Research Paper　　　　　　　　　　　　**Engineering**

Gendering Bias in Product Design Decision Making

Arun kumar	M.E student ,Industrial Design(Production), PEC University Of Technology, Chandigarh.
R. M. Belokar	Associate Professor, Production Department, PEC University Of Technology, Chandigarh.

ABSTRACT　This study examines gender bias of industrial products in the activity of industrial design. Thus firstly, the meaning of gender, related theories and gender stereotypes have been reviewed through the literature survey in order to pinpoint the stereotypical attributes assigned to men and women through society and culture. Secondly, the effects of the stereotypical gender attributes on the act of possessing products have been examined. In return, a literature survey on the cognitive aspects of design has been conducted in order to question whether these gender attributes might have a similar impact on the design activity.

The findings of the literature survey pointed towards categorical information processing theories as an appropriate tool to gender type products and also as a tool to measure the gender qualities of a product. To test the applicability of the methodology of categorization a study has been conducted with industrial designers and industrial design students in which the students were asked to design gender typed products and industrial designers were asked to rate their perceptions of genderedness of the designs. The test revealed the existence of a mental library consisting of categorized images corresponding to stereotypical gender attributes in the individuals, thus preparing the grounds for the use of this process in the industrial design activity.

KEYWORDS: product design, product form, gender stereotypes, gender typed products, categorization.

Introduction

Industrial design is responsible for creating products with instrumental functions as well as uploading meaning on to the products that will correspond to the needs of the individual's identities. Identities are formed through social interactions and cultural factors, thus while a person's identity develops it is constantly confronted with social norms and values that are ingrained into the society. These values, accumulated in society collectively are hard to remove once they are formed. One such group of values are those concerning gender and the notion of how a typical man and a typical woman should be. Gender identity is an important part of most people's self concept because our gender regulates our social relationships on certain levels of communication.

The current research extends this work on gender discrimination, or behavior aimed at denying particular social groups positive outcomes (Allport, 1954), and bargaining to the domain of deception. By examining whether feminine stereotypes imply that women are easier to mislead and, if so, whether women negotiators are especially likely to be misled, theory and research are extended on multiple fronts. Thus the designers' design activity must be carried out with this fact in mind. The design activity can be enhanced by using social values and norms as a point of reference. So, the designer must consciously develop a strategy to make use of such points of reference through an analytical method. Accepting the notion that social norms affect the visual and functional qualities of products, points of reference could be used to investigate previous and current products with regard to gender. In return, through the design activity more finely calculated products may be produced.

Since the market of consumer goods is naturally biologically split into two as targeting the male and the female, the act of designing is critical not just for designing consumer goods but also transmitting images supporting our communication, the designers must be conscious about the images they inscribe into their designs with regard to gender.

Gender Bias

Gender bias in research is as old as science itself. Even though gender bias in research in the twenty-first century is less pervasive than it was in the past, it persists in some scientific fields. As described in greater detail elsewhere in this volume, the term sex generally refers to biological differences between males and females and the term gender refers to the social characteristics that are commonly ascribed to men and women, such as masculinity, *femininity, and* androgyny. In the context of social and medical research, the term bias refers to a systematic error

that can occur at any level or stage of empirical investigation, which is caused and goes undetected by the researcher. Gender bias in research occurs because researchers' stereotypes and prejudices about gender become implicitly, and hence unknowingly, but systematically infused with the research process. Such biases typically support the unfair preferential treatment of masculine characteristics (enhances men) and unfair negative treatment of feminine characteristics (derogates women). Gender bias in research is, therefore, undesirable and to be avoided.

The Aim of the Study

The aim of this study is to explore and discuss the way that industrial design captures and may capture the "male identity" and the "female identity" based on social conventions of gender in designed products.

The Structure of the Thesis

The following chapter discusses the concept of gender, its stereotypes, how stereotypes are generated from a historical perspective and how individuals develop gender identity in the light of gender socialization theories.

The third chapter firstly focuses on the relationship between technology and gender, the remainder of the chapter discusses symbolic meanings of possessions for male and female consumers after a brief section on gender and advertising, the chapter concludes with a general review of products gendered by design.

The fourth chapter begins by discussing design definitions and creativity in design to find out how products are created, followed by a discussion on the effects of social norms and values on the creation of new products also building up a mind library in the individuals. And finally in the light of previous sections, the method of giving a character to artifacts has been discussed.

The fifth chapter defines categorization of objects as an explanation to how products are gendered. Group resemblance of products and prototypical categorization issues are revealed to explain the perceived imagery of objects in individual's mind. Following this section atypicality and typicality of products is explained with regard to gendered products by means of examples. Following taxonomic relations of products, razors as a gendered product category has been examined, concluding with character modeling in user and metaphors.

GENDER IDEOLOGY AND THEORIES
The Meaning of Gender

Sex refers to the biological distinction that defines people as either male or female according to their sexual organs and genes (Basow, 2). Gender on the other hand, refers to the social meanings attached to being male or female in any given culture or society, expressed in terms of masculinity and femininity (Richardson, 14019). A person's gender identity refers to the degree to which a person identifies oneself with masculinities and femininities.

When a child is born, his/her biological sex is used as the basis for the assignment of gender (Philips, 6016). Once the baby's sex is determined, he/she will firstly be given a gender appropriate name, will be dressed in gender appropriate clothes, and will be presented with gender appropriate toys. Thus, the society begins to impose sex typed attributes to children different from the moment they are born. Though one's biological sex is the first determinant of gender, one's gender identity is culturally and socially constructed and develops through social interactions in time. Definitions of masculinities and femininities, distinct from the biological terms of male and female, vary across cultures, vary in any one country over time, change over the course of a person's life, and vary within any one given society at any one time (Kimmel, 9318). It is the culture and society, which the individual is a part of, that defines masculinity and femininity in terms of, for example, personality raits (e.g. instrumental and agentic for masculinity /communal and expressive for femininity), social roles (e.g. head of household /caretaker of children), occupations (e.g. truck driver / secretary), and physical characteristics (broad shoulders / grace).Thus people are viewed as masculine and feminine to the extent that they comply with the societies' definitions of masculinity and femininity. These definitions are compiled in what can be called a "gender belief system". Such a belief system, which is constituted of opinions about males and females and the purported qualities of masculinity and femininity shapes the way we perceive and evaluate others (Baslow,3). Two fundamental aspects of this system are the stereotypes of women and men, and the roles assigned to women and men.

Gender Stereotypes
Gender stereotypes are structured sets of beliefs about the personal attributes of men and women.

Table: Universal Gender Stereotypes: Traits commonly attributed to men and women in gender stereotype studies conducted in 25 countries around the world. (Williams and Best, 1982) Reprinted (Brehm and Kassin, 155).

MALE	FEMALE
Active	Affected
Adventurous	Affectionate
Aggressive	Anxious
Autocratic	Attractive
Coarse	Complaining
Courageous	Curious
Daring	Dependent
Dominant	Dreamy
Enterprising	Emotional
Forceful	Fearful
Independent	Feminine
Inventive	Gentle
Masculine	Mild
Progressive	Prudish
Robust	Self-pitying
Rude	Sensitive
Severe	Sentimental
Stern	Sexy
Strong	Soft-hearted
Tough	Submissive
	Superstitious
	Weak
	Whiny

Theories of Gender Socialization
Since our concern is gendered products, or how products can be seen as promoting gender, mainstream gender theories must be referred that attempt to explain how the concept of gender, gender identity and sex typing is established in individuals. In order to understand where the designer comes up with conscious or unconscious effects that hint to gender and how the consumer selects and analyzes these hints or finds meanings in the design even if none was intended, we must understand how one becomes aware of gender and how it is interpreted in the first place. Thus the following theories offer explanations to how, as children, we are firstly confronted with the fact that there exists two biologically different sexes, how we react to this knowledge, how we choose to express ourselves through this knowledge, how we are re-

inforced to act in certain ways, or how we choose to imitate certain people with respect to this knowledge, how we make decisions based on this knowledge etc.

Social Learning Theory
The social learning theory emphasizes the importance of environment in a child's development and views gender identity as a product of various forms of learning in his/her social environment. According to this theory the child learns his or her role through the way he/she is treated, the rewards and punishments received as well as observation and modeling.

Cognitive Developmental Theory
The Cognitive Developmental Theory focuses primarily on the child's active role in acquiring sex role behaviors. Once the permanence of gender is grasped at the age of 5 or 6, this self-categorization becomes a reference point for future actions.

Thus the child begins seeking out models and situations in accordance with the categorization to maintain consistency. The initiator of this theory, Kohlberg, asserts that the establishment of gender identity guides the perception of gender stereotypes and the consequent development of gender attributes (Basow, 123). As children develop cognitively, their rigid stereotyped views of appropriate behaviours for males and females begin to change until adulthood due to greater cognitive ability and capability for complex thought (Stockard, 218).

Technology and Gender
The question of technology and gender as a new field of study emerged in the 1980s when feminists claimed that the male monopoly of technology was an important source of men's power and females'lack of skill and exclusion from technological areas except as end users was an important element concerning their dependence on men (Wajeman, 5976).

Gendered by Design
Gender is imprinted on objects with advertising, associations through the gendered division of labor and gender symbols. In this section examples of how gender is imprinted on technical objects through design will be given.

In Design for Society Nigel Whitely notes that any shop or catalogue with a range of product lines will almost surely offer 'feminine' versions of a product fig1. "Mugs with delicate pictures of flowers or sentimentalized cuddly animals, and casserole dishes and saucepans with romantic images of nature in contrived patters or vistas, are all aimed at the conventional 'feminine' woman" (Whitely, 138). The "blue for boy, pink for girls" gender distinction in childhood evolves and varies in adulthood where many gendered objects give away these clues through black, grey, and military green for men and light pastel color for women.

Gender and Product Advertising
In her paper "On Gender and Things", which describes the findings of the exhibition organised in Netherlands and Norway, Oudshoorn asks the question,'Do Artifacts have Gender?' (Oudshoorn, 471). Presumably, the answer to the question as she gives is 'yes'. Since the products cannot abandon their sign qualities unavoidably it would be impossible for the products not to carry gender information as parts and elements of communication of social domain. As Lunt and Livingstone depict, goods do not simply reveal social relations; they are also participants in stocial relations.

Figure1: Philips Woman & Man Saver from http//www.

electricsavers.com

GENDERED PRODUCT CATEGORIZATIONS
Categorizing Objects

As a matter of fact, a product is an input to the mental world of the individual. Mental world within a culture, forms the basis of the individual's thought process through extensive childhood learning conformed to culturally accepted notions. It has to be remarked that this mental world does not comply a mirror image of the real world which the individual lives in; it rather deals with concepts in lexical terms (Athavankar, 1).

Prototype Categorization

When a single line of product is considered, comparison of potential members with a well characterized central member creates prototype effects within the category (Athavankar, d7). Then as Athavankar states, other members are evaluated on the basis of their 'closeness' to the central member, giving these members a 'goodness rating' or a 'degree of legitimacy'. However, this grading system takes place in two accounts going along separately; "real world – product hardware layer", "mental world - communication layer." Athavankar suggests, a designer is to satisfy specific expectations of the real world through the physical shape and features of a product belonging to the hardware layer. Whereas, the second layer independent from the first one is associated with the abstract property of that product. When a product, whether new or not, satisfies the needs of the real world, it may automatically lead to an expression of that product (Athavankar,d8). It has to be noted that, being partially interdependent, mental concepts are influenced by the objects and activities of the real world but are not dictated by it. Real world and mental world process show in fig 2.
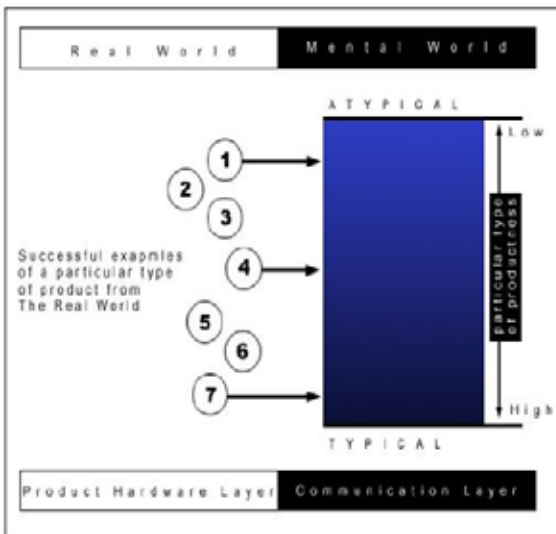

Figure2: Illustrates Real World and Mental World Processing (Athavankar Modified, 7).

Taxonomic Relations of Products

The framework which Athavankar presented permits and encourages visual innovations while ensuring that a certain level of continuity with the present world is maintained within its dualistic structure. The interconnecting links within the semantic boundary ensure that the identity of concepts and objects are enhanced with the assist of the links to other concepts. In other words, the links give the products its identity, pointing to the potential source of new visual clues (Athavankar, d16). Thus, human concepts and man-made products is always synthetically and connected to each other, unlike natural species in the organic environment. This system of linkage in fact is about the spatial organization of man-made items on a super ordinate level. Such point of view may explain the products taxonomic relation with each other show in fig 3.
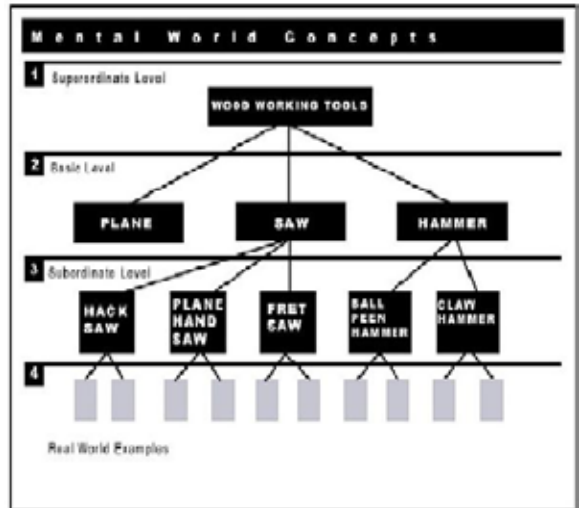

Figure3: Taxonomic Structure of Nested Human Concepts Modified (Athavankar, d17).
CONCLUSION

This study discusses the gender information that products might conduit through their designs. As a starting point for the research, first of all the meaning of gender bias, gender, as different from biological sex and its construction in individuals through the influence of society has been retrieved through the literature survey and it was found that, gender refers to the social meanings attached to being male or female in any given culture or society, expressed in terms of masculinity and femininity. The subject was then extended to the issue of stereotypes which are referred to as internal pictures and mental representations of social groups in contrast to their external reality and it was revealed that individuals tend to refer to stereotypical gender images and attributes while interpreting gender roles.

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