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## **OPEN-ENDED DESIGN. LOCAL RE-APPROPRIATIONS THROUGH IMPERFECTION**

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### **ABSTRACT**

Design for Sustainability (DfS) focuses on wicked problems that cannot be modelled in reductionist ways. Furthermore, when bottom-up local interventions prove to have positive effects in their context, they remain hard to spread and might face failure if transferred the other contexts. Here, a researchthrough-design approach is presented for highlighting a new paradigm, that questions the very nature of both design process and outcomes. Specifically, Open-ended Design (OeD) is introduced pursuing the creation of unfinished and ever-evolving outcomes (imperfect by intention), embracing the out-ofcontrol local instances. In this approach balance between openness and over-design is sought, to facilitate both the global diffusion of design outcomes and their local re-appropriation. The aim of the research is to highlight existing connections between OeD and DfS, listing its values and limitations through some reported cases. In conclusion, designers might start designing for emergent aspects of the designed solutions, supporting multiple local re-appropriations.

Key Words: Open-ended Design, Re-appropriation, Design for Sustainability, Design for Change.

## 1. INTRODUCTION

Nowadays, Sustainability for All is one of the most crucial global goals and it encompasses a broad variety of sub-goals (often referred to as “Sustainable Development Goals”<sup>1</sup> drafted by the United Nations). These sub-goals reach full potential when seen as a unity, in their interconnectedness and as parts of the broader ecosystem within which we live and design. Furthermore, Design for Sustainability (DfS) can be seen as the broad set of design-driven activities that help the transition to more sustainable futures, by challenging very complex problems (Bhamra & Loft-house, 2016; Ceschin& Gaziulusoy, 2016; Vezzoli, 2018). These problems have been defined as “wicked”, meaning problems that cannot be solved and not even represented (or modelled) in reductionist ways or adopting linear causality (Rittel & Webber, 1973). At the same time, the expression “Sustainability for All” strongly resemble the widely spread expression “Design for All”, being a design for “human diversity, social inclusion and equality” (EIDD Stockholm Declaration, 2004). One of the potential threats underlying these approaches comes from the engagement with terms as “all” or “universal”, this conflicts with the widely recognized need to “think globally, act locally”. In fact, even if the concept of “appropriate alternatives” as contrary to providing a single solution for everyone is clear in the Design for All movement, it is not always clear how this is implemented in the design outcome, especially when produced for high volumes of production that intrinsically require some standardization (Ostuzzi, Rognoli, Saldien, & Levi, 2015)(De Couvreur & Goossens, 2011). Sustainable solutions are far from being universal, or definitive. On the contrary, once agreed on recognizing sustainability related problems as wicked problems, it becomes important to embrace the impossibility of limiting our interventions to “ultimate tests”. Many explanations for the same problem can be found, and the problems themselves should be recognized in their dynamic and context-dependent nature. A definition that includes some of these perspectives is SLOC (Manzini, 2010) for which design interventions for sustainability should be Small, Local, Open and Connected.

In this paper, it is the authors’ intention to describe Open-ended Design (Ostuzzi, De Couvreur, Detand, & Saldien, 2017), as an approach that can possibly inform designers in their Design for Sustainability practices specifically by framing the creation of unfinished and ever-evolving outcomes (imperfect by intention). The Open-ended Designed outcomes are in fact intentionally balancing openness and over-design, Design for All and Design for One, in order to facilitate both global diffusion and local re-appropriations of the design outcomes. In the text, existing connections between OeD and DfS are highlighted and underpinned both by theoretical considerations and practice-based pieces of evidence. The main value of the proposed paper lays in the act of questioning the very nature of the design process and outcomes, suggesting a change in perspective and roles both in the use-context and in the design-context.

## 2. STATE OF THE ART

To frame the topic, it is necessary to outline the state of the art of research in this field. The two basic points are: 1) the dominant design paradigms and (2) change in design as spontaneous process.

### 2.1. Design paradigms

Consumption patterns across the industrialized world, such as the tendency towards accumulation, hyper-consumerism and throwaway dynamics became dominant, causing drastic environmental repercussions (Cooper, 2010) (“Annual Report on Sustainable Development Work in the OECD”, 2008).Also, it has been recognized that most of these impacts are defined since the design phase (Thackara,2005), putting the role of the designer in strong connection with the need for a more sustainable development, defined as a development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland 1987, p. 13). It is essential to focus on two main aspects of this definition: the future perspective and the diversity of needs (their own needs). In this Section, two diametrically opposed approaches to design and Design for Sustainability are introduced: the general (or universal, ideal, standard, for all)approach and the local (or contextual, idiosyncratic, unique, for one) approach, both represented in Figure 1. Design goes then beyond the creation and modification of the arti-

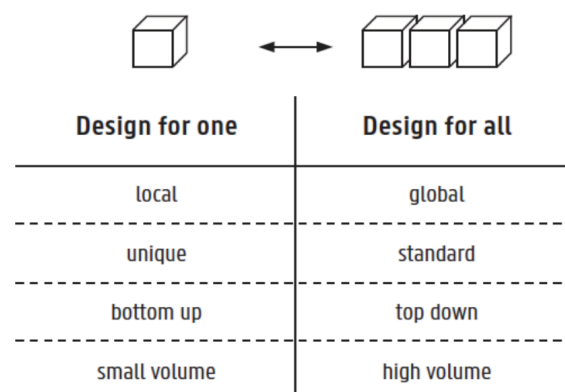


Figure 1 Design outcomes: Design for one as opposed to Design for All

<sup>1</sup> <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

ficial aspects of the world since it ultimately deals with social organizations and patterns of human interactions (Nelson, 1994). This transition can be supported by engaging with participatory design in combination with an open process where small local activities operate while keeping in mind a more global vision (Manzini & Rizzo, 2011; Manzini, 2010). This transition can be supported by the current digital revolution, that builds upon networked society with increased trust in sharing dynamics, diffusion of creativity and production capabilities. In other words, radical social and technological innovations where resources (creativity, knowledge, etc.) are shared.

Nevertheless, spreading relevant design solutions is not easy since this process strongly relies on the kind of design outcome we are facing. For example, in the case of more universal solutions (Design for All), also definable as top-down solutions, difficulties might be encountered during adoption and use phases. In fact, the product may face non-acceptance in the real environment because of loss of the “intentional” (from the designers’ point of view) initial value: or it may happen that users’ behaviors escalate, generating the phenomenon of the rebound effect. Examples could be One Laptop Per Child(wiki.olpc.org), and Nonfuture (designthatmatters.org/nonfuture). In the case of specific solutions (Design for One), also definable as bottom-up solutions, difficulties can be found while up-scaling them to solve globally diffused problems. Examples could be provided by very context-dependent and local projects, as Design for Every(one) (designforeveryone.howest.be), and the Eye Writer (eyewriter.org). In this study, we recognized as one of the core issues in this process of diffusion the hard conversations between global and local spheres. In synthesis, it is difficult for the context of use to change the designed outcomes in accordance to specific and contextual needs.

**2.2. Change in design as spontaneous process**

Being part of reality, products (also artificial ones) are dynamic entities, as well as dynamic is our perception of them. Specifically, when products move from the “design space”, where they are thought to be and enter in contact with the “real environment”, they spontaneously start changing (Nelson & Stolterman, 2012; Wakkary & Maestri, 2008). In fact, in the design space, they are strongly subjected to the abstract conceptualization of the designers -they are under-control and ideal, while in the real environment they are strongly interwoven with the coordinates of space and time becoming subject to the messiness of life, out-of-control and real. Products’ attributes often emerge (both implying material changes and change in meanings), becoming the local and “ultimate particular” expressions of the initial abstract intention of the designer (Rognoli & Karana, 2014; Bridgens & Lilley, 2017; Lilley et al., 2019). The changes occurring in the designed outcomes are not always predicted, or even predictable, by the designer. Therefore, design space and real environment, appear as distant and profoundly different. This perception is well spread among the scientific community (Hermans, 2014; Risdiyono & Koomsap, 2011; van der Bijl-Brouwer & van der Voort, 2014;

G. Fischer, Giaccardi, Ye, et al., 2004). A simplified list of possible dichotomies used to distinguish the design space from the real environment has been provided in Figure 2.

| Design space       | Real environment |
|--------------------|------------------|
| abstract           | concrete         |
| standard           | unique           |
| stable             | dynamic          |
| true               | real             |
| proximal           | distant          |
| under control      | out of control   |
| simple             | complex          |
| use through design | use through use  |

*Figure 2 Possible dichotomies used to distinguish the design space from the real environment*

The design space is proximal and under control, while the real environment is distant and out-of-control. The design space aims at simplifying and recognizing problems as tame, while the real environment is complex and characterized by wicked problems (Rittel, 1972; Buchanan, 1992). The design space defines use in the “design time”, through design (designing for use before use), and the real environment defines use through use, in the “use time”, better defined as “design after design time” – since it doesn’t only refer to the use stage, but also production, distribution, end of life, etc. (Ehn, 2008; Bjorgvinsson, 2008; Redstrom, 2008). But, if we identify change as a spontaneous process, why, then, do we tend as designers to think of our products as stable entities? Why do we often design gathering information from abstract constructions of a specific situation, or controlled environments, more similar to laboratories than reality?

### 3. OPEN-ENDED DESIGN AND DESIGN FOR SUSTAINABILITY

Open-ended Design has been seen as a possible method to intentionally suggest out-of-control conversations (Ostuzzi, 2018). It starts from the recognition that participatory design works with identifiable users (Ehn, 2008), or stakeholders, at a precise moment, while the final products will be addressing – of course – to more users, stakeholders, ecologies, at different moments in time (Bjorgvinsson, 2008). This way, the unexpected part of the desiderata, a more honest conversation intime, and potential subversion of non-intentional appropriations might be lost (Dix, 2007). Different methods are then needed to engage with reality in its messy dynamic, in which design becomes “not a matter of getting rid of the emergent, but rather of including it and making it an opportunity for more creative and more adequate solutions to problems” (Gerhard Fischer & Giaccardi, 2006). It can be done only by observing reality and anticipating, or foregrounding, it. The term anticipation is different from prediction, and it is used to highlight the conscious not knowing of the designer (Nelson, 1987).

Open-ended Design has been defined as “An Open-ended Design (OeD) is seen as a project able to change, according to the dynamic and changing context. Open-ended Design, can also be defined as suboptimal, error-friendly (Manzini, 2010), unfinished, Wabi Sabi (Juniper, 2011) contextual, context-dependent and is characterized by its inherent flexibility due to the incomplete voluntary definition of its features, also defined as its Imperfection.” In other words, it suggests a paradigm shift where products become themselves becomes learning objects and, in this perspective, they share characteristics with prototypes (Bjorgvinsson, 2008)(Ehn, 2008), definable as prototypes-in-context. In this way, the design outcome is intentionally done to be changed and re-appropriated, becoming a suggestion for action and call for participation.

#### 3.1. Description of cases studies

In this paper, we decided to report on two cases that meaningfully show intentional engagements with Open-ended Design outcomes, meaning outcomes that are made to be changed through outof-control conversations. The cases are (1) the collaborative development of Mycelium-based Materials, specifically by the Belgian cooperative GLIMPS (glimps.bio, biofabforum.org) and (2) the project Incremental House by the Chilean Architecture studio Elemental (elementalchile.cl).

Mycelium-based materials are the result of the convergence of both experimental and applicative research in combining living biological systems with materials science in order to produce new circular and sustainable materials from biological resources. Mycelium-materials are characterized by a low tech and slow process, which is respectful of the natural rhythm of growing. One uncommon feature of the material is that it can be grown in a mound, which allows designers to grow the mycelium directly into the shape of the final object (Parisi et al., 2016; Parisi & Rognoli, 2017). Thanks to its unique structure and composition it is expected a significant diffusion of materials based on mycelium (Karana et al., 2018). Furthermore, the process -as it is for now, in the DIY scale-takes advantage of out-of-control process instances, generating every time products that are unique and beautifully imperfect.

What is of great interest of this family of materials and the way they have been addresses by some research streams is the clear challenge they pose to traditional industrial paradigms. In the Bio Fab Forum, we can read “The research approach is community-based and uses an online forum (www.biofabforum.org) for knowledge sharing with the commons. It includes action-oriented and material-based research which is probabilistic, explorative and shaped by its local context. While most experiments on the open-platform are not always scientifically reproducible, they embody a valuable set of psychogeography possibilities for the re-appropriation of matter. (...) Furthermore, the collaborative and non-competitive engagements regularly form new ‘out-of-control’ information, which creates fertile and fluctuating spaces between disciplines, the people, and their relationships. As such, the approach is based on two main concepts: non-competitive dynamics and closed-loop dynamics.”

Incremental Houses is a project for people who lost their own house during an earthquake in Chile. This house is not finished, while the entire structure is visible, and half of the volume is completely built, the second half is still empty. To finish the house, the occupant has to take an action, to reappropriate the void. In this way every house becomes personal and different from the other surrounding ones. The house, that started as identical to many others, becomes personal and addresses the aesthetic and functional needs of the occupant. The local re-appropriations of this house can be seen in Figure 3.



[Figure 3] The same house becomes many houses: Open-ended Design through unfinished products



#### 4. DISCUSSION

Throughout the research around Open-ended Design, several examples have been collected<sup>1</sup> (Ostuzzi, 2018). These examples share the capability of being able to change meaningfully according to the contextual needs and wishes. Furthermore, their ability to change is the result of an intentional act from the designers' side, who decides to engage with out-of-control instances that might merge thought out the whole life cycle, as well being activated by human and non-human stakeholders. It has been claimed that these characteristics are typical also of design solutions meant for sustainability, being fundamental for these solutions to keep their local and dynamic nature. It has been decided to report on only two cases, selected based on their different characters and reach, hoping to trigger a quick glimpse inside the whole broad framework for OeD. On the one hand, mycelium-based materials show the possibilities of out-of-control production processes, where each product results as unique. They also vanish at the end-of-life, meaning that they can be fully integrated back in the eco-system, and even they can be grown locally and in a small volume, and to assure that a broad community of designers and researchers is providing easy-to-use and re-appropriate knowledge. On the other hand, we have the example of Incremental House which is a project made to be changed by the user (defining use through use, Redstrom, 2008), to achieve a unique outcome and triggering higher emotional bonds. Finally, this paper is essentially explorative, and it aims including the accepted complexity of Sustainability for All challenges into our designed outcomes, through imperfection. Therefore, by sketching the link between Sustainability for All and Open-ended Design, an approach firstly emerged within the assistive technology field, the authors intend to stimulate the reflection around the necessity of engaging in out-of-control and imperfect outcomes to improve re-appropriation, that is understanding, copying and modifications on the original, core project (Ostuzzi et al., 2016).

#### 5. CONCLUSION

Sustainability for All is one of the most crucial global goals. It challenges very complex problems that are diverse and strongly interconnected, globally diffused and differentiate in time, depending on the specific context from where they emerge. In this paper an attempt has been done in order to connect the Open-ended Design approach with a broader Design for Sustainability one. In fact, Open-ended Design intentionally seeks for a better balance between unfinished and over-design, opening-up space for local (in space and time) re-appropriations of the designed outcomes. In this way, a mutual conversation is suggested. On the one hand, designers lose control on their designed outcome and suggest participative actions needed to "finish" the design process itself, while on the other hand, the use-context can participate to the creation of the emergent qualities of the design outcome. In this shift of perspective, Open-ended Design does not aim at solving the problem, but rather becomes a prototype-in-context aiming at lowering the barriers for re-appropriation and facilitating the steps towards action from all stakeholders' sides. Finally, it suggests a shift from a Design Sustainability for All to a Design Sustainability for Every(one) goal (cfr De Couvreur, 2011) where each stakeholder (human and non-human) is asked to take part of a common conversation for more sustainable futures.

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<sup>2</sup>They can be seen at [open-ended-design.com](http://open-ended-design.com), a sharable archive of OeD cases studies.

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