Eco-Topia: Design 4.0 and the Construction of E-Image City

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Abstract—**Design is, by nature, a creative activity in which human beings are looking deep into their living ideal. In a historical review, the revolution in design has been constantly lifting people's aspiration for a real-life Shangri-La. If we name the empirical design Design 1.0 of the handicraft era, the rational design Design 2.0 after the industrial revolution and the consuming design Design 3.0; then the design revolution, triggered by the surging Industry 4.0 technology that brought about all-around revolution in material, dynamics and control fields, can be named as Design 4.0. The "5Is" of Design 4.0; Intelligence, Interneticity, Interactivity, Intentionality, and Integration, are constructed out an E-image City - an illusioned but accessible Eco-topia landscape blending virtuality and reality, body and media, localization and globalization, manual work and nature, and classic and virtual space-time with a characteristic of "light-clear-young".**

Keywords—Design 4.0; E-image City; Eco-topia

I. INTRODUCTION

People are born with transcendentality and always have strong aspiration for an ideal living status. In the early period of civilization, the "Blessed City" of early Sumer, the "Ancient Manhattan" of ancient India, the "City of the Dead" of ancient Egypt, and the urban city ethical system in ancient China all represented the eagerness and endeavors of the people for an ideal place. The Republic of Plato in ancient Greece, the Utopia of Sir Thomas More in England in the16th century, the City of the Sun of Italian Campanella in the 17th century, as well as La Ville Radieuse (The Radiant City) of Le Corbusier in France in early 20th century, though they had different names, each shared a similar idea. The hope of achieving their ideals by contributing their advanced technology into the design of the land. The latter half of the 20th century witnessed the arrival of Industry 4.0, a technological revolution marked by new dynamic materials, control technology, The Internet of Things and intellectualizaton, and an industrial revolution based on big data. A great transformation would happen to design, with a change in peoples living mode and a shift in design aesthetics.

II. INDUSTRY 4.0 VS DESIGN 4.0

The revolution of design depends on technological revolution. The basic elements include three aspects; material, energy power and control technology. The manufacturing means and methods of technology determine the operating and power modes of the things designed, thus determining the ways people feel, the mode and scale people perceive, and the method people cognize knowledge, so that a new living method can be constructed. When we are describing the developing history of design in accordance with its evolution, the revolution based on technological principle is obvious. As an analogy of the internet technology versions showing the division of technological eras since industrial age, we divide the design age into 4 phases, Design 1.0, Design 2.0, Design 3.0, and Design 4.0.

A. Handicraft Era and Design 1.0: Empirical Design and the "City of Symbol"

The handicraft keeps the interactive relationship between people's physical and mental activity, nature, and people duirng its process. The handling experience of the materials of the handicraftsman means the process of dealing with the nature of material is an interaction of human and nature, and a conversion from nature to human. The handicraftsman creates things based on an image in mind, thus he can symbolize the expectation, characteristics and personal feelings in his product. When it comes to the architecture, the "City of Symbol" is constructed with functionality and expression as symbolic marks through hints in semiology and oriented metaphor.

B. Industrial Era and Design 2.0: Rational Design and "The Radiant City"

Mechanization and electrification have come true since the industrial revolution in the 18th century. Machines have become not only the power unit of technology, reducing manual work, but also less dependent on human labor. In other words, labor gains a new form of production, dependent on machinery not personel. The machinery production eliminates all the perceptual experience factors in handicraft process and requires more rational factors. Modern industrial revolution requires that the modern design must apply to the functionality need of industrial products. Le Corbusier designed a concentrated city based on his machinery aesthetics: a mass of skyscrapers and subways; a highly efficient transportation system. He gave a full play of machinery and rationalism in the industrial era and imprinted his ideal onto this monument with a distinctive mark of the machinery era. He created a fully-modernized living environment for people with modern technology.

C. Consuming Era and Design 3.0: Consuming Design and the "City of Simulacrum"

Great machine and standardized production generate large-scale consumption. In this era design stimulates the consuming desires and shapes the customers values. The design and image become a method through which many consumers express their pursuits and achievements. More opportunities to access goods eliminates the traditional hierarchy and changes the social structure. The increasing number of consumers constitute a new class. The combination of design and bulk production moves taste and luxury to a popular style. A new relationship of "consumer-design" is formed. Those who seek a sense of belonging, confidence and superiority indulge in a world of "conspicuous consumption" and "simulacrum". The simulacrum destroys the difference between true/fake and reality/imagination and becomes a symbol of reality. It finally accelerates the culture conversion as an emphasis of design for experience. The line between authentic and artificial is blurred and people fall into symbolic simulacrum from rationalism.

D. Information Era and Design 4.0: Intelligent Design and E-image City

Since the 1970s, the intellectual technology, smart material, automated production system and intelligent network have formed the technological background of Industry 4.0. Design has been quietly transformed into a new revolution; intellectualized design. The revolution of design spans three levels: "logic or technical principle", "pattern or characteristic of things" and "emotional property of the design", formed by new energies (hydrogen energy, biomass energy, solar energy, wind energy, geothermal energy, ocean energy fuel cell, etc.), new materials (superconducting materials, magnetic materials, nanometer materials, energy materials, smart materials, semiconductor materials, photocatalytic materials, optical fiber and cable materials, etc.), new intellisense control technology and internet technology. These elements initially constituted the design element structure of Design 4.0, and the looming concepts of the early 21st century E-image City.

III. DESIGN 4.0: FEATURES OF E-IMAGE CITY

Five Features of E-image City:

A. Intelligence

Intelligence not only endows the products with the ability to make rational judgement, but also transfers the "person-perceiving-objects" to "object-perceiving-persons" in perceptive senses, in order to achieve the 'human-centered' design. With the 'life' given by the biological perceptive technology, objects have perception, character, and personality - such as the "necomimi" and "mononone" invented by Neurowear. Biological sensors can establish the communicative channel between people and objects by perceiving human brain waves.

B. Interneticity

International technology establishes the interconnections between persons and objects, as well as objects with each other. Despite the fact that Web 4.0 is not clearly defined, it is usually called symbiotic web. For example, Web 4.0 can be used as the mind controlled interface. Obviously, Web 4.0 is taking advantage of intelligence to develop itself towards the intelligent web [1]. WebOS will operate together with human mind, which indicates an enormous and interactive internet with high intelligence [2].

C. Interactivety

Internet and the crowd-funding mode alter the way of interpersonal communication and cooperation, which brings more interactions between "designers" and "clients" [3] 37. Everybody in the era of Design 4.0 can be entitled as a designer, as design has become part of daily life. Smothering of designers comes with the decay of "design". In the very year the Bauhaus design revolution realized the separation between design and production, design gained its independence. After a hundred years, design seems to be again returning to the status in which it takes control and accomplishes the entire process of "creating things". Besides, interconnected information sharing also allows people to complete the "creating things" together. The idea of a informationized architectural model based on the interaction of environment-architecture-user makes it possible to maximize users' participation in subscription and decision-making. That is to say, users become the most significant decision makers in the productive chains of the entire house production line [4]. Every behavior of a human being should be a creative attempt [3] 67.

D. Intentionality

Before design 4.0, design was always something well-planned from top to bottom; now, it is an intentional formation process from bottom to top. The Internet liberates the creativity of mankind, and the gaining of Maker identity provides each person with rich originality, dedication to innovation, taking pleasure in practice and sharing with new opportunities and conditions. In the times of Maker

standardized production is discarded, and non-standardized and individual production emerge instead. Factories begins to wane. Stiff and overwhelming forests of iron will become superseded by vibrant and diverse minds, and more interesting, more humane ideas. "Since the neural network and the planetary network collide and form connection, our brains will invade cities, and cities will also intrude into our brains [5] 99." The cyber network is part of our sense organs and helps us with constructivism [5] 85, with which we can feel a virtual sense of immediacy. The world generated by subject construction is increasing its power and enlarging its field, and will become a Mind-City in which the subject is engaged into the intentional construction.

E. Integration

Integration is mirrored from diverse dimensions. First comes the integration between virtuality and reality, which means one could dwell on both the real world and the virtual world. Wormholes enable us to go through the space between the real world and the virtual world, the nature and super-nature. We create a parallel world and live in it, and realize the genuine selves and long-distant presence in the same continuum. Next comes the integration between body and medium. We are all connectors, seeing computers as the medium, and being enhanced by those computers. This has become a qualitative change - the 'Cyberception' in the post-biological discipline [5] 85. The sense towards technology makes our sensory centers continuously enlarge, to include brand new feelings and ideas. New body and new consciousness bring in a new environment with more intelligence. An architecture equipped with System Interface and network mode is able to; respond to our eye-sight, pay attention, listen, and make interactions with us. We live in an environment where we can be heard, watched, perceived and engaged into. The new mission for architects is to join the material structure with cyber space together, and develop them into a new continuum.

To sum up, the Virtual Reality constructed through the new design medium featured by the above "5Is" is dynamically growing and continuously springing up. It is variable reality that changes all the time like Zen. It is also called Eco-topia.

IV. ECO-TOPIA: LIGHT-CLEAR-YOUNG, BIOLOGICAL REALM

Eco-topia is Utopia in the biological sense, possessing three features:

A. Light-- Material Design and its Incorporeity

The magnificent epic of machinery aesthetism has collapsed, and the steel and iron material (or heavy material) has been transferred into light material, or even something non-material. "The Radiant City" has descended to the sunset glow. Post-modern vulgar buildings made from glass, concrete and steel are gradually lowering their vitality. In the future, architecture will become transformable houses with superluminal path and multi-agent structure. We are moving from the entity city to the electronic E-image City, and the

world will finally become a sentient Net (Roy Ascott). It feels real, but invisible. Design in the 21th century lays more emphasis on the design transformation from the object to non-object, from product to service, and from functions to feelings.

B. Clear-- Relationship Design and its Transparency

From the perspective of interpersonal relations, 'clear' means transparency. Visual images constitute broad space orders by the features of light, and indicate that people can perceive the different space positions at the same time. Transparency is the word we use to describe future interpersonal relations. Cybernet, as the community, forms non-linear, interpersonal, geographical, urban and national structure. Society is no longer clusters of cities; digital design takes up the space (T-space) for long-distant information processing, which destroys classical space and makes time into territory [5] 104. Social formation is gradually managed by connections rather than borders. The Internet passes global transparency, management, distribution, participation and cooperation to key sectors like industry, politics, society and others [6]. The decentralization brings people into 'person-to-person' relations. New values, new politics and new lifestyles are gradually emerging from our global connectivity. From the view of the relationship between human and nature, 'clear' is an environment trait regarding clean energy and clean building materials. For example, RoffDishc, a German architect, designed the "Sunflower" house by taking lessons from the sunflowers' trait of phototaxis, and made the house spin towards the sun driven by solar energy, which guarantees the warmth and electricity in the house.

C. "Young" --Development Design and its Sustainability

"Young" means vigor, growth and nature. Chinese architect, Su Yunsheng has designed a solar intelligent 3D printing house which is made from nano aerogel, highly-intense carbon fiber and other high polymer materials. The whole printing process only takes 40 minutes. In addition, ultra light steel is employed as the frame to make the house shockproof. Since the house is assembled by the printed objects, it can be loaded, unloaded and moved at any time. Su names the house a "Sustainable Cocoon"; not only does it convey the Chinese traditional philosophy idea that everything is in continuous reproduction, but also describes the growth, reproducibility and variation.

V. CONCLUSIONS

The desired Utopia was at first out of reach, and the great discoveries of geography made it disillusioned. Then it was imagined upon the dimension of times - past or future. As a matter of fact, Utopia lies in the present. The "E-image City" constructed by William J.Mitchell with "me++" and interconnected cities, transcends the empirical "City of Symbol" in classical times, the rational "Radiant City" in industrial times, the irrational "City of Simulacrum" in consumption times and becomes the genuine Eco-topia. It is partly illusioned but accessible to everyone. It is the "Ideal City" combining virtuality and reality, body and media,

region and globe, as well as man and nature. It not only provides a possibility in the real society, but also presents us with a "poetic habitation" of healthy eco-lifestyle.

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