities and technological innovation. Therefore design activities make an important contribution to the innovation process.

"The effective use of design is fundamental to the creation of innovative products, processes and services. Good design can significantly add value to products, lead to growth in sales and enable both the exploitation of new markets and the consolidation of existing ones" (UK Government White Paper 1995).The intense competition and patent litigation between Apple and Samsung over their phone designs highlight the commercial value of 'good design'.

Innovation researchers have generally focused more attention toward achieving innovations through R&D, the organization of the firm and management capabilities.The value of design to innovation is increasingly gaining both commercial and academic attention. Supported by scholarly textbooks on new product development, wherein the practices of design take centre stage, the strategic value of design in capturing innovation, especially for new products and services, is increasingly recognized. As an indication of this trend, scholars in the fields of innovation and design increasingly cite the concept of design-led,

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design-driven, or design-inspired innovation to highlight the essential link between design and innovation. The term references the practice of design as means to achieve innovation outcomes.

Categories of design

Design can be classified into three categories: drawing, problem solving, and ideal pursuit. We will explain these three categories of design and discuss their capacity to produce a really new product, system, or concept for our society and thinking.

Drawing

Design is widely thought of as the expression of images in the form of pictures or sketches; in other words, it is strongly associated with art or drawing. This is the categorization of the term on the basis of its most popular and generalized use. Although drawing seems to be creative, the drawing process itself cannot create a truly new output, since drawing itself is a process that involves only transforming an abstract image into a concrete figure or shape. Thus, it is creative only in that it entails imagining a nonexistent figure or shape. It's essential creative nature lies in the abstract image from which the figure or shape is derived. In some cases, particularly in the field of art, this process is thought to involve an examination of the past, since the inspiration for an abstract image comes from the designer's memory.

Problem solving

The notion of design comes to the fore when attention is paid to the procedural aspect of designing rather than to its results in the form of sketches and drawings. In this case, the design process is mainly considered within the framework of problem solving. Within this framework, a problem is defined as the difference between the current state and the desired goal. Thus, the process of developing a solution toward the desired goal is synonymous with the design process. However, in many cases, the solution can be found by analyzing the gap between the current state and the design goal. In other words, it can be said that the solution lies hidden in the gap. This discussion suggests that the problem-solving process itself cannot really create a new goal.

Therefore, our next concern is with regard to the question "how do we determine the desired goal?" We can have explicit goals (problems) that need to be achieved, such as finding solutions to natural disasters. Similarly, in a case where we need to meet our customers' requirements, which are clearly spelled out, it is easy to set goals. However, there sometimes exist cases in which the goals are unclear. We will now discuss the latter case.

Ideal pursuit

We can use the term "design" to mean the pursuit of certain ideals; such an explanation would differ in meaning from the other definition of design, i.e., the solving of obvious problems. For example, from a social perspective, designing involves the notion of ideal pursuit. Moreover, the term "ideal pursuit" contains within it the notion of the future. In comparison with the problem-solving category, which is usually used in the context of current problems, ideal pursuit refers to looking ahead at the future.

In this model, we can identify a distinct feature of design as something that is aroused within us and is supported by the requisite criteria of our ideals. It involves the presence of the abstraction process in an ideal environment. Moreover, it recognizes designs that conform to the perspective of the "future" and "something which is meant to be"—that is, something only human beings can predict. The aim of design is not "change," as change simply influences the ultimate form taken by an ideal design.

In order to facilitate design theoretic, we feel that all the above mentioned categories should be included within the definition of the term "design." Therefore, we define design as **the process of forming a desired figure toward the future.** Designers have to ask themselves questions such as: is the product they're creating really wanted? Does it fulfil a need? Will it cost too much to manufacture? Is it safe? Designers learn that ideas that may seem strange are worth exploring and that the 'common-sense' solution is not always the right one.

Good design is essential to good business. It turns new ideas into practical products, environments and services around the changing needs of users. This section describes design in the context of business innovation. Colours that are viewed together and produce pleasing affective responses are considered to be in harmony (Burchett, 2002). In product design, it has been suggested that positive emotion would not only add extra value to a product but can further increase the possibility of a product being purchased (Desmet, Overbeeke, & Tax, 2001). Therefore, when designing products, designers endeavour to establish emotional connections among ideas, products, services and brands (Crossley, 2003). Using harmonic colours is one way to create positive emotional connections.

There is a considerable diversity of positions concerning the relationship between design and innovation. Some authors point out that, with regard to improvement and making human conditions better off, innovation and design share the same goals. They claim that design and innovation are sort of synonymous (German Design Council 1983); design can only be justified by an innovative context.

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Sincemid-1970sGros (1984) from the Academy of Art and Design Offenbach (Germany) developed the so-called theory of product language. In this conceptual model, Gros makes a distinction between the practical functions of a product (and various others such as ergonomical, economical, ecological functions) on the one hand, and communicative aspects, the so-called product language functions on the other hand. Technological innovation was a driving force for more than a century, while in the saturated consumer markets of the 1980s and 1990s the symbolic embodiment of socio-cultural and societal change became an increasingly important factor in the competition for innovation (Cova, 1993).

But what will the future look like? Is innovation, as some assume, infinite? (Petroski, 1992).Innovation is the only one and most effective survival ability for enterprises to face the future. And constant innovation will help trigger the business growth and keep the leading priority in enterprises. More importantly, rapid launch new products into the market place will help enterprises to break bottlenecks, even to turn the defeat into victory, particularly in a time of business recession, (Hsu, 2013). Initiating such a discussion though first requires a definition for the term innovation and this can be simply defined as "the act of introducing something new." (Canadian Dictionary, 1998).

There are various other definitions available however most of these try to introduce some level of qualification such as the introduction of a new product or service to generate profitable economic activity. The use of a qualifier in this instance represents an effort to assign value to the notion of innovation. The qualifier dilutes the definition by imposing a value standard on the term innovation that exists outside of the precise definition of the word. In other words, the phrase to generate profitable economic activity defines the extent of success in a given innovation rather than the nature of the innovation itself. As the focus here is on the essence of innovation, the simplest definition must prevail.

From the definition above, two things are required to accomplish innovation: the existence of something new and a method for introducing it. The question then arises as to what exactly constitutes something new and what constitutes its introduction. In new product development, an executive might view the introduction of something new as the market introduction of a fully designed and developed product. To someone more technically minded innovation might refer to the act of developing the initial product idea, 'introducing it' to its own existence. Or it could refer to the need to redesign a prototyped idea so that it can be easily manufactured.

Often, the point where an individual might draw this delineation is a reflection of their own background and experience. Innovation strategy refers to the idea that an enterprise is able to provide an environment for creativity and innovative condition in which it can offer unique products or services different from other competitors. 'The implementation of a new or significantly improved product (goods or service) or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations' (Oslo Manual, 2005).

The New Idea

A new idea is always an abstract thought which could be difficult to analyze. Sometimes it's spontaneous as it appears out of nowhere. Yet ideas do not just appear, they are a product of human experience and can be examined in this light. Scruton (1979) refers to this experience as an act of imaginative perception. A useful reference for such human experience lies in Scruton's discussion of the aesthetic experience of architecture. This discussion provides a model of a certain type of experience that can inform our understanding on the generation of ideas.

The experience of architecture is described as a potentially pleasurable one that is based upon an act of imagination in the appreciation of a given piece of architecture. Through our senses we may perceive that a building is literally built of red brick, but it is our imagination that allows us to see and understand the overriding forms in their assembly, such as the semi-circular arrangement for the array of stones in an arch. It is the same type of experience that allows someone to see the shape of animals in the clouds or a face in the moon. Exercising our imagination allows us to experience something in a manner beyond what we perceive it to be at a basic or literal level. We know that clouds are made up of water vapour and can never be an animal, but our imagination allows us to experience the clouds in the form of an animal.

Similarly, the ability to see beyond the mere assemblage of bricks or concrete and to fully experience the formal composition in architecture requires the exercise of our own imagination. An interesting aspect of Scruton's discussion is the ability of architecture to command our attention for this imaginative perception

Considered Idea

The value of idea within the framework of design and innovation cannot be overemphasised. For instance the background, the knowledge and the experience of the individual will impact on his or her ability to imaginatively consider a given topic. In

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order to see the shape of a horse in the clouds one must be equipped with the knowledge of what a horse actually looks like. A large personal library of experience and knowledge can be used to a great extend in the imaginative consideration of any given topic which in turn can influence the eventual quality of an idea. The potential ability and indeed willingness to contemplate a subject in a variety of ways is an asset in the creation of new ideas.

One's willingness to openly consider a given topic is indicative of another issue in the way ideas are created. One's imaginative consideration of any topic is tempered to some degree by what psychologists refer to as conceptual space. This refers to the overriding theories, rules, paradigms and grammars that govern how an individual might consider a given concept. "The dimensions of a conceptual space are the organizing principles that unify and give structure to a given domain of thinking" (Boden, 1994). Such principles are useful in terms of communication in that they allow for a common currency in the exchange of information, such as the way English grammar gives rules to the way we use and combine words.

However such principles can be problematic in the generation of ideas by limiting the way someone may imaginatively consider a given topic and by controlling the way a given problem or query is defined. For example, in an exercise to develop new types of surgical drapes (material used to isolate sterile fields in surgery), 3M implemented a program of "lead users" (Von, 1999). In this instance people who have experience in doing similar things and using similar technologies but at an advanced level in far fields are assembled in brainstorming sessions to explore the potentialities of the proposed 3M technology. This is very much an effort to enhance the generation of ideas by the targeted assembly of individuals with very specific types of experience and knowledge.

Industrial Design

To fully understand what industrial design is, it is important to know the origins of the industry. Industrial design really got started at the beginning of the twentieth century. Along with growth in technology and the industrialization of the Western world's manufacturing capabilities, came a need for someone to engineer this process. The phrase "industrial design" was first conceived of by the New Zealand based Joseph Claude Sinel in 1919. In the early days of industrial design, the role of the industrial designer was to merge mass-market production techniques with the skills of traditional craftsmanship. The industrial design process is essentially applied to every product that is manufactured and used by consumers. It takes the idea for a new product from the concept stage, through design and refinement to actual production of the final product. The overall aim of industrial design is to basically ensure that a product functions well and does the job required, has an attractive appearance, and is appealing to customers so that it sells.

Technology

The word technology comes from the Greek words techne which means "craft" and logy which means "scientific study of." So technology means the "scientific study of craft." Craft in this case, means any method or invention that allows humans to control or adapt to their environment. What is technology? Simply put, technology is the extension of our human capability, in order to satisfy our needs or wants. Technology involves systems, sometimes very simple ones, and at other times very complex ones, and everything else in between. Systems are human-developed organizations of subsystems and/or components that interact to achieve a goal. Systems use feedback to better achieve their goal(s). Systems are hierarchical; they exist in the context of supra-systems which can also be considered to form the system environment. Systems consist of subsystems and/or components that work together to achieve the system's goal.

Conclusion

Design and innovation is a strategic discipline that can bring about positive and practical changes to our lives. However, this (design and innovation) cannot realise its goal without the infusion of technology into the process. The task of developing outstanding new products is difficult, time-consuming, and costly. People who have never been involved in a development effort are astounded by the amount of time and money that goes into a new product. Great products are not simply designed, but instead they evolve over time through countless hours of research, analysis, design studies, engineering and prototyping efforts, and finally, testing, modifying, and re-testing until the design has been perfected.

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