ON THE ROLE OF FORMGIVING IN DESIGN

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ABSTRACT
This paper discusses different interpretations of the word "formgiving" in design literature. A comparative study has been made between the two main areas of design, industrial design (ID) and engineering design (ED). The main findings are that in ID, the use of the keyword formgiving is related to the artistic visual elements, while in ED the use of this same keyword is related to the engineering principle solutions. In terms of the approaches of formgiving in design, for ID, which is related to art and design, qualitative measurement is the preferred way of documenting the findings, which in this context refers to the quality or type of form. In ED, which is related to technology and engineering, quantitative measures are common. Quantitative, in this context, relates to the quantity or amount of the form. The totality of formgiving can, however, only been examined by using linguistic interpretations. Finally, within these two areas of design, the study illustrates that formgiving can also be influenced by aesthetics features. The aesthetics in this perspective can be interpreted as a study of the effect of formgiving on human sensations. The focus here is on the appearance or the consequence of the form. This differs from most previous publications which deal with creation and appreciation of the form.

Keywords: aesthetics, design, formgiving, shaping

1 INTRODUCTION

In the design process, the most crucial part in making the product appearance outstanding is during *form* creation [1]. Form in design means to shape or mould a particular model into a certain state or shape.
For more than 20 years, the word *formgiving* or *form-giving* has been commonly used in Scandinavian countries. According to the Norwegian dictionary, the meaning of "*formgivning"* or "*formgjeving"* is fashioning, moulding: industrial design. Previously, most of the design authors used the word "shaping" in the same meaning as *formgiving.* Moreover, available Standard English dictionaries do not interpret the meaning of *formgiving*. But yet, it seems that the use of the word *formgiving* has become popular among many design authors when discussing design practice.
Formgiving, when used in engineering design, relates sometimes to a specific phase in the design process: the part in which a solution-principle is developed into a materialized design [2]. Here, the emphasis is on the embodiment; the determination of form and material, as well as the process of bringing both in line with each other.

In this paper, we intend to provide some viewpoints about *formgiving* based on the following structure: (1) introduction; (2) elements and properties of product form; (3) the comparative study of *formgiving* based on different approaches in design; (4) discussion; and (5) conclusion. The aim of this study is to uncover the meaning of the keyword of *formgiving* and demonstrate how its role contributes to the product appearance.

2 ELEMENTS AND PROPERTIES OF PRODUCT FORM

In Industrial Design (ID), the creating of form(s) during designing involves the understanding of use of basic entities of *visual elements* (VE) such as point, line, plane or surface, and volume (see Figure 1), as well as the organization rules and principles for putting together the composition or structure [3]. VE form part of the attributes of form that create tone and texture, imparting visual interest and meaning. Their importance becomes evident through their use in generating images and form(s) that are both two dimensional (2D) and three dimensional (3D).

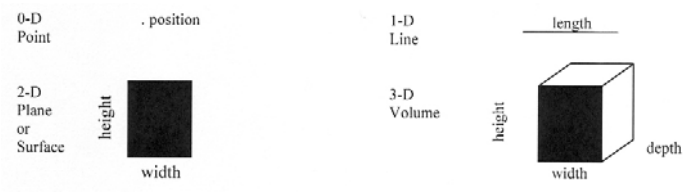

Figure 1 Four basic visual elements (Akner-Koler, 2000, p.7, and Muller, 2001, p.80)

According to Wallschlaeger [4], defining and relating the application of VE to visual studies is sometimes most challenging since the term(s) can be interpreted and used in different ways, not only in art and design but in other disciplines, especially engineering, mathematics, physical sciences, and the humanities. To give a clearer picture, the mathematician may think about defining words such as point, line, plane or surface, and volume in abstract terms. In geometrical terms, a point has no dimension. It is only attributed in defining a location or position. A line is thought as a point in motion within space, and it has only one dimension length. A plane or surface is a flat surface bound by lines that has the attributes of length and width, but no depth. Volume, in conceptual terms, is described as a plane in motion of a direction other than its inherent direction. For example, a 3D form is derived from and enclosed by planes that have a position in 3D space.

In Engineering Design (ED), the creating of form(s) can be based on several form generation models. Many of these models are based on *principle solutions* such as the problem-solving process [5], and synthesis–analysis order [6]. The problem-solving process is an activator assisting in the creative process that in a general sense encompasses a variety of activities with widespread applications [1]. This process is found in a form as either a structured and unstructured way, and can also result in the generation of form(s). The problem-solving process also considers the design activity as a problem to solve [5]. Besides, synthesis-analysis is considered here as a compound activity as it involves search, exploration and discovery of design solutions, and composition and integration of these solutions [6].

The use of the method of quantified structure is common in ED in the creation of form. Tjalve [7] states that quantified structure is used from two points of view that differ by whether or not the functional connections between the elements can be included. If

these functional connections are ignored, the structure variation method gives a number of suggestions for a very rough construction of the product. If the functional connections are included, we get a definite further development of the basic structure, with the aim of optimizing and specifying the parameters involved.
In order to see the gap in different uses of meaning of *formgiving* in ID and ED, a comparative study has been carried out.

3 COMPARATIVE STUDY OF FORMGIVING BASED ON DIFFERENT APPROACHES IN DESIGN

Two experts in representing different views on design education have been selected as case examples in this paper. The first, Cheryl Akner-Koler (Akner-Koler), has been educated in ID [3], and the second one, Wim Muller (Muller), has been educated in ED [2].
Akner-Koler states that the evolution of form can be done through several stages such as join (u-joint, o-joint), intersectional (core), divide (accordance, discordance), adapt (assimilate, dissimilate), merge (converge, diverge), distort (conform, deform) as well as organic or geometric (convexo-concave, concavo-convex).

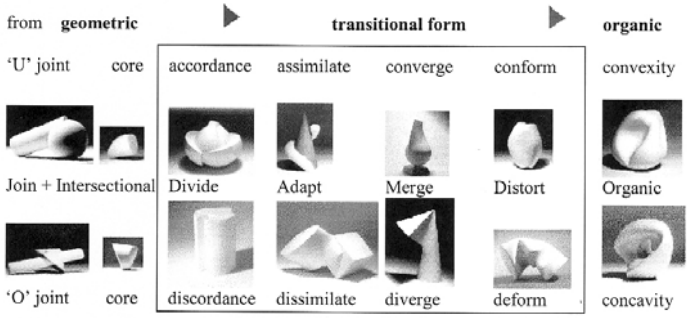

Figure 2 Form evolution based on visual elements by Akner-Koler (2000, pp.46-47)

The evolution can be expanded using the manipulation of VE until the designer is able to select the appropriate form and use it for detailing and further refinement until the embodiment phases (see Figure 2). This is the sample of form evolution, 3D form model, bringing geometric structures to organic structures created by Akner-Koler. The first horizontal axis presents a sequence of geometrically derived forms that gradually take on organics quality of convexities and concavities. The second axis expands the model in the vertical dimension to include a bipolar spectrum at each stage. The vertical dimension opens up a dichotomy (separation of different or contradictory things) between congruent (with same form) and incongruent properties in relation to the original features of the geometric form. This makes it seem as if form has been developed throughout qualitative structure (based on the quality or character of form).
According to Muller, in the beginning of form generation phase, designers have indicated that the core of design is founding the transition of function into form, and then, this transition marks the form creation phase through the evolution process. The difficulty of the transition and the great challenge for designers is the fact that in principle many solutions are possible and, in addition, not one single correct solution can be determined for the fulfillment of a technological function.
Many different viewing positions are required to get an impression of formal material elements and the plasticity of complex touch form. However, Muller illustrates that

form evolution is developed from the primitive object through the *topological*, *typological* and *morphological* levels, and it does not only refer to exterior geometric form, but also to the *physico-chemical* form or material composition of an object.

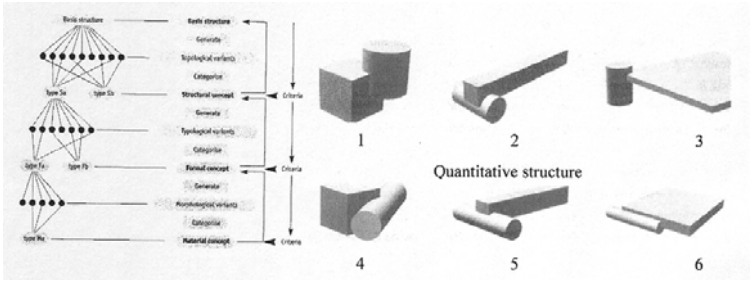

Figure 3 Form evolution based on principle solutions by Muller (2001, p.281)

Muller, in one part of his example, believes that different form compositions act as the starting point for an exercise in "form integration." Starting from a composition, an integrated whole has to be obtained by means of additive and/or subtractive transformation by the manipulation of principle solutions through quantitative structure (see Figure 3). This is similar to the approaches of Tjalve [7] for the quantified structure. For Akner-Koler and Muller, understanding and perceiving the potential expressions of form that are embraced in the "Form evolution" model, a broad aesthetical attitude to *formgiving* can be developed. The organizational capacity that is represented through form and space offers this pluralistic structure that can create coherency out of seemingly disparate demands.

4 DISCUSSION

An analysis based on the approaches by Akner-Koler and Muller has provided more similar patterns rather than differences toward the meaning of *formgiving* as form creation (see Section 3).

4.1 Design inspired and measurement approaches

While *formgiving* requires design-inspired approaches, understanding engineering principle solutions can make the design process easier. Design can be based on patterns in nature and on mechanical functions. It can also be based on other factors such as the use of code of language, semantics, symbols, reproductions, or the individual choices of the designer [7, 8]. In terms of measurement approaches for *formgiving* in design, Akner-Koler who relates to art and design prefers qualitative measurement for documenting findings, while Muller who relates to technology and engineering, quantitative measures are more commons.

4.2 *Formgiving* related to the aesthetics

Current design solutions require consideration of *aesthetics* features all the way from form surface appearance to making the form marketable. The aesthetics goal of a design concept toward *formgiving* is mainly interpreted as a *natural* (e.g., beautiful or ugly) form and as a creation for spatial condition. Aesthetics in this context mean the study of the effect of product gestalt on human sensations [8]. Product gestalt, in turn, is the arrangement of parts which constitute and function as a whole product, but which is more than the sum of its parts.

For Muller aesthetics is a measure that gives the impression that beauty benefits from a high degree of ordering and low complexity; "the simpler, the more beautiful" is what theory tells us. However, besides immediate sensuous responses, aesthetics have always been connected to the function of *linguistic interpretations* like semantics too. Semantics includes the dimension of semiosis, and the study of semantic aspects of sign systems, the production of meaning by signs, as well as their interpretation. The term "Semiosis," was coined by Charles Sanders Peirce as a performance element involving signs. Semiosis means relationship between what a sign refers to, the representation, and the understanding of the sign in the "mind" of the sign receiver. Akner-Koler in 2006 in her article about "*Expanding the boundaries of form theory: Developing the model Evolution of form*" tries to relate aesthetics in the development of form, which plays an important role in *formgiving* development. However, her appreciations about the aesthetics seem similar to Muller who is more focused on sensational aesthetics aspects.

4.3 Advantages of *formgiving* development in design education

There are many potential advantages incorporating *formgiving* understanding; and the form development process in design education. Since aesthetics play a major role either in ID and ED, people can correlate *formgiving* with elegance, efficiency, robustness and alertness. When *formgiving* features are incorporated into the layout of modern cars, people are more likely to perceive the car as elegant, efficient, and good function performance. It is important for the final product form.

One example is by applying *animal* form (zoomorphism) to the design. Animal form is now uses in the styling of modern motorcars design [9]. Many animals are highly optimized for fast movement and this produces aesthetics features such as curvaceous, forms, symmetry, wholeness and distinctive body profiles. Here the character of the Cougar animal is mapped onto the Ford Cougar car (see Figure 4) by reflecting to prominent features of the animal face (e.g., Headlamp – Eye). This kind of similarities can also be seen in other models of car such as Jaguar XK, Volkswagen Beetle, etc.

Figure 4 Cougar animal and Ford Cougar car

Since people often associate animals with elegance and efficiency, the use of animal forms in car styling can lead to form with a wide appeal. In addition, the use of animal forms is inherently compatible with functional requirements because of the high level of optimization of nature forms. Instead of animal form, the *nonhumans* form (anthropomorphism) which bases its attributes on human characteristics can also been considered as references in the design. It can be built on to become a more specific design when *embodied agents* are designed for specific task and domains like gender, casting, and recasting [10]. Gender is a primary design feature and should be a critical consideration in design of embodied agents. Casting is a means of fleshing out agent personality. Recasting is a means for creating experiences within and across product use. One important question is how we use cannon-animal form and cannon-nonhumans form to visualize ideas?

However, the use of metaphors, meaning, symbols, and signs as influence can transmit *formgiving* to the aesthetical judgment. Furthermore, the use of analysis based on semantics and semiotics in relation to aesthetics is expected make form able to capture human attention.

5 CONCLUSION

In this paper, we conclude that the definition for the keyword of *formgiving* is form creation, and it deals with the concreteness of aesthetical reasoning in the design process. There are three levels of form development in design phase: (1) The early phase, when we question the orientation of the image elements; (2) The middle phase, when we need to consider the type of form in which we format the image elements; and (3) The final phase, when we make decisions that lead to a more detailed picture of the image developed so far. All of these phases involve a well-known transitional process of form evolution. The finding shows that the use of linguistic interpretations is significant as a mean of analysis in order to examine *formgiving*. In terms of the measurement approaches of *formgiving* in design, from Akner-Koler's (ID) art and design perspective, qualitative measurement is the preferred way of documenting the finding. Meanwhile, from Muller's (ED) technology and engineering perspective, quantitative measures are common. Finally, within these two areas of design, the study shows that *formgiving* can also be influenced by aesthetical features.

Our future work will include exploring the notion of qualitative structure and quantitative structure throughout the methodology featuring *formgiving*, in order to understand how it might change the use of the method underlying the designer's way of thinking.

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