From Reality to Being Future: Sustainable Design and Rethinking

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Abstract. His paper summarizes the concept, main strategies, essential elements and important ways of speculative design, and analyzes the sustainable product design in speculative design from three aspects of materials, technology and use of sustainable products. Then rethink the potential problems of sustainable product design in speculative design, and put forward three problems in the whole design process: ecological crisis caused by potential excess of raw materials, ethical challenge caused by excessive technology, and cognitive dilemma caused by insufficient experience. Through concept interpretation, case analysis and reflective thinking, the future of sustainable product design in speculative design is viewed with a sober and speculative attitude.

Keywords: Speculative design · Sustainable design · Product design · rethinking

1 Introduction

As a recently-emerging concept, speculative design, which derives from *Speculative Everything: Design, Fiction, and Social Dreaming* by Anthony Dunne and Fiona Raby, is drawing the design community's increasing attention. According to the book, speculative design is a format of conceptual design evolved from critical design, aiming to enable its audiences to ponder the matter other than to solve the matter [1]. In the introduction part, they propose an A/B Manifesto to make a rationale over the differences between speculative design and traditional design (Fig. 1). The Manifesto accommodates the traditional design to the parallel design dimension they were exploring: Dimension B is considered a new dimension other than Dimension A, and speculative design is a concept extracted from Dimension B. And the practice and exploration of speculative design should adhere to the definition. Besides, speculative design may use some additional strategies and props for criticizing, unreality, transforming, and considering purposes, in which the props (carriers) serve as the essential elements of speculative design, aesthetics of unreality is the main strategy for speculative design to achieve its goals, and futuristic scenario is the key channel for thoughts-delivering.

1.1 Strategy: Aesthetics of Unreality

Audiences capture information in a straightforward way of visual appeal, and the discrepancies of aesthetics because of visual language expressing arouse audiences' thinking,

A	B	A (广义的设计)	B (平行维度的设计)
Affirmative	Critical	肯定的	批判
Problem solving	Problem finding	解决问题	发现问题
Provides answers	Ask questions	提供答案	提出问题
Design for production	Design for debate	为生产而设计	为争论而设计
Design as solution	Design as medium	设计是解决办法	设计是媒介
In the service of industry	In the service of society	为产业服务	为社会服务
Fictional functions	Functional functions	虚构的功能	功能的虚构
For how the world is	For how the world could be	世界是怎样的	世界还可能是怎样的
Change the world to suit us	Change us to suit the world	改变世界以适应我们	改变我们去适应世界
Science fiction	Social fiction	科学的虚构	社会的虚构
Futures	Parallel worlds	未来	平行世界
The "real" real	The "unreal" real	"现实"的真实	非"现实"的真实
Narratives of production	Narratives of consumption	产品叙事	消费叙事
Applications	Implications	应用	暗示
Fun	Humor	有趣	幽默
Innovation	Provacation	创新	激进
Concept ddesign	Conceptual ddesign	概念设计	概念化设计
Consumer	Citizen	消费者	公民
Makes us buy	Makes us think	让我们购买	让我们思考
Ergonomics	Phetoric	人机工程学	修辞学
User-friendliness	Ethics	用户友好性	伦理道德
Process	Authorship	步骤程序	作者身份

Fig. 1. The A/B Manifesto (Source: the author drew according to Dunn and Raby's chart)

by which speculative design has its first step for achieving the design goals accomplished and it marks the beginning of a mental interaction between the work and the audience [2]. Zeng Yiwen, a designer for critical products, was inspired by her first connection with speculative design to create Illusion Collionaire, a distinctive coin bank. Shaped as an abstract wireframe, Illusion Collionaire allows audiences to hear a coin sliding down along the metal structure, offering pleasure from giving coins. Yet such a coin bank is not designed for money saving since it specifically blurs people's familiarity with coin banks in the daily viewing experience and thereof persuades people to rethink the reason for using a coin bank: whether it does help save money or offers a mere mental solace. The aesthetics of unreality, as defined here, recodes the object according to a synchronous pattern, to attract the audience's attention visually and convey a specific concept.

1.2 Essential: Carriers

As the essential elements of speculative design, the carriers (props) are a significant technique of expression. Unlike products, prototypes, or models, speculative props do not have to provide practical functions nor refer to authentic objects [2]. Instead, it means designing a product model or service system with futuristic technologies in the context of reasonable imagination. Anthony and Raby conducted a project called "Foragers" when they considered how people in the future deal with food shortages (Fig. 2). In their design, people build DIY devices integrated with the digestive systems of other mammals, birds, and insects to serve as new synthetic digestive organs, enabling extracting nutrients from trunks, meadows, pools, and other natural materials. The alleged DIY devices could be grotesquely different from traditional products in forms and functions, and that is exactly what the work of speculative design attempts to do: trigger the mass's attention and reflection upon future food shortages by presenting a possible future with unconventional products.

Fig. 2. Foragers (Dunne & Raby, 2009. Source: http://dunneandraby.co.uk/content/projects/510/0)

   a   b

Fig. 3. Technological Dream Series: Robots (Dunne & Raby, 2007. Source: http://dunneandraby.co.uk/content/projects/10/0)

1.3   Channel: Futuristic Scenario

The speculative design attempts to build a "discussion platform" to invite audiences for free imagination and argument. In other words, it provides an open system with compatible interactions and usage scenarios to encourage users to serve as one of the elements of the design, enabling them to break their traditional understanding of things with imagination [3]. As for the "Technological Dream Series: Robots" project, Dunne and Raby designed four "strange" robots to explore their interactions with the users. The wooden furniture in Fig. 3a is a sentinel robot, which can decide which visitors are allowed to access the owner's network data according to eye gazing. And the robot in a white shell (Fig. 3b) seems like an intelligent one but is immovable until its owner helps because of the white "cage". In such scenarios, robots in the future are interacting with people in a strange but intimate manner. As domestic robots, they are no longer some half-beings with super intelligence and powerful functions and yet get rid of their original feature of simply being tools to become housemates in people's life.

2   Sustainable Products of Speculative Design

Design for sustainability (e.g., design of sustainable products) is one of the principles of sustainable development, a theoretical reflection on the relationships among environment, society & ethics, economy, etc., and a practice for innovational solutions and

meaning construction [4]. The design for sustainable products integrates design into the holistic "human-machine-environment-society" system, meeting the requirements for environmental objects and economic benefits while guaranteeing the product-design philosophy of sustainable development [5]. Speculative design considers design a catalyst for future living, and it is infused with complex basic principles of societies, cultures, emerging technologies, and ethics of human beings to start the erupt of imagination to make people ponder and question actively. Issues concerning sustainable development such as recourses, environment, and population are critical to the shift of people's thoughts and attitudes, now of frequent social issues and deteriorating ecological environment. The naïve optimism of "design as solution" could never true challenges to human survival and development such as resource shortage, environmental deterioration, and overpopulation [6]. Speculative design will be a tendency and how sustainable products promote people's reflection and discussion through the power of speculative design to generate new inspirations and possibilities is worth exploring.

Speculative design has opened a new path for sustainable design to provide sustainable products with more possibilities in material, technique, and usage and to change the mass's awareness and behavior while solving realistic problems (as the common goal of design). Centering on design for sustainability, speculative design is seeking ways to pass some futuristic visions in material, food, or living patterns through the carriers (also known as "physical props" in speculative design) in the form of an industrial product or art installation. Nothing short of enabling more people to reflect and imagine the future may break the current deadlock of "making design to solve problems".

2.1 Material Possibilities

New materials serve as a crucial part of the process of sustainable design and manage the influence of design on the ecological environment [7]. From the perspective of speculative design, the same materials humans used as the tools to understand and transform nature long before have become the major supporters to consider low carbon and energy saving, thereof many attempts can be reached concerning the development of sustainable materials. Sinae Kim from Central Saint Martins considered urine a potential material to create Urine Ware with a mixed glaze (Fig. 4), and the shape is also similar to a bladder. This work intends to imply that urine is an available crude material when people tend to waste it for ethical and social stereotypes. Likewise, organic substances like green plants, shells of aquatic crustaceans, and food residues are alternative sustainable materials. Above, speculative design enriches the directions for exploring sustainable materials by waste recycling.

2.2 Biotechnological Props

Sustainable materials have done the transformation with significant support from biotechnology, which serves as one of the props (carriers) to realize those designs capable of improving environmental performance. In this case, biotechnology becomes an important means of developing sustainable designs. At the 2015 London Design Festival, Zeng Yiwen, then a student from the Royal College of Art, presented a bio-digestion car driven by 3D bioprinting organs (Fig. 5). Based on biotechnology, this work establishes

Fig. 4. Urine Ware (Sinae Kim, 2021. Source: Pinterest)

Fig. 5. Bio-Digestion Car (Zeng Yiwen, 2015. Source: https://www.bilibili.com)

a power generation system after the pattern of a cattle's digestion process, in which the forage would be constantly digested by four "stomachs" to generate methane and other wastes as bioenergy for sustainable power generation. Bio-Digestion Car highlighted the greenhouse effect, a persistent hot global issue, to motivate people's imagination concerning how to solve the problem in the future. More specifically, this work of design takes the car and cattle as their carriers to remind people of the causes of the greenhouse effect: excessive methane and car exhaust. It is a sustainable design idea involving environmental pollution and transportation.

2.3   Futuristic Scenarios Rely on Living Experiences

Laying sustainable products based on biotechnology in daily life to explore the possible lifestyles in the future may have some similarities with the scenario system of speculative design for they emphasize establishing a living experience as far as the definition of the alleged "ecology" [8]. In the "Personal Carbon Economy" project, Zhang Shihan, a futurist of design, conceived how the world could be if personal carbon emissions would be charged (Fig. 6). In this scenario, people start wearing a moss beard to avoid paying bills because it would offset the carbon dioxide the individual emits through photosynthesis. Then the user may wash the beard once it is matured to make a salad

Fig. 6. Personal Carbon Economy (Zhang Shihan, 2017. Source: http://www.shihanzhang.com/future-breathing-store-2038)

smoothie with fruits, therefore planting moss beards to offset personal carbon footprints is promising to become a fashionable lifestyle. Being offered an experience, people would participate in the work of sustainable design to interact closely with the plants as they sprout, grow, and mature, and users, in this way, are introduced to be a part of the designer's conceived futuristic scenario.

3 Rethinking of Sustainable Design from the Speculative Design Perspective

Speculative design is being recognized and popularized by the design community. As an emerging design concept, it is of great potential and significantly challenged. Despite its stronger vitality than traditional design, its problems are unsettling. With further exploration of sustainable design, the number of ideas for a sustainable future is increasing. In light of the cases above, it is apparent that many practices have been conducted in reflecting realistic issues and still most production outputs are small-scale conceptual tentative items. To find proper paths for integrated development of speculative design and sustainable products, a further reflection on the potential problems of the design of sustainable products according to the realistic design needs and the challenges in developing and propagating speculative design.

3.1 Ecological Crisis Caused by Overdevelopment

Serving as the essential for creations (i.e., sustainable products in this case), the material is considered a practical problem that speculative design draws the mass's attention on. Thus, designers are making innovative efforts in developing and using sustainable materials. Many disadvantages and difficulties have to be considered despite the promising future of sustainable materials. A series of practices for sustainable design has predicted that algae would be the first choice for numerous designers. Then the mass continuing the concept of taking algae as the raw material could lead to scale breeding of aquatic algae for the rapid demand growth. The supply would be favorable until the capacity becomes supersaturated, otherwise, the excessive reproduction would cause an uncontrollable ecological crisis.

The source and supply of a given material have to be taken into consideration. The realization of a revolution to design for sustainability concerns the whole life cycle of a product from design to the biological chain's balanced development. Speculative design has to accommodate biodiversity when exploring new prospective materials and adopt a multi-path design strategy provided with alternatives to avoid excessive dependence on certain materials or energy resources and reduce the possibility of ecological crisis when inspiring the mass to develop and explore sustainable materials.

3.2 Ethical Challenges in Applying Emerging Technologies

Oddly Speculative design opposes the mainstream technological optimism to speculate and fabricate the negative impacts of emerging technologies on humans visually [9]. Many innovative technologies such as gene editing and bioprinting are involved in the exploration of speculative design and are prone to pose significant ethical challenges to human society once they are of high economic benefits. Even though speculative products use emerging technologies as a bridge between humans and nature and among humans, the ethical challenges in technology will be inevitable if the relationship between humans and the network and the social activity depends on technologies at all to lead to an overturning change on the social status and value of people. After all, technologies are mere tools to realize design inspirations.

In light of the definition of the term "ethical challenge", technical subjects (e.g., designer, producer, marketer, and consumer of a given technology) shall consider both the favorable possibilities and the justifiability of the consequences the technology may trigger and their possible developments. "What we should do is make technology a strength of 'good' and use it innovatively rather other using it as an "evil" power", as Stefano Marzano, global design director of Philips Design, stated [10]. A sustainable future requires support from emerging technologies, and sustainable designs can serve human beings and benefit future generations indeed when various utilities, including material, function, and aesthetics, of the products are explored through technologies.

3.3 Cognitive Predicament: Absence of Experience

As a foreign concept derived from the western experimental teaching context of industrial design in the 20th century, speculative design is of strong fictionality and radical ideas for Chinese people. Average audiences would come to a swamp in interpreting a speculative product due to limited cognitive level, which causes a situation where these products cannot trigger their "effective questioning" over the sustainable problems and mislead them to doubt speculative design itself instead. Some speculative products present a new design direction for sustainable living in the future and are not applied in real-world scenes currently. In this case, users may find it hard to understand their implicit functions. When the public fails to accept or appreciate the outcomes of speculative design but is impeded to view or accept the design works due to their appearances, probably none of the new forms of design initiate a change in mass behavior.

In speculative design, apart from the design, a sustainable product concerns the integration of reflections to uphold a reasonable pattern of production and consumption and pursue a more benign lifestyle for people [11]. Moreover, in China or Western countries,

still, the propagation of speculative design relies on the interpretation of the public or experts, through offline exhibitions and online promotion, to express the reflections on sustainability embedded in the speculative products to the mass. Accordingly, speculative design may serve as a tool for us to respond to the challenges and conceive a future, exploring alternative solutions for the honored sustainable development.

4   Conclusions

The attention of speculative design on sustainable development refers to the designers' reflection on realistic issues such as ecological environment and social problems, and its sustainable products are outlining a favorable future for the mass through physical practices. Upon imagination and reflection, creative thinking patterns and design methods for sustainable products are springing up. However, while an effective combination between the exploration of speculative design and the development of sustainable products shall be achieved provided, they are embracing each other and promoting mutually, it necessitates rethinking the potential challenges in the process to review the future of speculative design in creating sustainable products from a provident, speculative perspective.

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