

Chapter 2

The Role of Design as a Catalyst for Sustainable DIY

Giuseppe Salvia and Tim Cooper

Abstract Amateurs committed to self-production (i.e. DIY) are reshaping the relationship between production and consumption, leading to a ‘new DIY age’ (Hoftijzer 2009). The spreading of this trend suggests scenarios in which non-professional people are, or will be, able to create artefacts supported by innovative technologies, networks and, perhaps, companies with new business models. Easy access for consumers to the production system could lead to inefficient resource use and increased waste, however, and so the sustainability of this trend has been debated. Nonetheless, recent research by Salvia (2013) envisages this contemporary self-production phenomena as a ‘window of opportunity’ to foster positive environmental and social impact, through activities intended to prolong product lifetimes, e.g. *re-using*, *re-pairing*, *re-purposing* and *re-appropriating*—collectively named RE-DIY. This chapter addresses the role of design as catalyst for sustainable RE-DIY. Four scenarios portray the possible role of professional designers as educators or facilitators in the relationship with RE-DIY practitioners, at both a global and local scale. On the basis of a review of the current ‘state of the art’, cases of design-led sustainable initiatives promoting RE-DIY are explored to highlight the potential and feasibility of novel relationships between producers and consumers. Finally, barriers to the evolution of RE-DIY towards sustainable patterns are identified and discussed, and triggers for scaling up this practice on a broader societal level are proposed.

Keywords Co-design • DIY design • Fablabs • Hackerspaces • RE-DIY

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2.1 Introduction

At the Rio+20 conference, many Heads of State and Government renewed their commitment to sustainable development (United Nations 2012). Decades of declared intentions for environmental sustainability (WCED 1987) and the pursuit of Sustainable Consumption and Production (SCP) (United Nations 2002) generated limited or even negative practical responses (Frascara, in Cipolla/Peruccio 2008; Krantz 2010). Governmental institutions adopted weak actions (Fuchs/Lorek 2005), producers pursued eco-efficiency with consequential rebound effects (Hertwich 2005), and individuals were encouraged to change their behaviour with little notable success (Lilley 2009).

Furthermore, a higher level of consumption is, paradoxically, decoupled from perceived happiness by people in industrialized hyper-consumerist countries (Easterlin 1974; Lipovetsky 2006; Porritt 2003). A revised and hopefully more sustainable interpretation of well-being (Manzini, in Bœuf et al. 2006) is required in order to encourage people towards alternative forms of satisfaction in which well-being is disconnected from a perceived need (and, even, perceived right) to increase consumption indefinitely (Cooper 2005; Thorpe 2010).

For this purpose, a multidisciplinary approach is fundamental to influencing the complex system of production and consumption towards an alternative, low resource-demanding form. Such a goal may sound extremely ambitious; however, strategies integrating technological efficiency with sufficiency-driven lifestyles have been explored (Cooper 2005; Stahel 1997; Tukker et al. 2010) and a resulting increase in perceived happiness verified (e.g. Mont/Plepys 2008).

Reduced consumption has been pursued as a means to achieve greater happiness by several communities, namely for down-shifting and ‘voluntary simplicity’. These niches or ‘local discontinuities’ have been described as laboratories of successful solutions for SCP that should be observed and potentially catalysed by design action (Manzini 2010).

2.1.1 *DIY as a Promising Area of Intervention*

Low resource-demanding practices in the above niches have been explored in order to identify components leading to individual happiness or satisfaction. Past research findings suggest that communities of voluntary simplicity commonly practice self-production and repairing, motivated by the rewarding sensation they receive and the longer-lasting relationships they can establish with artefacts (Marchand/Walker 2008; Marchand et al. 2010). Recently concluded research by Salvia (2013) addressed contemporary practice of self-production and repairing (i.e. Do It Yourself or DIY) through the sociological perspective of practice theory (Shove 2006; Warde 2005). This theory proved supportive in the systematic and detailed description of DIY and people’s main motivations for engaging in

practicing DIY ('meanings' in practice theory), such as monetary savings or individual attitudes and lifestyles (Salvia 2013). Perceived satisfaction gained in the DIY practice appears to be the crucial component motivating pursuance and accomplishment of the task, regardless of the level of the individual's commitment and ability. In other words, less committed and skilled 'DIYers' are very likely to gain levels of enjoyment and satisfaction comparable to highly committed practitioners when a task is accomplished.

Based on four major observations, DIY appears to merit further design-led research:

1. DIY has been identified as a major trend in contemporary society (Anderson 2012) deserving further research (Watson/Shove 2008);
2. DIY may contribute to the provision of individual and social empowerment (Manzini 2003) while reducing the consumption of resources (Lorek/Spangenberg 2014);
3. DIY's inventive nature and the implied 'design thinking' (Cross 2011) facilitate interventions by designers and their dialogue with DIYers;
4. Design for DIY can represent a business opportunity (Fox 2013).

Everyone can—and does—design (Cross 2011: 3). Concepts have emerged to describe this contemporary phenomenon, such as the 'new' DIY age (Hoftijzer 2009), the 'post-professional era' (Atkinson 2010) and a paradigm shift to DIY-led invention (Fox 2013). Engaged individuals have been described as 'craft consumers' (Campbell 2005), 'lead users' (von Hippel 2005), 'professional amateurs' (Leadbeater/Miller 2004) and 'prosumers' (Anderson, in Toffler 1980). Such individuals are united by the will and ability to create artefacts that they desire and may be supported by innovative technologies (e.g. Atkinson et al. 2008), networks (e.g. Leadbeater 2008) and, perhaps, companies with new business models (e.g. Franke et al. 2006).

The spreading of physical and virtual places where people can undertake creative activities is enabling the coalescing of committed individuals who support each other in 'communities of practice' (Lave/Wenger 1991) or even 'creative communities', i.e. groups of people who cooperatively invent, enhance and manage innovative solutions for new ways of living (Manzini, in Bœuf et al. 2006).

Nevertheless, the spreading of DIY risks generating unwanted rebound effects on the environment. Facilitated access to the production system by consumers could, in theory, lead to inefficient resource use and increased waste, and thus the sustainability implications of this trend are still being debated (Troxler, in Abel et al. 2011; Watson/Shove 2006).

Self-designing and crafting of artefacts may still depend on systems of mass production (Watson/Shove 2008). The disruptive innovation brought about by these trends then risks being reduced to a different form of production and consumption of more goods: essentially a new form of capitalism (Ritzer/Jurgenson 2010).

The question is then how to align the current DIY trend with sustainability targets. Research by Salvia (2013) envisaged this contemporary phenomenon as a '*window of opportunity*' to foster positive sustainability impacts through, for example, personal growth, community empowerment and waste reduction. The

research addressed self-production as a means to prolong product lifetimes by re-using, re-pairing, re-purposing, and re-appropriating, hereafter named ‘RE-DIY’, i.e. RE-activities in DIY practice. In addition, grassroots innovations—as also happening in contemporary DIY—are recognized as incubators of the social change that is needed to minimize future environmental harm (O’Brien, cited in Feola/Nunes 2014). In fact, there is a growing and diverse population applying the DIY approach to the replication, repair, regeneration, redesign, or refunctionalization of products (e.g. fixers, remakers, refurbishers, customizers and hackers) (Bianchini/Maffei 2013).

2.1.2 Aim

The spreading of this ‘social and participatory innovation’ may have significant implications for design (Abel et al. 2011). The objective of this chapter is thus to identify and evaluate the possible contribution of the design profession to contemporary self-production practices that foster a positive impact on the environment and society. The focus is on RE-DIY practice applied to the most voluminous bulky waste, i.e. furniture and other domestic products (apart from electrical and electronic equipment).¹ These account for around 60 % of landfilled waste in the United Kingdom (*Waste and Resources Action Programme* [WRAP] 2012) and other European countries, e.g. Italy (Centro di Ricerca Economica e Sociale Occhio del Riciclone 2010), the majority of which are in such good condition when discarded that reuse has become a key policy area for the European Union (Beasley/Georgeson 2014).

The chapter explores the potential transition of RE-DIY from niche to broader levels of engagement in society. In the following sections the role of design for SCP is briefly depicted and its application in the realm of self-production is then addressed.

2.2 The Role of Design in SCP and RE-DIY

Design is widely considered to have a major influence on whether SCP is realized: it has been estimated that 80 % of the impact of products, services and infrastructure is defined at the design stage (Design Council 2002). On this basis, the EU 7th Action Programme gave priority to promoting resource efficient products, namely by intervening on durability, reparability, re-usability and recyclability (European Parliament 2013).

¹Electric and electronic equipment was excluded because of different implications, e.g. technological obsolescence and safety issues.

The environmental crisis is thus, in many ways, a design crisis (van der Ryn and Cowan, in Marchand/Walker 2006) and, indeed, there has long been interest from the design profession in the development of strategies to prompt change and transition under the umbrella of Design for Sustainability (Spangenberg et al. 2010; Walker/Giard 2013). Such approaches, also known as Green- or Eco-design, have challenged paradigms of design and industrial production and consumption previously taken for granted (Madge 1997). However, it has been argued that design is mostly absent from discourse on sustainable consumption (Thorpe 2010). An exception is Manzini (1994), who describes how design gives form to a changing world and offers opportunities for new types of behaviour, calling on designers to move from being part of the problem to become part of the solution (Manzini 2006).

Although it is technically possible to design more durable products, economic, institutional and psychological factors seem to prevent their success (Mont 2008; Cooper 2010), and a more structured and systematic approach is required. Recent guidelines on sustainable design have highlighted the need to frame the design contribution at several concurrent levels, ranging from product improvement to the creation of new lifestyle scenarios (Barbiroli 2008; Lewis/Gertsakis 2011; Giudice et al. 2006).

Vezzoli/Manzini (2008) propose four levels of design action for the creation of a (positive) ‘sustainable impact’, ranging from intervention on the production side to new scenarios for a sustainable and satisfactory quality of life. Such design actions could support the spreading of a perceived quality of life and wellbeing that is not reliant on material consumption (Evans/Jackson 2008).

The involvement of final users gradually increases at each of the four levels, ultimately becoming co-creators of the results that they want to achieve. At each level, the design profession can contribute in redirecting contemporary self-production trends towards low resource-demanding RE-DIY practice, without a loss of perceived wellbeing (Cooper 2005; Manno 2002).

RE-DIY practice has already received interest from the design community (Redström 2006; Brandes/Erlhoff 2006; Rosner/Bean 2009; Akah/Bardzell 2010; Coskun/Dogan 2010; Aguirre 2010; Jencks/Silver 1972). In the following section, opportunities of design interventions in RE-DIY are considered from a broader perspective and mapped.

2.2.1 The Four Scenarios

A review of current RE-DIY practice identified several elements that appeared to offer scope for positive impacts on the environment: the channels used for collection of artefacts, suitability of the place where the practice is performed, and the means by which information is gathered (Salvia 2013). It is evident that designers can contribute towards each by designing ‘enabling solutions’, i.e. “systems of tangible and intangible elements (such as technologies, infrastructures, legal

frameworks and modes of governance and policy making) that enable individuals or communities to use their skills and abilities to best advantage and, at the same time, make a proposed solution more effective, more accessible and therefore more likely to spread” (Manzini, in Boeuf et al. 2006: 13).

Cases of design-led sustainability initiatives promoting RE-DIY have thus been identified as examples of good practice in the reduction of resource consumption with active and formative involvement of the user.

In these cases designers can support RE-DIYers either as collaborators with experts or as facilitators (or even educators) with less experienced practitioners, according to the creativity level of the RE-DIYer (Sanders/Stappers 2008). As collaborators, designers bring an equal contribution into a project shared with practitioners. As facilitators, designers support the development of the project drafted (or defined) by the practitioners.

The interaction between the design and the practitioner is necessarily influenced by the means of contact, e.g. in person, or web-based platform dialogue. The four cases presented below are grouped according to the scale of action (i.e. geographical level of intervention) and proximity. In this research, the value of locality is fostered within a globally connected framework, as proposed in the SLOC (Small, Local, Open and Connected) model of Manzini (2010), to address novel and visionary, yet viable, scenarios for sustainable design.

Designers can support RE-DIYers locally by:

- assisting RE-DIY designers over the creative process
- co-designing with municipalities for citizen engagement

and on a global level by:

- designing ‘enabling products’
- networking between activists, researchers, professionals and DIY designers.

Each of these four scenarios is described in more detail below.

2.3 Local Level: Assisting RE-DIY Designers in the Creative Process

In the last decade many DIY workshops equipped with user-friendly devices have spread globally (e.g. 373 FabLabs, 1,801 Hackerspaces, over 1,000 Men’s Sheds, plus Community Garages, TechShops, etc.² Generally aiming at providing facilities for self-production, these workshops offer members the opportunity to share skills, knowledge and projects with others passionate about DIY. Although the efficacy of

²FabLabs <https://www.fablabs.io/labs>, Hackerspaces http://hackerspaces.org/wiki/List_of_Hacker_Spaces Men’s Sheds <http://mensshed.org>, 100 k Garages <http://www.100kgarages.com>, TechShops (<http://www.techshop.ws/locations.html>) (7 September 2014).

this model towards sustainability is still debated (Troxler, in Abel et al. 2011), significant efforts have been addressed to this end by organizations such as The Restart Project³ and ReFab Space⁴; both are social enterprises that promote the extension of electric and electronic equipment lifespans by teaching and sharing repair and maintenance skills, either in their premises or during workplace events, as an empowering practice.

The focus on repairing is currently also pursued by grassroots initiatives such as Fixit Clinic or Repair Café,⁵ local, community-led initiatives of amateurs supporting citizens wishing to repair their items. In these cases, designers can facilitate the process, bringing knowledge (e.g. about materials and technology) and competences (e.g. design thinking) to address the problem of minimizing resource consumption and, especially, empowering and educating individuals. An example is offered by Fixperts, a project which promotes creative and social values through design; designers will support people with small fixing tasks that a non-professional person may find difficult to accomplish, thus giving confidence to the individual facing a challenge.⁶

2.4 Local Level: Co-designing with Municipalities for Citizen Engagement

Self-production initiatives take place on a wider scale, while still at the local level, through groups of citizens contributing to community projects (e.g. Transition Towns). There is a tradition of designers engaged in collaboration with local communities (Meroni 2007).

The Italian design studio Controprogetto,⁷ for example, has been actively involved in initiatives for the engagement of non-professional people in social enterprises and community projects. Its particular studio expertise is design and manufacturing using scrap materials as an opportunity to promote a culture of doing, individual creativity, engagement with diversity (of people and disciplines), and a sense of ownership of public spaces.

The vision is reflected in their project Parteciparco, a playground designed and created with a co-operative that is intended to engage its members (mostly 16 to 30 years old) in the creative process of participatory construction with reclaimed materials. The Controprogetto designers operate as catalyst for people's ideas and energies, raising them to visionary levels. This experience nurtured the creativity of

³<http://therestartproject.org/>.

⁴<http://www.refab-space.org/w/doku.php>.

⁵<http://repaircafe.org/en/>.

⁶<http://fixperts.org>.

⁷<http://www.controprogetto.it/>.

subsequent users of the space, eventually stimulating a sense of respect towards this shared infrastructure (Salvia 2013).

Similar results have been encountered in a bigger project, ParkUrka⁸ with enthusiastic members of a neighbourhood in Taranto, Italy, to transform part of the town. The project aimed at strengthening inhabitants' sense of belonging towards the public space through collaborative, formative, but still enjoyable, experiences.

Designers operating at a local level can support RE-DIY practitioners in the development of their ideas through direct contact. They can contribute their skills in managing meta-design and problem-solving issues to extend product lifetimes, at the same time catalysing the process of increasing people's awareness of material, processing and, perhaps, environmental issues relating to artefacts. Operating at a local level provides the designer with an opportunity to receive instant feedback from the 'RE-DIYer' and allows for an iterative process of refinement according to the practitioner's response.

A different approach is required in the case of design interventions involving RE-DIYers at a global level, without direct contact.

2.5 Global Level: Designing 'Enabling Products'

RE-DIY practice is being nurtured by accessibility to information through the web, typically through online tutorials and instructions guiding users wishing to repair technological devices. Beyond the more widely known platforms for generic purposes (e.g. YouTube), iFixIt⁹ is an on-line platform and community that supports the repair of all sorts of electrical and electronic devices by providing guides and selling parts. iFixIt thus aims at contributing to the extension of product lifespan and empowers people willing to repair faulty products.

Support provided in the form of communicating manual skills through virtual means does, however, face inherent limitations as direct feedback is generally lacking. Moreover, practitioners may be inhibited from undertaking a repair by a perception of lack of skills and competence, the latter "conventionally defined as a characteristic of the human subject [but] perhaps better understood as something that is in effect distributed between practitioners and the tools and materials they use" (Watson/Shove 2008: 77) .

Some studies are addressing this challenge (Fox et al. 2011). Meanwhile, designers have been creating practical means by which practitioners are able to undertake RE-DIY tasks, in the form of 'enabling products', indicating products—within the realm of 'enabling solutions' defined above—that limit the chance of error and enhance the confidence of users. RE-DIY practice has thus been facilitated by design professionals at different levels of competence through the

⁸<https://labuat.wordpress.com/2009/09/08/immagini-dal-cantiere-di-park-urka/>.

⁹<https://www.ifixit.com/>.



Fig. 2.1 Illustrations of some early Sugru repair products. *Source* Sugru.com (used with permission)

invention of new materials (e.g. Sugru, Woolfiller and Kintsugi),¹⁰ technologies (e.g. customization kits for consumers) and products (e.g. Project_RE).¹¹

For example, Sugru,¹² is a silicon-based material invented by a designer to support people willing to repair—or improve the status and use of—a wide range of products. These include improving the grip and heat resistance of pan handles, making cables for mobile phones more durable and making bath taps safer (see Fig. 2.1). Similar to plasticine, Sugru can be shaped according to the practitioner's taste and need. Once applied to any surface, it dries in the air and the object can be used as normal. Its attributes of self-adhesion, waterproofness and flexibility, together with aesthetic versatility (in shape and colour), make Sugru an accessible means for practitioners to restore or extend an empathic relation with objects.

A French design studio, 5.5 designstudio, addressed the challenge of designing components that facilitate reusing and repurposing practices in the project 'Réanim—the medicine of objects'¹³: prosthetic seats and legs allow for the recovery of

¹⁰More information about Sugru at <http://sugru.com/>, Woolfiller at <http://www.woolfiller.com/>, Kintsugi at <http://humade.nl/products/new-kintsugi-1>.

¹¹<http://project-re.blogspot.it>.

¹²<http://sugru.com/>.

¹³<http://www.5-5designstudio.com/en/project/2004-55designers-reanim>.

products through the use of adjustable devices that fit (almost) every chair. The task of repairing the artefact (i.e. connecting components of the chair) is shared between the object (through the adjustable joining system) and the user (with simple manual skills to connect the components). A conventional method of repairing a broken chair would normally require practitioners to have the ability to choose, saw, plane or lathe, sand, nail and finish a piece of wood. The solution developed by 5.5 design studio enables people with different levels of manual capability to accomplish the repair task by distributing the competences between user and object, with an almost negligible chance of error.

As suggested above, limiting the likelihood of mistakes in RE-DIY is also addressed by guiding the practitioner through some or all of the steps in the creative process. Designers have been considering the involvement of final users in creating (or finalizing) RE-DIY products through on-line platforms for consumer customization (Schreier 2006) (e.g. Indie Furniture¹⁴) and guidelines on how to make furniture using reclaimed materials and discarded objects (e.g. Open Chair,¹⁵ Cuisine D'Objects).¹⁶ The final goal is prolonging the lifespan of materials and promoting emotional attachment to products.

These enabling products might be criticized for reducing the opportunity for practitioners to develop their acquisition or improvement of competences. On the other hand, they could appeal to and motivate practitioners who might otherwise be deterred from RE-DIY because they do not consider a task to be feasible with their level of competence. Watson/Shove (2008: 77) suggest that such devices should not be seen as instruments of de-skilling but as “agents that rearrange the distribution of competence within the entire network of entities that must be integrated to accomplish the job in hand.”

2.6 Global Level: Networking Between Activists, Researchers, Professionals and DIY Designers

The establishment of the Internet, web 2.0 and social media has contributed to the spreading of groups who collaborate on a wide scale, often at a global level, for shared purposes. This is an example of commons-based peer production, whereby “large groups of individuals...co-operate effectively to provide information, knowledge or cultural goods without relying on either market pricing or managerial hierarchies to co-ordinate their common enterprise” (Benkler/Nissenbaum 2006: 394). It has led to several phenomena, initiatives and communities (e.g. open source, peer-to-peer, etc.) emerging with the aim of contributing to a more community-oriented society. Peer production has been envisaged as “an

¹⁴<http://www.indie-furniture.org/configurator/>.

¹⁵<http://www.jamestooze.com/open-design/open-source-chair/>.

¹⁶<http://www.5-5designstudio.com/en/project/2009-cuisine-dobjets>.



Fig. 2.2 Process for the generation of Open Structures components. *Source* Picture from <http://blog.makezine.com/2010/02/23/open-structures-help-create-an-open/>

opportunity for more people to engage in practices that permit them to exhibit and experience virtuous behavior” (Benkler/Nissenbaum 2006: 394).

Abilities in communication and compromise are likely to prove crucial for a successful output. Participants from different backgrounds need to establish a common terminology and understanding of each other’s experiences. *Open Source Ecology* (OSE),¹⁷ for instance, is a wiki platform connecting farmers, engineers and volunteers in order to develop the main parts for high-performance machinery collaboratively.

In another example aimed at facilitating collaboration between people involved in designing products, design studio Infrastructures¹⁸ developed Open Structures,¹⁹ an experimental construction system based on modules that can be designed collaboratively. The size and dimensional features of parts, components and products are based on a grid that allows for the creation, modification and integration of modular and compatible elements of a shared ‘library’. The Open Structures approach is based on a few defined principles²⁰ aimed at supporting personal growth, product longevity and resource conservation (see Fig. 2.2). The project seeks to initiate “a new standard for sustainable and democratic design that, based on the principles of open-source software, facilitates the re-use of objects, parts and components and allows us to build things together”.²¹ An open, modular system of this kind has the potential to stimulate re-use cycles of various parts and

¹⁷<http://opensourceecology.org>.

¹⁸<http://www.intrastructures.net>.

¹⁹<http://www.openstructures.net>.

²⁰‘Standardize dimensions’, ‘Allow disassembly’, ‘Exchange skills’, ‘Allow hacking’, ‘Stimulate growth’, ‘Transform waste’.

²¹http://www.intrastructures.net/Intrastructures/Analysis_files/flyer_final-ENG.pdf. Further information in Lommee, Thomas (edited by). 2010. Yes! we’re open. Open design for sustainable innovation. Exhibition catalogue. Kortrijk, Belgium.

components over time on a global level, thereby challenging product obsolescence and allowing for updating through the introduction of variety within modularity.

Members of design communities are also collaborating on the development of products that the user can buy online; in some cases, the file rather than the object is purchased and the user sources manufacture locally (e.g. Shapeways,²² Ponoko,²³ and Make Me platform. Kazzata²⁴ has been recently established to design and print spare parts on demand, thus avoiding the disposal of a whole product in the event of lost or faulty components. The company intends to build the world's most comprehensive online repository of CAD files, bringing consumers, manufacturers and designers into a virtual marketplace of spare parts. If the file required is not available, it will be possible to send in the broken item and the company will produce a virtual replica.

Collaboration between practitioners and design professionals on a wider scale has resulted in groups forming to share experiences and disseminate knowledge in order to support a culture of product longevity or, more specifically, repair. From the late 1990s, the Dutch Eternally Yours Foundation operated for several years as a design-led multidisciplinary group investigating the topics of product longevity and emotional attachment to products, resulting in two books (Van Hinte 2004, 1997); a similar role was played in Britain by the Network on Product Life Spans.²⁵ Subsequent design-led efforts have introduced communities of researchers and activists to promote product longevity (e.g. Platform 21, Mend*RS). However, a lack of long term resilience in such initiatives raises questions about possible barriers to bringing the topic from an area of niche interest to higher levels of action.

2.7 Barriers and Triggers for Spreading RE-DIY

The cases presented above provide strong evidence of the role of design, at both local and global levels, to redirect contemporary DIY trends towards patterns of SCP, especially by promoting product longevity through interventions of repair, re-use, re-purpose and re-appropriation. The resulting design-led RE-DIY practice fosters not only a reduction in resource consumption but has a positive impact on individuals and the social fabric, e.g. a preference for local resources and craftsmanship, skilling processes and environmentally conscious behaviour, encouraging collaboration. However, these potential benefits may be undermined by certain factors discussed below.

²²<http://www.shapeways.com>.

²³<http://www.ponoko.com/>.

²⁴<http://kazzata.com/>.

²⁵<http://gow.epsrc.ac.uk/NGBOViewGrant.aspx?GrantRef=GR/S87645/01>.

2.7.1 *Availability and Suitability of Local Resources*

The four scenarios demonstrate interventions that may involve making use of locally available resources and products to, for instance, repair products. Countries or localities with limited means could, however, be strongly challenged in this respect. Nevertheless, optimization of available resources contributed to success in some cases, namely as a driver for variety and even innovation. In fact, historical evidence suggests that cultures constrained by limited resources may in such circumstances demonstrate inventiveness, performance, efficiency or beauty, as in ancient Japan with the Urawaza (Juniper 2003), England during the Great Depression and World Wars with ‘Make-Do-and-Mend’ (Ministry of Information 2007), Russia with contemporary folk artefacts (Arkhipov 2006), and the current Cuba with the Rikimbili (Oroza 2009).

In recent times, designers have been exploring the condition of limited resource availability as a business (and environmental) opportunity. One of the most notable cases is Swiss manufacturer Freitag,²⁶ which reuses discarded truck coverings and car safety belts for unique high-performance bags. In short, designers can support the interpretation and utilization of locally available resources to meet people’s needs.

2.7.2 *The Aesthetics of Imperfection*

Artefacts resulting from RE-DIY practice generally show signs of age that may accelerate a desire to replace them with shiny new objects. However, they can gain value through design-led contributions, as seen in particular in the case of enabling products. The positive implication envisaged is a new aesthetic paradigm: the provision of dignity to ‘imperfect’ appearance and the acceptance—or even appreciation—of mutable, physically degrading products (Salvia et al. 2010). Signs of imperfection due to wear and use bear witness to the shared existence of an artefact and its user, potentially strengthening their relationship.

Design has increasingly addressed strategies for emotional attachment (Mugge et al. 2010; Lilley 2009; Scott et al. 2009; Van Hinte 2004; Chapman 2005; Woolley 2003) with products that evolve with the user, e.g. by adaptation to new needs, visual traces of use, or ageing gracefully. The object then becomes the representation of its user’s identity and story, embedding significant and valuable components and memories, and making the user more willing to keep and take care of it for longer.

²⁶<http://www.freitag.ch/>.

2.7.3 Possible Side-Effects of ‘Green Consumption’

Products that are intended to support a shift to sustainable consumption may nonetheless be treated as commodities and risk offering no more than a greener form of consumerism, even triggering the acquisition of new goods, the ‘Diderot effect’ (McCracken 1990). This risk can be limited by strengthening the pro-environmental information and experience that the item embeds or favours. The provision of a clear and engaging message, stimulating enquiry about skills acquisition and environmental questions, can trigger or amplify the trend towards SCP. For instance, Sugru (described above) has a web-gallery showcasing possible uses of this material at different levels of complexity, thus encouraging people to use it according to their personal level of skill. Likewise the online stores for collaboratively designed products presented above could inform buyers about the environmental and social benefits of their products if the client opts for purchasing the file and manufacturing the product locally rather than purchasing the product and requesting delivery.

According to Shove/Warde (2001: 237), “the Diderot effect could be appropriated in support of less wasteful consumer practices, by restoring value to durability, by encouraging the matching of those items whose production and distribution is not a threat to sustainability, and so forth.” In other words, promoting the consumption of one type of less environmentally harmful product could encourage the purchase of other types of less environmentally harmful product, thereby accelerating progress towards SCP.

The provision of enabling solutions allowing for successful results may increase self-confidence in practitioners, thus “setting and moving the boundary between what amateurs are and are not willing to do for themselves, and in permitting and sustaining innovations in practice” (Shove et al. 2007: 66). As a consequence, practitioners may become keen to extend the range of RE-DIY activities in which they engage, with further potentially positive effects on the environment.

2.8 Discussion and Conclusion

The four scenarios presented above demonstrate that design can redirect contemporary DIY practice towards SCP through a focus on RE-activities. Some barriers that might prevent its evolution or spreading have been identified and possible ways to overcome them proposed.

Current RE-DIY trends with design involvement can be elements of innovation in (potentially) sustainable practices. The positive results collected in what are relatively small scale projects should encourage adoption more widely. Even so, RE-DIY practices need to be nurtured. The design-led cases presented above represent opportunities for innovation, either at a local or global level, but effort and resources are required to support these and similar cases, namely by introducing

them into the daily life of current (and possibly future) practitioners. This could enable the transition of RE-DIY from niches—where it currently it resides—to a broader level. Salvia (2013) proposes the introduction of RE-DIY culture and practice in education programs (e.g. modules in schools of Design), social enterprises and repair workshops.

Policy-makers can play a crucial role in encouraging design-led initiatives involving local and global communities in SCP projects. However, grassroots innovations such as the DIY trend discussed in this chapter are sometimes either not visible to them or do not attract their support, and consequently their potential remains largely underdeveloped (Feola/Nunes 2014). This is unfortunate, as governments could act to catalyse the innovation brought by the RE-DIY niches in wider societal levels arising from the interest of manufacturers (e.g. of rapid prototyping machineries), development of technologies (e.g. Web 2.0) and emergent networks (e.g. repair communities). Governments could, for example, offer support for establishing or developing infrastructure to facilitate RE-DIY (e.g. local workshops) and for deepening relationships between local communities and industry (e.g. through public funding for collaboration). These are topics that merit further investigation.

References

- Abel, B. van; Klaassen, R.; Evers, L.; Troxler, P. (Eds.) 2011: *Open Design Now: Why Design Cannot Remain Exclusive* (Amsterdam: BIS Publishers).
- Aguirre, D., 2010: "Design for Repurposing: A Sustainable Design Strategy for Product Life and Beyond", in: *Industrial Designers Society of America 2010 Conference*, 1–25.
- Akah, B.; Bardzell, S., 2010: "Empowering Products: Personal Identity through the Act of Appropriation", in: *CHI '10 Conference* (Atlanta, GA, USA: ACM): 4021–4026. doi:10.1145/1753846.1754096. <http://dl.acm.org/citation.cfm?id=1754096>.
- Anderson, C., 2012: *Makers: The New Industrial Revolution* (Toronto: McClelland and Stewart). <http://books.google.co.uk/books/about/Makers.html?id=L5zxn5JFleQC&pgis=1>.
- Arkhipov, V., 2006: *Home-Made: Contemporary Russian Folk Artifacts* (London: Fuel Publishing). <http://books.google.com/books?id=HLi0AAAAIAAJ&pgis=1>.
- Atkinson, P., 2010: "Boundaries? What Boundaries? The Crisis of Design in a Post-Professional Era", in: *The Design Journal*, 13,2: 137–155.
- Atkinson, P.; Unver, E.; Marshall, J.; Dean, L.T., 2008: "Post Industrial Manufacturing Systems: The Undisciplined Nature of Generative Design", in: *Proceedings of the Design Research Society Conference*, Sheffield Hallam University, 194/1–194/17. Sheffield. http://eprints.hud.ac.uk/5628/1/Atkinson_et_al_DRS2008_194.pdf.
- Barbiroli, G., 2008: "Profile of Products' Enduring Quality Over Long Periods as Strategic Factor to Increase their Utilisation Rate", in: *International Journal of Product Development*, 6,3/4: 450–467. <http://inderscience.metapress.com/index/J877K19201143093.pdf>.
- Beasley, J.; Georgeson, R., 2014: *Advancing Resource Efficiency in Europe: Indicators and Waste Policy Scenarios to Deliver a Resource Efficient and Sustainable Europe* (Brussels: European Environmental Bureau).
- Benkler, Y.; Nissenbaum, H., 2006: Commons-Based Peer Production and Virtue. in: *Journal of Political Philosophy*, 14,4 (December): 394–419. doi:10.1111/j.1467-9760.2006.00235.x; <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9760.2006.00235.x/full>.

- Bianchini, M.; Maffei, S., 2013: "Microproduction Everywhere: Defining the Boundaries of the Emerging New Distributed Microproduction Socio-Technical Paradigm", in: *Social Frontiers: The Next Edge of Social Innovation Research*: 1–21; Available at: http://www.researchgate.net/profile/Stefano_Maffei3/publication/269996138_Microproduction_everywhere._Social_local_open_and_connected_manufacturing/links/549dd6d90cf2fedbc3119a04.pdf (11 June 2015).
- Bœuf, J.Le.; Amatullo, M.; Breitenberg, M.; Maffei, S.; Villari, B.; Menzi, R.; Loetscher, M.; Fleming, D.; Lynch, G., 2006: *Cumulus Working Papers*. 16/06. Publication Series G. Nantes.
- Brandes, U.; Erhoff, M., 2006: *Non Intentional Design* (Cologne: DAAB).
- Campbell, C., 2005: "The Craft Consumer: Culture, Craft and Consumption in a Postmodern Society", in: *Journal of Consumer Culture*, 5,1 (March 1): 23–42. <http://joc.sagepub.com/content/5/1/23>.
- Centro di Ricerca Economica e Sociale Occhio del Riciclone, 2010: "Rapporto Nazionale Sul Riutilizzo 2010" (in Italian). Centro di Ricerca Economica e Sociale Occhio del Riciclone; Available at: <http://www.occhiodelriciclone.com/attachments/article/1211/RAPPORTO%20NAZIONALE%20SUL%20RIUTILIZZO%202014.pdf> (20 June 2015).
- Chapman, J., 2005: *Emotionally Durable Design: Objects, Experiences and Empathy* (London: Routledge).
- Cipolla, C.; Peruccio, P.P. (Eds). 2008: "Changing the Change", in: *Changing the Change: Design, Visions, Proposals and Tools* (Torino: Allemandi).
- Cooper, T., 2005: Slower Consumption: Reflections on Product Life Spans and the 'Throwaway Society'", in: *Journal of Industrial Ecology*, 9,1–2: 51–67. doi:10.1162/1088198054084671.
- Cooper, T. (Ed.) 2010: *Longer Lasting Products: Alternatives to the Throwaway Society* (Farnham: Gower).
- Coskun, A.; Dogan, C., 2010: "Post-Use Design Thinking Presenting Insights into a Design Research for Sustainability", in: *Proceedings of LeNS Conference*, Bangalore, India. (Sheffield, UK: Greenleaf Publishing): 368–381.
- Cross, N., 2011: *Design Thinking: Understanding How Designers Think and Work* (Oxford: Bloomsbury Academic). http://books.google.co.uk/books/about/Design_Thinking.html?id=Ndu48n8Ik9UC&pgis=1.
- Design Council, 2002: *Design Council Annual Review 2002. Review Literature and Arts of The Americas* (London: Design Council).
- Easterlin, R., 1974: "Does Economic Growth Improve the Human Lot? Some Empirical Evidence", in: Paul, A.D.; Reder, W.M. (Eds.): *Nations and Households in Economic Growth: Essays in Honour of Moses Abramovitz* (New York: Academic Press): 89–125.
- European Parliament (2013). Decision no. 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 "Living Well, within the Limits of Our Planet." *Official Journal of the European Union*. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013D1386&from=EN>.
- Evans, D.; Jackson, T., 2008: *Sustainable Consumption: Perspectives from Social and Cultural Theory*. RESOLVE Working Paper 05–08.
- Feola, G.; Nunes, R., 2014: "Success and Failure of Grassroots Innovations for Addressing Climate Change: The Case of the Transition Movement", in: *Global Environmental Change*, 24: 232–250. doi:10.1016/j.gloenvcha.2013.11.011. <http://www.sciencedirect.com/science/article/pii/S0959378013002197>.
- Fox, S., 2012: "The New Do-It-Yourself Paradigm: Financial and Ethical Rewards for Businesses", in: *Journal of Business Strategy*, 33,1: 21–26. doi:10.1108/02756661211193785. <http://www.emeraldinsight.com/10.1108/02756661211193785>.
- Fox, S., 2013: "Paradigm Shift: Do-It-Yourself (DIY) Invention and Production of Physical Goods for Use or Sale", in: *Journal of Manufacturing Technology Management*, 24,2: 218–234. doi:10.1108/17410381311292313. <http://www.emeraldinsight.com/10.1108/17410381311292313>.
- Fox, S.; Ehlen, P.; Purver, M., 2011: "Enabling Distributed Communication of Manual Skills", in: *International Journal of Managing Projects in Business*, 4,1: 49–63. doi:10.1108/17538371111096881; <http://www.emeraldinsight.com/10.1108/17538371111096881>.

- Franke, N.; von Hippel, E.; Schreier, M., 2006: "Finding Commercially Attractive User Innovations: A Test of Lead-User Theory", in: *Journal of Product Innovation Management*, 23,4: 301–315. doi:[10.1111/j.1540-5885.2006.00203.x](https://doi.org/10.1111/j.1540-5885.2006.00203.x); <http://doi.wiley.com/10.1111/j.1540-5885.2006.00203.x>.
- Fuchs, D.A., Lorek, S., 2005: "Sustainable Consumption Governance: A History of Promises and Failures", in: *Journal of Consumer Policy*, 28,3: 261–288. doi:[10.1007/s10603-005-8490-z](https://doi.org/10.1007/s10603-005-8490-z); <http://www.springerlink.com/index/10.1007/s10603-005-8490-z>.
- Giudice, F.; La Rosa, G.; Risitano, A., 2006: *Product Design for the Environment: A Life Cycle Approach* (Boca Raton, FL: CRC Press).
- Hertwich, E.G., 2005: "Consumption and the Rebound Effect: An Industrial Ecology Perspective", in: *Journal of Industrial Ecology*, 9,1: 85–98. <http://onlinelibrary.wiley.com/doi/10.1162/1088198054084635/abstract>.
- Hoftijzer, J., 2009: "DIY and Co-creation: Representatives of a Democratizing Tendency", in: *Design Principles and Practices, An International Journal*, 3,6: 69–81.
- Jencks, C.; Silver, N., 1972: *Adhocism: The Case for Improvisation* (New York: Doubleday).
- Juniper, A., 2003: *Wabi Sabi: The Japanese Art of Impermanence* (Boston: Tuttle Publishing).
- Krantz, R. (2010). "A New Vision of Sustainable Consumption", in: *Journal of Industrial Ecology*, 14,1 (January): 7–9. doi:[10.1111/j.1530-9290.2009.00220.x](https://doi.org/10.1111/j.1530-9290.2009.00220.x); <http://blackwell-synergy.com/doi/abs/10.1111/j.1530-9290.2009.00220.x>.
- Lave, J.; Wenger, E., 1991: *Situated Learning: Legitimate Peripheral Participation* (Cambridge: Cambridge University Press). http://books.google.co.uk/books/about/Situated_Learning.html?id=CAVIOrW3vYAC&pgis=1.
- Leadbeater, C., 2008: *We-Think: Mass Innovation, Not Mass Production* (London: Profile Books).
- Leadbeater, C.; Miller, P., 2004: *The Pro-Am Revolution: How Enthusiasts Are Changing Our Economy and Society* (London: Demos).
- Lewis, H.; Gertsakis, J. (Eds.) 2011: "Electronic and Electronical Products", in: Lewis, H.; Gertsakis, J. (Eds.): *Design and Environment: A Global Guide to Designing Greener Goods* (Sheffield, UK: Greenleaf): 164–184.
- Lilley, D., 2009: "Design for Sustainable Behaviour: Strategies and Perceptions", in: *Design Studies*, 30,6: 704–720. doi:[10.1016/j.destud.2009.05.001](https://doi.org/10.1016/j.destud.2009.05.001); <http://linkinghub.elsevier.com/retrieve/pii/S0142694X09000301>.
- Lipovetsky, G., 2006: *Le Bonheur Paradoxal: Essai Sur La Société D'hyperconsommation* (Paris: Gallimard).
- Lorek, S.; Spangenberg, J., 2014: "Sustainable Consumption Within a Sustainable Economy—Beyond Green Growth and Green Economies", in: *Journal of Cleaner Production*, 63: 33–44. doi:[10.1016/j.jclepro.2013.08.045](https://doi.org/10.1016/j.jclepro.2013.08.045); <http://www.sciencedirect.com/science/article/pii/S0959652613006008>.
- Madge, P., 1997: "Ecological Design: A New Critique", in: *Design Issues*, 13,2: 44–54. <http://www.jstor.org/stable/1511730>.
- Manno, J., 2002: "Commoditization: Consumption Efficiency and an Economy of Care and Connection", in: Princen, T.; Maniates, M.; Conca, K. (Eds.): *Confronting Consumption* (Cambridge: MIT Press): 67–87.
- Manzini, E., 1994: "Design, Environment and Social Quality: From 'Existenzminimum' to 'Quality Maximum'", in: *Design Issues*, 10,1: 37–43. <http://www.jstor.org/stable/1511653>.
- Manzini, E., 2003: "Scenarios of Sustainable Wellbeing", in: *Design Philosophy Papers*, 1,1: 5–21. doi:[10.2752/144871303X13965299301434](https://doi.org/10.2752/144871303X13965299301434); <http://www.ingentaconnect.com/content/bloomsbury/dphp/2003/00000001/00000001/art00002>.
- Manzini, E. (2006). "Design Research for Sustainable Social Innovation", in: Michel, R. (Ed.): *Design Research Now: Essays and Selected Projects* (Board of International Research in Design) (Basel: Birkhäuser): 233–245.
- Manzini, E., 2010: "Small, Local, Open and Connected. Design Research Topics in the Age of Networks and Sustainability", in: *Proceedings of LeNS Conference*, Bangalore, India, 14–18.

- Marchand, A.; Walker, S., 2006: "Designing Alternatives: Sustainable Consumption, Lifestyles and 'Responsible Consumers'", in: *Proceedings of Changes to Sustainable Consumption. Workshop of the Sustainable Consumption Research Exchange (SCORE!) Network*, Copenhagen, 253–264.
- Marchand, A.; Walker, S., 2008: "Product Development and Responsible Consumption: Designing Alternatives for Sustainable Lifestyles", in: *Journal of Cleaner Production*, 16,11: 1163–1169. doi:[10.1016/j.jclepro.2007.08.012](https://doi.org/10.1016/j.jclepro.2007.08.012); <http://linkinghub.elsevier.com/retrieve/pii/S0959652607001837>.
- Marchand, A.; Walker, S.; Cooper, T., 2010: "Beyond Abundance: Self-Interest Motives for Sustainable Consumption in Relation to Product Perception and Preferences", in: *Sustainability*, 2,5: 1431–1447. doi:[10.3390/su2051431](https://doi.org/10.3390/su2051431); <http://www.mdpi.com/2071-1050/2/5/1431/>.
- McCracken, G.D., 1990: *Culture and Consumption: New Approaches to the Symbolic Character of Consumer Goods and Activities* (Bloomington: Indiana University Press). <http://books.google.com/books?id=sZALv30Usi0C&pgis=1>.
- Meroni, A., 2007: *Creative Communities. People Inventing Sustainable Ways of Living* (Milano: POLI.design). <http://books.google.com/books?id=CISXPAAACAAJ&pgis=1>.
- Ministry of Information, 2007: *Make Do and Mend* (London: Sabrestorm Publishing) (Historic Booklet Series). http://books.google.co.uk/books/about/Make_Do_and_Mend.html?id=fEgAngEACAAJ&pgis=1.
- Mont, O., 2008. "Innovative Approaches to Optimising Design and Use of Durable Consumer Goods", in: *International Journal of Product Development*, 6,3/4: 227–250. doi:[10.1504/IJPD.2008.020395](https://doi.org/10.1504/IJPD.2008.020395). <http://www.inderscience.com/link.php?id=20395>.
- Mont, O.; Plepys, A., 2008: "Sustainable Consumption Progress: Should we be Proud or Alarmed?", in: *Journal of Cleaner Production*, 16,4: 531–537. doi:[10.1016/j.jclepro.2007.01.009](https://doi.org/10.1016/j.jclepro.2007.01.009); <http://linkinghub.elsevier.com/retrieve/pii/S0959652607000352>.
- Mugge, R., Schifferstein, H.N.J., Schoormans, J.P.L., 2010: "Product Attachment and Satisfaction: Understanding Consumers' Post-Purchase Behavior", in: *Journal of Consumer Marketing*, 27,3: 271–282. doi:[10.1108/07363761011038347](https://doi.org/10.1108/07363761011038347); <http://www.emeraldinsight.com/10.1108/07363761011038347>.
- Oroza, E., 2009: *RIKIMBILI. Une Étude Sur La Désobéissance Technologique et Quelques Formes de Réinvention*. (Saint-Étienne: Université de Saint-Étienne).
- Porritt, J., 2003: *Redefining Prosperity: Resource Productivity, Economic Growth and Sustainable Development*; Available at: <https://research-repository.st-andrews.ac.uk/bitstream/10023/2238/1/sdc-2003-redefining-prosperity.pdf> (26 May 2015).
- Redström, J., 2006: "Towards User Design? On the Shift from Object to User as the Subject of Design", in: *Design Studies*, 27,2: 123–139. doi:[10.1016/j.destud.2005.06.001](https://doi.org/10.1016/j.destud.2005.06.001); <http://linkinghub.elsevier.com/retrieve/pii/S0142694X05000359>.
- Ritzer, G.; Jurgenson, N., 2010: "Production, Consumption, Prosumption: The Nature of Capitalism in the Age of the Digital 'Prosumer'", In: *Journal of Consumer Culture*, 10,1: 13–36. doi:[10.1177/1469540509354673](https://doi.org/10.1177/1469540509354673); <http://joc.sagepub.com/content/10/1/13.abstract>.
- Rosner, D.; Bean, J., 2009: "Learning from IKEA Hacking: 'I'm Not One to Decoupage a Tabletop and Call it a Day'", in: *Proceedings of the 27th International Conference on Human Factors in Computing Systems CHI '09* (New York: ACM): 419–422. doi:[10.1145/1518701.1518768](https://doi.org/10.1145/1518701.1518768); <http://people.ischool.berkeley.edu/~daniela/research/note1500-rosner.pdf>.
- Salvia, G., 2013: "Design for satisfactory and sustainable patterns of consumption and production: design for the contemporary practice of do-it-yourself" (Ph.D. thesis, Milano: Politecnico di Milano); Available at: <https://www.politesi.polimi.it/handle/10589/74842> (11 June 2015).
- Salvia, G.; Ostuzzi, F.; Rognoli, V.; Levi, M., 2010: "The Value of Imperfection in Sustainable Design", in: *Sustainability in Design: Now!* Bangalore, India, 1573–1589.
- Sanders, E.B.; Stappers, P.J., 2008: Co-Creation and the New Landscapes of Design. in: *Co-Design*, 4,1: 5–18. <http://www.tandfonline.com/doi/abs/10.1080/15710880701875068>.

- Schreier, M., 2006: "The Value Increment of Mass-Customized Products: An Empirical Assessment", in: *Journal of Consumer Behaviour*, 5: 317–327.
- Scott, K.; Quist, J.; Bakker, C., 2009: "Co-Design, Social Practices and Sustainability Innovation: Involving Users in a Living Lab Exploratory Study on Bathing", in: *Proceedings of Joint Actions on Climate Change conference*, Aalborg, Denmark, 8–10 June 2009, 1–15. <http://ordinarylifestudy.typepad.com/files/scottbakkerquistsm.pdf>.
- Shove, E., 2006: Towards practice oriented product design. Presented at Towards Practice Oriented Product Design, London, 6 September; Available at: <http://www.lancaster.ac.uk/fass/projects/dnc/media/towards%20popd.pdf>.
- Shove, E.; Warde, A., 2001: "Inconspicuous Consumption: the Sociology of Consumption and the Environment", in: Dunlap, R.; Buttell, F.; Dickens, P.; Gijswijt, A. (Eds.): *Sociological Theory and the Environment: Classical Foundations, Contemporary Insight* (Plymouth: Rowman and Littlefield): 230–250.
- Shove, E.; Watson, M.; Hand, M.; Ingram, J., 2007: *The Design of Everyday Life* (Oxford: Berg).
- Spangenberg, J.H.; Fuad-Luke, A.; Blincoe, K., 2010: "Design for Sustainability (dfs): The Interface of Sustainable Production and Consumption", in: *Journal of Cleaner Production*, 18,15: 1485–1493. doi:10.1016/j.jclepro.2010.06.002; <http://linkinghub.elsevier.com/retrieve/pii/S0959652610002143>.
- Stahel, W.R., 1997: "The Service Economy: 'Wealth Without Resource Consumption'?", in: *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 355,1728: 1309–1319. doi:10.1098/rsta.1997.0058; <http://rsta.royalsocietypublishing.org/cgi/doi/10.1098/rsta.1997.0058>.
- Thorpe, A., 2010. "Design's Role in Sustainable Consumption", in: *Design Issues*, 26,2: 3–16. http://www.mitpressjournals.org/doi/abs/10.1162/DESI_a_00001.
- Toffler, A., 1980: *The Third Wave* (New York: William Morrow).
- Tukker, A.; Cohen, M.J.; Hubacek, K.; Mont, O., 2010: "The Impacts of Household Consumption and Options for Change", in: *Journal of Industrial Ecology*, 14,1: 13–30. doi:10.1111/j.1530-9290.2009.00208.x; <http://blackwell-synergy.com/doi/abs/10.1111/j.1530-9290.2009.00208.x>.
- United Nations, 2002: *Report of the World Summit on Sustainable Development* (Johannesburg: United Nations).
- United Nations, 2012: *Report of the United Nations Conference on Sustainable Development* (Rio de Janeiro, Brazil: United Nations).
- Van Hinte, E. (Ed.) 1997: *Eternally Yours: Visions on Product Endurance* (Rotterdam: 010 Publishers).
- Van Hinte, E., 2004: *Eternally Yours: Time in Design* (Rotterdam: 010 Publishers).
- Vezzoli, C.; Manzini, E., 2008: *Design for Environmental Sustainability* (London: Springer). doi:10.1007/978-1-84800-163-3; <http://www.springerlink.com/index/10.1007/978-1-84800-163-3>.
- Von Hippel, E., 2005: *Democratizing Innovation* (Cambridge, MA: MIT Press). doi:10.1111/j.1540-5885.2006.00192_2.x.
- Walker, S.; Giard, J. (Eds.) 2013: *The Handbook of Design for Sustainability* (London: Bloomsbury). <http://www.bloomsbury.com/uk/the-handbook-of-design-for-sustainability-9780857858528/>.
- Warde, A., 2005: "Consumption and Theories of Practice", in: *Journal of Consumer Culture*, 5,2: 131–153. doi:10.1177/14695405050503090; <http://joc.sagepub.com/content/5/2/131.short>.
- Waste and Resources Action Programme (WRAP), 2012: *Composition and Re-Use Potential of Household Bulky Furniture in the UK* (Banbury: WRAP).
- Watson, M.; Shove, E., 2006: "Materialising Consumption: Products, Projects and the Dynamics of Practice", Working Paper no. 30. Cultures of Consumption and ESRC-AHRC Research Programme, Vol. 1.
- Watson, M.; Shove, E., 2008: "Product, Competence, Project and Practice: DIY and the Dynamics of Craft Consumption", in: *Journal of Consumer Culture*, 8,1: 69–89. doi:10.1177/1469540507085726; <http://joc.sagepub.com/cgi/doi/10.1177/1469540507085726>.

- WCED (World Commission on Environment and Development) 1987: *Report of the World Commission on Environment and Development: 'Our Common Future.'*; at: <http://www.un-documents.net/our-common-future.pdf> (26 May 2015).
- Woolley, M., 2003: "Choreographing Obsolescence—Ecodesign", in: *Proceedings of the 2003 International Conference on Designing Pleasurable Products and Interfaces—DPPI '03*, Vol. 77. (New York: ACM Press). doi:10.1145/782896.782916; <http://portal.acm.org/citation.cfm?doid=782896.782916>.

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