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A Semantic Analysis Of Symbiosis Inspired Built Forms In Architectural Design

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Abstract: This article is about exploring and highlighting the role for semantic analysis for educators, students, designers and consumers today. Here, visual perception of symbiosis inspired built form has been explored semantically. A catalogue of 17 designs of built structures that connote the idea of symbiosis was shortlisted by the researchers and 3 Design industry experts on the basis of a primarily visual examination. The conceptual grounding of this exercise was that the source forms are expressions and material manifestations of theoretical concepts, and could be investigated using semantic analysis. A cohort of 23 final year B. Des. students were tasked to verbally describe these images in English language. These descriptions were later rationalized by the experts in to 64 symbiosis related key-terms. These terms were analyzed by the experts using card-sorting and organized in to a set of 8 semantic-factors. This article shares the process and results of this exercise of analyzing symbiosis inspired built forms, and the synthesis of semantic factors underlying them.

Index Terms **– Semantic analysis, symbiosis, architectural form, verbal descriptor, semantic factor.**

I. INTRODUCTION

The motivation for this study comes from the concern shared by the authors of a troubling trend experienced during their experience of academic instruction in different higher education institutions in India. Different technological tools and workflows for form making and exploration have gained popularity in design and architectural training and practice in India. Most design schools offer either some specialized training that focus on tools, technologies and materials for design, manufacturing and construction. However, an important aspect of designing, i.e. the act of meaning making, or design semantics is often overlooked or under-explored. With a greater fascination and push for tangible and final outcomes in Design schools, today an important limitation with many Design projects in academia and practice, is the poor analysis of the semantic criteria behind developing the form.

The mainly tools and technology focused approaches to Design, run the risk of developing artefacts that may be too removed from the human-centered concerns. Human-centered designs could arise only out of meaningful analysis of the human perceptions and sense making in the context of the specific project. The lack there-of could often resulting in unforeseen outcomes, such as modification of the intended use of the artefact, and unexpected user perception and behavior around the use of the designed artefact. ‘Misfits’, if they emerge as an ‘unintended’ consequence of a design process - should be a reason good enough to deem the design process as a failure. Clarity of the semantic criteria is a mature criterion to assess any design from a ‘non-design’, ‘poor-design’ or a ‘mis-design’.

1.1 Symbiosis as a theme in design

The Merriam-Webster dictionary defines symbiosis as [1] –

a cooperative relationship (as between two persons or groups) (1.1)

In the specific context of architectural design, symbiosis has been referred to in a couple of interesting ways. According to Vista Smart Cities [2] –

Symbiotic architecture refers to an approach to architectural design that seeks to create a mutually beneficial relationship between a building and its surrounding environment. It aims to integrate the built environment with the natural environment, creating a harmonious and sustainable relationship between the two (1.2)

Symbiosis is also the essence of the architecture of the famous architect Kisho Kurokawa. According to him [4] –

When I am asked to define my style, I would probably say that it is a symbiotic style. What I mean is the simultaneous expression of conflicting things in a symbiotic manner; that's my style (1.3)

His designed works have been recognized for the following qualities [3] –

symbiosis between nature and architecture (1.4)

creating a symbiotic relationship with the surroundings (1.5)

In his Hiroshima City Museum of Contemporary Art project, Kurokawa brought in his symbiosis philosophy in this design with a sequential change in the building materials as the visitor moves upwards – from natural stones to tiles to aluminum and concrete – that highlights the civilization from the past to the future [4].

1.2 How do we make meaning in design

The Webster-Merriam dictionary defines semantics as [4] –

of or relating to meaning in language (1.7)

Semantics is a very important consideration in the design disciplines. Semantics in web design refers to the organization and structuring of content to convey the intended meaning effectively [5]. Nie & Zhang (2014) define design semantics is the annotation of form and the reflection of its symbolic meaning [6].

In the context of Design, the criteria of form, function and phenomenon [7] could be explored by semantically examining the physical manifestations - say, in the form of built architectural structures. The concerns of these 3 criteria remain intricately entwined in to one another, and conceptual ambiguities make it difficult to isolate one concept from the others. A specific challenge is the cause-effect ambiguity, which makes it difficult to understand if either the form, the function, or the phenomenon is a cause, or an effect of the other. Exercises of meaning making often depend on a user's subjective experience and perception of the perceptible world and beyond, and it has been observed that the user may find it difficult to decide if primarily -

1. It is the interpretation of form that helps a user to make a certain meaning of the artefact, or,
2. For a defined function, an artefact assumes a specific meaning, or,
3. It is the phenomena (behavior or interactions) that leads an artefact assuming a certain meaning.

It might be difficult to objectively conclude which one of these concepts - the form, function, or, phenomena - comes first, or is the most important during a semantic analysis of artefacts. As form seems to be the factor that is the most fundamental among the three criteria, in this project the authors have focused on form as the basis (stimulus) to conduct the semantic exploration. At the same time, in order to substantiate and explain the

experiences around the form, references to functionality and phenomena were not strictly denied. What more specifically then, could be summarized as the approach for this project is the investigation of form, before the function and phenomenon.

1.3 Aim

The aim of his study is –

1. To conduct semantic analysis of symbiosis inspired built forms.
2. To identify the key-terms and semantic-factors associated with symbiosis inspired built forms.

II. METHODOLOGY

2.1 Participants

Five highly experienced designers were contacted to inquire if they would like to volunteer for this study as industry experts. Out of these, 3 designers gave their approval and were recruited as Design experts for this study. For exploring the verbal descriptors in the form of key-terms associated with the stimuli images of symbiotic built forms, a final year batch of students enrolled in the Bachelor of Design programme at a regional University were contacted. Twenty-three Design students from the final year of their Bachelor of Design programme agreed to participate in the study and were recruited as participants. Additionally, the authors who are themselves designers and Design researchers, supported the participants with any challenges they faced during the study.

2.2 Procedure

The methodology adopted for this research has been summarized as follows -

1. The authors decided to use symbiosis inspired built structures as stimuli for semantic analysis and collected 30 images which best connoted the idea of symbiosis in built structures.
2. Three industry experts (designers with more than 10 years relevant experience) were recruited in the study to shortlist the most effective examples of symbiosis from among the 30 designs. From among these, 17 most appropriate designs were shortlisted to be analyzed further.
3. For the 17 shortlisted designs of built form, 23 University level design students were recruited to describe their meaning using English based verbal descriptors.
4. Experts extracted 64 key-terms from the verbal descriptors and used card-sorting to classify these in to a higher order list of 8 symbiosis-inspired semantic-factors.

Card sorting is a research method in which study participants place individually labeled cards into groups according to criteria that make the most sense to them [8]. In this study, the criterion for conceptual grouping was to select only those terms which related to the idea of symbiosis most closely.

III. RESULTS AND DISCUSSION

The stimuli in the form of symbiosis relevant images of built form from the field of architecture have been shown in an aggregated collage in Fig. 1. These images were collected by the authors by utilizing their own experience of more than 10 years in the field of Design education, practice and research. Additionally, ideas about the symbiosis in the context of design were reviewed from multiple reliable resources, e.g. [2], [3], etc. Thirty examples in the form of clear and impactful images of architectural projects were compiled.

These images were then provided to the Design students to verbally describe them. Examples of a few verbal descriptors have been provided below –

the structures are converging into a larger monolithic form (Participant-3)

the sheltered roof is tied down to the forest (Participant-3)

it looks like the cabin is seated comfortably on the mountain (Participant-8)

window pattern from the adjacent structure is echoing in this building (Particpant-17)

The statements and phrases which were considered most relevant to the idea of symbiosis were then content-analyzed by the experts and translated in to meaningful key-terms. As a result, 64 key-terms were identified, as listed in Table 1. From the perspective of common context of purely linguistic use, some of these terms may appear to be very similar in meaning to each other. However, in the visual context of this study, each of these key-terms have been considered as unidimensional independent factors.

The Design experts then performed an exercise of cart-sorting to synthesize a set of 8 semantic-factors underlying these ideas. These semantic-factors have been drafted in the form of titles, or descriptive phrases. To give an example, the key-terms namely - *coexistence, harmony* and *nested*, have been grouped together under the factor titled *"the design appears to convey an overall theme of coexistence"*. The details of the key terms and the factors have been provided in Table 1.

Fig. 1: Seventeen stimuli images of symbiosis inspired built form.

Table 1: Key-terms and semantic-factors underlying them.

S. No.	Key terms (by Design students)	Semantic-factors in the form of thematic phrase (by industry experts)
1	Coexistence; harmony; nested	*The design appears to convey an overall theme of coexistence*
2	Adjoining; aligned; camouflaged; continuity; convergence; juxtaposed; matching; monochrome; monolithic; overlap; redundancy; seamlessness; similar	*The design and its components seem like comfortable, natural fit to the context*
3	Adapted; adjustment; compatible with; conforms to; flexible; in line with	*The design appears to be actively and readily adapting to the context*
4	Hierarchical; looking over; overarching; overlooking; positioned on; proliferation; sitting over; transcendence	*The design appears active and confidently in charge of the situation*
5	Anchored; cutting across; embedded; entangled; entrenched; entwined; intersecting; patched in; peeking from; stuck together; teether; tied to	*The design appears distinct to, yet deeply connected with the background*
6	Distributed across; echoes; grid; jungle; network; pattern; repetitive; spread; systematic variation; web	*The design appears to have systematically distributed components across space*
7	Derived from; extracted from; moulded from; scooped out	*The design seems clearly derived from the context*
8	Assembled; clubbed together; collected; curated; fit together; part of; teamed up; union of	*The design appears like a deliberate collection of multiple independently meaningful parts*

IV. CONCLUSION

In this study, an exercise of semantic analysis of images of symbiosis inspired built forms was conducted. The authors collected images of the reference stimuli. Three industry experts shortlisted 17 most relevant stimuli images. Twenty-three Design students semantically analyzed the images and generated verbal descriptors to describe the symbiosis inspired built forms. The experts translated the descriptors in to 64 key-terms. The experts conducted a card-sorting exercise to then classify the terms in to 8 semantic-factors, namely – *"the design appears to convey an overall theme of coexistence", "the design and its components seem like comfortable, natural fit to the context", "the design appears to be actively and readily adapting to the context", "the design appears active and confidently in charge of the situation", "the design appears distinct to, yet deeply connected with the background", "the design appears to have systematically distributed components across space", "the design seems clearly derived from the context"*, and *"the design appears like a deliberate collection of multiple independently meaningful parts".*

An important contribution of this research work is the development of a repository of verbal key-terms and semantic-factors that were found to be underlying the stimuli images of symbiosis inspired architectural built forms. Future researchers could employ these key-terms and semantic-factors to design, develop and evaluate symbiosis inspired designs and artefacts.

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