

Design For Survivability

a participatory design fiction approach to Sustainability

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ABSTRACT

Design For Sustainability (D4S) is an established and popular perspective for discussing environmental, economic, and social considerations in product design. Design participants use the concept of Sustainability to discuss short- and long-term externalities of a product's lifecycle (such as fossil-fuel consumption, recyclability, and habitat impacts) from their shared perspective of a sustainable world. This work attempts to broaden D4S by proposing "Design For Survivability", a methodology for discussing products through stories of the diverse technologies, societies, and other objects they might drive to extinction. A Survivability decision process is proposed, as is an experiment comparing design discussions and outcomes between Survivability and Sustainability, and suggestions are made for analytical techniques to be adopted from ecology and conservation biology.

CCS CONCEPTS

• **Human-centered computing** → HCI theory, concepts and models; • **Social and professional topics** → Sustainability;

KEYWORDS

decision processes, design for sustainability, design fiction, object oriented ontology, participatory design, product design

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1 DESIGN FOR SUSTAINABILITY

Design for sustainability (D4S) is a methodology for incorporating considerations of Sustainability into the design of products and other commercial artefacts [4, 22]. As a field, D4S builds upon diverse conversations about Sustainability, from analyses of fossil-fuel consumption and CO2 production to conceptions of permaculture, the broadening of fiduciary duties to a "triple bottom line" (considering environmental and social impact as well as profit), the creation of private and public initiatives, and many other interests [4, 10, 22]. In the integration of all these goals, the abstract concept

of Sustainability is often undefined, an ambiguity that is foundational to some D4S processes. In particular, if we examine D4S in terms of the *conversations it seeks to create* – that is, the constitutive, archetypal, and expected conversations that design participants will have under this methodology – we find that design conversations of Sustainability often start with an explicit step of agreeing on a definition for Sustainability [22]. This consensual definition is the common ground on which participants build the later steps of their D4S process. Thus we would be missing the point if we tried to define what Sustainability *means* in these conversations; instead, let us examine aspects of how it *operates*.

1.1 Sustainability in the design conversation

1.1.1 Sustainability is integrative. A great hope of sustainable design is that all pressures on a design, its externalities and internalities, supplies and demands, stakeholders and shareholders, can be balanced to find a consensus solution [3, 10]. Sustainable design discussions thus adopt a process of consensus-finding, wherein participants collaborate to find designs which from every chosen perspective (potentially including that of unborn human generations) present paths to a consumptive built world in harmony (and potential overlap) with a productive natural world [3, 4].

1.1.2 Sustainability is utopian. This vision of an integrated Sustainable design is the reflection of an ideal Sustainable world, a world which may not be realized or realizable but which serves as a useful shared vision [3, 15]. The word "utopian" here is not a judgement of practicality, but description of an important way in which Sustainability integrates participants concerns: by seeking agreement that a sustainable world is either conceivable or a useful concept, and then shifting discussion to the terms of how best to approach it [22].

1.1.3 Sustainability is ambiguous. As a corollary of this integrative utopianism, Sustainability is necessarily ambiguous. This is shown succinctly in Birkeland's preface [4], which begins:

Some decades ago it was obvious to many that society, in its present form, was not ecologically sustainable. Today, some still debate whether we have 10 years, or 100, before we must change course dramatically and transform society to correspond more closely with ecological systems. Yet the dominant Western model of development does not sustain the (roughly) 40,000 people dying each day as a consequence of the destruction of natural systems, and the resultant lack of clean air, water, fertile soils, wetlands, or biodiverse forests, which once provided for their sustenance and health. Nor does it sustain the 1 billion people now living in

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extreme poverty and hunger without clean water or reliable energy supplies, often amidst warfare over land and resources. The notion that ecological sustainability is a future problem denies their existence.

Birkeland starts with the notion of “ecological sustainability”, relates it to “correspond[ance] with ecological systems”, and notes that people lacking environmental resources such as wetlands and soils, or goods such as water and food, are not being sustained. But as ecological systems often contain habitat destruction, hunger, and conflict, surely the notion of Sustainability this paragraph ends on is different from the notion of ecological correspondence with which it began. Calling this usage “ambiguous” is not a judgement of its effectiveness or appropriateness, just a description of how Sustainability operates in the design conversation: for if the concept of Sustainability is something seen anew in every design consensus, it is necessarily not reducible to any specific component such as renewable, carbon-neutral, upcyclable, and so on. To function, Sustainability must mean differently for different products.

1.1.4 Sustainability intervenes by changing a product's lifecycle. Who is the archetypal designer that is expected to have these conversations? Sustainability projects an image of the designer as a negotiator and facilitator, guiding other participants to practicable consensus on a product's “lifecycle” [4, 10]. The lifecycle is an expected or designed-for path which instances of a product follow from production, to consumption, to points at which their materials no longer form an instance of that product. The field of D4S has primarily considered the two ends of this cycle (i.e., manufacturing and recycling) and fuel inputs during use, but there is a growing body of work analyzing products' use, psychological consequences, maintenance, and repair, notably in the area of Sustainable Interaction Design [5, 7, 12].

The concept of a “lifecycle” is biomimetic, of course: products are not born, nor do they pupate, molt, give birth, or die. By introducing the lifecycle, D4S relates designed events of a product to a natural process of aging, as if the product were an organism that had developed these stages through coevolution with its biotic and abiotic environment.

This focus on lifecycles leads conversations of Sustainability to an emphasis on analysis and data collection of the product's own consumptions (during manufacture and use) and productions (in recycling and reuse) [7, 16], while consideration of a product's interactions and competitions with other products are secondary, external as they are to the through-line of a lifecycle, and at times left to marketing and business concerns (except in the field of International Development, where Sustainability often begins with analyses of economic self-sufficiency [6]).

2 DESIGN FOR SURVIVABILITY

Conversations of Sustainability thus provide an *integrative abstract utopianism of product lifecycles*. With such weight resting on a single word, it is interesting to consider alternate concepts, supportive of the project of Sustainability, that could lead to different conversations. This work proposes the experimental concept of Survivability as one such alternative, and in the following section will argue that Design For Survivability can provide *divergent narrative dystopias*

of interactions between products. Social networks, specifically Facebook, will be used as an exploratory example throughout; discussions of their Sustainability can get mired in datacenter cooling strategies and other minutiae, dead ends Survivability avoids.

2.1 Survivability in the design conversation

2.1.1 Survivability is divergent. If (from Section 1) the first question raised by calling something Sustainable is “just what does sustainability mean for this?”, the question raised by calling a thing Survivable is generally, in my experience, “hang on, what's going to survive or go extinct because of this, and why?” This is a question that diverges, with different participants extrapolating different consequences. These scenarios likely share characteristics—models of how products adapt to particular niches or grow into adjacent ones, or mechanisms of interaction between products and their biotic and abiotic environments—and they share a starting point, but the positive-feedback loops of each extinction separates them. These starting points feed back into and coevolve with the product itself. While some product dynamics may converge onto cycles or equilibria, the identification of these will also require a deliberate divergence of stories.

For example, the design question “is Facebook survivable?” could become “is Facebook survivable for the open web? for activist movements? for traditional news publishers?”. Answers to these questions will share similarities, but an imagined society focused on Facebook's endangering of activist movements will be different from one focused on endangered publishers or journalists. As the scenarios unfold these differences deepen; Facebook moves to different niches as different spaces open up. While in the former Facebook's story might be told as the imposition of a static state, an end-of-political-reform driven by the inability of activists to reach the people they're trying to convince [21], the latter may be a story of incredibly chaotic politics in a news landscape splintered by the absence of journalistic standards.

2.1.2 Survivability is narrative. Discussions around these survival stories often center on the realism or believability of their mechanisms, critiques beginning with “no, that wouldn't happen” or “things don't work like that.” This kind of narrative believability is called “verisimilitude” in the field of speculative design [2], and its use as a material of design discussion can draw upon previous work in that field and the adjacent field of design fiction [14, 18, 19]. The product under examination may be the protagonist of these stories of survival and extinction, and other characters may be products, technologies, environments, or other objects, inspired by Object-Oriented Ontology and other non-human-centered considerations [20], in particular that of Global Warming as a hyperobject [11]. If Sustainability's practitioner is a facilitator, Survivability's is a storyteller in a circle of storytellers; as in other collaborative storytelling games, the story is told to see what happens next [1].

Returning to our previous scenario of Facebook shattering the news ecosystem, we might critique it as a narrative and retell it in another direction and with different characters, describing the emergence of novel news institutions that build walls around the largest filter bubbles, carefully selecting what their cloisters see. What differences does it make to this story if Facebook removed its news feed or group-management features?

2.1.3 Survivability is dystopian. It is unquestionably grimmer to consider questions of survival than those of sustenance. As with the previous labels “utopian” and “ambiguous”, this is not a critique of Survivability, but an analysis of how it functions. Survivability as a concept draws upon a tradition (and recent trend) of dystopian fiction, journalism, and storytelling games that explore dark consequences of technological and social systems. Dystopias have a long tradition, including the origins of satire [9, 17] and science fiction [8]. Dystopian projections can have aspects of wish-fulfillment, wherein imagined futures not-quite-coincidentally flatter the storyteller [13]; a diverse group of storytellers may be the best protection against this lure. In design conversations, dystopia lets participants analyse complex structures of technology and oppression from the inside, instead of from a theoretical remove [18]. Sustainability is at times critiqued for a focus on reducing quantifiable harms rather than reframing problems to search for new kinds of benefit [10]; Survivability, focused on both reframing and on harm, might bring these two sides together.

In our Facebook-news scenario, analysis of survival could draw on interviews of Arab Spring activists about the difficulties Facebook’s policies caused them [21] and, by extrapolating their experiences into the future, make it easier to examine today’s social-network design decisions.

2.1.4 Survivability intervenes by changing interactions between products. Like Sustainability, Survivability is a biomimetic practice, encouraging participants to draw on their experiences with living systems to examine the possibilities of human-constructed ones. Instead of considering the lifecycle of a product, however, Survivability is concerned with consequences and adaptations within an ecosystem of products and other objects. In a Survivability framework, design participants’ discussions of possible designs can be like those of conservationists discussing the introduction of an invasive species; the question is not what the design will do in its cradle-to-grave lifecycle [10], but rather how it will change a chaotic ecosystem of technologies, products, and cultures.

2.2 Survivability in practice

2.2.1 Decision Processes. Waage’s Sustainability decision-making process, as shown in Process Algorithm 1 [22], can be contrasted with the proposed Survivability process of Process Algorithm 2. As can be seen, these decision-making strategies have quite different approaches and specifications. The Sustainability process encourages agreement at every step, while the Survivability process responds to agreement by generating more critiques.

2.2.2 Experiments. In the experiment shown in Process Algorithm 3, I hypothesize that design participants working from a perspective of Survivability will be distinct from those working under Sustainability in several ways:

- (1) Speaking time will be more equitably distributed amongst participants in a Survivability process,
- (2) Non-numerical materials (stories and articles) will be used more often in conjunction with numerical materials under Survivability,
- (3) Participants will more be more likely to say they learned something new after using Survivability, but more likely to

Algorithm 1: Sustainability decision-making [22]

Input: Corporate managers and designers. *Optional:* shifting regulatory landscape, challenging material sourcing (particularly in regard to the endangerment of habitat or species), activist pressures, consumer requests for “healthy” or “environmentally and socially responsible” products

Output: Actions that should be taken.

Level 1 Defining the system

- How is the system itself constituted?
- What are the relevant principles for the constitution of the system, including both ecological and social principles?

Level 2 Identifying outcomes and success

- How can sustainability be defined?
- What are the basic mechanisms by which humanity can destroy the system?
- What are the principles for sustainability (i.e., a successful outcome)?

Level 3 Articulating strategies

- What are strategic and actionable principles for sustainable development?

Level 4 Determining actions

- What concrete actions should be undertaken?

Level 5 Listing available assessment tools

What tools would help us:

- manage and monitor actions for compliance,
 - build capacity for effective actions, and
 - measure if progress had the intended effect?
-

Algorithm 2: Survivability decision-making

Input: Designers, stakeholders, other participants. *Optional:* endangered materials, habitats, and species, critical research or journalism

Output: Design changes, scenarios for future reuse.

while new consensus scenarios are still arising
Discuss extinctions this design might cause.
Choose separately which to explore.

for each survivability

The scenario is told by its Storyteller

It is critiqued by the group

if the storyteller wants to then

they rewrite and tell it a second time

if any stories are agreed by all to be possible or interesting

then Determine how to avoid these scenarios;

say their group mostly agreed on what to do after using Sustainability.

My reasoning for (1) and (2) is that existing Sustainability discussions prioritize the numerical input of “experts”, leading to a preference for numerical materials and inequally distributed talking time; Survivability, focussing as it does on divergent narratives, may be measurably different in this regard. In (3), I think that that Sustainability’s focus on consensus will have measurable advantages and disadvantages, encouraging agreement at the cost of some novelty.

Algorithm 3: Process comparison experiment

Input: Respondents to an call for study participants.
Numerical and narrative background material.

Output: Group discussion, design decisions, and individual pre- and post-surveys.

Divide participants into groups of 4-7.

for each group describe
their design challenge and the Sustainability or Survivability process they will be using.

to each participant give
time alone with documents containing information (numerical or narrative) about the product they are to design.

Participants are brought back into groups to follow the design process. They can read but not show it their personal information to their collaborators as they go through the design process.

Unfortunately I was not able to conduct a focus group or workshop before the final submission of this paper, but I hope to do so in future work.

2.2.3 Analytical Techniques. The ecosystemic nature of Survivability opens up analytical possibilities from the fields of conservation, ecology, and network theory: what stories of survival and adaptation can we tell, of products outcompeting other products, or losing out to them? What stories of products moving each other's niches and finding complementary roles in the system? Structural Equation Modeling and food-web analysis are both well-developed methods used to analyze models of complex interactions between living organisms; their application to design could provide an evocative and biomimetic alternative to marketing and operations analyses.

3 CONCLUSION

Survivability is an experiment of flipping Sustainability from utopia into dystopia, from integration into divergence, and from ambiguity into narrative, but Survivability is also a synonym for Sustainability; what good is survival without sustenance, or vice versa? My hope with this work is to open a space for recombination. Far from opposing the processes of Design For Sustainability, Design For Survivability is best used alongside of it, or with one containing the other, so we can design with both our fears and our hopes. It and other experimental conversations about imagining and shaping a better world can be played with and held up against each other through experiments like the one outlined above, by theory, and in practice. Participants in design face a world with many limits, but the structure of the design conversation does not have to be one of them.

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