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An Analogical Exemplification on the Time Oriented Variance of Design and Technology

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Abstract Designers were arised in a period which appreciable change in values were occured, as a result of the need for re-interpreting and understanding the relationship between the human and the world of artificial he created. In spite of the discussions about the terms "communication" and "meaning" that the products accommodate in the early times; the perception of these terms as a design problematic had occured by the motility of technological innovation. The research process indicates peculiar criteria differentiating an accomplished engineering design activity from a device proposed by means of disponibility benchmarks. Particular evidence is exposed, entertaining the time oriented variance of technological innovation and design innovation, which are results of the efforts for modifying the existing structure of human needs and resources. The findings of the study emphasize the important distinction between the linear change of technology and the development model of design process that can be stated as the limited validity of some new technologies.

Keywords Design, Innovation, Technology, Technological Innovation, Design Innovation

1. Introduction

The national level studies that have diffusely transformed into 'science', 'technology development', 'innovation' and 'design' policies beginning from the second half of 20th century, are continuing their evolutions for meeting the constantly changing socio-economic needs of societies. At the present time, the stated performances of many developed countries that have structuralized their prior aims on 'sustainable economical growth' and 'social development'; are being determined by their successes on transforming their traditional economies into design – focused innovation economies.

The non-price factors on products stick out as the determinative agents in industrialized societies, as a result of the industrial developments triggering the development of national scale service sector. "It is not suggested that technology is necessarily the dominant or sole determinant of the nature and structure of society. Nevertheless, it is a powerful influence which itself may be initiated and directed by other forces: Scientific, economic, social, political and legislative; as well as technology itself."[1] Thus through the aim of increasing the national competitive level, innovation process have been completely implemented on national policy structures in almost all countries that have provided continuous success in economical and social means.

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While science and technology factors can be evaluated as important inputs of innovation process, on the other hand, R&D can be introduced as an important activity supporting innovation. "Technological innovation is dependent on research, design and development; and deals with new materials, products or devices (…) new processes, systems and services, or (…) improving substantially those already produced or installed."[2] As for design activity that is more extensive than 'invention' and 'innovation' concepts in this basic structure, can be evaluated as an essential and central factor and a basic competitive agent because of being in close relationship with user needs and increasing the commercial success possibility.

Evaluating the national policy structures of countries that have made competitive advantage and reached their aim of sustainable economic development, it can be deduced that innovation process have penetrated into the overall country policies, especially 'technology', 'trade' and 'education' areas; and had effective role on policy designing structures.

Emergence of a society, development of its common values, formation of its cultural infrastructure, its struggle to define itself, emergence of its written and unwritten legislation through development of its perception of justice, formation of its people's coexistence routines, maturation of social relations. A very old process lived, repeated, experimented again and again throughout history. The concepts that make this process attained to civilization, positioned in progress of mankind and nature are; expression and record. Looking back on our history and our roots, we notice that all the things we've found, solved, deduced are the only ones that were expressed and recorded. Thus we

understand our will of leaving traces that we have from the start of everything made us establish civilizations that are repeated and renewed each time concurrently.

Expression methods that have evolved through our presence make us rise to civilization and enlightenment not consistently but determinedly. To express ourselves, we develop our own methods on several conscious levels. We tend to visualize what we have experienced. With possible visual ways, we express creatures that we can identify. We first acknowledge ourselves, then the environment. We abstract objects by emphasizing visually determinant elements. We assign common meanings to what we have told. We come across with the ones that we are not capable to tell. Nature pushes us to identify what we couldn't identify. When visuals that we used to express objects are not sufficient for concepts, we write. We try to express in a way each period. We compose artifacts. Liberalization motivates us for more expressions.

Somewhere on the way, when we want to express what is beyond ourselves, we need to get out of our individualities. What we tell is a vision beyond us. This vision evolves to a "product" when it is expressed; and the one expressing to a "designer". We can easily tell that the most accepted way taking mankind to civilization is education. That's why societies give importance to visual expression education on this way. They try to strengthen their social connections by common visual expressions. They raise their vital qualities by providing individuals to understand each other more with visual expressions.

When considered semantic contents of "technological change" and "innovation of technology" concepts, it is seen that converting new produced technologies to usage advantages and thus to commercial success plays a determining role on product development process. Since user expectations are shaped independent from the speed of technological development but perception speed and ease of use oriented, affect and responsibilities of product designer and product design should be reviewed and defined with short periods during this process. "Among the value adding elements counted in innovation process, Industrial Design is the only activity that is necessity-oriented and determined by user expectations. Besides necessities, trends and movements, changes in technology also play an important role in the development process of industrial design. Technology consistently changes in relation with time. "It has both positive and negative effects, and it usually has the two at the same time and in virtue of each other. By enlarging the realm of goal choice, or by altering the relative costs associated with different values, technology can induce value change."[3] While propounding different opinions about emergence and development of new technologies, it is commonly agreed that necessities are not prerequisite for this process. When development of design is compared to technological change which follows a linear progressing process, a multi-factorial process which can be defined as "upgrade" and is not directly dependent on time, is came across with. In this process, changes in technology do not affect product design in the same direction and continuity. technology and design show a continuous change as the time passes. However, the time oriented change of these two terms, which is a result of the efforts for modifying the existing structure according to the needs changing by time, shows difference from each other. As a result of the fact that design deals with the cultural assimilation of technology, upgrade in design have to be considered with upgrade in technology. In the evolution process of a product, stages which come after each other do not entirely replace each other in some sequence of linear progression. Instead, new faces become layered on the old."[4] To make innovation possible in design, the developed technology must have a strong contribution on usability and level of expectation fulfillment of the product; and this can be realized by design innovation to make technology usable and beneficial.

With various other motives, technological changes play a determinant role in the historical development process of product design. This determination takes place by the interference of technological changes to the development of design criteria. Technology shows a continuous change parallel to time. However, the contribution of these regular changes to product design is not that stable. The effect of this contribution that is not similar to the changes in technology to product design can be expressed by the term "upgrade". Every kind of new technology used in an industrial product has entailed an upgrade in the design of it, which is a need for a new adaptation.

In this study, role of design activity on adapting new developing technologies to industrial products are examined with presenting the interaction between changes in technology and development process of design. For this purpose, concept of "technological change" is discussed with its different aspects interacting with design and history of technological change is examined in consideration of development of design elements.

2. Correlation of Technological Change with Design Elements

Technology has been consistently changing since human needed to manage his environment. Thus, skill of technology producing can be counted as an important feature that separates human beings from other living beings. Technological change which is defined as "a system based upon the adaptation of information"[5] gains continuity with rising acceleration of information data. When studies on consistent change of technology are evaluated[1][3][5][6], it is seen that appearance, formation and development processes of technology come to the forefront as important discussion focuses in literature.

In consideration of this point of view, main mission of technology which causes value changes is to push society to social changes. According to that, necessities of society cannot be defined as a necessary requirement for developing new technologies.

Litter[1] discussed this subject by defining the technology

itself as a significant power of which results cannot be predictable and which triggers technologies that to be developed in the future. According to this opinion, a technological development creates a chain of technological changes by triggering one other.

To propound the distinction among those kinds of approaches, it would be useful to evaluate two different points of views usually discussing technological change. View of "Requirement Pull" brings up a proposal stating that the technology being used is largely a result of social and economic pressures. But the view of "Technology Push" defends the opinion that technological changes push bounds of applied information to expand in order to trigger changes and create opportunities for their usages.

When points of views above are examined, it can be told that no matter how they emerged or triggered which forces, technological changes are in a constant and close relation with life styles, necessities and with products of individuals or society.

Technological changes have been determining factors of product design development at every stage. According to Heskett, history, which is indispensable tool to understand our current position, embodies holistic findings related to design practice defining new developing technologies.[7] Although change is not a guide because of its nature and speed, history can be shown as the only certain source about facing with the future.

The traditional approach defining technology emphasizes the concepts "necessity" and "benefit". In spite of this, role of human necessities on history of technological development is preauthorized in different concepts and discussions.

Currently, there are two intersecting histories of technology (…): History of relation systems where objects and inventions found meaning; history of objects evolving to systems on biological necessity phase of which continuity is provided by the contribution of science.[8]

For both situations, technology cannot be truly examined without discussing the term "necessity". According to Basalla, if human was structured with the limits required by earth oriented main necessities, it would offer less diversity.[9] This opinion is explained by new technologies not being largely based on new inventions and creations; but on pre-developed technologies. In this context, "continuity" concept can be used for expressing the evolution of technology. Besides the various assumptions defining stages of technological changes, a study of Langdon emphasizes continuity of development stages of an industrial product:

Stage 1: Introduction: An important technical innovation can realize a new industry along with many firms and entrepreneurs. This situation causes emergence of different designs and a large number of innovations competing in a mobile and changing market. (Diversity in Design)

Stage 2: Advancement: (…) Product innovation ratio decreases, but main process innovations come into play in order to satisfy the growing demand and reduce the cost. (Convergence in Design)

Stage 3: Maturity: (…) Additional process innovations come into play in order to improve product quality and/or reduce labor cost. (Differentiation in Design)

Stage 4: Falling: Firms try to avoid from decreasing demand for their products by various products and process innovation induced strategies.[10]

Here it should be considered that each stage is structured on continuity principle; not over the former stage.

3. Technologies Affecting the Working Mode of Industrial Products

Besides all the discussions made on formation and development of technology, it can be stated that it is the practical knowledge of how to do something and it makes the society adapt to its environment and become able to control it. Littler defines the development of technology as "a wide concept that embodies many technologic threats".[1]

The transfer of mechanics technology and mechanism industry to highly developed electronics technology based industry had totally changed the design oriented milieu's perception of design conception. Designers had to develop new courses to express the functional and symbolic values of the products. After this technological change, the traditional expression and approach models of design became totally out of term. The extremely condensed compact circuits, which were produced by the developed microelectronic technology, had achieved new product types while changing the usual engraving and operational techniques of products.

By the appearance of miniaturization, the connection between material, technology, form, function and usage has disappeared. The design attitude which was defining the shape of the mechanisms and mechanic compounds as an original aesthetic and using them in products without hesitating, had in a sense, replaced by shell design to misshapen micro-processors; after the development of a series of technological changes.

The most concrete inference that can come out of such a system of complex and important terms can be defined as "technology's becoming to a source which makes human life more comfortable and simple". In many studies "Technology" and "Progression" are discussed in affiliation with each other. However, in order to shed light on discussing technological change, it would be beneficial to look for an answer for this question: 'Does the developed technology mean progression?'

Undoubtedly, technology has various results having both positive and negative affects for the society. Teich states this situation as "Technology is not only machines; but also a complex system shaping all elements of our life by its cultural, political, social and intellectual factors."[3] These factors have great impact on design of industrial products. Mentioned factors also shape many principles and criteria related to product design process. In this case, it can be concluded that technology affects the design of industrial products in more than one mode. However, in order to

evaluate adaptation of new technologies to product designs with more realistic inferences on product-user relation basis, current and possible contributions of designers on working process of products should be also examined.

4. Technology and Design Criteria

20th century has witnessed the transformation of the terminology of "technology" from mechanics and mechanism technologies, to electromechanics, electronics, and finally, microelectronic technologies. This transformation caused the products that those technologies were adapted on, be percieved much more different from the previous times; by the user. Considering that designs are for use and application, the prior design intentions and planned usage areas should be examined for evaluating them. Today, the same method is valid for evaluating the aesthetic values of the products.

In spite of the discussions about the terms "communication" and "meaning" that the products accommodate in the early times; the perception of these terms as a design problematic had occurred by the changes in technology. This situation has loaded brand new responsibilities to the designer who is yet obliged with expressing the product aims to the user, by using the functional and symbolic values of the product.

Technological changes have started when humankind realized his ability of controlling the events happening around him. Those changes aiming to ease the life of individuals have continuously affected life styles and products developed through the civilization history. As long as product design becomes an important field of study for the definition of industry concept, it could not resume its developing stage independently of technological changes. Perceptions and meanings related to daily usage products are shaped parallel to these changes.

In the light of such information, it would be beneficial to make a distinction between development process of technology and design concepts. Technology emerges, develops and is applied continuously. This means changes in technology are time dependent. On the other side, there are other factors that design criteria are dependent on. According to La follette and Stine processes that innovative technologic solutions applied for social and industrial problems are rarely linear.[11] Mostly, using a developed idea for a technical solution takes decades or a technical solution is put forward but it cannot be applied since it causes other problems.

According to futurologist Watts Wacker, design is the power giving identity to each generation of people in existence.[12] When technology is accepted as a basis variable and design is a proof of it, it would be beneficial to discuss technological changes parallel to developments in design criteria. The studies show that design activity is always dependent on technology and civilization.

A successful designer can be defined as the person who continuously produces efficient products in a stable and balanced way. To exhibit such a skill, it can be expected a set of globally accepted principles and criteria to be well defined and consciously individualized. In this point, it should be beneficial to expound principles and criteria at issue. Conventional basic design education is structured on internalizing elements and principles of a visual composition. In the scope of most known basic design education process, it is aimed to make system of concepts which are relatively but can be explained and identified subjectively such as harmony, direction, repetition, rhythm, hierarchy, opacity and interaction between point-line-plane-space and even beyond internalized. While from a perspective this gains meaning as deconstructively separating gained information and experiments about life and constructively restructuring them; from another perspective it refers to act of making students coherent and sensitive. In this education process of which application experiments can be followed in preschool, primary school or high school, analyzing and criticizing design stages of a visual composition by educators and teachers is widely done with the help of system of concepts defined above. On the further stages of the process, during the evaluation of a product design project subtitles that can be examined in the light of main evaluation criteria such as safety, usability, reproducibility, perceptibility, originality, innovativeness, quality and validity of the necessity, level of meeting the requirement, balance of cost and benefit can be helpful.

A scientific process is expected to be perceptible, definable, repeatable, measurable, expressible, resolvable and controllable. For being able to be applicable in this direction, design activity can also be expected to follow a main method verifying the factors listed above. Although this main method has different expression ways, it can be declared that at the present time it is widely accepted in terms of its general structure and implemented. Being examined in that direction, design activity is being structured within the frame of these stages will increase the probability of success and decrease the effectiveness of randomness factor; determining and defining workspace, making necessity and solution inferences for previous periods in the defined area, necessity and user analysis, determining the main and sub problems, determining the design purpose, listing and eliminating idea proposals, propounding visual solution offerings, drawing first sketches, designing and telling used scenarios, deciding materials and production methods, cost analysis, detailing, scaling, ergonomic analysis, preparing production drawings, prototyping, production, packaging, commercial presentation and marketing, post-purchase service, feedbacks, improvement, etc.

5. Conclusions

Technological changes were started by human being realising his ability to direct the events that took place in the environment. Aiming to ease the lives of individuals, these changes have continuously affected the life styles and products in the history of civilisation. Product design,

becoming a significant branch of study by the exposition of the concept of "industry", naturally couldn't sustain its development stages independent from technological changes. The perception and interpretation of the products for daily usage had also formalised parallel to those changes.

The growth and extension of mass production techniques after the First World War had affected entirely the traditional forms that the user had preferred upto that time. This influence had resulted either by the modification of the mentioned forms, or by the invention of many new ones. Since that period, the mutual interaction of design and technology, had both gained dimension and acceleration.

A technology implemented on a product could successfully contribute to the product-user relationship when the aims of the product and the underlying criteria affecting those aims are clearly perceived and identified by the user. Similarly, a recently emerged technology could be mentioned as completely adapted to the historical development process of a product, when the success of the criteria planned to be provided on the product are confirmed by the user.

Continuous evolution of technology, which is one of major factors pushing society to social change, is in a constant interaction with individual and social necessities. Technologies widely following an unplanned and accidental changing process cannot completely evolve necessity oriented but it usually directly affects the social values and trends shaping those necessities.

This interaction process between technology and necessity lasts continuously between reciprocal pressures of social and economic conditions, and returns of technology. In this entire complex relations, technology mainly shaped by dynamic balances and trends of society. Since usability and need fulfillment level of technology are taken as basis in product development and innovation processes, design activity focuses on human necessities on product-user relation base comes to the forefront as a determining factor.

An important distinction between the linear change of technology and the development model of design process can be stated as the limited validity of some new technologies because of newer technologies produced in the continuing process, that cause many new technologies lose their availabilities. On the other hand, correlations of universal design criteria like functionality, user safety, conceptual stability and ergonomic infrastructure directly with needs and user expectations; can be indicated as to be the reason for chronic consistency of design values. Similar to the development model of design , innovation has come to a position as to be defined with a development model, by the effect of social trends.

Invents' and products' gaining meaning requires development of objects to follow a constant and systematic progress process in the light of necessity concept. Design activity defines the efficiency and value of new developing technologies. Nonetheless, technological changes play an active role on the development process of product design. Parallel to this interaction process, social values and individual and social necessities constantly keep in step with conditions and trends of the era shows that directly time dependent change of technology can only gain meaning for the purpose of "making the life simpler and more comfortable" with the contribution of nonlinear multi-factorial development process of design activity.

Design is an activity conducted for human and in the direction of human necessities. Unlike technological changes and trends that are directly in close interaction, every contribution of humankind to design values entitles to be exposed as a development. Therefore, the primary expectation from design activity is vital quality and contribution to efficiency beyond propounding that has not been thought. This perpetuating close interaction being endured with human expectations and necessities privileges design through innovation process and makes it the most determinative proof in history of humanity.

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