Undo-Replay: re-scripting unsustainable toy consumption through value transference

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Abstract

This paper presents an account of the design of the Undo-Replay project: a combination of strategies from design for sustainability and product, service system design aimed at redirecting plastic toys from entering waste streams at the end of their use lives. Aimed at equipping children and adults alike with opportunities to participate in their own transferences of value, the Undo-Replay project uses gameplay and narrative to create new cultures of repair and re-making that are critical in a transition towards sustainability. The authors offer an analytical account of the socio-material systems that underpin toy consumption and waste practices, and discuss how designers might build new constructive social experiences to foster more sustainable behaviours. In considering how the project unsettles existing relations to transfer value, this paper fleshes out the tensions of environment, material, and consumption at play for designers committed to notions of sustainable redirection.

Introduction: Toy Consumption, Waste, and the Need for Redirection

For millennia, toys and games have been vital to childhood. They play a critical role in how children learn, and the worldviews they come to adopt. In pre-industrialised civilisations, toys were usually created by children from found things – such as knuckle bones or dolls made from rags and painted sticks (Cross, 2001). The past two centuries have seen a rapid shift from this mode of production into serial production, and then to mass-manufacturing for global markets where each phase has transformed the nature of toys. Toys are now fast-paced, trend-seeking, often defined through licencing agreements with media companies, and drivers of the development of consumerist tendencies in children (Clark, 2007). Enabled by adults –as the procurers, producers and designers of toys – modern toys propel the early scripting and habitation of unsustainable consumption practices (Fry, 1999).

This scripting of consumption follows a particular pattern. Current toy trends are amplified through their relationships to social media and digital worlds, where the physical toy becomes the key to accessing new online televisual social worlds (Fry, 2003), embedding unsustainable materialism through digital consumption. The now popular "Big Reveal" and tactile/sensory toys tend to be framed by a social media presence, with many unboxing and "satisfaction" videos found on YouTube and Instagram. New toy formats such as "Wearables for Children" resemble digital smart-devices and demand endless attention, simulating the wearable-tech devices of adults, gathering data for toy companies through use, and pre-figuring particular object-user relationships (Afshar, 2014). Toys geared towards parents are similarly activated and are promoted through younger parents' tendency to "share" through online platforms. With a rise in social media use by children, toys are increasingly linked to online platforms, adding drama to the physical toy through online animation, narratives, personalisation and other mechanisms that underpin notions of exclusivity. Consequently, the once material-semiotic and kinetic value proposition of toys is now changed (Li, 2016) and made

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subservient to a new digitally-mediated visual and social excitement – a factor now crucial in their marketability (Holloway & Green, 2016).

Purchased with increasing frequency, mass-manufactured and low-cost children's toys are damaged in use, out-grown, and seldom maintain their value, rendering them a rapidly disposable consumer product. Despite the ubiquity of these types of toys, solutions to their unsustainability tend to revolve around strategies that avoid any direct questioning of their increasingly short use lives and the hyper-consumption that contemporary toy design practices produce. Conventional design approaches in this domain include material substitution, eco-redesign and the design of sharing-oriented service systems such as toy libraries. Redistribution strategies, through social and familial networks, private resale, and donation to charities, while more common, require used toys to be in good condition and simply delay their eventual trajectory towards landfill. Often not recycled, due to complex and mixed material assemblies, toy waste is rarely reprocessed into raw materials for other uses.

As the consumer market for toys has expanded, the lifespan for any single toy has decreased to an average of only six months. This increased rate of production and consumption and an accelerated path to end of life is in part made possible by petrochemically-derived polymers. The toy sector is one the largest users of polymers in the consumer product domain: globally, approximately ninety percent of modern toys are now made from plastics (UNEP, 2014). These materials, including polyolefins (polyethylene, polypropylene, EVA, etc.), styrene derived polymers (PS, ABS, SB, etc.) and plasticized PVC, are non-renewable and have substantial rates of embodied energy for applications that are very short-lived. These materials do not break down well, if at all in meaningful terms, and disrupt the natural ecosystem as they enter waste systems (Garcia, Martinez and Reche, 2016). Solutions to the problems of plastic overuse and waste often place the onus of responsibility onto the consumer who, often uninformed of more sustainable alternatives, is caught between the relentless push for re-consumption by dominant producers, and insufficient waste recovery systems. "Degradable", "biodegradable" and "compostable" plastics are increasingly deployed as a solution by big toy manufacturers (Lamontagne, 2018) and are often sold with the implication that they will decompose quickly, without impact to the environment. Yet these newer forms of plastics require different inputs, often from agricultural production, and very specific temperatures and conditions to decompose, while emitting harmful greenhouse gases into the atmosphere

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as they do. "Degradable" plastics are particularly deceptive. Virtually indistinguishable by the average consumer from plastics marked as "biodegradable", they are comprised of the same polymeric materials as traditional plastics but are combined with degrading agents to break down quickly into micro-plastics that remain in natural ecosystems for thousands of years (Mannix, 2018).

Plastics recycling is popularly discussed as a sustainable solution. It has many benefits when deployed on a large scale for industry applications that can make use of the material near to its sites of consumption and re-processing. However, conventional approaches are ill-suited to the recycling of comparatively lower volume, short-lived products comprised of multiple polymer types such as toys. Marginal value is gained between the loss of its embodied energy (as a toy) and the energy required in collection, recycling and re-manufacture into a new product [see fig. 1]. Even if the economics of recycling plastic toys could be negotiated towards better outcomes, plastics cannot endure infinite cycles of recycling and demand a continual feedstock of virgin materials to enter the system if rates of consumption are to remain unchanged.
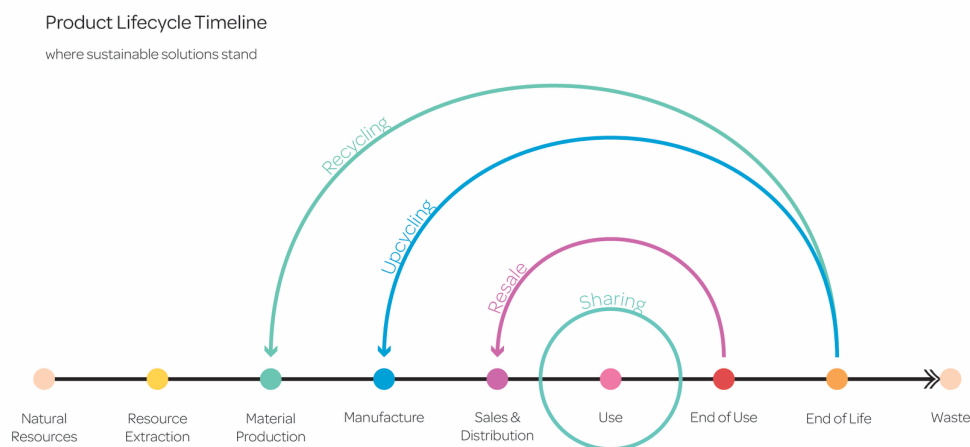

Fig. 1: A product timeline illustrating the different methods of sustainable re-consumption of products before they reach the "waste" stage. Smaller closed loops are preferable when designing for the environment as they require less repeated processing and consumption of energy.

Where toy recycling has been activated, it often comes at a substantial cost to consumers. For example, U.S. recycling company Terracycle's Zero Waste Toy boxes cost about $225.00 AUD for a small box ("Toys

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Zero Waste Box", 2019), and while made from recovered waste toys, presents a barrier to accessibility due to cost and the fact that it (perhaps ironically) simply serves as a storage container for other toys that will very soon become waste too. Most "eco-toy" companies tend to have much higher price points for their products than conventional mass-manufactured toy brands and are rarely stocked at major retail chains or advertised as widely. While choosing such toys over cheaper, mainstream options may appear less environmentally problematic, it proves to be a luxury that few parents can afford and is often only targeted at pre-school aged children. As children get older and begin to develop a capacity for voluntary attention, they require more complex toys and stimulus (Wallon, 1981) in ways that the products of most eco-toy companies do not offer.

The Undo-Replay Project

Undo-Replay is a design project aimed at facilitating a redirection of toy waste away from landfill (or the marginal advantages of conventional recycling) by positioning toys as bankable hazards that are not an environmental risk until they are physically disposed. This waste is typically benign in use and retirement, and at the end of its use-life able to be leveraged for new value through particular strategies. Undertaken through a series of design observations: stakeholder and expert engagements; product, service and instructional design activities; prototyping and user testing, the project sought to use design to enable new capabilities that might lead to a plausible transference of value. Undo-Replay is framed around the notion that the typical path to landfill for toys can be disrupted. This intervention focuses not only on material interference or financial revalue, but also on the creation of new and meaningful social experiences. By placing consumers in control of their own object interference, the project aims to activate each of these paths to maximise the reassignment of service value to waste objects through a particular strategy of socio-material engagement.

The Waiting Zone

To understand the typical path that toys go through from procurement to waste, the designer conducted a series of semi-structured interviews with parents to build a picture of typical play behaviours, toy lives and disposal habits. The data collected provided the basis for a temporal service-mapping of toy life cycles and the human practices that surround them.

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This mapping showed that used toys in good condition are often not directly disposed of by parents but retired, stored and incrementally gifted to friends or family, or donated to second-hand or charity stores when the child has outgrown them. While these practices do stall the path to disposal, many of these toys then remain unsold or unused – to eventually end up in landfill. Retired toys often accumulate in the home until the child outgrows the perception of needing them or when parents determine they have no residual value. These realisations are very often arrived at in moments of domestic change, such as spring cleaning or moving house, at which point the toys are discarded in bulk (Alix, & Zacharewicz 2012). The period between when children stop playing with their toys and when they are disposed of was identified as a key period of vulnerability in this path and is referred to in this paper as "The Waiting Zone" – a period that offers a prime opportunity to intervene through the design of new object-user relations.

Object-user Relations and the Transference of Value

Like many personal objects, toys are discarded once their perceived value is lost, their excitement factor wanes, they are replaced, or when their original play patterns are outgrown. This point offers an opening for design to intervene and enable a transference of value to extend the lifespan of otherwise unwanted objects: where the toy object can be re-cast in a vygotskian (Edwards, 2011) manner as a key subject of multiple activities, beyond simple notions of servicing the needs of childhood play, to being a key actor in a particular set of transgenerational, developmental, consumptive and obligation generating activities. Centred on notions of repair and re-use, there are many adult-centred creative communities that utilise children's toys such as dolls, action figures, trains and cars, and indeed all manner of mass-manufactured products to build new values (Gobert, Allais & Deroubaix, 2019). Adult hobbyists collect second-hand toys, often with damaged or missing parts, and transform them into detailed works of art. This process is therapeutic for some, and for others, gratification comes from outcomes fitting into a larger narrative (Graham, 2007) and the social worlds to which such practices provide access. Known as "modding", these practices have the potential to create intense bonds between object and user as they become a creator of new and valued objects. In product modding communities, new object-user relationships often develop through shared experiences and social narratives (especially when linked to a user's memories of childhood)

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where modding constitutes a form of resistance to the dominance of consumerist structures (Mitchell, 2018).

Fig. 2: The physical elements of the Undo-Replay product system: Top Left: The Toy Surgeon's Handbook, Middle Left: The Toy Surgeon's Vice, Top Right, Middle Right and Bottom Left: Undo-Replay (tabletop game).

The gamification of the modification process of toys at the brink of their end of life, in a way that is accessible and engaging for older children, adolescents and adults, pushes these otherwise waste materials into a process of value transformation with radically altered lifespans. To enable this the Undo-Replay project offers a toolkit to deconstruct toys and build new characters and forms to promote a new material, social and environmental consciousness. Working from the precept that construction-style toys, such as Meccano, tend to have long lifespans, the project effectively re-scripts the object-user relations of redundant toys with particularly narrow play narratives (such as action figures) by deconstructing them into parts imbued with new, and perhaps greater, values. Beyond their material affordances, these toy parts serve as components for the construction of new in-game and socially constructed narrative-based play, mediated by the creation of unique "franken-toys" and stories to accompany them.

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Deconstructing old toys (in order to make new and meaningful things) requires the development of new and transgressive play-skills (Møller, 2015) which similarly bring new values. Harvesting toy parts in this way opens the door for children and adults to develop new pro-environmental values of care, repair and repurposing. Undo-Replay introduces children to the activities of adult toy hobbyist communities in a way that is accessible and approachable through a series of elements including "The Toy Surgeon's Handbook",

"The Toy Surgeon's Vice", "The Toy Surgeon Society" Instagram profile, and "Undo-Replay" – a tabletop game [fig. 2]. These elements present a variety of activities that are designed to appeal to children with different interests and skillsets, for both solo and social play contexts [fig. 3].

UNDO-REPLAY
Product Service System Map

Solo Play

"Waiting Zone" toys enter the system as they reach their end of use lives.

The Toy Surgeon's Handbook teaches users deconstruction and modification techniques.

The Toy Surgeon's Vice aids users with deconstruction and safety.

Deconstructed toys are used for both solo and social play systems.

The Toy Surgeon Society Instagram platform transitions users into self-directed participation in the hobby.

Social Play

Undo-Replay utilises remaining unwanted toy parts, user-made creations and scrap material in a tabletop game. Designed to inspire creative thinking and hands-on making for a broader audience, the game uses narrative based prompts to create a sentimental social play experience.
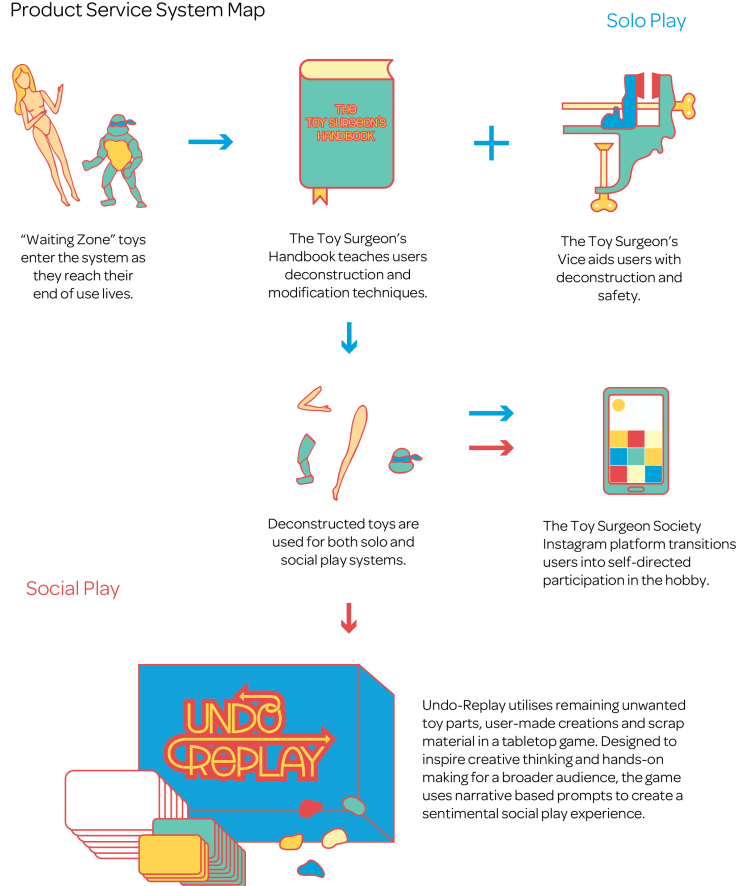
Fig. 3: The Undo-Replay PSS theoretically banks all toy parts in the home with a reassigned value, and thrifting or "rescuing" second-hand toys is encouraged by the community as an affordable and accessible way to get toy parts.

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Creating Toy Surgeons and Agents for Waste Recovery

The Toy Surgeon's Handbook [fig. 4] is a pocketbook that guides users through basic toy deconstruction and modification practises. The book is aimed at children aged 10+ whose toys are in, or approaching, The Waiting Zone. As the design project developed, conversations with experts in the field of toy modding and miniature hobbies (from action figure modders to miniature train collectors) were conducted to delve deeper into the practice and motivations behind the modification of toys and found objects. Given the toy modding community is significantly dispersed across various subcultures and toy categories, we identified that a lack of compiled resources makes it difficult for newcomers to easily engage. This led to a participatory approach to the design of the Undo-Replay prompt cards, game structure, and Handbook.

Fig. 4: A spread in *The Toy Surgeon's Handbook* covering types of hinge joints commonly seen in figure-based toys.

Detailed explorations of online modding forums and tutorials showed that most toy modification techniques could be performed exclusively using common household items, with the only specialised tool recommended for beginners being the Toy Surgeon's Vice designed for the safe

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deconstruction of plastic toys. Engaging in the Undo-Replay process entails toys being deconstructed by users at home following tutorials listed in The Toy Surgeon's Handbook. Dismembered parts are then used as pieces for the tabletop game Undo-Replay, where players are prompted to create characters and build narratives based on their creations [fig. 5]. While the gameplay for Undo-Replay aims to encourage children to experiment and build social narratives, it has limitations in terms of creating high-value object outputs due to its timed nature. The Toy Surgeon Society Instagram profile [fig. 6] fills this gap and provides a communal platform for toy hobbyists of different niches and abilities to come together and find inspiration, share resources, and develop strong sentimental bonds to the craft itself.

Fig. 5: One of the creations from a test-run of the Undo-Replay gameplay: a participant's response to the challenge "Make the most annoying character".

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Fig. 6: A post by *The Toy Surgeon* Society Instagram profile, promoting work by other creators across toy and miniature hobbyist communities that respond to a weekly prompt released by the account.

Evaluation of the Undo-Replay product system involved many iterations of collaborative workshop and user testing with groups varying in age from six to sixty. Due to its interactive nature, the workshop structure proved an effective tool for both testing and co-designing the Undo-Replay gameplay. All participants, regardless of age, found the game engaging, enjoyable and simple to learn. Some older participants initially expressed hesitation in their ability to get involved in the game, but later shared that their concerns diminished as they played each round. A similar phenomenon was observed with participants who had limited English skills and participants younger than the targeted age demographic. The combination of character and narrative-building prompts saw adults actively engage in a form of play that is typically outgrown by adolescence. Participants also stated that some loss was felt when discarding characters between rounds, showing an increase in sentimental attachment after only a short period of interaction with the structure.

The efficacy of the Toy Surgeon's Handbook in facilitating guidance for solo play was also evaluated via workshops and user-testing throughout the design and refinement process. Participants were observed to immediately explore constructive play after learning disassembly techniques, and remained engaged with the activity for over three hours with minimal assistance. Long term sentimental bonds between toys and "surgeons" are expected to develop as users explore the hobby, mimicking the behavioural patterns of existing adult toy collectors and hobbyists.

The significance of the impact that the Undo-Replay PSS has on the environment is directly related to levels of user engagement. In this way, a widespread and continual activation of the system appears crucial. As a largely user-run, explorative practice, limitations as to what can be created with these waste materials only exist until new opportunities are found and shared. As the number of users discovering the hobby increases, so too will the volume of accessible information, resources and awareness of the practice. The Toy Surgeon Society Instagram profile aims to be the first of many high-traffic and scalable platforms dedicated to this new hobby, providing for the sharing of such content through various interactive and passive forums, in multiple languages.

While not an explicit aim, testing the design proposition through a workshop format revealed it to be well-suited to an interactive public event, where participants learn to safely deconstruct their toys, or play the

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constructive Undo-Replay game. Such an event was recently run for Melbourne Design Week 2020 [fig. 7], where the game structure again proved to be engaging for all participants regardless of age or creative skill. As a platform for outreach, the project offers toy hobbyists a structure to run public workshops and presentations that extend participants to niche realms of toy modification while simultaneously encouraging the hobby as a means of critical engagement with the un-sustainability of conventional toy consumption.
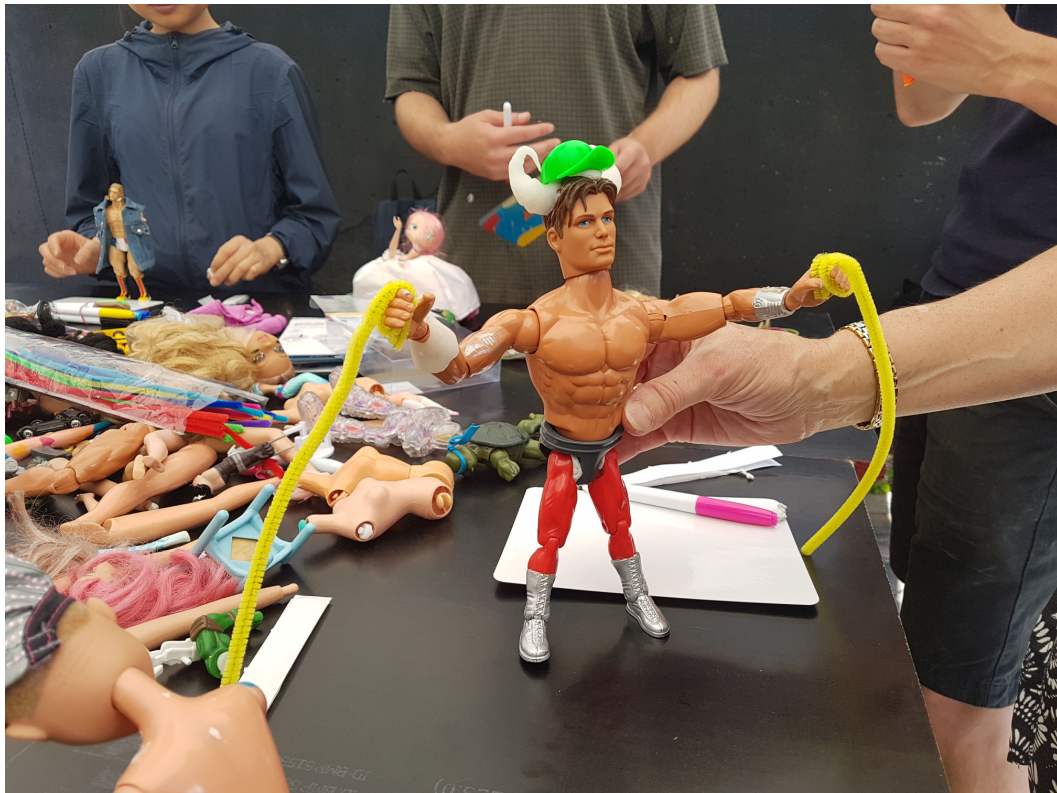

Fig. 7: One of the creations from the public workshop "Plastic Surgery", run for Melbourne Design Week 2020. A participant's response to "make the best climber". Other participants' responses can be seen in the background.

Conclusions

There are many opportunities for design to tackle issues of sustainability beyond the material, by interrogating object-user relations and approaching the task of design in a particular material-semiotic manner (Fennessy, 2016). Service design methods provide a valuable means of "seeing" opportunities for change in complex socio-technical and relational

systems, but in undertaking the project the authors realise the centrality of the material, practical and social attributes critical to effective service thinking for design. This paper describes a project of unsettling object-user relations to transfer the value of waste toys and to build new capabilities and cultures of repair and re-making that are critical for a transition towards sustainability. As intricately fabricated as many plastic toys now are, the project co-opts them into the service of sustainable behaviour change without the need for any energy-intensive processes. In this way, the project recalls the earliest forms of toy design and production: children making their own toys from things collected in nature and repurposed waste or objects at home as a socially-defined creative practice.

In making value transference into a social and playful process, the project creates a direct shift in perspective: toys that previously held value only in their complete and undamaged condition become more valuable as collections of parts – as meaning-rich components that enable customised high-value re-creation and facilitate social experience. The project transforms users into creators through transgressive acts of repair and alteration that both strengthens sentimental bonds to objects, and encourages people to find new value in unwanted and broken objects. Such a transference of value comes to function as a tangible pro-environmental, social and material practice that consciously re-positions users in control – and where the activity of repair and re-making is at once practical, pedagogical and political. Undo-Replay uses principles of gamification to achieve this kind of capacity development, solidifying object-user relationships through creating meaningful social experiences with creative and competitive rewards. By giving privilege to notions of repair, creation, risk, resourcefulness and thrift, the project offers an example of how individual agency toward sustainable change can be scripted through design – and how design can be recast in the service of sustainable redirection.

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