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COMMONING PRACTICES IN POSTCAPITALIST DESIGN

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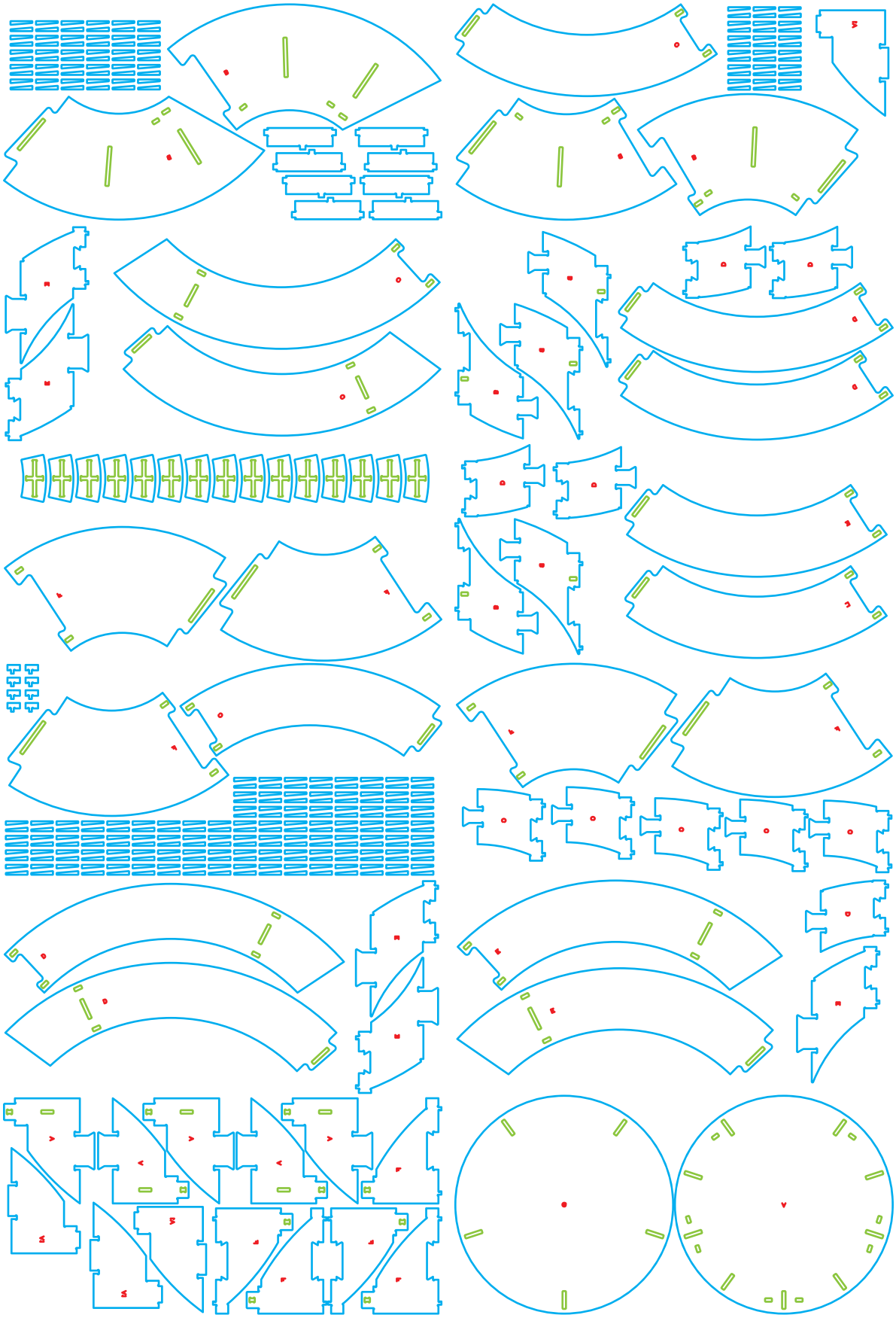

Unsustaining the Commodity-Machine:
Commoning Practices in Postcapitalist Design

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to mom, who introduced me to design,
and to dad, who introduced me to politics.

[i] If anything, I regret *not* having centred this project squarely on climate justice. Then again, the struggle continues, and so does the research.

Table of Contents

[We live in] a civilisation in which
we produce nothing of what we consume
and consume nothing of what we produce.
—André Gorz.

The apocalypse is always easier to imagine
than the strange circuitous routes
to what actually comes next.
—Rebecca Solnit.

Fig. 1. Wind turbine scale model (batteries included)

A children's toy is on offer in the aisles of a discount market. Priced at €5,99 and produced in China, it is a scale model of a wind turbine cast in plastic. It uses two AAA batteries (included). The packaging depicts lush green fields and bright, breezy skies. Accordingly, the whole product reflects the prevailing imaginary of sustainability in that it celebrates technological ingenuity, harnesses the power of the wind, and advances towards harmony between nature and civilisation... Although this is certainly an inspiring and heartening story for children, the physical materiality of the object betrays an entirely different narrative. This disturbing tale involves oil extraction, petrochemical derivatives, cheap labour, global trade, and toxic landfills. Fittingly, this model windmill works in reverse: it sucks energy in so as to produce more wind, an accurate metaphor for extreme weather events triggered by industrial societies' insatiable appetite for energy.[i]

[i] In fact, wind turbines are no simple solution to decarbonising energy in that they are remarkably resource intensive themselves. Indeed, large-scale, for-profit wind farms can be as destructive as existing the fossil fuel infrastructure (Dunlap and Jakobsen).

Fig. 2. BP's Helios House gas station in Los Angeles.

In 2000, British Petroleum (BP) changed its logo to a stylised sunflower and pledged to go "Beyond Petroleum". Its advertisements start promoting its interest in "thinking outside the barrel", adopting a slogan that, not long before, activists had used against the very same fossil fuel company. Alongside this new marketing drive, BP has also initiated several measures to reduce the carbon footprint of its supply chain, such as the exquisite gas station named Helios House, built in Los Angeles in 2007. It has a canopy made of triangular stainless steel sheets, which are partly covered with solar panels and partly with drought-tolerant cacti that collect rainwater. The building looks as if it comes from a future in which every detail of everything is thoroughly designed to be environmentally sound. For some reason, that future still involves pumping hydrocarbons into private cars.[ii]

[ii] Just like the multi-million dollar rebranding campaign, the Helios House does not in any way involve the company abandoning its core business of oil and gas exploitation, of "exploring, developing and producing more fossil fuel resources to meet growing demand" (BP, *Beyond Petroleum*). Along with the rest of the industry, BP remains dedicated to digging for the deeper, dirtier, and riskier reserves that will release untold amounts of carbon into the atmosphere (Beder).

Fig. 3. President Obama and the fighter jet that runs on biofuels.

On March 31, 2010, in a military airbase hangar, President Barack Obama gave a speech to an audience including high-ranking military personnel. For the most part, the talk is intended to justify his decision to expand offshore oil and gas exploration and extraction projects. To balance this decision out, the President took the opportunity to announce the Navy's latest sustainability initiative: behold the F/A-18 Super Hornet multi-role fighter jet, dubbed the Green Hornet. It is powered by a 50/50 mixture of conventional kerosene and a biofuel derived from camelina sativa, a non-food plant that can grow in harsh conditions. The President proudly declares that the military aircraft would be flown for the first time on Earth Day, becoming the first supersonic flight performed on biofuels. There is no trace of irony or ambiguity: for the Obama administration, drilling oil, waging wars, and conserving fuels can be part of one and the same energy security policy.[iii]

[iii] The Pentagon calls climate impacts "threat multipliers" that aggravate already existing conflicts and risks. The US military consumes more fuel and emits more carbon than any other organisation in the world. It wages wars to protect the US Empire's fossil energy infrastructure.

Introduction: The Design of the Anthropocene

In the early twenty-first century, planet Earth finds itself thoroughly *designed*. The designs imposed upon the planet have been overwhelmingly detrimental to the living systems sharing its thin crust. The world is now said to have moved into a new epoch, the Anthropocene, in which humans have shaped their environments so comprehensively that their influence is henceforth inscribed in the geological record (Crutzen). Although it was first proposed as a strictly geological term, the Anthropocene gained traction far beyond geology, taking the social sciences and humanities by storm.

That said, the concept has also drawn criticism on the grounds that it implies that humans are inevitably destined to damage their habitat.[i] The naming of the new epoch itself obscures unequal and divergent agencies at work in anthropogenic ecological change; there is no single "humanity" that has acted in unison as a geological force, nor even agreed to become one. The multiple, conflictual histories and agencies obscured in the unitary concept of the Anthropocene are brought into focus by the various dates suggested as the beginnings of the epoch. The European colonisation of the Americas (Lewis and Maslin), invention of the steam engine, and detonation of nuclear weapons (Crutzen and Steffen) have each been proposed as starting points. Nonetheless, these developments can be attributed to only a fraction of humans and were realised at the expense of other(ed) populations. This designed geological era, it

[i] For a comprehensive review of the debate in the humanities, see Chakrabarty; Demos; Morton; Moore; Haraway; Angus; Wark.

turns out, has a peculiar designer. The figure that I have in mind is less *homo faber* the maker than *homo economicus*, who has set in motion extractivist and expansionist projects that have reshaped the earth.

Ezio Manzini claims that "in a changing world everyone designs". In response, I would like to paraphrase Marx: everyone may be designers but they do not design as they please. They design "not under circumstances chosen by themselves, but under already existing circumstances, given and transmitted from the past" (*18th Brumaire*). If capitalism has been master-designer of our epoch, then the term Capitalocene presents a fitting counter-narrative to that of the Anthropocene. It unambiguously frames capital as the primary driver of planetary disruption and holds capital responsible for the metabolic rift between human and ecological systems. However, even this critique unintentionally endows the ideology of capitalist realism, according to which capitalism represents "the only viable political and economic system," with material certainty (Fisher, *Capitalist Realism* 2). The narrative of the Capitalocene makes it seem as if capitalism is here to stay, that it has stabilised as a geological epoch. It would be more accurate to say that the onset of capitalism triggered the post-Holocene era but is not its ultimate horizon. Instead of abandoning the term, I would suggest that we attend to the notion of an Anthropocene, which compels us to take it literally: now it is up to the human species to shape the next epoch of the planet Earth. This sense of responsibility comes across strongly in existential questions posed by Buckminster Fuller. "If the success or failure of this planet and of human beings depended on how I am and what I do", Fuller writes, "How would I be? What would I do?" (qtd. in Sieden 255). This brings on a set of questions of my own. Can the majority of humans redesign their ways of life? Can they substitute their destructive tendencies for reparative and regenerative practices? How can we distribute this task equitably among humans? How might people become eco-social designers able to remake our environments, communities, and livelihoods? Is it possible to design a just Anthropocene by simultaneously decarbonising and decolonising the earth? What happens to design when everyone designs?

What interests me about design in relation to the Anthropocene is its unique strategic position between the material and immaterial, and, by extension, the natural and cultural. Design has powerful immaterial capabilities, which might be harnessed in response to the challenges of material sustainability. When it comes

to sustainability, however, design is paradoxically seen as both a culprit and saviour. It is held responsible for single-handedly bringing about resource depletion, environmental pollution, mass production, manipulative marketing, wasteful obsolescence, and bottomless consumerism. Yet it is also presented as capable of overcoming all of its shortcomings, excesses, and failures. Indeed, alongside the changes that it has wrought on the earth, design circulates aesthetically compelling discourses that attest to its own sustainability. The objects that I presented in opening this study represent but a few select instances of a gaping cognitive dissonance in contemporary culture between artefacts in themselves (the actual shapes, materials, and circuits) and their perceived qualities and benefits (as mediated through packaging, marketing, and media). We are expected to believe that if only plastic toys were made to embody ecological values, gas stations were designed "a little bit better", and fighter jets ran on biofuels, then the worst can be avoided, and the future will be greener.

It is tempting to dismiss these samples as exceptional cases of greenwashing, which deceptively inflates negligible ecological improvements so as to provide cover for unsustainable practices[ii]. At any rate, despite their meticulous marketing strategies and sophisticated designs, my three opening objects are grossly inadequate to the task of solving the pressing ecological problematics that beset the Anthropocene. These objects do not serve to exemplify some exceptionally superficial cases, however. Rather, they illustrate the conventional wisdom concerning sustainable design that prevails in society in general. In capturing the core contradictions of green capitalist beliefs, they point to the impossibility of achieving sustainability within a capitalist framework.

The fundamental premise of this study is that misguided projects and false promises such as these must be abandoned. Indeed, design practices must look beyond the ill-conceived concept of sustainability as such. This study, in short, turns on the necessity of unsustaining predominant discourses of sustainable design and embracing novel approaches to theorising and practising design in the Anthropocene.

[ii] While the term greenwashing originates from activist discourse, it has already been adopted by the marketing sector. I have previously analysed greenwashing extensively as part of my MA thesis on "the design of cultural capitalism" (Balamir).

Design is a vast, slippery, and fuzzy concept. Denoting both a process and product (Ward, *Emergence*), it is overused in academic literature in fields ranging from technical engineering to social sciences. That said, scholarly studies dedicated specifically to design remain marginal. Designers themselves have provided several normative definitions; here I pick out four: "Design is form-making in order" (Kahn qtd. in Conrads 169); "Design is a conscious and intuitive effort to impose meaningful order" (Papanek 4), "Design is devising courses of action aimed at changing existing situations into preferred ones" (Simon 111), "Design is a manifestation of the capacity of the human spirit to transcend its limitations" (Nelson 13). Created in the present but bearing upon the future, design projects are by definition projections, blueprints that mediate between imagination and construction. These definitions paint a positive, optimistic, and inspiring picture of design, as do theories of "design thinking" and "designerly ways of knowing" (Cross). Design is a do-good, lateral-thinking, problem-solving, agenda-setting, future-directing, world-changing, innovative, and creative practice. It is to be found everywhere and in everyone.

Although such definitions certainly point to design's latent potentials, they nonetheless tend to apply only to rare instances of best practice in design. Rather than providing essentialist or normative definitions of what design can ideally be or do, design studies is concerned with what design already is or does as it operates imperfectly in the real world. Drawing methodological inspiration from anthropology and other social sciences, scholars situate design as a social practice and cultural phenomenon that is embedded in historical and geographical contexts. The artefacts that humans make and use, whether they are made for purposes of productivity, convenience, or delight, are expressions of cultures at their most pragmatic, technical, and mundane. From this perspective, design emerges as a type of knowledge embedded in artefacts. Attending closely to artefacts, it follows, can reveal much about the cultures that produced them. In making the elusive and contested concept of design more traceable and graspable, scholars draw on critical approaches in the broader interdisciplinary humanities. In this way, they explore design's interactions with social, political, economic, ecological, technological, cultural, and aesthetic

systems. In this study, I intend to both build upon and contribute to ongoing developments in the field of design cultures.[iii]

The scope of the concept of design has expanded considerably over time. As applied arts and crafts evolved into industrial production, design's purview extended in every direction and at every scale. A modernist dictum declared that everything from "the spoon to the city" was now subject to design (attributed to Ernesto Rogers, qtd. in Sudjic 35). Today design is said to cover everything from "jeans to genes" (Foster 17). The term has inflated to the point that, as Michael Hardt has observed, design is now being employed as the general name for any kind of immaterial production (qtd. in Hight 72). Richard Buchanan distinguishes among four orders of design. Beyond the historical categories of *visual communications* and *material objects*, he notes that design has increased in complexity, such that it now encompasses designing *interactions and services*, as well as entire *environments and systems*. Terry Irwin describes a continuum of approaches that spans "Design for Service", "Design for Social Innovation", and "Transition Design". Design's conceptual territory has been broadened so effectively that its centre of gravity has now resolutely shifted away from material production. This dematerialisation of design may be apposite when it comes to designing services, platforms, and apps. However, this process has been accompanied by a tendency to neglect material production altogether. It is as if the development of design is expected to transcend earthbound materiality and shake itself free from environmental entanglements and impacts. In the meantime, however, the unsustainability of actually existing industrial infrastructure remains unaddressed; in many cases the problem is being aggravated. Whereas the information economy and digital cultures strive to become light and frictionless, product design has yet to catch up, stuck as it is in its heavy and dirty industrial past.

Design is central to relations of production and, by extension, society at large. It is entangled in manifold circuits of value creation, in both the narrower economic and broader societal senses. Products are primarily defined by their use-value, commodities by their exchange-value. The social relations that create

[iii] In particular, I have found the following methodological contributions to design studies especially useful: Lees-Maffei and Houze; Fallan; Clarke, Milev; Julier; Clark and Brody; Margolin; and Michel.

products and commodities, though, involve processes of generating and attributing value that are far more complex than that binary schema suggests. This is encapsulated in a formulation that is widely attributed to Marshall McLuhan: "we shape our tools and thereafter our tools shape us." Put simply, design and society reflect each other. Echoing McLuhan, Boradkar also affirms that "people and things configure each other" (4-5). Artefacts themselves are designing things, endowed with agency, that shape their makers in ways that reproduce particular social relations. In other words, design cements social relations as things and things cement social relations. Marx hones in on the same dialectic in writing that production "not only creates an object for the subject, but also a subject for the object" (*Grundrisse*). It would seem that this mutually transformative relationship between objects, things, or tools on one side, and subjects, people, or "us" on the other, is a recurrent leitmotif in thinking about design. As such, it deserves more rigorous theoretical attention.

To formalise these insights into a coherent methodology, I put forward a framework for analysing design cultures that foregrounds the creation of value. In adhering to this framework, I eschew the conventional object-centric mode of design analysis, which surveys products from cradle to grave. Indeed, my analysis emphasises social relations over material features, processes over products, subjects over objects. Supplementing the subject/object division with a third mediating element, I distinguish three distinct meanings of design, which can be used as a verb, noun, and adjective. There is the activity of designing subjects (designers), circulation of design projects (blueprints), and production of designed objects (products). I name these three processes of value creation *design labour*, *design knowledge*, and *design artefact*:

designing subject	**designer**	**design labour**
design project	**blueprint**	**design knowledge**
designed object	**product**	**design artefact**

Table 1. Value-centric framework for design analysis

Approaching contemporary practices through this analytical lens immediately makes their market-based valorisation processes explicit: commodified labour, intellectual property, and consumer goods appear as indispensable elements of conventional design practices. Industrial capital and product design have become so intertwined historically that it seems almost tautological to specify the political economy of design as "capitalist design". It is as if design could not survive without capitalism's legal, financial, and logistical frameworks. I name this seemingly inextricable merger the "commodity-machine". This machine does not merely produce heaps upon heaps of commodities; it reproduces commodification too. When design is implicated in the production of commodified artefacts, in other words, it generates commodified social relations around them. Against this backdrop, it is little wonder that attempts to techno-fix the commodity-machine fail to meet the challenge of undertaking a rapid eco-social transition in a convincing way. Instead, such attempts merely reproduce existing capitalist valorisation processes and commodified social relations. If it is not products themselves that are unsustainable, but the economic relations in which they are embedded, it follows that design can only become sustainable if design labour, knowledge, and artefacts are decoupled from the commodity-machine. With this in mind, in elaborating on this critique of the political economy of design in the first chapter, I make the case for using my value-centric framework in studying forms of design that run counter to the commodity-machine.

If one wishes to practice design without sustaining, preserving, and perpetuating the unsustainable commodity-machine, two political courses of action are typically available[iv]. The first is to produce resistance—"many no's"—so as to build countervailing power. The second is to produce alternatives—"many yes's"—that pave the way to better outcomes. Inherently, design has far more affinity with the task of producing alternatives rather than with those of formulating demands, lobbying for reform, or fomenting revolt. It is an affirmative, not adversarial practice. Although resistance and generating alternatives are entwined, in this study I focus on the alternatives alone. Among a

[iv] A more nuanced description of the options can be found in Erik Olin Wright's work. He identifies *taming*, *smashing*, *escaping* and *eroding* as four strategic logics of anti-capitalism. Eroding capitalism has the most affinity with the approaches that I explore in this study.

diversity of approaches to producing alternative social realities, I pick out two strands that are relevant for design: speculative thinking and prefigurative doing. Speculative discourses express visions and tell stories about possible futures. They spark the imagination and make utopias palpable. Prefigurative practices intervene directly in the present while embodying the means and values of a world to come.

Admittedly, designating such prefigurative, speculative, or engaged discourses and practices as "alternatives" implies their marginality relative to conventional practices that predominate in society. Although they are united in opposition to established, hegemonic social relations, alternatives encompass a diverse range of improvised, ephemeral, and niche conditions and projects. Alternative design practices may be influential in the cultural sphere, but they are usually not considered a threat to the commodity-machine. Given both design and technology's complicity in late capitalism, anticapitalist discourse and aesthetics have tended to assume decidedly critical stances on design and technology in recent decades[v]. The late Mark Fisher laments that the meaning of desire (and I would add innovation, progress, and luxury) has been altogether abandoned to capital. It "is time for us to reclaim and positivise sneers such as 'designer socialism'", he proclaims, "because it is the equation of the 'designer' with 'capitalist' that has done so much to make capital appear as if it is the only possible modernity" ('Post-Capitalist Desire' 132). Following Fisher's insight, in this study I reject the false opposition between design and the common good. Instead, I theorise a design practice that has been liberated from its entanglements with capitalism.

A range of other practices have been labelled "speculative design, critical design, design fiction, design futures, antidesign, radical design, interrogative design, design for debate, adversarial design, discursive design, futurescaping, and ... design art" (Dunne and Raby 11). These practices project stories and scenarios about how things might be in the future, much like the utopian groups of the Sixties (Archigram, Superstudio). However, given their lack of engagement

[v] Beneath the surface of simplistic anti-technology positions, a rich undercurrent of emancipatory thought has embraced liberatory, convivial, and appropriate technologies. André Gorz, Murray Bookchin, Jacques Ellul, Ivan Illich, and Kevin Carson are notable thinkers belonging to this strand of thought.

with design's material, technical, and functional aspects, these practices are not quite the prime examples that I intend to explore in this study. I shall also pass over projects that remain at a conceptual phase, with little indication as to how they will be actively developed in the future. In recent decades, more engaged design practices have proliferated, emphasising social, localised, and tailored solutions instead of one-size-fits-all industrialism. They have devised meticulous methods of designing with instead of for society. Inspired by natural systems and applied to industrial processes, such methods are mindful of the human scale and cultural specificities[vi]. Although these practices compellingly redirect the values, priorities, and purposes of sustainable design, they remain local, context-dependent, and one-off social interventions. As such, they do not allow for the scalability and rapid replication required to meet the challenges of the eco-social transition. I am interested in identifying practices that convincingly overcome all of the aforementioned limitations and constitute a relatively coherent whole.

Just as design labour, knowledge, and artefacts can be subject to commodification, they can also present opportunities for instigating the opposite process. Indeed, existing prefigurative practices can be read through the lens of "commoning"[vii]. Over the last decade, the concept of commoning has emerged as a compelling means by which to imagine, describe, and analyse what constitutes a viable political-economic paradigm that rivals the state and market forces. Although the verb originates from *the commons*, a noun of Latin origin,[viii] commoning denotes three active, productive processes of shared (use) value creation and shared valorisation: *doing in common*, *managing in common*, and *holding in common* (this is, appropriating for common use). These definitions coincide with my design analysis framework: doing in common equates with *shared creation* on the part of design labour, managing in common with the *shared governance* of design knowledge, and holding in common with *shared access* to

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[vi] I draw inspiration from design theorists and practitioners of industrial ecology and biomimetic design, notably from Neri Oxman, Jody Boehnert, John Thackara and Gunter Pauli.

[vii] As I explain at length in I.B.1, my interpretation of commoning combines insights from De Angelis, Dyer-Witheford, Helfrich, Bollier, Linebaugh, Federici, Caffentzis, and Ostrom.

[viii] The commons is arguably a pre-modern and non-colonial concept, with a multiplicity of comparable terms in non-Western cosmologies. The theoretical and geographical richness of these correspondences is explored in Kothari et al.

design artefacts. Accordingly, Chapters II, III, and IV survey the commoning of labour, knowledge, and artefacts in emergent design cultures. Named after broader cultural practices of peer production, open-sourcing, and the maker movement, I approach design cultures that practice commoning under the rubrics of (i) *peer designing*, (ii) *open blueprints*, and (iii) *maker machines*.

doing in common	shared creation	peer designing
managing in common	shared governance	open blueprints
holding in common	shared access	maker machines

Table 2. Commoning in design cultures

In each chapter, I introduce some significant examples of the commoning of labour, knowledge, and artefacts respectively. All of these case studies are contemporary product design projects engaged in relations of sharing instead of exchange, in producing commons instead of commodities. In each of them, speculative discourses and prefigurative practices are intricately combined. By studying ambitious projects that actively seek to realise their goals in the present, I explore some possible ways to bridge the profound rift between what design says and what design does. I present examples ranging from everyday tools, through building systems, to fabrication machinery. As such, they can all be considered part of a productive infrastructure or means of production. Although they all originate from Western contexts, these examples entail practices of collaboration and replication that take place in cosmo-local or trans-national contexts. More specifically, I attend to design projects that develop, document and distribute design blueprints and instructions; have a substantial online presence and a coherent identity; attracted considerable interest or achieved recognition among the design community (as evidenced in recent exhibitions and publications).[ix] I employ the following methods to study the corresponding objects:

[ix] Consequently, I exclude the following from my case studies: artworks, anonymous or improvised production, indigenous knowledge or practices, software and high-tech devices.

- visual analysis of various media produced for the project (photography, website, brochures, videos, presentations),
- discourse analysis of textual statements by designers (press articles, critique and commentary about the projects),
- design analysis of blueprints, in their technical, functional, formal, aesthetic, economic, procedural dimensions,
- close reading of material objects, in their relational and affective qualities (and their making-of, impact, byproducts or offsprings),
- interacting with the projects by conducting interviews, engaging in action-research and undertaking self-production.

While no sample is sufficient to describe emergent cultures of commoning on its own, the suite of case studies assembled in this study constitutes an almost entirely decommodified valorisation of design practices.[x] Indeed, when considered together, these practices hint at a world in which built environments, artefacts, and values that are created through identities, institutions, and social relations that lie outside the circle of the neoliberal subject, market, and exchange. Countercurrents to the capitalist-industrial logic of design have existed ever since the Arts and Crafts movement. Even in the 1980s Nigel Cross was prophesying "the coming of post-industrial design". It is only more recently that the speculative term "postcapitalist" has gained significant traction as a name for the coming transition. Postcapitalism, which I go on to conceptualise in-depth, denotes an accelerated eco-social transition that would supercharge the existing diversity of alternatives by unleashing the potential of latent trends within late capitalism. Postcapitalism should not be only seen as a general name for practices that are relatively autonomous with respect to capital (i.e., commoning); it is also understood as a loosely coordinated political programme aiming to bring about a systemic transition away from capitalism. The concept is meant to capture the spirit of a time that, though still defined in relation to what preceded it, is nonetheless aware of the evolutionary (if not revolutionary) leap that it is poised to take. I am aware that taking Western, globalised, late-capitalist cultures as my starting point to conceptualise postcapitalism creates a bias towards predominantly white, male and privileged voices, who are more likely to

[x] It takes the combination of raw materials, labour, knowledge and infrastructure to create design products. Raw material supply is also a contested terrain between commodification and commoning, but it is not directly the interest of this study.

make overconfident, universalising claims about major paradigm shifts. I intentionally leave out non-Western, decolonial or indigenous knowledge and practices, in order to study the latent undercurrents of Western thought attempting to overcome itself, developing an imaginary and practice beyond its own supremacy.[xi]

Bringing all of this together, the main goal of this study is to explore the role of emergent design cultures in the postcapitalist transition. To this end, I unpack, analyse, and evaluate contemporary design cultures that, whether deliberately or otherwise, are situated outside exchange relations and market mediation. In so doing, I interrogate the extent to which the commoning of design labour, knowledge, and artefacts prefigure the creation of just and sustainable goods and livelihoods. I am not only concerned, then, to establish the degree to which any design cultures exist outside capitalism or at its peripheries. I also consider whether they constitute the material basis for a new paradigm that effectively disrupts and displaces capitalist modes of valorisation, downgrading them to a non-hegemonic, subordinate role. The sustainability of these design cultures depends on neither materiality nor discourses alone, but on their capacity to *unsustain* and unravel the value circuits of the commodity-machine. Sustainability, in this context, entails redirecting the production and distribution of artefacts towards viable, desirable, and equitable configurations. By shifting the understanding of (sustainable) design away from dominant towards under-theorised practices, I hope to highlight both the potential of those who seek sustainability beyond the commodity-machine and the challenges that they face.

The ultimate objective of ongoing efforts to alter our current predicament can be summed up by way of reference to the challenge set by Buckminster Fuller for his World Game, namely "to make the world work for 100% of humanity in the shortest possible time, with spontaneous cooperation and without ecological damage or disadvantage of anyone" (qtd. in Sieden 51). This interest is common to three subjectivities that I inhabit: designer by trade, researcher by profession,

[xi] I also attempt to maintain a critical distance to overrepresented voices (Bauwens, Mason, Srnicek and Williams, Bastani, Rifkin) by relying on eco-feminist perspectives (Ostrom, Gibson-Graham, Federici, Helfrich).

and activist by inclination.[xii] This work is by extension intended for three audiences: design practitioners (involved in creative production, emerging trends, practical solutions and positive impact), humanities scholars (interested in cultural analysis, critical theory, political ecology, alternative economics), and social movements organisers (engaged in community building, climate action, just transition and system change). With these audiences in mind, I put the discourses and practices of design projects in dialogue with broader cultural and critical debates, and interrogate their relevance for eco-social transformation. In striving to understand contemporary complexity, I practice "not the interpretation of the world, but the organisation of transformation" (Conti). Neither an activist critique of the commodity-machine nor a designerly crystal-ball reading of the future, this study aims to "look at those who are creating viable alternatives, try to figure out what might be the larger implications of what they are (already) doing, and then offer those ideas back, not as prescriptions, but as contributions, possibilities —as gifts" (Graeber, *Fragments* 12). As Rebecca Solnit observes in the epigraph, "what actually comes next" is harder to conceive than utter destruction (21). That said better outcomes are becoming perceptible to those who pay attention, even as socio-ecological catastrophes unfold around us. This study is an inquiry into one of the "strange and circuitous routes" leading towards a better place, at the crossroads of design, ecology, and politics.

[xii] Here I am paraphrasing Thomas Paine, who characterised himself as "a corsetmaker by trade, a journalist by profession, and a propagandist by inclination"(qtd. in Padover 32).

Chapter I. The *Commodity-Machine*: Sustaining the unsustainable

In Design and Crime, Hal Foster claims that we live in a total design; that design has become so prevalent and central that "it can no longer be considered a secondary industry. Perhaps we should speak of a 'political economy of design'" (22). Following his suggestion, this chapter provides a critical introduction to the political economy of design, by developing "commodity-machine" as an analytical tool on which to ground a critical exploration into design cultures and the social and economic relations that condition them. Foster uses the expression "commodity-machine" in the same design-critical essay when questioning the generalised unsustainability of this "contemporary inflation of design":

> ***What happens when this commodity-machine —now conveniently located out of the view of most of us— breaks down, as environments give out, markets crash, and/or sweat-shop workers scattered across the globe somehow refuse to go on?*** **(21)**

While Foster does not usually shy away from naming capitalism in his writings, he employs this peculiar and striking expression of "commodity-machine" as a euphemistic device, though declines to specify whether he alludes to any of the partially overlapping yet differentiated qualifiers to an ungraspable "capitalism". The preferred framing in this thesis for the current economic paradigm is "late capitalism", defined by Mandel as an epoch "in which the contradiction between the growth of the forces of production and the survival of the capitalist relations of production assumes an explosive form" (562), leading

to a spreading crisis in these relations of production. Given that the term was coined well before the rise of neoliberalism, this choice could appear to be somewhat naive and outdated, with an optimistic undertone suggesting that the end is nigh. In defence of the term, Jameson notes that late capitalism marks "continuity with what preceded it rather than the break, rupture, and mutation that concepts like "postindustrial society" wished to underscore" (*Postmodernism* xix). I share this reluctance to employ more recent markers like immaterial, digital or knowledge-based economy, as while they may be appropriate for explaining the prevalence of design, they nonetheless imply that the so-called new economy has supplanted the earlier, heavier modes of production. In fact, the old, carbon-based industries remained uninterrupted and indispensable, having merely moved "out of sight" of (over)developed nations. As I will elaborate further below, late capitalism is also a prerequisite for the conceptualisation of postcapitalism, and as such, "commodity-machine will be used hereinafter to refer to the total entanglement of design with late capitalism, and as the opposite of postcapitalist design.

Commodities bind together lively resources and deadly waste, workers and consumers, and money and capital, but simultaneously mask the relationships between nature, labour and finance. The whole (machine) cannot be grasped from the individual parts (commodities). Still, just as Marx begins his investigation of the entire political economy of capital with the analysis of a single commodity as its smallest unit, the political economy of design also requires an analysis of the commodity as a departure point. Marx defines commodities as having a dual character, having a "plain, homely, bodily form" as well as a "value-form", being "both objects of utility, and, at the same time, depositories of value." If a commodity implies both of these at once, it can be approached both as an object of political economy (value-form) and as an object for design studies (bodily form). Anything that is given a market value becomes a commodity, be it a raw material, land, labour, product or service of any kind. Certainly, not all commodities are designed (commodity markets trade specifically in raw materials rather than manufactured goods), and not every design artefact is necessarily a commodity; it is the moment of mediation, the market exchange between private owners that make a product a value-bearing commodity. Design artefacts, in their most familiar form as consumer goods, can therefore also be investigated as commodities. The fascination with design artefacts through the lens of commodity fetishism has been a recurrent theme in

Marxist literature (Baudrillard; Debord), and the political economy of design has been theorised as "commodity aesthetics" (Haug), following a Frankfurt School lineage. Paradoxically, design studies have inherited an overemphasis on aesthetic, semiotic and ideological qualities, and not enough critical interest on the materiality and social relations that surround commodities, thus normalising the entanglement of design in the circuits of the commodity-machine, and the manifold consequences. As this chapter demonstrates, the political economy of design could benefit from striking a better balance between the symbolic force and the worldly materiality of commodities.

Taken literally, a commodity-machine can be understood to be a mechanical instrument that is designed to produce commodities. A machine that produces commodities, conceived as a conveyor belt of the Fordist assembly line, or the "treadmill of production" (Schnaiberg 229–234), is by definition repetitive and relentless, churning out commodities at ever-increasing rates. Such is the Faustian deal of industrial design: the better the machines got at imitating skilful craftspeople, the more the humans had to work at the pace of the machines. Foster's provocative question, however, is meant to cast doubt on the prospects of this perpetual machine: "What happens when this commodity-machine breaks down, as markets crash, sweatshop workers resist, or environments give out?"[i] (192). In other words, what are the potential consequences (on design, as well as on everything else) of a hypothetical breakdown of economic, social and ecological systems – all of which are indispensable factors in commodity production? To put it even more bluntly, can really-existing-design survive without finance, workforce or material supply? The question is not formulated as a speculative, conditional "if" clause, but specifically with a temporal "when" mark, in which Foster implies that it is only a matter of time, as such calamities are inevitable. More than a decade later, Foster's apprehensions are more pertinent than ever. Whether it is the financial crash, the Foxconn factory worker riots and suicides, or the impending climate breakdown, there is much evidence that his critique was particularly insightful. Departing from the assumption that all these combined crises are already in progress, it is now more important than ever to conceive what comes next.

[i] Here quoted from a slightly rephrased variation than in the essay, taken instead from the entry on "environment" in "The ABCs of Contemporary Design"– a glossary supplement accompanying the eponymous essay collection, Design and Crime (Foster).

A. Late Capitalism:
Introducing the political economy of design

In this section, I follow the trail of commodities to expose the unsustainability of the commodity-machine. Drawing from design and ecological critiques, I extend this diagnosis to include predominant, "green capitalist" sustainable design practices that have proven to be inadequate for the eco-social transition. I conclude that beyond the materiality of commodities, it is the relations of exchange that remain the main obstacle hindering the search for sustainability beyond the commodity-machine.

1. The logics of global commodity production

Understanding the commodity-machine necessitates a study of how design and the economy are intertwined. The history of planning and design runs parallel to the development of the centralised organisation of production. Many scholars have recognised the mutually reinforcing relationship between design, industry and the market: Jeffrey Meikle argues that "industrial design was born of a lucky conjunction of a saturated market, which forced manufacturers to distinguish their products from others" (39). Stuart Walker summarises the general characteristics of industrial goods as, "they are mass-produced using automated (low labour) techniques, they are energy-intensive in their manufacture and international distribution, and they are not usually repaired or repairable" (116), noting also that this has remained essentially unchanged for more than a century (113). This, however, can be considered somewhat of an understatement, considering that the commodity-machine has expanded beyond regional or national borders and replicated itself at a global scale. Cost-saving processes have meant less skilled work, more plastic injection moulding, massive numbers of units, more delocalisation towards countries with lower social, environmental and fiscal regulations, more externalisation of negative impacts, and thus "always low prices" (as the Wal-Mart slogan goes). Traces of this corporate globalisation are not difficult to find. For instance, take the smooth, polished, rounded electronic products that have become ubiquitous in the last decade. They all carry a discreet mark on their rear: "designed by Apple in California. Assembled in China." This brief note on the country of origin gives a clear indication of the distinction between design and assembly, between commanding headquarters and executing sweatshops, and between a single idea and its infinite reproduction. Various indicators suggest the deep fractures that separate these places, such as income, life expectancy or ecological footprint, but they are nonetheless brought together in a highly sophisticated global network of transport infrastructure, containers, barcodes and sensors. What the label does not indicate is the origin of the resources and the numerous locations in which they are processed before final assembly. From raw materials to packaged goods, the commodity-machine is so vast that doing justice to its complexity necessitates elaborate descriptions. Stephen Petrina traces the global journey of a pair of sports shoes and the catastrophic consequences they unleash, in a paragraph that I want to quote extensively (even though only partially):

> ***These shoes are labelled, or 'branded', and designed by a multinational corporation in the US, engineered in Taiwan and South Korea, manufactured in China, South Korea, or Southeast Asia, and mostly purchased, worn, and disposed of in North America (...). The leather upper of the shoes, consisting of about twenty parts, is typically from cows raised and slaughtered in Texas. The hides are shipped to Asia and treated through a chemical-intensive chrome tanning process, with a by-product of toxins dumped into an Asian river. The synthetic parts of the shoes are made from petroleum-based chemicals from Saudi Arabia, and distilled and cracked in a Korean refinery, with wastes again making their way into rivers (...). The shoes are assembled in a Tangerang factory or similar Asian factories. Most of the assembly is done through the labour of children and women cutting, gluing, and sewing under sweatshop conditions of high temperatures and toxic fumes from solvent-based toluene glues and paint. Their average wage is about 15 cents per hour over their 65 hour work week (...). The boxed shoes are shipped as cargo back to the west coast of the US, transported to local outlets, purchased for about $60.00 to $150.00 per pair, and worn for occasions having nothing to do with sports or training. The average pair of cross-trainers lasts less than a year and usually ends up in a landfill.*** **(217)**

There is plenty of evidence of a "crime", but just like in a murder mystery game, uncertainty remains about who to blame and where to intervene. Is the designer the prime suspect, or should marketing be accused? Is this the result of two centuries of industrial capitalism, or the more recent neoliberal globalisation? Design studies haven't shied away from assuming their responsibility. The history of design's "original sin" can usually be traced back to "the emerging distinction between manual and intellectual labour in the early days of capitalism", and to the split between conceptual creation and physical manufacture that gave birth to "the role of the 'designer' as a separate social being" (Ward). Murray Fraser likens this separation to a "Faustian bargain made

with capitalist development in the first stages of modernism" (322). Creative skills that would in the past be dispersed among a large array of craftsmen and craftswomen were then concentrated in the hands of a few professionals. Lloyd Jones is bluntly self-critical of this specialisation: "I believe that professionalised design represents the ultimate division of labour. For by it, that creative impulse which is everyone's birthright is stripped from daily life in production and given to a tiny elite: us" (322). However, it remains unexplained why and how the professionalisation of creativity failed to form the basis of cooperation and solidarity, but instead gave rise to the commodity-machine, manifesting in a global asymmetry in which countless workers are destined to perform unskilled tasks on factory assembly lines, physically building what a few designers envision on their drawing boards. The decisions taken on the designer's desk have immense consequences downstream in the circuit of production; it is a common argument (although with little evidence to support it) that up to 80 percent of the environmental impact in the entire lifecycle of an object is determined at the design stage. This "lock-in effect" would seem to be the primary reason for the particular attention and responsibility given to the design stage. It is, after all, the task of the designer to narrow down the virtually endless possibilities and options in the materials and methods of production to a single final choice that is intended to synthesise all considerations. Most of the time, however, there is little deviation from already-established processes because of the lack of convenience, risk or time pressures that limit the possibilities of going "back to the drawing board". Boehnert argues that "the practice of design, understood as a socially beneficial activity engaged with building a better world, is integrally in conflict with the design industry" ('Design vs. the Design Industry' 120). Alastair Fuad-Luke suggests that by controlling the designers, companies control how design practices are expressed and evolve (33), observing that designers are left with minimal agency of reform to redirect their practice towards social or environmental benefit. While designers certainly profit and prosper more than assembly workers, this does not mean that they are the ultimate decision makers, being rather tied by the briefs of their clients, bosses or managers, and occupying a strategic and yet dependent position in the hierarchical chain. Superstar designers and factory riots are two sides of the same global coin, tied to the company that employs both designers and workers. Prasad Boradkar sees a subservient role for design in the interest of capital, being to "identify opportunities where a new commodity can be inserted. (...) It certainly generates new needs adding to the proliferation of gadgets, meanwhile satisfying one

primary need – that of the capitalist" (qtd. in Durling et al. 5). Like the factory worker who is "an appendage to the machine" – to borrow an expression from the Communist Manifesto – the designer is then an appendage to the commodity-machine. There will be other opportunities to question the agency of designers, both individually and collectively, but pulling apart the illusion of the designer as the sole "master" of design is a precondition to any realistic assessment of their potential agency.

If design occupies such a strategic and central position in a massive enterprise of command and control, then it would appear to many to be the right place to start correcting the destructive path of the commodity-machine. Since there are so many unsustainable elements in this process, remedies and tactics also come in various flavours, ranging from strictly technical to broadly cultural approaches (Pyla 14). Such diversity is equally observable in the names given to these practices, among which green design, eco-design, design for environment and design for sustainability are just a few.[i] Several authors have identified ethical, techno-scientific and socio-cultural tendencies in the history of sustainable design (Keitsch 180), representing "a steady broadening of scope in theory and practice, and to a certain extent, an increasingly critical perspective on ecology and design" (Madge 44).

Given that the techno-scientific approach remains the most influential among these, its main strategies of efficiency, substitution and dematerialisation merit closer attention. After all, since the commodity-machine is a wasteful, energy- and material-intensive process, any reduction in its impact can only be a welcome initiative. Calls to reduce the ecological footprint of humanity by a "factor of four" (in the 1980s) were followed by a more ambitious "factor of ten" (in the 1990s), or a 90 percent decrease in energy use and material flows (Robèrt et al. 205). This would either imply a strict reduction in the resources used by more people, or radical efficiency to match both environmental limits and human needs. Compared to the insurmountable political and social challenges of the first, the second objective requires only technical and scientific innovations and designs to be developed by existing industries. While such eco-efficiency measures have been adopted unanimously across sectors, they largely failed to

[i] I often encountered these terms in sustainable design literature, including Bhamra & Lofthouse; McDonough & Braungart; Vezzoli & Manzini; Shedroff & Lovins; Orr; Thorpe.

deliver any noticeable decrease in resource and energy consumption, both are witnessing a consistent rise (York 143–147). This situation is explained in ecological economics by the Jevons paradox or rebound effect – suggesting that efficiency gains are over-compensated by increased consumption, primarily due to lower costs and prices. For instance, fuel-efficient personal vehicles encourage users to drive more, while energy-efficient lightbulbs trigger the superfluous illumination of gardens. Similarly, the substitution of one resource by another does not necessarily reduce the pressure on any resources, as seen in the increased paper consumption with computers and electronic information (Sellen & Harper). Efficiency and substitution are, therefore, not impediments to the commodity-machine, but quite the opposite: they render companies "leaner and meaner" and more profitable, and as a consequence, drive market expansion and growth (Næss & Høyer). Dematerialisation, while necessary, is likely to be limited by the overriding imperative of economic growth. As John Ehrenfeld notes: "almost everything being done in the name of sustainable development addresses and attempts to reduce unsustainability. But reducing unsustainability, although critical, does not and will not create sustainability" (7). In other words, designing less bad products is not the same as designing good products.

Other than those that champion dematerialisation strategies aimed at making quantitative changes, there are others that strive for qualitative differences in the production cycle, aiming to introduce circularity. "Reduce, Reuse, Recycle", durability and closed-loop processes acknowledge the limits of dematerialisation, and focus on redesigning the materiality of goods in compatibility with the assumptions of steady-state or circular economies (Daly). One of the most prominent and widely debated approaches is the Cradle to Cradle (C2C) model, introduced by chemist Michael Braungart and architect William McDonough. Taking its inspiration from the biomimicry and permaculture principle of "waste equals food", C2C supports up-cycling when possible (instead of down-cycling), avoids toxic and hybrid materials (difficult to separate), and encourages easy disassembly. As a well-publicised example, the Mirra office chair by Herman Miller was redesigned for a C2C certification with an overall score of 80%. Whatever this achievement means, we must take their word for it, as the assessment and rating tool is not entirely transparent, neither it is independently verified, nor is the actual chemical composition of the materials ever disclosed publicly (Rossi et al. 208). Furthermore, the design innovations have been patented by the company to preserve its eco-competitive

advantage, and the chair remains a commodity that generates profit by the number of units sold. In contrast, adopting a Product-Service System would eliminate the commodity exchange and ownership altogether (Chick & Micklethwaite 112). Ultimately C2C still remains a technical fix to the commodity-machine, requiring further professional specialisation and more technical expertise in the research and development of designs than ever before, only to be protected by copyrights and trademarks. This also limits sustainability efforts to the confines of techno-scientific expertise, without seeking eventual social or cultural solutions (Bakker 3), increasing as a result the level of unsustainable complexity of the commodity-machine rather than reducing it towards more resilient configurations.

I have so far introduced the commodity-machine as constituted by coordinated efforts in design and manufacturing, each having a share of responsibility, and both mobilised for the production of commodities. I have further identified several contested practices that are clearly reflections of the commodity-machine, being an extreme division of labour, vast geographical separation and an endless depletion of resources. In response to these tensions, the predominant approaches to sustainable design are strictly interested in the material impact of designed goods, and are therefore an integral part of the logic of the ecological modernisation of the commodity-machine itself. I will now make a study of the discourses surrounding the commodities, where certain mediating channels (such as branding, advertising and marketing) play a strategic role in the "green" overhaul of the commodity-machine.

2. The greening of commodity discourses

I started out by recounting how things are designed, engineered, extracted, refined, formed, treated, assembled, transported, distributed, sold, purchased, used, trashed, dumped and replaced, although very few of these processes are legible on the pristine surfaces of the goods themselves. Walker laments that "their superficial, fashionable façades too often disguise a hidden world of resource depletion, pollution and social disparity and exploitation" (59). The materiality of commodities is designed to mask these worlds; and the task of revealing their stories is thus delegated to the mediating channels that surround the commodities. Channels such as branding, advertisement, packaging and retail design fill the void between production and consumption, although with entirely different narratives – sports shoe commercials tend to feature top athletes, and rarely show cows, oil refineries or sweatshop workers. Walker argues that industrial design has become strongly dependent on marketing, as expressed in the styling of products, "outer casings can be defined more subjectively and can be updated much more rapidly [than the inner workings], making the previous model seem old-fashioned and less desirable" (142). Similar to the designers implicated in the production of "cheap plastic junk", advertising and marketing professionals are also accused of placing commercial priorities over concerns for "human needs". Timothy Luke states unequivocally that designers specialised in mediation, such as "advertising, fashion, interior design, product styling, mass media", are indispensable for the commodity-machine: "Without the aestheticization of commerce, life as we know it in late capitalism would be impossible" (74). Marketing may coat commodities with stories and messages that both aestheticise commerce and anaesthetise consumers, and that reproduce consumerism and commodity fetishism, but it may be somewhat of an exaggeration to claim that it is the ultimate driving force behind the commodity-machine.

Nigel Thrift (echoing Boltanski and Chiapello) reminds that capitalism is a highly adaptive and constantly mutating formation, "the whole point of capitalism (...) is precisely its ability to change its practices constantly, and those who run corporations must be able to surf the right side of the constant change that results, or risk being washed up on the reefs of irrelevance – and thrown into bankruptcy" (3). Ecological crises are driving yet another cycle of renewal and a reinvention of marketing, this time endorsing and promoting a "green" agenda.

Such approaches have been labelled "greenwashing" in contemporary activist discourse, and the marketing sector has been quick to catch up and adapt itself: handbooks produced for advertisers concede that misleading messages are frequent, and that responsible advertising is required to be factual and accurate in its communication (Horiuchi et al.). Rather than calling out the superficial hypocrisy of greenwashing through mediating channels, it may be more relevant to identify the ideological foundations that enable them in the first place. What makes recklessness commonplace and acceptable has been dealt with in scholarly discourses on sustainability, providing legitimate grounds for practitioners to build upon. I present below two articles on sustainable design that align themselves with market-based approaches. My intention here, however, is not to debunk them point by point, but to showcase their uncritical endorsement of the commodity-machine.[i]

The first paper showcases how the Design for Sustainability (D4S) concept is understood and implemented by UNEP in collaboration with TU Delft, a technical university in the Netherlands. The authors explain that their methods are based on the "triple bottom line" principle that simultaneously seeks the sustainability of "people, profit, and planet" (Clark et al. 410), in which sustaining profitability is seen as a fundamental factor. Similarly, they insist that "industry is vital for the economic growth of all nations", and that "product innovation is instrumental for economic growth" (412). The reasons for and benefits of subordinating sustainable design to growth imperatives are never explained, while that decoupling of economic growth from environmental degradation is presented as a concept of "great importance": "Sustainable innovation and design is (...) about rethinking how to meet the need for growth while at the same time reducing negative environmental and social impacts" (410). Critiques of growth, from their origins in the Club of Rome report to the more recent proponents of degrowth (Latouche; D'Alisa et al.; Demaria et al.), have consistently pointed out the inherent contradictions between the needs of people and the limits of the planet on one side, and the profit-seeking motives of

[i] Most interest in recent cultural studies of globalisation has entered this sphere of "the mediation of things" (Lash & Lury). My intention is to draw attention back to fabrication as the primary stage of interest. Bans and restrictions on advertising are cited as potential degrowth policy measures (Latouche 71), but it is uncertain whether they can singlehandedly strike a fatal blow against the commodity-machine.

companies on the other. They have also underlined the lack of empirical evidence supporting the absolute decoupling of GDP and environmental pressure (Jackson 67). None of these matter for the authors, however, whose eyes are fixated on the big picture, leading them to repeatedly make a case for the global applicability of D4S methods, "[the] fitting design and marketing of products and services for the vast potential markets in Latin America, Africa and Asia, both by multinational companies and by SMEs worldwide" (Clark et al. 412). In other words, the world should be considered a "land of opportunities" in which multinationals can expand their markets, with the indispensable contribution of sustainable designers on their side. Perhaps it would be unfair to expect a decolonial critique of Western developmentalism from a technical research institute. These disciplines have been progressively integrated to the generalised post-political, post-democratic environmentalism of recent decades (Swyngedouw). That said, their strong attachment to growth, profit and marketing exemplifies what Victor Margolin regards as "designers' attempts to introduce ecological principles to the market economy" (101).

A second paper, entitled "Greening Capitalism: Opportunities for a Green Commodity" by Prothero and Fitchett, approaches sustainability from a macro-marketing perspective. The frank and confident language of the authors makes them prime representatives of green capitalist claims, and their assumptions and arguments deserve closer inspection. Their definition of green commodities has three façades. The first corresponds to the objectives of conventional sustainable design, referring to "goods that are designed, produced, and exchanged while causing minimal detriment to the environment" (51). Here, they commend the efforts of the companies that are part of the World Business Council for Sustainable Development, among which are those that are considered the worst environmental offenders, and that actively lobby against effective climate legislation (Greenpeace 50–51). The second definition of green commodities overlaps with sustainable consumption, although the authors acknowledge that it remains a "fuzzy concept". They argue, somewhat optimistically, that if marketing can convince "that two cars are better than one (or three better than two), then the very same commodity discourse can be used by the green movement to encourage people to buy less" (Prothero and Fitchett 50-51). Finally, the third aspect of green commodities call on people "to consider the systems within society that can be used to commodify the environment in such a way that enables the green message to be communicated to the wider

public through the mechanism of the market itself" (51). This seems to be an endorsement of the marketisation of "ecosystem services", such as emission-trading schemes, carbon offsetting mechanisms and other green capitalist measures that are thoroughly criticised as land grabs and new enclosures (Böhm 26). Macro-marketing experts do not hesitate to affirm that greenwashing "conclusively demonstrate that green themes can be successfully communicated and implemented via commodity culture" (Prothero and Fitchett 49). In other words, greenwashing is actually proof that companies can communicate sustainability, and that consumers are willing to buy (into) it. Going further, they are persuaded that "relations of commodity exchange cannot themselves be rejected" (50). Similarly, they argue that environmentalist movements "cannot continue to operate on the assumption that capitalism has an implicit bias that favours further ecological destruction because the commodity discourse has no such ideological bent", and advise them to endorse the mainstream economy and its commodity culture, "rather than hanker after subversive ideals and the romanticism of the revolutionary" (51). Yet a little further below, the authors admit that with sustainable businesses "major emphasis is still on the capitalist goal of profit-making. We need to change the reliance on this capitalistic goal" (53). It remains unclear why they would have an issue with the goal of profit-making if it had no environmental side effects, and how one is supposed to abandon profit-making while still being dedicated to the production and marketing of commodities.

When the dominant conceptualisations of sustainable design come with a skewed vision, one can question whether the term "sustainability" is adequate for design. As sustainability became a buzzword over the last decades, the political usage of the term has paradoxically eroded into nothingness. Sustainable development was popularised by the World Commission on Environment and Development in its 1987 report "Our Common Future", coining the widely adopted definition, despite the vagueness of its meaning; "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (sec.Conclusion). What might at first have been a bold and fresh idea, subsequently passed through several amendments in the following decades. As George Monbiot recalls, at the 1992 Rio Earth Summit "world leaders signed up to something called "sustainability". After being subordinated to the objectives of "development", it was further revised to "sustainable growth", which is somewhat of an oxymoron for those who argue

that sustainability and growth are incompatible. Luckily, the world leaders must have recognised the cognitive dissonance, as they came up with yet another term for the Rio+20 Declaration: sustained growth. There is no contradiction here, since there is no longer any mention of sustainability, with the stated objective being to sustain growth at all costs. Sustaining growth promises overall continuity with minimal but necessary change. Rephrasing and updating the original meaning of "sustainable development", we now have a tentative definition of what is to be sustained to grow: economic growth that accumulates capital in the present, without compromising the ability of future generations to accumulate capital. After all, capital must self-replicate in ever greater amounts in order to be capital – if it ceases to reproduce, it simply ceases to exist as such. If sustainable development has become synonymous with green capitalism, then sustainable design means no more than sustaining design as close as possible to its business-as-usual, commodity-machine state.[ii] Chick and Micklethwaite echo this view, "the term sustainable design suggests we are concerned with sustaining design in and of itself, whereas we are actually concerned with the application of design in pursuit of sustainability" (115).

In this section, I have investigated the "greening" of commodity discourse by showing how design industries have been the ideal carrier of such a discourse. Drawing upon the debates in ecological economics and related fields, I have touched upon the critiques of green capitalism, ecological modernisation, economic decoupling, post-political environmentalism and the commodification of nature, and in doing so, exposed the paradoxes of sustainable design principles that cannot envision anything other than the production of commodities for capitalist markets, being bound to profit and growth objectives. Presenting examples that illustrate the inadequacy of maintaining a narrow focus on material performance or the superficiality of supplementation with misleading aesthetics allows me to claim that conventional sustainable design principles fail to respond to the severity of the crises facing the commodity-machine. In the final section, I question whether the commodity-machine itself is in any way capable of confronting and overcoming the challenges of sustainability.

[ii] Design scholars have attempted to come out from the muddy waters of sustainability discourse by proposing "sustainment" (Fry) and "sustainism" (Schwarz and Elffers) as alternative concepts.

3. The reproduction of commodification

Following the stages in Grace Lees-Maffei's design historiography, design cultures are studied along the separate conventional stages of production, mediation and consumption. Shortened as the 'PCM paradigm' (351), this linear, object-centric analytical model was useful in providing the first definition of the commodity-machine as simply commodity production. However, whether analysing the production of commodities by breaking it down into containerised domains, or investigating the sum of its distinct parts, we fall short of explaining the overall "organised crime" of the commodity-machine. In this final section, I propose an alternative conceptualisation of the commodity-machine that reveals aspects that would be indiscernible in a study of its components. As argued previously, over-emphasis on the materiality of objects results in hyper-specialisation in design practices, and diverts attention from the fact that the objects remain commodities, i.e., exchange goods that are produced by, and intertwined with the commodity-machine. The object-centric sustainability critique is consistently mirrored by the object-centric proposals of sustainable design principles, certainly lessening the worst impacts of commodities to a certain extent, but still showcasing an apparent inability to disentangle design from the commodity-machine. Summarising this challenge, Jesko Fezer states:

> ***The current emergence of ethically motivated attempts to redefine the paradigms of design, employing the catchwords "sustainability," "social compatibility," and "producer-consumer equity", generally fall short. They argue vigorously in terms of market-alignment and reflect a consumer-oriented or individualist approach, with the result that urban or social objectives—and hence also any design-political dimensions—remain off the map.*** **(4)**

To understand why this is the case, we need to take another look at design cultures, not through the lens of objects, but through the processes of value creation. A value regime consists of "the rules that determine what society and the economy consider to be of value" and can be understood by studying "the underlying modes of production – i.e. how value is created and distributed" (Bauwens 'Commons'). Firstly, the act of "designing" (as a verb) done by a

"designer" subject, takes place for a design (as a noun) to emerge. Marx distinguishes the architect from the bee by the labour-process of "raising his structure in imagination before erecting it in reality" (*Capital* chap.7). This is in fact a generalised human practice of problem-solving, being an intentional, subjective and reflective process. While it is usually recognised as a creative, innovative activity, anything from making the bed in the morning to concocting a master plan to take over the world could fit this extremely vague and elusive definition. The normative definitions of design professionals exemplified in the introduction are concerned specifically with this original stage; making sense of designing (as a verb) serves to justify its existence as a human activity, it gives design a social purpose. Secondly, "design" (as a noun, from it. *disegno*, fr. *dessin/ dessein*) denotes a finalised project, a plan or a blueprint, and the solution to a problem, with the intention of realisation. It is no longer in the hands of its designer; once the process is complete, the design has an autonomous existence on its own. It can take shape in a visualisation (as a drawing), a narrative (as a manual), or in any communicative medium that can be distributed and circulated. It is the immaterial information or knowledge that precedes the material. Issues of secrecy, openness, access and control are determined by how the plans will be deployed. Thirdly, a "designed" (as an adjective) object or product is the physical, material equivalent of a design (as a noun), being something that is made, built or constructed according to the plan. Not every design is materialised, and not every artefact is designed. Some designs remain fictional, in the sense that they remain unrealised; and some objects are the fruit of immediate improvisation, without a preceding design phase. This coupling between a design and an object (in a broad sense) is thereby a precondition for the consideration of something as "designed" (as an adjective). In the case of software – as an infinitely reproducible virtual object – the distinction may appear to be redundant, since no material production is necessary, although the lines of code and a running program can still be thought of as separate entities.

I observe several advantages of this triad in a design analysis. The stages of labour, knowledge and artefact are similar to the stages of production, mediation and consumption, both being a series of distinct, logical and sequential steps. The two visions of design cultures diverge in their focus: the PCM paradigm requires an object to be traced "from cradle to grave"; whereas labour, knowledge and artefact can all be seen as processes of valorisation. This approach downplays the emphasis on the object in its "plain, homely and bodily

form", and instead develops an analytical frame for design as a "depository of value". The labour of the designer is a valuable activity in itself, having different values to the blueprint of a project, and the final object is involved in its own valorisation processes. By shifting focus away from physical objects towards value forms, it is possible to gain a deeper understanding of the political economy of design. The PCM paradigm takes for granted the distance between industrial production and individual consumption, and specifically their mediation through the market. Instead of having market mediation as the common ground that brings diverse parties together, at the centrepiece of this value-centric model is the design project itself that mediates between the designers and the makers. Similarly, instead of the assumed unity of design and manufacture at the "production phase", where in reality manufacturing is dependent upon designing (which may yet physically be miles apart), my framework distinguishes between the labour that goes into designing and making, each of which have their own valorisation processes. Ultimately, while the object-centric paradigm serves well as a descriptive tool for the study of already existing – if not dominant – practices of material production, it remains inadequate for an analysis of the emergent practices that blur the boundaries of material and immaterial production, or the undefined boundaries of the marketplace. In contrast, since value itself is a "travelling concept", criss-crossing economics, politics and ethics, this value-centric model would be applicable to descriptive, critical as well as normative research agendas in design studies.

Looking at the commodity-machine from this analytical frame, I distinguish three processes that are subject to capitalist valorisation, private ownership and market exchange. First, designers either earn their wages in exchange of their labour, or are paid as freelance workers under structurally precarious conditions. Second, the designs themselves are owned and legally protected as intellectual property, or through patents and copyright, and are consequently subject to exchange just like any other commodity. Third, the resources and means of production necessary for the making of an object are already overwhelmingly privately owned – in all probability, by stockholders of corporations that control an out-of-sight and securitised industrial infrastructure. As a result of this triple commodification, any physical object produced on this thoroughly enclosed planet appears to be predestined to circulate as a commodity, to be consumed in exchange for money, or possibly earned in yet another commodified labour relationship. If all of the social relations involved in the production of goods are

themselves commodified, then the commodity-machine is essentially a machine that (re)produces commodification, rather than being mere commodified-machines sold on the supermarket aisles. Since it recreates its own conditions of existence, the commodity-machine does not stop, but disseminates around the globe an incessant flux of commodities seeking further commodification, and in the process, transforms life into lifeless objects. In this light, the commodity-machine, which was perceived initially as a linear system, emerges now as a self-reinforcing cycle of ever more commodification. Since the cell-form of capitalism is the commodity, the reproduction of capital depends on the production of commodities, enabling further commodification. The primary purpose of the commodity-machine is then to expand the web of commodification surrounding the commodity, until everything is mediated by market exchange. Considering that the commodity-machine is not an isolated process, but is itself embedded within a larger cycle of commodification (of nature, culture and social relations), then the contradictions of the systems on which it depends are also contradictions of the commodity-machine. Petrina claims that "it is not only our products that have become ecologically unsound – it is our entire process of capitalistic design along with our lifestyles" (212), or in other words, it is not designed objects themselves that are unsustainable, but the economic relations they are embedded within. As much as individual designers may authentically aspire for well-being, sustainability or even justice, they nonetheless remain bound to the commodity form, and are embedded in the commodity-machine. There is an invisible hand behind the visible hand of the designer: a structurally crisis-ridden, fragile, and therefore unsustainable commodity-machine that effectively operates as an unrivalled master-designer. Design practices can be sustainable only if they are decoupled from "the grip capital has exerted on consumption and from its monopoly of the means of production" (Gorz, "Exit" 9), and by extension, from the logic of the unlimited accumulation of capital within a global, unregulated market economy. Any effective sustainability of design practices is ultimately dependent on its decoupling from, or the overcoming of, the structural unsustainability of global capital.

In this section, I presented the commodity-machine as something more than the production of exchange goods, being rather a reproduction of exchange value and exchange relations. However, this claim needs to be nuanced: design cultures are not supposed to be bound inevitably to this spiral of commodification. The commodity-machine is only the starting point of the

analysis, as what lies outside, opposite, or beyond the commodity-machine is the main concern of this research. Walker suggests that "rather than defining objects within strict boundaries, and 'professionalizing' material culture, we need to open up new ways that allow us to delight in the act of creativity, and in the products of creativity" (37). But how does one open up these new ways and develop a design-political dimension, while avoiding the pitfalls of the commodity-machine? How can sustainable design resist the sustainment, preservation and perpetuation of the commodity-machine with minimal tweaking, but go resolutely beyond it? Looking from the nexus of design and the political economy, the essence of unsustainability is perhaps best captured as follows: "the current political economy is based on a false idea of material abundance" coupled with "a false idea of immaterial scarcity" (Bauwens and Iacomella 323). In other words, the commodity-machine treats natural resources as infinite (i.e., extractivism and growth), but cultural resources as finite (i.e., patents and copyrights). The challenge of sustainability seeks how to reverse both processes simultaneously; operating within ecological limits while lifting the barriers to knowledge production. Sustaining societies and species on this planet requires designing without sustaining the unsustainable commodity-machine, or simply put, designing to unsustain the commodity-machine. Strategies for the disentanglement of design from the commodity-machine need to be elaborated alongside strong theoretical foundations that go deeper than merely labelling a passing trend. By shifting the understanding of sustainable design away from dominant practices and towards those that are as yet under-theorised and emergent, in the following section I propose a design-political framework based on an alternative value-centric model that decidedly seeks to unsustain the commodity-machine.

B. Postcapitalism: Peaking carbon, capital and beyond

In this section, I present a number of contemporary theorisations and speculations on how capitalism may come to an end, as well as some emergent practices that are illuminating pathways that may surpass it. To this end, I explore various spatial, temporal and political strategies concerned with the end of capitalism and the aftermath, for which I will seek answers to the following questions: What are the current discourses on the creation of a counter-hegemonic project to move beyond capital? How can we determine what constitutes an alternative viable political economy? In what ways can design practices contribute to a broader postcapitalist project? I conceptualise the terms "peak carbon" and "peak capital" in order to distinguish between the current postcapitalist imaginaries and the historical ones, and propose a radically different political economy of design to be deployed at great pace and scale. As an alternative to conventional object-centric analysis and critique, I elaborate a threefold framework for the study and practice of sustainable design that shifts focus towards value processes that practice commoning.

1. Speculating the End

Postcapitalism comes with a rich prehistory of desires, experiments and struggles that are all but impossible to do justice to within the scope of this thesis. I will nonetheless try to establish some continuities and to clarify some new characteristics that are relevant to the political economy of design. The initial literal meaning of postcapitalism related to its conceptualisation as a temporality – what happens after, or beyond, capitalism. Lacking the ability to predict the future, we must rely on our mental faculty to imagine a future without capitalism. This is certainly not a new interrogation, as many non-capitalist utopias have been envisioned since the dawn of the industrial age. However, the term "postcapitalism" is rarely employed in early studies of political discourse or social sciences. Socialism and communism were the original names given to non-capitalist futures, which describe coherent, positive narratives about how social and economic relations are (meant to be) organised, how value is produced or, simply, how lives are lived in the absence of capitalism. These terms do not prescribe the immediate aftermath of the grand revolutionary finale nor exactly the process of getting there, but describe something occurring much later, once the transition to a new state of affairs is complete. Until the 1960s, the predominant belief was that the end of capitalism would be arrived at by means of a full-blown revolution stemming from a social uprising. With the growing disillusionment in the Leninist road to communism and the subsequent collapse of really-existing-socialism, these approaches have increasingly been dismissed as unrealistic, if not downright delusional. The disappearance of the alternative from the world map has paved the way to "capitalist realism" (Fisher), notably with Francis Fukuyama to (prematurely) declare the "end of history", after which capitalism was supposed to extend into eternity. As revolutionary politics were on the retreat, the risk of a nuclear catastrophe emerged in parallel; and hope was eclipsed by fear as the agency of radical change shifted progressively from mass movements to out of control complex systems. In his epoch-defining musings about the end of the world being easier to imagine than the end of capitalism, Fredric Jameson remarked "perhaps that is due to some weakness in our imaginations" (Seeds xii). The collective desire to conceive a better outcome appears to have been supplanted by the fixation of the collective psyche on an imminent global breakdown, whether it was to be capitalism causing an ecological meltdown, or the ecological meltdown causing the end of capitalism. Given this, is it even reasonable to speculate on postcapitalism?

If anything, the end of really-existing-socialism should teach us that even too-big-to-fail constructs can dissolve unexpectedly, and there is no reason to believe that capitalism should be exempt from such a fate. It is reasonable to expect that the end of capitalism will sooner or later follow the end of socialism – after all, History appears to continue, if not towards progress, at least towards entropy. If capitalism is an organism with a finite lifecycle (Mason), a linear periodisation could be proposed as follows: pre-, early-, late- and post-capitalist eras. At the same time, it should not be assumed from the unexpected and rapid dissolution of the (heavily centralised and hierarchical) Soviet system that the only imaginable ending for capitalism is an abrupt one. While the 2008 market crash could not immediately shake off the hegemony of capitalism, it undoubtedly triggered a widespread recognition of its finitude, as well as the legitimacy and urgency of imagining alternatives. Accordingly, recent debates following the financial crisis are less interested in long-term utopian visions and more concerned with the near-future radical transformation of capitalism. The distinctive feature of the term postcapitalism is then its resistance to the temptation of conceiving the end as a complete abolition of the current status quo – whether via an instant overthrow or a sudden collapse. There are other, far subtler and deeper ways to conceptualise an ending, in that transitions from one period to another are not clear-cut moments in history, but rather periods of incremental change, where marginal, parasitic practices expand and eventually become dominant. Capitalism itself did not become hegemonic overnight, but was rather a result of a centuries-long disintegration of the feudal model, and its concurrent and seemingly haphazard substitution by a combination of emerging political ideals, technical breakthroughs and social formations. If the transition to capitalism was gradual, so could be the transition to postcapitalism – or rather, postcapitalism would be the name of the period of transition into something yet to be named.

Admittedly, the term shares the unfortunate ambiguity of the concepts "post-industrial", "post-colonial" and "post-modern" – none of which resulted in the actual end of industrialism, colonialism or modernity as such. In the same way, postcapitalism risks conveying a false sense of "moving beyond" capitalism, without really implying its disappearance. Perhaps a more realistic (and deliberately reformist) goal could be formulated as the immediate replacement of neoliberalism, without challenging the entirety of capitalism. The case for a

gradual transition can also be justified by the level of complexity of capitalist globalisation, which would require an equally multifaceted, distributed and cumulative replacement. Among others, Srnicek and Williams champion this approach. While their 2015 book "Inventing the Future" is unambiguously subtitled "Postcapitalism", they admit that some of their proposals "will not break us out of capitalism, but they do promise to break us out of neoliberalism, and to establish a new equilibrium of political, economic and social forces" (chap.6). If postcapitalism is meant to follow the current late-capitalist neoliberal era, a relevant objection would be that such gradualism qualifies as post-neoliberalism. Similar to historical social-democratic reformism, this would temporarily resolve the contradictions and introduce a qualitatively different form of capitalism. Then why insist on a term that promises more than it can deliver? As will be argued below, there are strong reasons to believe that the unique historical conjuncture of the early twenty-first century justifies more than ever the conceiving of the end of capitalism. The premise of reformed capitalism would only hold if its contradictions were strictly internal (extreme concentrations of wealth, inability to invest idle capital, sluggish economic growth, etc.), although it is in fact on a collision course with (or has already broken through) multiple external, ecological limits.

However imperfect and temporary it may be, a "reality check" informed by climate science can help contextualise the current stakes and the road ahead. As probabilistic scenarios indicate, to have more than a 50% chance of avoiding an irreversible and abrupt climate meltdown, curbing the greenhouse effect requires multiple swift measures running in parallel, such as reversing deforestation and reconfiguring agricultural systems. However, the determining factor remains curbing the carbon emissions of fossil fuel-based energy systems. This entails halting their exponential growth rate with a momentary peak or a brief plateau, followed by a period of rapid decline at a rate at which emissions are halved every decade until complete decarbonisation is achieved by the mid-century (Anderson and Bows 30). Given that such a steep curve of radical reductions would be immensely disruptive for every industrial system that relies on fossil fuels (agriculture, construction, heating, transportation, to name just a few), reversing the trajectory of carbon emissions entails a far more fundamental redirection than a switch in energy supply from fossil to renewables, or from neoliberalism to green capitalism. The "health" of a capitalist economy is indexed to the growth of its GDP, and economic growth has depended

consistently on fossil fuel-based energy since the dawn of the industrial revolution (Malm). There is no empirical historical evidence, nor any rational basis to suggestions that economic growth can be decoupled from its appetite for energy, especially considering renewables cannot substitute the intensity of fossil fuels, and are themselves dependent on finite resources. In fact, scholars from diverse disciplines agree on the premise of degrowth, being the impossibility of infinite economic growth on a finite planet (Heinberg; Jackson; Kovel; Magdoff & Foster; Frankel), and that radical reductions (in the order of 10% annually) remain incompatible with a growing economy. In short, peak-carbon and peak-growth are linked inseparably to one another, although they may not occur at the same time.

Of course, the end of capitalism can be either "by design or by disaster", and the alternative to radical reduction scenarios remains the exhaustion of the carbon budget in as little as one decade, with worldwide catastrophic impacts by the middle of the century. It is highly unlikely that it will be possible to sustain an integrated and growing global economy in the presence of extreme weather patterns, unreliable food supply, mass migratory flows, increased conflict zones, unsustainable nation-states and other consequences. While undesirable, a chaotic disintegration of globalisation would still be a radical rupture from the overall path of the recent centuries, and the beginning of a long-term tendency that is ultimately incompatible with the very foundations and aspirations of capitalist economies. Considering the intertwined history of fossil fuels and capitalist economies, Imre Szeman proposes "to think about the history of capital not exclusively in geopolitical terms, but in terms of the forms of energy available to it at any given historical moment" (806). Following this insight, and given the correlation between the volume of carbon flows and the intensity of capitalist relations, the question is then no longer whether carbon emissions will ever peak, but rather how soon they will be made to peak, and whether the decline can be managed without collapse. Whatever the outcome, the climate-carbon-capital nexus allows us to conceptualise our current conjuncture as Peak Capitalism.

A peak is not an endpoint; and it is neither a sheer cliff nor the bottom of a pit. Unlike a revolution or a collapse, a peak is a virtually unnoticeable shift that can almost go unnoticed, only to be confirmed retrospectively. Yet that little shift changes everything, because the previously established rules, habits and

assumptions no longer hold, and what was once impossible becomes inevitable. The same grim ecological outlook that weakens the imagination paradoxically provides an alternative attitude towards the timeline of the transition. Just as ecological collapse is not a single apocalyptic moment but a continuum towards multiple tipping-points of no return, responses to it are bound to multiple hard deadlines. The urgency in mitigating climate meltdown means working against time, without waiting for the revolution nor the collapse: a revolution can be postponed indefinitely into the future, just as reformism does not come with a "countdown" after which no half-measures would be available. Instead, peaking combines the pragmatic gradualism of the transition with the concrete necessity of swift action. This cannot be indefinitely postponable, since it comes with a rather narrow time frame that has far-lasting consequences for the centuries to come. This duality echoes the intertwined nature of resistance and its alternatives – the hard deadline requires concerted effort to politically enforce the peak, while the continuous weakening of capitalist relations will depend on the availability of alternatives. In this sense, postcapitalism, as suggested here, is not a simplistic assumption of an inevitable historical outcome, nor is it an option that is indefinitely available, being rather an acknowledgment of the urgent necessity to seize a one-off opportunity. Simply put, the temporality of postcapitalism implies an emergency pathway – missing this opportunity, the only remaining outcome will be the disintegration of the global civilisation alongside the mass extinction of other species.

Given the stark choice between the ungraspable consequences of a failing climate, versus the relatively modest tinkering with the (hu)man-made economic systems, it should be arguably easier to believe in the likelihood of the latter. What is implied here is the assumption (and hope) that it is possible to have intentionally and quantifiably "winding down" of capitalism without a cataclysmic crash. Having less-and-less-capitalism depends on desiring, then enacting and finally recognising the material confirmation of a quantitative peak in capitalism as the dawn of postcapitalism. Postcapitalism is then the extended, undefined period triggered by the peak, in which capitalist relations start to retreat, but do not disappear completely. While it is likely capitalist relations will linger throughout this century, what is uncertain is whether they will maintain their hegemonic – and ever-expanding – position. Even though the process may be "combined and uneven", the overall global trajectory of piecemeal and ad-hoc steps would be only a quantitative regression of capitalist relations over time. It

may not bring about a qualitatively distinctive kind of culture in the immediate, but without the wholesale supersession of capitalism by another coherent model, the vacuum is bound to be filled, if not by another totality, at least by an un-totalisable multiplicity – an imminent "new normal" with its own contradictions and dynamism. Being not exactly an apocalypse, nor a revolution, nor a complete overhaul of the economy in a distant utopian future, postcapitalism is the harbinger of a gradual decline of the economic order, to be progressively surpassed by other modes of production and socialisation. After providing a sense of the temporal conditions and possibilities of postcapitalism, I will explore in the following sections the processes that provide the means for its actualisation.

2. (Re)searching the Exit

I have so far considered postcapitalism only as a temporality. While this has allowed me to conceptualise novel (geological, social and even eschatological) "grand narratives", such speculations are equally remote to the present, and lack engagement with the world as it is. In this section, postcapitalism is defined from an entirely different angle. Instead of waiting for the End (of History, of capitalism or the world), the main focus here is the search for the Exit. Like when faced with an emergency, the absolute distance to the "outside" may be less important than the availability of safe passage – a successful Exit depends on the escape route taken by those actively looking for it. In other words, the pressing concern when "exiting" is not the final destination, but the direction to take in the immediate, as what is done in the present is not a fleeting moment, but rather loaded with long-term consequences.

While many authors could be considered a point of departure for this specific meaning of postcapitalism, one figure stands out as exemplifying the transition between the old and the new approaches. French thinker André Gorz is somewhat of an exception among the Marxists of his time due to his positions against wage labour, his endorsement of universal basic income, and perhaps most notably, his pioneering work on political ecology. In his later years, he developed an interest in cognitive labour and information technologies as additional factors that aggravate the contradictions of capitalism. The following passage from his final text, published posthumously in 2008, encapsulates, with a confident (if not prophetic) tone, his core argument on postcapitalism:

> ***To envisage a different economy, different social relations, different modes and means of production, and different ways of life is regarded as "unrealistic," as though the society based on commodities, wages, and money could not be surpassed. In reality, a whole host of convergent indices suggest that the surpassing of that society is already under way, and that the chances of a civilized exit from capitalism depend primarily on our capacity to discern the trends and practices that herald its possibility.*** **('Exit' 8)**

Here, Gorz begins by identifying capitalism as a set of economic, social and productive relations based on "commodities, wages and money" – in a rather conventional Marxist analysis. Note that Gorz does not question how capitalism can be defeated, dismantled or abolished; his interest lies rather in how it can be surpassed, implying substitution by something that performs better. He restates these desires by specifying that the Exit ought to be taken in a "civilised" manner – and this plain yet crucial precision echoes the options seen a century earlier between "transition to socialism or regression into barbarism", as popularised by Rosa Luxemburg. Indeed, a disorderly and hasty Exit may trigger a stampede, resulting in tragedy rather than liberation. In some ways, "surpassing capitalism" and a "civilised exit" express the same desire to bring change through resolutely non-antagonistic, non-confrontational means. Gorz's most remarkable insight comes at the end of the citation, where he lays out a condition to the success of postcapitalism: our understanding of the already-existing "trends and practices" determine our likelihood of the "civilised" outcome. If the future ways of living are already discernible in postcapitalist spaces and the practices embedded in the here-and-now, they would definitely be worthy of analytical interest – not only would they provide a glimpse of the possible, but would also pave the way to their realisation. As neither a class revolt nor an autonomist exodus, this self-realising logic is the defining characteristic of postcapitalism – a prefigurative emphasis on how social change is actualised.

To pre-figure means "to anticipate or enact some feature of an 'alternative world' in the present, as though it has already been achieved" (Yates 4). Rooted in early utopian socialist communities, as well as in the Paris Commune of 1871, prefigurative politics were eclipsed by the success of Leninist-style party organisation in the first half of the twentieth century, only to be rejuvenated by the feminist, ecologist and pacifist strands of the New Left in the 1960s. More recently, the Occupy and Indignados movements have also been characterised by a strong prefigurative practice (Maeckelbergh). The term "prefigurative politics" was originally coined in 1977 by Carl Boggs as "the embodiment, within the ongoing political practice of a movement, of those forms of social relations, decision-making, culture, and human experience that are the ultimate goal" (99-100). While the term is often applied narrowly to practices complementing adversarial protest and direct action movements, it is possible to broaden its frame to include any cultural practice that valorises the means over the ends. Postcapitalist practices are not prefigurative only in the sense that they embody

the present behaviours, techniques and values that belong to an intended future, in that, as Yates notes, building such alternatives "should only be seen as prefiguration (and can only be distinguished from subcultural or counter-cultural activity) when combined and balanced with processes of consolidation and diffusion" (18). Put differently, prefiguration is not necessarily about absolute purity and consistency with one's values, but about one's willingness to reinforce and spread its values further.

While the temporal/speculative approach to postcapitalism does not distinguish between its geographical discontinuities, spatial/prefigurative practices in the present are characterised by their confinement in particular locations, and in their contours defined by the spaces of capital. There has been a strong undercurrent of alternative practices that have consistently remained more or less disconnected from the "combined and uneven" process of globalisation. These may be the result of traditional pre-capitalist practices, interstitial pockets of anticapitalist resistance or non-capitalist responses to crises (which are weakened when growth is resumed), creating a tapestry of spaces that escape the logic of profit-driven growth-oriented market capitalism. In "A Postcapitalist Politics", feminist economic geographers J.K. Gibson-Graham rely on ontological reframing, re-reading and creativity techniques to uncover and perform "diverse economies" in the pursuit of overcoming the dominant "capitalocentric" understanding of the world. They conceptualise the economy as an iceberg, with only the commodified spheres of wage labour, capitalist enterprises and market goods being visible, while it is the submerged, invisible part of non-commodified economies that ultimately keep the iceberg afloat. This vast, ambitious research agenda initiated by Gibson-Graham maps an entire alternative political economy, covering practices as diverse as squatting, caring, gifting and cooperatives. Rendering them visible, understanding their particularities and addressing their limitations can nurture a rich imagining of alternatives, and by extension, a fertile ground for the postcapitalist reconfiguration of the economy. This optimistic outlook raises inevitable questions about the strength, extent and pace of these practices in substituting their capitalist equivalents. While the existence of a diversity of non-capitalist practices may be uncontested, whether they constitute a viable autonomous "outside" that grows within the "cracks" (Holloway) remains to be seen. Chatterton and Pickerill point to the overlaps between "anti-, despite- and post-capitalist" (476), in the sense that such practices negotiate between the

complementary positions of being "against, within and after capitalism" (488). While inhabiting all these positions at once is not necessarily a contradiction, but demonstrates rather the capacity to inhabit multiple temporalities at once, it does not necessarily lead to practices that will constitute the seed form of postcapitalism. Another way to name them would be para-capitalist, in that while they may exist alongside capitalism, they have no influence over it.

Acknowledging the relatively benign and co-optable nature of existing non-capitalist practices, perhaps postcapitalism cannot be expected to emerge solely from the margins. Instead, another approach would be to seek signs for the Exit at the very core of late capitalism. This expectation stems from the belief that capital has become incapable of propelling societies forward, and that it holds back (social, technological, environmental) advancements to secure its self-preservation. This attitude echoes Gorz's word choice of "surpassing", and the same sense is conveyed by Jeremy Rifkin, another contemporary author speculating on postcapitalism (and hardly a radical figure), who writes about "the eclipse of capitalism". Several ecological metaphors may be comparable in their tone. Recent slogans have expressed a desire to "overgrow" or to "compost" capitalism, and the striking commonality of all these expressions is the assumption that the transition ought to be organic and inescapable. Rifkin is particularly confident about the future. He does not hesitate to declare that by the middle of the century, capitalism "will no longer exclusively define the economic agenda for civilization" (21) and, whether we like it or not, will be replaced by what he calls the Collaborative Commons by mid-century "as the primary arbiter of economic life in most of the world" (2). Others are as certain about the outlook, while being less interested in the nomenclature. Gus Speth avoids the question altogether by stating "whether this something new is beyond capitalism or is a reinvented capitalism is largely definitional" (11). Such indifference is revealing, in that if one expects such change to be inevitable, incremental and non-confrontational, it could indeed be named anything out of convenience (the present-day denomination of "Chinese communism" or "Western democracies" could attest to this). On the other hand, if it is an intentional and oppositional project aimed at making a clear break from the past, then it would legitimately distance itself from capitalism. Climate urgency and impacts aside, there are plenty of other reasons for doubting the possibility of a smooth, self-actualising transition; if anything, the vacuum left behind the disintegration of the global order can easily be filled by rising reactionary forces.

A deliberate postcapitalism would go beyond the observation of prefigurative impulses and build a coherent political project around them.

While postcapitalism may be a general name applied to the cultural, social and economic practices that have relative autonomy from capital, the point is not merely to delineate what lies outside or at the periphery of the commodity-machine, but rather to consider these practices as part of a political project that seeks a systemic transition away from capitalism. Neither satisfied by the diverse economies of Gibson-Graham, nor convinced by the "inevitable outcome" optimism of more recent authors, Srnicek and Williams put forward a distinct strategic vision for postcapitalism, complemented by a (rather polemical) critique of what they label "folk politics", taking the form of the horizontalist, localist and immediatist tendencies that are predominant in recent social movements and sustainability initiatives. They argue that "any postcapitalist project will require an ambitious, abstract, mediated, complex and global approach -- one that folk-political approaches are incapable of providing" (chap.1). They put forward a position that (re)embraces a universalist, intentional and counter-hegemonic project as the path to exit capitalism. They unambiguously advocate the building of a new world "not on the ruins of the old, but on the most advanced elements of the present", suggesting that the existing capitalist infrastructure "can and will be reprogrammed and reformatted towards post-capitalist ends". Their Accelerationist Manifesto appeals to those situated inside, and that even benefit from late capitalism, and yet want to surpass it by unleashing latent potentialities: "the material platform of neoliberalism does not need to be destroyed. It needs to be repurposed towards common ends. The existing infrastructure is not a capitalist stage to be smashed, but a springboard to launch towards post-capitalism" (Williams and Srnicek 355). Standing in stark contrast to prevalent anticapitalist rhetoric, but having equally high expectations, the left-accelerationist project consists mainly of a series of populist and transitory demands formulated in such a way that they resemble the Gorzian non-reformist reforms. It is nonetheless possible to extend their willingness to repurpose (or hack) the capitalist infrastructure and to adapt that insight to this research. Can something as essential to capitalism as the design of commodities be the breeding ground of its transcendence?

Discussing another recent approach to postcapitalism will bring this interrogation closer to design and the political implications. A recent and

outspoken advocate of postcapitalism, Paul Mason synthesises several of the previous positions. He is doubtful of the "forced-march techniques" aimed at the abolition capitalism, believing that the way out is "by creating something more dynamic" in its place (chap.Introduction). He considers the current economy to be incoherent, ambiguous and hybrid, containing complementary and conflictual elements, and "an incomplete transition, not a finished model" (chap.5) requiring concerted efforts to direct it towards postcapitalism. He appreciates existing practices as a "process emerging spontaneously" that needs to be supercharged – "the challenge is to turn these insights into a project" (chap.10). He goes even further than previous positions, as encapsulated in the following statement:

> ***We have to* design *the transition to postcapitalism. Because most theorists of postcapitalism either just declared it to exist, or predicted it as an inevitability, few considered the problems of transition. So one of the first tasks is to outline and test a range of models showing how such a transitional economy might work.* (chap.5)**

While Mason's emphasis on models and projects already implies design in the broader sense, here, he explicitly embraces a designer's attitude to postcapitalist politics. Designing the transition suggests something other than developing an integrated "master plan" of the future, involving the deployment of strategic interventions in the present to resolve the problems of the transitional economy. Neither simply desiring nor observing postcapitalism, designing the means of transition tends to dissolve the tension between speculation and prefiguration. If design can be both prefigurative and speculative, then postcapitalism can indeed be designed, and the means and the ends of the transition reconciled. This raises two questions, however: what makes a practice postcapitalist other than being broadly "alternative", and does such a distinction also apply specifically to design practices? Having so far established postcapitalist discourses and practices at large, the final section of this chapter will provide a specific outline of how postcapitalist design can be theorised and practiced.

3. Commoning in design

In the previous section, I defined what constitutes existing alternative practices at large, and identified some conditions for their proliferation and their potential in unravelling capitalist relations. I will now seek ways of expanding and specifying these definitions to include also design practices. Those that are relatively autonomous from the market can certainly serve as a starting point for determining what already exists, however a consistent analytical model is needed to distinguish them from their capitalist counterparts. Branka Ćurčić succinctly poses a question in a similar vein:

> ***Is it possible today to observe and practice design outside of the dominant functionalist principles and the market-dictated production and consumption, and to develop their engaged dimension in creating more humane social relations, i.e., is it possible to conduct politicization of design practices during "transition" times?*** **(Ćurčić)**

Here, Ćurčić rightly defines the politicization of design practices as an engagement in the creation of more humane social relations, and I could add by extension, less commodified relations. Unlike greening commodities, this requires attentiveness to the kind of activities, processes and values with which one engages in design practices. So far, I have described this politicisation broadly as postcapitalism, defined in negation to capital, and denoting only its absence. An affirmative project requires an analytical lens, a vocabulary and an imagination that can provide an appropriate replacement for the complexity of commodified relations with "more humane" equivalents.

In the recent decades, the term "commons" has gained prominence in academic and activist debates as a general name for such alternative forms, without being reductionist in regard to their diversity – a counter-totality. Commons are the opposite of commodities; if the latter are goods that circulate on the basis of exchange, the former are goods that are available for sharing. It is worth noting that while the critique of commodities and commodification is well established in Marxist literature, theorisations on the commons remained a rarity

until recently.[i] Following the symmetrical (if not simplistic) opposition of commons and commodities, the commons are collective goods that are distinct from (state-controlled, impersonal) public goods and (market-based, individual) private goods. Depending on the scope, angle or intent, there may be as many categories as there are commons scholars, and such distinctions may be useful, in that all require slightly different analytical models and political strategies. My goal here is neither to pit them against each another, nor to deny the wisdom they all contain; instead, by providing another categorisation, I intend to highlight the fields that have not yet been subject to a commons-centric analysis.

The commons have been conventionally conceived in two opposing categories, being the defence of natural commons (land, resources) and the proliferation of cultural commons (language, knowledge). In the words of P.M., these commons correspond to access to "bites", as in food or fuels, and "bytes" as in digital information: "it's all about potatoes and computers" (17). While this polarity is in itself lucid and instructive, it does no justice to the commons that fall beyond the strict categories of the goods and resources defined by property relations. Silke Helfrich claims that this distinction is an artificial one, since all natural commons require the necessary knowledge to manage them, and all cultural commons depend on natural resources: "The common denominator among commons is that each one is first and foremost a social commons – a social process" (qtd. in P2P Foundation 6). Elsewhere she provides another useful distinction: "Our economy must not just be commons-based but commons-creating" (Helfrich). Combining both observations, I put forward a spectrum that ranges from predominantly material to predominantly immaterial commons sets on one axis, and the distinction between productive (commons-creating) and reproductive (commons-based) labour on the other axis. While natural and digital commons have already been mentioned, the social reproduction of care work could benefit from the same commons-centric analysis. Equally missing from the general understanding of the commons is the production of physical goods, which depends both on the reproduction of natural resources and the production of design knowledge, and my interest lies primarily in this quadrant:

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[i] In recent years the term has been adopted and popularised broadly by commons scholars: Linebaugh, Pasquinelli, Hardt & Negri, Dardot & Laval, Bollier & Helfrich, Rifkin, Stavrides, De Angelis, Federici, Dockx & Gielen.

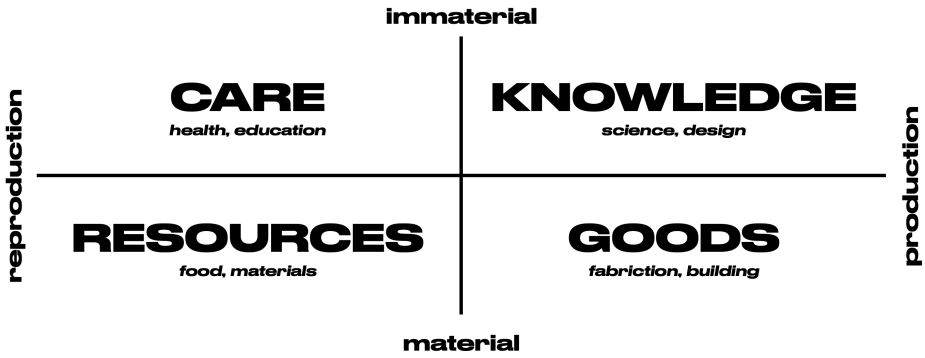

Table 3. Commoning in four quadrants.[ii]

Elinor Ostrom's life-long dedication to the study of an uncountable variety of commons around the world makes her arguably the most consequential contributor to the theorisation of the commons. Her conceptual innovation conceives the commons as "institutions for collective action" and governance, by commoners who regulate and manage the commons in non-hierarchical and non-coercive ways of self-organisation, thus setting the commons distinctly apart from state and market institutions. Ostrom's design principles for successful, long-enduring commons (90), left a lasting mark on commons scholarship – one with an increasingly more relational understanding of the commons. If there is a constant in the infinite variety of commons, it is neither the existence of (material or immaterial) resources, nor is it the existence of (formal or informal) rules, but rather people forming an intentional community. But what do people, as commoners, really do in common? They "common". Describing the activity or practice of commoners with the verb "commoning" is a relatively recent linguistic and conceptual breakthrough.[iii] There are two intertwined meanings to commoning. The first one, closer to previous definitions, can be understood as "doing in common", that is, to make, create or produce commons, or to put it differently, to produce shared value rather than exchange value. The second meaning is "managing in common", in the sense of

[ii] A comparable typology is developed also by Wim Reygaert (Bauwens and Onzia).

[iii] It is possible to encounter "commoning" both in historical and contemporary sources, but its theoretical substance was created by the Marxist historian Peter Linebaugh (*Magna Carta; Stop, Thief!*).

maintaining, administering and governing a resource or an institution as a commons. The distinction may be expressed as the etymological difference between collaboration (to labour together) and cooperation (to operate together). These two meanings are indistinguishable at the very definition of commoning, whereas they are considered entirely separate activities in industrial capitalism (leadership and base, management and execution, design and manufacture). Additionally, a third meaning to commoning is "holding in common": reversing enclosures, i.e., putting into shared hands that which was previously commodified. This meaning of commoning is still distinct from communisation, which suggests the abolition of private property through the expropriation of land, factories or infrastructure, and rather modestly implies a "voluntary" pooling of private assets as a commons. In other words, goods or resources that may have come into being as commodities or private property can still have a "second life" as commons if the institutional configurations allowing their mutually beneficial sharing are available for adoption.

Summarising these definitions, commoners self-organise and self-govern their collectivised labour practices in institutions of collective action, while commoning signifies this shared value creation that results from the combined activities of the production and reproduction of resources as commons. These definitions of commons and commoning have the potential to demystify what the more general terms "alternative" or "diverse" are unable to explain, and their specificity allows an understanding of the capacity of commons to overcome, outsmart and disrupt their market counterparts. Just as the commodity-machine is not a static property relation between subjects and objects, but rather a dynamic of commodification of relations, commoning is also to be thought as a (re)productive social process that extends the non-commodified sphere, shrinking the flux of capital, and expanding the flux of commons. De Angelis generalises this: "commoning is the life activity through which commonwealth is reproduced, extended and comes to serve as the basis for a new cycle of commons (re)production, and through which social relations among commoners – including the rules of a governance system –are constituted and reproduced" (201). Adopting a broader perspective, separate instances of commoning activities appear to build up towards commons systems that mutually support, proliferate and reinforce each other. For the (post-)Marxist scholars associated with the Midnight Notes Collective, this insight goes beyond the historical and contemporary analysis of the commons, becoming a strategic vision for a

political project to build counter-power (Caffentzis and Federici). If the commons are potentially a social force that resists and counters capitalist valorisation, what is needed is both vigilance, to avoid the risk of co-optation and capitalist capture, and a programmatic willingness to replicate, expand and accelerate commoning with greater ambitions. Dyer-Witheford proposes a quasi-symmetrical analogy between the commodity and the common as the cell form of capitalism and "commonism", respectively: "If capitalism presents itself as an immense heap of commodities, 'commonism' is a multiplication of commons" ('Circulation'). He notes elsewhere that "this is a concept of the common that is not defensive (...) Rather it is aggressive and expansive: proliferating, self-strengthening and diversifying. It is also a concept of heterogeneous collectivity, built from multiple forms of a shared logic, a commons of singularities. (...) It is through the linkages and bootstrapped expansions of these commons that commonism emerges" ('Commonism' 111). Put differently, a commonist horizon – the systematic replacement of commodified relations by socialised ones – materialises in the construction of "complex and composite forms" ('Circulation') by combining and integrating already existing practices of commoning.

Having outlined what commons are, what commoning does and what commonism strives for, I can now propose some commoning practices that are applicable to design. A straightforward yet simplistic expectation would be to look at and to strive towards "common goods", as objects with shared ownership. This, however, would not only be limited to a number of collaborative consumption cases, but it would also not be the normative claim that I would like to make. I am not concerned with the private ownership and use of most things (even a commonist would like keep some pairs of socks without having to communalise them). Instead of challenging the private ownership of raw materials and consumer goods – which, in any case, would fall outside the scope of design studies – my interest lies in the qualities of value processes within the reach of design practices. As a guiding interrogation, it is possible to rephrase the questions of Michael Hardt regarding the role of the artist:

> ***What possibilities are opened by the recognition that [design] practice and political action are both engaged in the production and distribution of the common? Can [designers] participate, through their [design] practice, in the many contemporary political struggles around the world in defence of the common,***

***for an equitable distribution and autonomy in the production of the common?* (28)**

As will be detailed extensively in the following chapters, I organise my answers along the three stages of shared valorisation in design. Chapter Two on *peer designing* focuses on the labour of designers. How does commoning (in the sense of the creation of shared value) transform the design process, and how does a designer become a commoner? In what ways are design skills, tasks and decision-making redistributed, and to what extent are autonomy and authorship maintained? Beyond the collaborations between professional designers and the participation of users within the design process, the most distinctive commoning practice is peer production, or "the ability to create value in common" (Bauwens, "Designing" 53). How is peer production deployed in design projects and how do they become apparent in the designs? To what extent do peer designing practices happen outside competitive markets and call for new ways of valorising design work? I inquire whether the organisation of work in novel cooperative and democratic forms offers workers a better deal than exploitative wage labour and precarious self-employment.

Chapter Three on *open blueprints* closely investigates a second valorisation process, being the commoning (in the sense of shared governance) of design projects themselves. Influenced by the emergence of technologies that facilitate the sharing of information and the spread of cultural goods through peer-to-peer networks, digital commons have been flourishing. The opportunities provided by the open/free/public circulation of knowledge are stifled by the rent extractivism of the predominant intellectual property rights regimes, although Gorz, Rifkin and many others argue that knowledge, being digitally reproducible and therefore abundant, tends towards becoming common property. Commoners in peer production both rely on those resources as input, and return their output to the public domain (open-source, copyleft, creative commons). In other words, the practical knowledge of building the commons is produced (developed) and reproduced (shared) by a community. What are the economic and social dynamics behind the free sharing of design knowledge? What open-sourcing strategies are employed effectively? To what extent do such strategies generate meaningful engagement by designers, makers and users? The extent to which open blueprints need institutional arrangements to sustain their longevity needs to be investigated.

Chapter Four on *maker machines* studies the commoning (in the sense of sharing as commons) of design artefacts. More specifically, my interested is in tools and machines as tangible means of production that are developed by makers and put into use by productive communities. What motivates and guides the development of such maker machines, and what qualities and aesthetics emerge? The practices I study are "counter-industrial" in the sense that they testify to a shared vision on the right to access localised, distributed and self-produced means of production (instead of, for instance, taking over the existing industrial infrastructure). I question the implications of liberating, self-creating and democratising productive capacities, for resilience, autonomy and abundance. Design scholars Franz and Elzenbaumer provide a final set of questions, directed at designers interested in commoning practices:

> ***Who is involved in the production of the commons and who is excluded? Who can decide on the process of commoning and who cannot? Who benefits from them, directly or indirectly? What are the effects of a specific process of commoning locally and translocally?*** **(Franz and Elzenbaumer)**

These interrogations will be useful in an evaluation of the validity of this framework, and for the identification of blind spots that may remain beyond the scope of this research. Undeniably, design, commoning and postcapitalism are concepts and concerns of Western origin, and thus are not exactly universalisable. While my interest in these concepts is firmly rooted in the (self-)critique of Western thought and way of life, they may not immediately be relevant for, compatible with or beneficial to non-Western cosmologies. Encouragingly, more recent works intersecting design and decolonial thought raise similar interrogations and offer some striking perspectives of the coming transition (Escobar 46). As the following chapters will testify, there is a remarkable open-endedness and cross-pollination potential that can be fostered by postcapitalist design within the many worlds that inhabit this planet.

Chapter II. Peer Designing: Becoming 'designer-commoners'

The analytical framework I introduce for the analysis of postcapitalist design practices distinguishes between three valorisation processes, involving designers, blueprints and machines. This chapter focuses mainly on the first stage: design labour, or the creative activity of designers that results in the production of design knowledge, and eventually the production of artefacts. Designing is a quintessential example of post-Fordist biopolitical production (Hardt and Negri, *Empire*); designers are engaged in both cognitive and affective labour, in that they work both with knowledge and creativity (Elzenbaumer, 'Precarious Designers'). However, while design is often mentioned as an example of post-Fordist labour in general, rarely have the labour conditions under which designers operate been approached specifically from the angle of value production. It is nonetheless essential to reveal the context of the political economy in which designers are implicated through their work. Studying design labour thus pays particular attention to this strategic intersection, as the particularities of design labour ultimately delineate what is possible and what lies beyond the reach of design. Furthermore, the social relations around design practices shape design solutions, as much as design solutions shape social relations.

André Gorz observes that “many more skills and talents exist than the capitalist economy can use — and also much more creativity” ('Exit' 2010). In other words, markets are unable to appropriately valorise creativity, and hence impede the full development of productive potential. The “creative turn” in the

cultural and urban policies of recent decades was intended to valorise and capitalise on the previously untapped potentials of the sector (Lovink and Rossiter). Under the radar of predominant the labour markets, however the diverse practices of amateurism, participation and co-creation are gaining increasing visibility. As clear-cut boundaries dissolve, new subjectivities emerge from the margins, contending for the title of archetypical knowledge worker. Such is the peer producer, first originating in software development, and then spilling over into product design. It is worth questioning the intrinsic motivation of peer-designers that are involved in collaborative activities, sometimes at the expense of their autonomy or authorship, and with or without monetary compensation. In this regard, how do perceptions shift of the actual (social) value of designing? How does the outcome become valorised without being monetised?

The ambiguities of peer designing can be best understood and resolved by approaching peer-designers as (proto-)commoners. For Michel Bauwens, the director of the Foundation for Peer-to-Peer Alternatives, the practice of commoning is indispensable for those seeking to become transformative subjects: "the new political agent of change is neither the proletariat nor the precariat, but the commoner, an empowered figure fit for the challenges of our times" (P2P Foundation), although they could be seen as the one and the same, since "precarious-to-precarious" (Foti 150) self-organisation can be a harbinger of commoner subjectivities and communities. Elsewhere, Bauwens and Ramos claim that "if we have capitalism, it's because we had capitalists; if we have a post-capitalist commons transition, it will be because we have commoners" (6). A simplified distinction could be made between the current peer-designers and future designer-commoners; the former are unable to reproduce themselves fully, and are therefore predominantly precarious, involved in ad-hoc and voluntary basis; whereas the latter have established themselves as providers of indispensable social functions, carrying more responsibility and intentionality. The following questions can guide the exploration of the intersections, hybridities and gradients between designers and commoners:

> ***What are the tensions and contradictions we encounter or create when designing for the commons? In activating commons to create and sustain alternative livelihoods, how does the role of designers change as well? If we take the commons and***

> ***'community economies' as a tool rather than as a goal, what do they allow us to contribute to? What practices of self-organization and division of labour are useful in getting people involved in commoning for progressive social change?*** **(Elzenbaumer et al.)**

The labour relations in the emergent practices may promise novel processes of collaboration, although their originality alone is not sufficient to constitute a counter-current to the capitalist valorisation of design labour. Regardless of however incomplete or imperfect the current state of these projects may be, I question whether such processes initiated by peer-designers present a pathway for design labour that is decidedly situated beyond the commodity-machine. Considering that peer designing counters the isolation of would-be producers, and empowers them in ways no previous mode of production had made possible, it would at first seem relatively easier to socialise material production without the mediation of the market, the state and even the unions. By aligning themselves with common needs, peer-designers that are interested in sustainability, social design and sharing can converge around common means (shared governance) and common ends (shared value creation), and thus consciously and concretely co-design exit strategies and pathways away from the commodity-machine, and towards postcapitalist design practices.

A. Designers:
Shared valorisation of design labour

In this section, I identify the organisational characteristics of the emergent design practices, and question how (and under what conditions) designers become commoners, i.e., how they collaborate to achieve common ends, or to co-produce shared value. Three overlapping subjectivities will be considered. First, the designer in their current state of entanglement within market relations; then the peer, as the emergent model of the worker beyond hierarchy and competition, that originated in software development; and ultimately the commoner, or the latent potential of peer-producing designers as the creators of shared value.

1. Workings of design in (post-)Fordism

In this section, I conceptualise design labour as the first and foremost an instance of value creation, and as a precondition for the subsequent valorisation stages of design knowledge and design artefacts that will be investigated in the following chapters. I introduce this as a term that is distinct from design practices (denoting a lens of cultural-anthropological analysis) and design processes (which has discipline-specific methodological undertones). In contrast, design labour is to be understood squarely in the field of political economy, emphasising the economic valorisation and social organisation of design as part of a broader context. By adopting a labour point of view, it is possible to make space for the conceptualisation of design between the general overview of practices and the close observation of processes. In fact, this partially overlapping and slightly differentiated concept is necessary to identify the genealogies, continuities and transformations of what exactly becomes valorised and what remains hidden from view depending on the context. Many theorists have shown an interest in the labour conditions of design-related professions. Marxist architectural historian Tafuri is unambiguous about the subordination of the discipline to the economy, claiming that it is impossible to have any social benefits under capitalism (Deamer xxx). Haug was another early critic of commodity aesthetics, describing designers as the "handmaidens" of capitalism, alongside those involved in media and advertising (Clarke 77). Beyond these unequivocal statements, design labour merits closer inspection to explore what margin of negotiation exists for designers to function outside market relations.

Designers occupy a niche (or rather, an intersection) that it is halfway between an artist and an inventor; neither the activity of the artisan, nor the one of the engineer (Margolin). While it cannot be described as repetitive, manual labour (as in low-skilled physical work), it is also not a purely mental activity either, involving the crafting of physical models usually as prototypes (Sennett). Designing involves working with matter, signs and people, and necessitates thinking, making and caring simultaneously (Cross, *Design Thinking*). While specialised design occupations have traditionally been conceived as part of the managerial class, the field increasingly appears to transgress the established boundaries of the disciplinary, economic and cultural spheres, making the activity of designing a multicoloured-collar job (Manzini). Design labour is a

strange, untameable beast; a process of trial-and-error, speculation and unquantifiable results that comes with a degree of resistance to the productivist logic. It is a rather peculiar business, being situated both inside and outside the commodity-machine, preserving an edge that escapes the extraction of surplus-value. Design labour resembles an exemplary liberal profession, in which creative, artistic or conceptual activities form a holistic, non-alienated and socialised work. At the same time, by inhabiting a cross-disciplinary intellectual sphere and by providing concrete economic benefits, designers are highly integrated into the commodity-machine, occupying a strategic place in a world that is thoroughly designed. That said, how do we make sense of these ambiguities, and where is design labour posited in relation to the rest of the economy?

As a starting point, some foundational definitions of labour can be found in Marxist theory. Labour implies (predominantly manual, physical) work toward the transformation of nature, and is carried out in order to obtain use-value. As an economic category, labour-power is what the worker sells to the capitalist to earn a wage, making it a commodity carrying an exchange-value. The labour theory of value conceives labour as the primary factor in value creation, where value is usually measured in relation to the time spent at labour. The classical division of labour among manual and mental specialisations is drawn along class lines, with the lower classes destined to work in unskilled manufacturing jobs and higher classes occupying executive, managerial positions. While subservient to capital accumulation, labour remains an obstacle, a site of friction, conflict and negotiation. This makes labour a site of possibilities, and an ineluctable point of departure for any alternative form of social organisation and economic valorisation. These definitions apply to design labour only in a very general sense, disregarding many of its specificities and complexities. To begin with, designers do not directly transform nature, but rather devise ways to do so in an indirect, mediated way. Design labour cannot be confined to a rational process, since creativity, improvisation and instincts are an intrinsic part of designing. It is nonetheless possible to valorise design labour under the conditions of wage labour, by remunerating designers for the time spent developing a project. This is the case of designers working for permanent in-house design departments within companies, as well as those working for specialised independent firms that provide design consultancy services. This form of "designing-by-the-hour" employment has the advantage of bringing a steady income to the designer, as well as having relatively well-defined working hours (Deamer 72). However,

creativity does not flow evenly during "working hours" the way productivity is imposed on a sweatshop worker, and attempts to subject design labour to pressure (i.e. delivery times, intensified productivity, market performance) may even be counterproductive. Without the right conditions, dull, unoriginal outcomes may emerge rather than innovative or competitive ones. Placing design labour entirely in the service of capital eclipses its socially beneficial qualities, delivering only what is to be valorised by the market (Tombesi in Deamer 82-100).

Of course, not all design labour fits this Fordist framework, as recent decades have witnessed a generalised drive towards precarious and flexible forms of employment. In this post-Fordist economy, independent work has also been on the rise in the creative sector (Leighton and Duncan). Designers are increasingly working as freelancers, depending on more or less reliable commissions from commercial clients, as well as exhibitions or fairs that may increase their visibility. Designers are expected to compete with each other in their respective categories, with multinationals with internal design departments competing among themselves; design consultancies seeking to attract more prestigious clients; and freelancers striving for broader recognition, with some degree of collaboration between like-minded designers. As the working hours of freelancers are much less strictly defined, the distinction between occupation and job is becoming increasingly blurred. By leaving control over production to the self-employed, self-exploited designer, the client effectively ceases to valorise labour, rewarding the resulting blueprint on the condition that the results satisfy the market objectives of the client. This may appear somewhat paradoxical, considering that the work of designers is a gift that keeps on giving, being a precondition for the subsequent generation of further value from the design blueprint and artefact. Designers may aspire to social purposes, may induce affective responses and may ultimately shape individual behaviours and social relations. However, at the end of the day, it is output that matters, in that they are expected to come up with a working, understandable and replicable model that can be reproduced in numbers. If the designer does not deliver patentable or profitable results in a given timeframe, then the work is considered a (market) failure. This is how design, just like other creative practices, is disciplined and put at the service of commodity production, and since the labour process cannot be entirely mastered, the commodity regimes do not valorise it independently from the outcome of that labour. The process and product are subjected to differential treatment in the sense that the value of the service (designing) is

abstracted when the product (the design) is sold. When the relationship between the designer and the client is one in which the ownership of the design is traded, the designer surrenders all rights of the project, except its authorship.[i]

None of these conditions are unique to designers, and so it would be more fitting to contextualise contemporary design labour as part of the so-called "new" economy, theorised with increased attention given to the economic functions of intellectual, immaterial or cognitive labour (Moulier-Boutang), knowledge production and creative industries (Hartley; Raunig et al.). Hardt and Negri define immaterial labour as that which produces "an immaterial good, such as a service, a cultural product, knowledge, or communication" (*Empire* 290), which is a definition that fits the work of designers perfectly. Lazzarato specifies the various skills needed as "intellectual skills, as regards the cultural-informational content; manual skills for the ability to combine creativity, imagination, and technical and manual labour; and entrepreneurial skills in the management of social relations" (136). In contrast, in a scathing critique of the post-workerist focus on immateriality, Haug rejects the designation, and dismisses the historical relevance or strategic importance of cognitive labour (Haug and Fracchia). They may be indeed problematic terms (considering the industrial, Fordist economies have not disappeared, but have only been displaced and reconfigured globally), but it is nonetheless striking that none of the archetypical characteristics of the new economy are particularly new developments. As described in the introduction, design labour carried such features since its inception as part of industrialisation. At the very least, what was once a peculiarity of design labour has become increasingly generalised throughout the economy; and what was once an exception to predominant labour formation has now become the new norm. I would even argue that, in the light of the turn towards post-Fordism, design labour has become a somewhat overlooked forerunner of the new modes of production. It is worth noting how exceptional a role design has twice played in catalysing the reorganisation of the economy; first, being instrumental in the generalisation of industrial production,

[i] While wage labour and freelancing are presented here as two major approaches to the valorisation and organisation of design labour, a third, relatively rare form also exists, being the collection of royalties per unit manufactured or sold. From a political economy angle, it is a privileged position of the rentier that not many designers can successfully negotiate with manufacturers.

and then second, as a blueprint for the generalisation of post-industrial labour formation. This gives us another reason to pay attention to the specificities, as well as the ongoing transformations, of design labour. If design labour has been instrumental in shaping the economy before, then it may also be involved in future transformations of labour, and the emergent modalities of design labour could be the forerunners of future labour relations.

The challenge faced by design practitioners is how to develop ways of valorising their design labour independently of their productive output, and how to liberate their design knowledge from the exclusive control of the client. In this sense, the autonomy of the designer depends on recognising that the creation of value in the design process is independent of the market valorisation of its outcome. In doing so, design labour can effectively take part in the "autonomy of the productive synergies of immaterial labor" hypothesised by Lazzarato (138). In the next section, I take a closer look at the new configurations that transcend the established post-Fordist organisation and provide grounds for the emergence of commoning in design labour, exploring the challenges that arise when designing is no longer dictated by the market or valorisable as a commodity.

2. The rise of amateurs, participants and co-creators

Having presented the conceptual outlines of design labour, now I can direct my attention to more recent trends. Professional titles and economic functions have defined the boundaries of design labour, while interactions with makers and users have been confined to the conventional, linear value chain of commodities, although these boundaries are becoming more porous in both directions. On one side, there has been decades of evolution towards principles that are more inclusive of end users, multiple stakeholders and communities, who now participate both creatively (providing input and feedback to design processes) and politically (participating in design-related decision-making that affects them). On the other side, most notably with the emergence of new communication channels, amateurism has been gaining visibility and accessibility, revealing the countless of ways design is practised without being a full-time profession, but more as a daily practice and reproductive work. Design labour has become a contested terrain in which the encounters of actors operating outside the marketplace give rise to more complex roles and subjectivities. If the definition of design labour is to be extended to include non-commodified forms, then several types of design-related activities must be considered. In architectural theory, non-professional design is usually described as vernacular, covering local, traditional and indigenous practices (Asquith and Vellinga). While this definition of the vernacular applies to any design practice, the kind of "twenty-first-century vernacular" I am interested in is highly dependent on, and perhaps inconceivable without, the globalised economy, communication infrastructure and cultural trends of the last decade. In this section, the relevance of such transformations is scrutinised in order to establish whether the shifting roles of the designer (and the emergence of new designing subjectivities) constitutes evidence for commoning in design labour.

Even though only professional designers are thought to pursue design as an economic activity, design cannot be thought of solely as a job, being equally an occupation and an everyday practice (Lupton; Levine and Heimerl). These aspects remain distinct from the professional work through their lack of visibility, recognition and remuneration, and yet they produce (use) value when the marketplace cannot fulfil needs or desires. This means that a sizeable proportion of design labour actually takes place outside the capitalist economy, and can be considered part of reproductive work, as theorised by feminist scholars. Federici

observes that "capitalist accumulation is structurally dependent on the free appropriation of immense quantities of labor and resources (...), like the unpaid domestic work that women have provided, upon which employers have relied for the reproduction of the workforce" (105). Practices such as crafts, DIY and amateurism may be dismissed as hobbies, pastimes or leisure activities outside economic production, but they are still an effective part of social reproduction and need to be (re)valorised as such (Gibson-Graham). In the wake of these insights of feminist economics, there has been increasing interest in and exposure to amateurism. Amateurism implies practices without a specialised, "certified" design formation, carried out in informal settings or through non-remunerated arrangements; and (perhaps most relevant to this research) DIY/craft/maker practices that are documented and diffused thanks to information technologies (Beegan and Atkinson). DIY is defined as the antithesis of professional design, being "a more democratic design process of self-driven, self-directed amateur design and production activity carried out more closely to the end-user of the goods created" (Atkinson). For the purposes of this chapter, I distinguish between designing for DIY and improvised bricolage or self-made practices, in which the former involves developing and circulating blueprints for others, while the latter is motivated mainly by the possibility of showcasing a finished object, usually as a source of pride or inspiration. What was previously an unsubstantiated claim that "everybody is a designer" is now evidenced by blogs or platforms that offer tutorials, how-to guides and step-by-step instructions of how to do virtually everything. More than being a glorified shop window for every individual hobbyist or craftsperson to sell their products, online platforms enable the replication of designs without ever encountering a third party for the manufacture, marketing and delivery of products.

One remarkable example in which digital networks have been harnessed for a novel design practice is HomeMade Modern by Ben Uyeda [see fig. 4]. Trained as an architect in the United States, Uyeda abandoned his professional sustainable design practice when he realised that it catered only to the wealthiest, while leaving many at the mercy of big corporations selling cheap and unsustainable products. Neither brokering a deal with mass manufacturers nor establishing his own small production, he makes instructional YouTube videos on how to self-produce low-cost furniture with high-modern aesthetics, or "affordable alternatives to pricey designer home goods and cheap, plastic and particle-board junk" (HomeMade Modern). Working alone or together with his partner, Uyeda's

videos have attracted a large following, and his designs have been mass replicated, and yet he does this without ever competing with IKEA by short-circuiting its hyper-efficient production chain. Lacking the means to invest time and money into the prototyping, manufacturing, shipping and marketing of consumer goods, HomeMade Modern instead makes use of existing infrastructure by outsourcing marketing to social media, logistics to home improvement stores and labour to end-users. He claims that he "can have an idea on a Thursday, sketch it on a Friday, build and film it on a Saturday, edit the video on Sunday, and by Monday it has reached tens of thousands of people" (Uyeda). Rather than working for design firms or private clients, being a one-person designer-communicator seems to be more enjoyable as well as creatively more gratifying. The website states: "In its purest form design is about communication —not packaging, branding and customizing." Such a rewarding practice may generate both recognition and income for Uyeda, but it is certainly not possible for everyone to achieve the same level of success. To begin with, the most visible source of income for HomeMade Modern appears to be the sponsorship deals with hardware brands and stores. The website summarises this business model by referring to the company as a "design firm that produces media content and generates revenue from carefully selected sponsorship partners". The presence of these partners shows that corporations are not entirely absent from the circuit, but are seemingly subordinated to the interests of the designer. He maintains control over the process while remaining a one-person enterprise, which offers some insight into the kind of occupations that can be pursued outside the domains of trade, craft or hobbies.

The internet not only facilitates the sharing of designs (which will be further investigated in the next chapter), but also opens up possibilities for collaborative designing principles that bring together professionals, amateurs and users alike. Despite the interactive tools at his disposal, Uyeda's practice remains nonetheless limited in the sense that he seems to design primarily for himself, and others are merely meant to follow his instructions. It is still a conventionally one-way, mass-media attempt to "democratise" design, disconnected from pressing problems or special needs. Thackara is unequivocal about the hypocrisy of "designing emergency shelters for poor black people from the comfort of a Soho design studio" (Chapman and Gant xvii). In other words, co-designing with people who are going to live with the results of that design is fundamental. Since the 1970s, most notably in the Scandinavian context,

innovative experiments have been carried out in which non-designers have been included in various stages of the design process and in a multiplicity of roles (Erlhoff and Marshall 291). Social design, participatory design, collaborative design, transformation design, user-centred design, co-creation and meta-design are only a few of the ever-expanding range of labels, methodologies and theories adopted to describe processes that seek more or less active involvement of multiple stakeholders (Fuad-Luke 146-156). These practices have been analysed and widely celebrated for their identification of legitimate, effective and beneficial ways of involving impacted communities, citizens, workers, experts, investors, consumers, users, repair and recycling specialists in the process, who may be consulted to include diverse forms of expertise, to identify needs and preferences, to generate user experience scenarios, to adapt generic models to specific audiences, to evaluate proposed solutions or to synthesise conflicting interests. If so much can be "outsourced" to non-designers, it could be argued that the designer is altogether redundant, and no longer has any core function. In fact, these developments do not erode the centrality of the designer at all: "designing with, rather than for, a community of users does not mean allowing them to design for themselves. The designer is still at the centre of the process, but working more inclusively" (Chick and Micklethwaite 47).

The role of the co-designer can potentially be empowering for recipient communities, but conversely, it may also instrumentalise people only to extract the relevant insights from them ("focus groups" to better target products to consumers). The interchangeability of those who design, decide or realise indicate an increased complexity in terms of attribution, responsibility and the rewarding of design practices. Those who were described in the 1980s as "prosumers" (Toffler), meaning people who consume the goods they produce, or more recently as "produsers", defined as "the collaborative and continuous building and extending of existing content in pursuit of further improvement" (Bruns and Schmidt), all surpass the artificial separation of production and consumption. The politics of participation remains ambiguous, in that these practices can valorise and elevate the problem-solving capabilities of non-designers as much as they can function as a form of exploitation of free labour, in the same vein as the non-remunerated value creation practised on social media platforms. For Terranova, the abundant availability of such labour "does not exist as a free-floating postindustrial utopia but in full, mutually constituting interaction with late capitalism" (*Network Culture* 84), hence their cohabitation is

not necessarily conducive to autonomous or emancipatory practices. Nevertheless, she later notes that "if the wealth generated by free labor is social, so should be the mode of its return" ('Free Labour' 53), indicating that such a creation of value can serve as the basis for the reproduction of the common instead of its private capture.

This overview of the evolving roles and definitions of designers is not meant to resolve any of the tensions mentioned above, but rather to give more nuance to the previously clear-cut definition to design labour by doing justice to the fuzziness of actual practices. Designers are becoming less and less creative as professionals in a studio, and more similar to social workers in the field. However, it would be too simplistic to conclude that the discipline is becoming spontaneously more collaborative (or inclusive, or democratic) than ever, as if anything, these mutations are integral to post-Fordist labour itself (Holert). What is perhaps surprisingly missing from all of these approaches is the most obvious partner for a designer with which to collaborate: other designers. Pasquinelli warns that "cooperation is structurally difficult among creative workers, where a prestige economy operates (...), and where new ideas have to confront each other, often involving their creators in a fight" (Lovink and Rossiter 80). McRobbie reminds that cultural work "has been subjected to such intensive individualization that the idea of a common cause has for many years been all but lost" (15). This existential separation among the designers themselves, their isolation and atomisation, and their lack of collective decision-making processes merits interrogation. The collaboration of like-minded peers, regardless of whether they are professional or amateur practitioners, would arguably be the most appropriate framework for a commons-based valorisation of design labour. In the next section, I explore the affinities between collaborative design principles and peer-to-peer theories, which suggest new possibilities for designer-to-designer collaboration.

3. Free association of self-organised peers

The previous sections have detailed the dissolving boundaries between professionals and amateurs, and the participatory tendencies in design labour that defy hierarchical organisation. In this section, I argue that emerging practices are best understood through the lens of *peer designing*. Some preliminary definitions and discussions of peer production are necessary before studying its impact on design labour. Peer (as in "peer review") is a familiar notion in the academic context, denoting an equal footing and reciprocity, being a relational principle that is distinct from and opposite to both hierarchical authority and market transaction. Just as the open-ended, egalitarian and universal collaboration between peer researchers has been a building block for the development of science, a similar logic has been a critical feature of the networked communication protocols that evolved into the Web. More recently, Peer-to-Peer (P2P) has moved beyond the realm of information technologies to become the general term for the horizontal, decentralised, distributed and transparent organisation of humans, machines or their cyborg combinations. It is now applicable to many social practices, principles or platforms, from file sharing to car sharing, which gave rise to the so-called "sharing economy". It is an absolute misnomer, since these commercial platforms are "instead driving a harsher form of capitalism: deregulation, new forms of entitled consumerism, and a new world of precarious work" (Slee 163). While P2P protocols can undoubtedly be co-opted to serve the market mechanisms, they can also potentially short-circuit those same market mechanisms. Indeed, the relational basis of P2P makes it applicable to a vast and fuzzy range of activities, where ambiguities and contradictions abound. Bauwens embraces this complexity wholeheartedly:

> ***Peer-to-peer technology is the basic infrastructure of cognitive capitalism; it is a third mode of production not based on either profit or hierarchy; it is a new mode of distribution such as in the file-sharing networks; it is a new mode of organizing and conceiving cooperative relationships, expressed in a wide variety of social and political movements; it is a new way of***

feeling and thinking about the world. **(Bauwens, 'Peer-to-Peer' 166)**

A concept with such civilizational paradigm-changing aspirations is arguably unstable in its definition, and is wide open to (mis)interpretation. In a more narrow sense, Bauwens distinguishes between three P2P processes, namely Peer Production, Peer Governance and Peer Property. While these defining features are intricately intertwined, most emphasis appears to be given to production, since it implies value creation. The commons and commoning are in fact recurrent also in other definitions of Peer Production, and the term was originally coined by Benkler as "commons-based peer production". Silke Helfrich, in turn conceptualises this mode of production in slightly different terms. Instead of commons-based (where the commons are conceived as a resource), she proposes the term "commons-creating peer economy", which emphasises the social process of commoning. This makes the commons both the input and the output of peer production, making P2P and commons inseparable as the process and product of commoning. Peer production potentially resolves the paradox observed by André Gorz – in contrast to the commodity-machine in which "we produce nothing of what we consume and consume nothing of what we produce" ('Exit' 10), commoners can simultaneously be producers and consumers of the same commons.

Regardless of their interpretative differences, all of these scholars seek to describe new the forms of knowledge production and the immaterial labour that cannot be explained using preexisting terminology. Benkler defines peer production as "radically decentralized, collaborative, and nonproprietary; based on sharing resources and outputs among widely distributed, loosely connected individuals who cooperate with each other without relying on either market signals or managerial commands" (60). Instead of following orders in a chain of command, or engaging in an activity based on economic interest, peer producers appear to produce knowledge (and therefore value) on the basis of free association. Working neither with permission nor for compensation, networked peers cooperate voluntarily and work towards a common goal, often driven by a sense of purpose, recognition or simply use-value. "Each volunteer chooses the tasks she performs, the amount of time she devotes to the collective production, and the place and time of her productive activity" (Rigi, "Peer" 397). In the industrial logic of the division of labour, it is inconceivable that large, complex

projects emerge spontaneously. Yet, peer production manages to distribute labour through self-managed and non-exploitative principles. In the natural sciences, the term "stigmergy" is used to refer to such forms of self-organisation (for instance, in social insects) that rely on an indirect, distributed coordination of actions, mediated by modifications to the environment. Kostakis and Bauwens adapt the notion to human systems, and argue that stigmergic collaborations are a crucial organisational principle for peer production (54), observable not only in software development, but applicable also to design labour:

> ***This model can be generalised to all knowledge production. A person who works on a particular project or a design can put the work in progress online and invite others to cooperate in completing it. In this system, there is a distribution of labour, because, while the final product is a result of the total work of the community of contributors, participating individuals choose to work on different supplementary features of a common project.*** **(Rigi, 'Peer' 409)**

Based on these descriptions, the peer-to-peer organisation of labour stands in stark contrast to the competitive conditions associated with knowledge work. Peer production promises the means of commoning for immaterial labour, and the blueprint of "an ecology of production" (P. Moore 83). However, not every scholar is convinced that a paradigm shift as foundational as the industrial revolution is taking place so smoothly; and several concerns are worthy of mention here. While specific tasks are determined and executed by the peers themselves, the more important decisions and the general direction of a project are to be decided upon either collectively, or by a form of leadership. Sometimes they are even taken by a "benevolent dictator" (Raymond 101), a recurrent and almost normalised organisational feature in some open-source software projects – a far cry from the democratic control of commoning. There are doubts about whether peer production actually eliminates the need for bureaucracy and management, as it may in fact "involve a host of other forms of regulation that are less transparent than bureaucratic forms" (Kreiss et al. 250) that complement or extend preexisting forms of coercion and domination rather than abolishing them. In other words, decentralised protocols are not inherently more emancipatory than their precedents, unless fought for and built accordingly

(Galloway). It remains to be seen through the case studies the extent to which product design projects reproduce these dynamics, considering that they may be less distributed and more immediate than software projects.

A prevalent and unresolved challenge to peer production is its inability to provide financial support for its contributors. Considering that peer producers work voluntarily, how are they supposed to earn a living in an economy that still runs on money? Without the means to sustain their livelihood through their voluntary practices alone, peer producers currently need to engage in other waged labour or other market-based practices. So far, time availability and alternative sources of income seem to be preconditions for the securing of the social reproduction of peer production. In other words, commons-producing practices are still subordinate or "parasitic" to market-based relations, and do not constitute an autonomous sphere of value creation (Pasquinelli 48). While there may be beneficial outcomes, they nonetheless remain as auxiliary contributions that are at the whim of peer producers, rather than being indispensable for social reproduction. However, the question of "how peer producers are paid" is not necessarily the right one in the first place. Considering how reproductive care labour isn't economically valorised, and yet is absolutely essential, the claim for the valorisation of peer producers' labour remains somewhat a secondary concern, and part of a larger, systemic contradiction. Perhaps a question more worth asking would be "where does the value created by peer producers actually go, and who benefits financially from that wealth? This is the primary line of suspicion and critique raised against the techno-optimism of what Pasquinelli calls "digitalism" (66), suggesting that the ethics of sharing and freedom are enough to generate positive outcomes in the coming paradigm of "social production". Kleiner rejects the optimism of Benkler's "wealth of networks" and describes the "poverty of networks" as "extracted economic rents, surplus value captured by way of forcing producers to accept less than the full product of their labor as their wage by denying them independent access to the means of production" (21).

In some cases, peer-produced value is captured by capitalist enterprises (Rigi, 'Coming Revolution' 393), making the commons serve the further accumulation of capital—the exact opposite of the intended effect. This is perhaps the most important critique of peer production – that it is simply not antagonistic to capital, but may be in fact a new cycle of its post-industrial

reinvention. When the very proponents of peer production acknowledge that it is still at a subordinate stage to capitalist production, how is it possible to claim autonomy and to avoid being co-opted by capital? These risks are ultimately there for all postcapitalist projects – while they are never sufficient to stand up against capitalist forces by themselves, their hybrid, ambiguous states make them potentially far more adaptive and disruptive than complete exodus and isolation. In other words, the outcome of "who is going to co-opt who" is not determined in advance (Dyer-Witheford qtd. in Bollier 49). In this regard, there are then two possible trajectories that can be taken: either instrumentalising limited and strategic integration into certain market relations (for instance, to generate remuneration to sustain livelihoods), or striving to come up with non-commodified and socially necessary practices through which peer production becomes indispensable and worthy of support (Lund). Bauwens takes a somewhat ambivalent stance towards the two options, simultaneously endorsing both positions:

> ***Peer production is both immanent and transcendent vis-à-vis capitalism (...). Peer production functions within the cycle of accumulation of capital but also within the new cycle of the creation and accumulation of the commons. (...) Workers associated with peer production have a natural interest to maintain and expand the commons of knowledge, code, and design, and under conditions of capital, the role of wage labor and capitalist investment contributes to the sustainability of both the commons and the commoners.*** **(Bauwens, 'Thesis' 208)**

Elsewhere, the challenge is formulated in a more explicit (and perhaps controversial) manner to counter the "communism of capital", i.e., the free-riding of commons for accumulation purposes (Beverungen et al.), by generating "capital for the commons" (Bauwens and Kostakis 358). This can be achieved through the use of an "open cooperative" model (Conaty and Bollier) that is intended to provide the legal basis for combining the democratic tradition of cooperativism with the emergent practices of open and contributive accounting systems (Bauwens and Niaros 40). Still, reversing the current capitalist valorisation of peer production remains an ambiguous, complex and unpredictable project, and there are countless sectors beyond the cutting-edge

of digital knowledge production that are yet to be remodelled. Rigi predicts that peer production "can overthrow capitalism only if the strategic means of production (land, major sources of energy and raw material, and major technical infrastructures) are transformed into commons" ('Peer Production' 398). In other words, in order to have any sort of meaningful impact, it first has to spill over from the digital to the physical realm. Rigi's condition that reclaiming the means of production as commons is self-evident; and yet some of those means may be produced as commons rather than being declared as commons. This precondition implies that design practices, as an interface between the material and the immaterial, are situated precisely at the pioneering position where peer production expands into the industrial domains. Some diverse expressions of this desire will become apparent in the case studies presented in the next section and in the following chapters, where peer-designers employ diverse strategies to fulfil the challenges faced when commoning their labour.

B. Peers:
Redesigning P2P production

I have so far clarified the affinities between commons and P2P scholarships, based on their manifestations in software development and other design labour. Providing a more extensive evaluation, this section investigates OpenStructures as a prime example of how peer production can be adapted to product design projects. An analysis of the modular domestic appliances made through OpenStructures reveals the challenges and limitations that are traceable in the tensions between the practices of designers and the discourse of the designers themselves, as expressed in publicly available media and in my conversations with designers.

1. Assembling modules into systems

A red plastic cylinder bracketed in a wooden frame on skate wheels, attached by a hose to a brush with matching red bristles [see fig. 5]. An assemblage of laser-cut, CNC-milled or 3D-printed pieces, together with some standard industrial components and a recuperated motor. This short description of an Improvised Vacuum modestly indicates that it is built around a plastic thermos – one may think of bricolage, creative reuse or "IKEA hacks", and proof that users can be smarter than designers by repurposing their products in entirely unexpected ways. Without context, it would appear to be a one-off, quirky, idiosyncratic designer object; a provocative piece illustrating DIY that is destined for exhibitions, and never to be used, let alone to enter production. As part of the OpenStructures project however, it stands as evidence of the alternative value circuits that some designers already inhabit. By extension, it hints at how mundane, household items would be designed and produced in an alternate universe, perhaps one in which exchange relations are absent.

Transparent Toaster comes in two sizes, regular and "industrial", stretched along its length the way a limousine is to an ordinary car [see fig. 6]. Perhaps this is meant to suggest an infinite possibility of sizes, a steel mesh that can be as long as the number of bread slices to be toasted concurrently. It has no sophisticated spring mechanism, and no timer to ensure perfect crispness; it is a structurally transparent toaster stripped to the bare bones. It comes with a single-page assembly guide where every piece is referenced and sourced, as off-the-shelf components, OpenStructures-compatible parts and a repurposed heating element. What does the physical transparency of the object reveal about the aesthetics and ethics of its material cycles? What does the materiality of objects tell about the conditions of their production?

The OS WaterBoiler is not your usual plastic moulded case kettle that could once be bought dirt-cheap from the nearest big-box retail store, before breaking down or melting away, never to be repaired nor recycled. Neither is it a special edition reissue of a Bauhaus design, nor a postmodern monument made for the Italian brand Alessi, targeting the tastes and budgets of those looking for more than the ordinary plastic kettle. Instead, the OS WaterBoiler is a research project on the material flows that create assemblages of parts and components. It has multiple iterations that are a result of different processes of production – the

version destined for single-unit limited production has parts that are either self-produced or bought at a local retail, whereas a 100- or 1000-unit production scenario mixes local production with internationally supplied components [see fig. 7]. Against the inevitability of the standard plastic kettle for the mass market, it hypothetically activates a multiplicity of alternatives that are adaptable to the local economy. Can this object provide insight into how home appliances may be composed and assembled in an alternative globalisation?

All three objects are designed by Jesse Howard, in collaboration with Thomas Lommée, and all share a common logic and are part of the larger OpenStructures project in which Lommée and his collaborators are engaged. This project and its offsprings/spinoffs constitute the main case studies of this chapter, primarily due to their unfamiliar appearances, but essentially because of their unconventional designing process. As reminded in the previous chapter, beneath their shiny appearance, commodities mask the social relations in their creation. Would it be possible for product design beyond the commodity-machine to do the opposite, that is, to reveal, to render legible the labour conditions of the design within the materiality of the objects themselves? OpenStructures, through its reliance on open standards and distributed modularity, is highly illustrative due to the strong correlation it presents between its physical features and the organisation of its development. In this section, I explore how and why this project became a symbolic early example of the rejuvenated interest in values that were lost with the throw-away consumerism induced by global commodity flows of recent decades. That said, rather than treating my case studies as examples of DIY or participatory design, as defined in the previous section, I consider them to be rather attempts to adapt peer-production principles to design, and in doing so, they constitute interventions that negotiate the modalities of design labour away from market-based practices, and towards commons-based forms of value production. They may not instantly abolish the categories of designer, maker and user, although they do manifest a new kind of designer – one that is less concerned with occupying the privileged position between the manufacturer and user, and more interested in redesigning the modalities of design labour itself.

The OpenStructures project was introduced with a simple yet ambitious formula: "everyone designs for everyone" (OS, *About*), which can be understood to be in direct contrast to the solitude of Do-It-Yourself and its libertarian or

individualist connotations, In short, this is a project that is meant to bring people together on a common ground. In order to facilitate the mutual design process, "Common design guidelines" provide some "rules of thumb" that are worked out in advance (OS, *Guidelines*)[i]. The first principle is to design for disassembly, in which no glue, tape or nails are allowed so that the structural integrity of every component is maintained, and by extension, repairs, upgrades and hacks are encouraged. The second principle is to opt, whenever possible, for infinitely recyclable materials so that the pieces can be reborn as a resource when no longer serving as components. These two principles are common to other design standards, such as Cradle2Cradle. What sets OpenStructures apart is the third principle – the OS Grid, consisting of 4x4cm squares as the basis of a 60x60cm OS Ruler. The grid and the ruler impose dimensions, assembly points and diameters that are meant to make every part, component, or structure compatible with each other —a common denominator for things, or, as it is often suggested, a Meccano or Lego kit for useful objects. Collaboration can be a principle to strive towards, or can be integrated into the project by design. OpenStructures intends the latter approach -- like an open jigsaw puzzle, pieces created by anyone can fit into anybody else's composition. If circular principles like Cradle2Cradle are for materials, and second-hand circuits are for entire objects, OpenStructures enables and encourages the circulation of components of modular systems that "should generate objects of which it is not entirely clear anymore who designed them" (De Decker). Each part, component, or structure is documented and indexed in an online database —a Library of Babel for things.

At first sight, this level of standardisation may seem to imply severe restrictions and rigid rules, and to be at odds with the values of freedom and autonomy associated with DIY[ii]. Embracing open standards and interoperability, however, can be beneficial in efforts to counter the fragmentation and incompatibility of self-made, and therefore unique, components. This principle is, after all, also at the core of networked technologies – without telecommunication standards, the Internet would simply not exist. It is no coincidence that peer production first became apparent and effective in software

[i] As the main source of information for OpenStructures (as well as later case studies) is their online presence, most references are given without page numbers.
[ii] It may also indicate as a very designerly expression of an obsessive-compulsive behaviour; see the neat arrangement of components over the grid.

development. The immateriality of software provided the ideal conditions for the development of successful examples of peer production, where Internet-based collaboration requires little investment other than labour time and already-existing hardware, thus facilitating the contributions of others. The organisation of software and hardware design along the lines of P2P principles can be comparable to the valorisation of creativity and knowledge production. However, it has been extensively debated whether the methods of software development can be as successful in the domain of product design, where upfront costs and investment imperatives are unavoidable. After all, without raw materials, shaping moulds or physical prototypes, not many products can be designed. Still, OpenStructures follows the models initiated in software, with the intention being to adapt them to physical objects. It does this by encouraging modularity of design and the self-appointment of tasks, and arranges collaborations in autonomous temporalities (as opposed to real-time collaborations). Modularity is the key to countering the division of labour, and subsequently, to lowering the threshold for participation. Smaller sub-projects are more manageable than vast design problems, and subdivisions and components are useful for the distribution of tasks in a project, each having autonomy in their respective roles. However it is yet to be determined if the supply of free creativity can match the demand of specific development tasks, or in other words, if the tension between the holistic solutions to design problems and modular contributions to distributed development can be resolved. Lommée expresses a clear preference for the latter approach:

> ***Designing within certain common standards will require a different mindset from all stakeholders of the design process. In order to think "within the box", in order to accept and embrace the new opportunities that emerge out of common restrictions, we need to acknowledge that we are part of a bigger whole, rather than being the whole itself. It requires us to give up the myth of creating "something new", something that "hasn't been done before", and to replace it by a willingness to dissolve into bigger projects that just make common sense. This new mindset will severely damage the romantic ideal of the "designer-***

creator" and shift it towards the "designer-collaborator". ('Esperanto' 95)

Lommée encourages the new generation of designers to both cultivate humble approaches to define their own roles, and to search together for ever bigger, collective goals. Global collaborative projects like Wikipedia or Linux are, according to Lommée, "challenging —and outperforming— the individual achievements of some of our brightest, leaving us with no other choice than to acknowledge the limits of our individual projects and participate in these larger collusive processes" ('OpenStructures' 68). In comparison to taking part in such grand projects, the lone designer figure of the present appears old-fashioned and outdated, as the genius inventor of early industrial innovations. The underlying assumption is that a single designer (or alternatively, a design studio with a hundred workers) that secretly develops closed and "finished" objects from scratch cannot compete with globally connected, swarming creativity that relentlessly improves and diversifies the outcome? OpenStructures responds to the latest developments in network technologies as well as maker cultures by presenting itself as research in modularity, meant "to rethink its potential within a network context —because we live in a network context" (Lommée, interview). Ultimately, modularity is not sought as a functionalist end-goal in terms of how objects interact, but as a means of coming up with more collaborative design principles, based on how designers interact. Instead of one designer proposing a closed system of objects with many uses, OpenStructures brings together many designers into an open system each time for the development of a single-use object. In this way, the objects mirror their development, in that it is through modularised design work that modular designs emerge. This is equally valid at the opposite end of the spectrum, as when products are designed in-house with the highest level of secrecy, as exemplified by Apple (Julier, *Object* 479), the resulting objects are as integrated and sealed off as the company itself. Design products themselves can thus become legible from an analysis of the organisation of their design labour. That said, things are rarely designed once and for all, as designs are subject to transformations over time, and even more so if they are open-ended, modular and collaborative projects. In the next section, I explore how modifications and reappropriations are negotiated among "designer-collaborators", or peer designers.

2. Hacking Households, forking OpenStructures

The OS Boiler and Transparent Tools were only part of the initial batch of home appliances that Jesse Howard worked on. In 2014, he led a group of designers, hackers and makers that responded to a callout to develop "Hacking Households" as part of the Biennial of Design in Ljubljana. After a 3-day kick-off gathering where Thomas Lommée presented the OpenStructures project, they continued collaborating via online brainstorming tools, and met a few times to accelerate the process, only six months before the exhibition opening. The project resulted in a collection of fans and a mixer, all built around a rotational motor, thus sharing a common logic and interchangeable components. At the time of the exhibition, the basic fan was functional, including its electronic components, while the heater and mixer remained in the early prototype stages due to time constraints. The video accompanying the project features stop-motion animated components that change dimensions according to given parameters, and in which objects seem to self-assemble without any human agency [see fig. 8]. In fact, the only human intervention depicted is a hand switching on the fan, first with a button and then via a smartphone. A voice-over calmly explains the process, with additional text overlays that to provide emphasis:

> ***This is a fan. Its life is composed of four steps. You buy it, you use it, it breaks, you throw it away. This object is closed —let's start from scratch.***
> ***This is a block. You can define its width or its height. You can also change its shape, or change its material. Now you have a collection of blocks —and this is an object.***
> ***This is another object —a fan. You can adjust its height, or change the number of blades, their shape or their colour. You can add blocks that add new sophisticated interfaces to the fan. (...) You can add a block that extends the fan's function, turning it into a heater. Or the same blocks and components can be recombined, transforming it into a complete new object — a mixer. Iterating this process can generate a family of devices in which functional blocks and structures are shared among***

***different objects, and each new object can evolve from existing ones —a whole ecosystem of open products.* (Hacking Households)**

A recombination of components, generative structures, an ecosystem of open products – this is the set of promises made by OpenStructures. Then what exactly sets this project apart? After all, it seems to comply with the ırules of thumbı of disassembly, recyclability, and to a certain extent, grid compatibility. Yet there is no mention of OpenStructures as an inspiration, nor are the designs available on the database. Does this implicit "declaration of independence" reveal the limits of collaborative design principles? This fragmentation of open-modular systems may appear to be a failure to engage designers in production for the platform, especially for OpenStructure, which claims to be "the most diverse modular system in the world" (qtd. in King). However, instead of seeking strictly active collaboration and collective decision making, it can also be seen as a respectful distance between likeminded yet autonomous projects that contribute to a larger common pool of knowledge. Here we encounter a principle that has clearly been adopted from software development: "forking", referring to the proposal of a derivative that retains aspects of an open project while developing other aspects further, without necessarily claiming to be the definitive progression of the original. Howard gives several reasons for choosing a forking approach. While the Hacking Households team are familiar with and sympathetic to the OpenStructures principles, the exploration of parametric processes was prioritised over the finalisation of definitive objects, and since then, their investigation has shifted towards logistics and economics, or in Howard's words, "designing the system in a way that bridges the design world to the maker world", where such objects can be developed further. Lommée equally shares such concerns, and there would seem to be space for cross-pollination, increasing the chance of generating diverse strategies.

The results of such mutual inspirations are apparent in the more recent video introducing the OpenStructures project [see fig. 9]. Similar to the Hacking Households video, it also features a stop-motion animation of objects over a blank background, but without a voiceover. It begins with an object entering the spotlight to applause and a drum roll – a Lamp Shade, designed by Marianne Cardon (FR), prototyped at FabLab Brussels (BE) and produced through vacuum forming. The Lamp Shade hops onto a perforated panel, held together by a shelf

pin, a wooden stick, a rivet and a screw, all of which are found to be compatible with the holes that match the OS grid specifications. The Lamp Shade then whirls around and doubles itself, meets a wooden baseplate and a laser-cut half metal arrow to become a Bedside Lamp, "configured by" Marianne Cardon and containing OS parts by Pia Jacques. The next adventure of the Lamp Shade develops together with the evolution of the 3D printed Clip 1.0, designed by Maxime Loiseau. The lamp first reveals Clip 1.1, edited by Florian Bédé, and made through additive manufacturing, and then Clip 1.2 by Marianne Cardon, made through a sintering technique. The duo is joined by a handcrafted marble baseplate designed by Christiane Hoegner, and then assembled with a standard wooden stick and custom ball joint plates to become a Desklamp "configured by" Thomas Lommée. In the third, comical act, all of the previous components make a final apparition, accompanied by a tube scaffolding and a car clip. They gather on top of the OS grid, extending to the horizon, and attempt to self-assemble once more, this time becoming a dysfunctional composition that quickly comes apart, to the amusement of the invisible audience. They neatly fall into place over the grid, and the tagline is spoken –each word by a different voice: "OpenStructures: It all works together or it doesn't work at all." Instead of a chorus chanting in absolute harmony, this rendering of a collaboration does not seek perfectly coordinated efforts; but rather endorses individuality to the point of embracing dissonance.

It is not only the objects that seem to be animated with intent, as their designs also have a life of their own. Each successive generation is placed on an evolutionary tree, carrying forward a genetic inheritance that is either expressed in mathematical formulae or complemented with version numbers, bringing product design all at once closer to biological structures, as well as to the programming language. Interest in generative and interchangeable systems comes not only from technical reasoning, it also expresses a sensibility to ecological systems. For the OpenStructures project, the ecological parallels are made explicit in the "structural buildup" of different scales [see fig. 10]. Borrowing from biology, the 4 cm by 4 cm squares are proposed as equivalent to cells, the parts (panels or beams) correspond to tissue, the components (such as drawers) to organs, the structures (kitchen or bathroom) to systems (respiratory or digestive) and the superstructures (like a house) to organisms. This echoes the long-standing influence of biomimicry in design, the interest in growth patterns and the fascination with scales that date back to the Arts and Crafts movement,

to metabolist architecture, or to the 1977 documentary film "Powers of Ten" by designers Charles and Ray Eames. What is novel is that open modularity offers a compelling imitation of evolutive mechanisms. "It adds the dimension of time" to design processes that are otherwise marked by a few sudden jumps and plenty of dead-ends (Lommée, *Open Modular Systems*). Contributors to a project do not collaborate in real-time, but rather build upon the previous works of others. Instead of conceiving objects from scratch, "they are upgrading, restoring and adding layers to an existing tissue" ('OpenStructures' 69), and knowledge gets transferred and accumulated over time. For Lommée, this has far deeper social implications:

> ***Each design object becomes a prototype, an update, a new version. If we shift from project to process, failure becomes opportunity and criticism becomes feedback, a different perspective we need to further develop and improve our ideas. If we see our society as something 'under construction', rather than something 'accomplished', we will free up space for progress.*** **('OpenStructures' 69)**

To see an object as a modest update to a collective effort instead of a proud achievement of an individual is not an insignificant request in a professional culture that is dominated by designer-brands, in a consumer culture where every new product is "revolutionary", and in a civilisation where the cult of the author as a solitary genius has been established ever since the Renaissance (Stillinger). Questions of authorship have become even more ambiguous in the context of firms that employ, control and own the creative labour of hundreds of designers under the banner of a single starchitect (Picon). After all, authorship and authority are not only related etymologically, as creative production grants makers exclusive rights over what can be done with that work in terms of ownership, circulation and modification. In this context, the absence of humans (designers, manufacturers and even users) from the assembly process in favour of objects and components "coming alive" is striking, although stop motion animation has become a recurrent strategy employed in such presentation videos. Several reasons for this can be put forward. First, downplaying the designer makes sense, considering the fact that there is no individual designer to which the object can be attributed, hence the credit is given not for designing, but for "configuring". The same kind of shift in roles may be true also for the

manufacturers, since they are supposedly supplanted by digital fabrication tools, with manual labour becoming redundant as they are subsequently reduced to the role of machine operators. Finally, the users of such objects can no longer be signified by the passive consumer stereotypes, but by more ambiguous subjectivities. What remains is, therefore, the objects themselves, in an aesthetic treatment that is not exactly one of commodity fetishism, and yet still expressing a relationship between things that exceeds their use-value. In the following section I will subject the case study to theoretical debates on the potentials and pitfalls of peer production, and investigate what values are produced or embodied in such projects.

3. Listening to commoner subjectivities

The goal of this chapter was to identify the organisational forms under which design practices lead to commoning, in which the current conditions of designers were theorised from a labour perspective, and to discuss the shifting approaches to design. A value-based analysis of design labour enabled me to see beyond the definitions of the latest trends and to visualise the broader dynamics. Designers are subject to either hierarchical or competitive working environments that conflict with design principles and ethics, and while there are increased opportunities for cooperation between designers, manufacturers, users and other stakeholders, collaborations between freely associated designers are not exactly widespread. While peer-to-peer theory has been an appropriate framework for the identification and examination of the commons-based valorisation of design labour, several critical challenges have been identified to the successful adaptation of these principles to product design. I put forward OpenStructures as a prime example of peer-to-peer principles applied and adapted to product design. This case study offers suggestions of how to overcome these difficulties through the introduction of open standards, distributed modularity and the forking of contributions. It hints at how designer-to-designer collaborations can be encouraged, organised and valorised, and testifies how peer-produced objects can reveal the organisation of their design labour, unlike the masking of social relations on the surface of commodities. What sets OpenStructures apart is the role of the designers, which cannot be explained entirely within the field of DIY or maker cultures, as they should instead be considered as designer-commoner subjectivities. This is why I conclude this chapter with an interview with Lommée, the initiator of OpenStructures. In listening to a designer-commoner subjectivity, my intention is not to take their words about their practice for granted, but to question the intentions, considerations and positions of this emergent subject. This will contribute to mapping where OpenStructures succeeds and fails, and the limitations of peer designing.

Thomas Lommée expresses his belief that "it is not the object that needs to be redesigned (...), but it is actually systems that produce the objects that need to be rethought" (*interview*). In other words, a designer must first redesign him/herself before designing anything else, since the designer is also part of that system. Such an open invitation with existential implications can be a catalyser as

much as a paralyser. In a system where everything from the smallest component to the largest superstructure is to be redesigned for everyone, where does one begin? Indeed, without concrete goals as part of a more extended project "roadmap", there is the risk of spreading the attention too thin over several fields or objects at the same time. When questioned about this lack of direction, Lommée states that he is aware of it, and claims that his approach is to leave it radically open intentionally for the first 6–7 years, and to experiment without limitations, regardless of whether it leads to successes or failures. Some patterns eventually emerge, with scaffolding systems, bikes and other small vehicles being the most promising fields so far. The other case studies addressed in the following chapters all have a much narrower focus in the development of a single item, and yet they remain an open-ended process that is still open to improvements and diversifications of the object. Lommée, however, prefers to approach his design project as a question rather than an answer, because "it allows you to try things out, and perhaps fail" (*interview*). As is the case with scientific inquiry, individual failure is no longer a failure if it generates collective learning, a common sense, and this apparent modesty has to be one of the qualities that sets OpenStructures apart. Lommée even confesses, "It is true that some things that I made don't work, it's really absurd" (*interview*). When asked if this is why OpenStructures was dubbed an "Esperanto of objects" by Domus Magazine – an admirable and beautiful idea of a common language that never fully materialised, he responds that almost all open projects have this limitation in common. Just like a language, OpenStructure is meant as an infinitely generative system in which designers and their designs understand and reconfigure each other.

There have been other modular and self-assembled systems, including such significant antecedents as the works of Ken Isaacs as well as Enzo Mari's *Autoprogettazione*, both from the 1970s. These were groundbreaking projects that countered industrial production by encouraging users to become producers. While such projects left their mark on design history, their impact remained limited, if not overwhelmed by globalised commodity flows. They were, after all, developed by a single designer and destined to individualised self-production, mass participation in design processes not yet being an option. It could be argued that modularity has been somewhat of a holy grail of industrial design, with everything fitting perfectly together, derived from a common language, leaving great freedom for adaptation according to needs and desires. Can

OpenStructures succeed where previous projects have failed? Can it deliver anything unprecedented? There are two contradictory signals that can be traced in the language employed to describe the purpose of the project. To begin with, the project declares a maximalist "ultimate goal" that includes everyone and everything all at once: "to initiate a universal, collaborative puzzle that allows the broadest range of people —from craftsmen to multinationals— to design, build and exchange the broadest range of modular components, resulting in a more flexible and scalable built environment" (OS, *About*). Since the first time the modernist project was contested (and subsequently abandoned), no designer has dared to formulate an agenda in the manner of the early industrial design manifestos of universalism, broad adoption and harmony reestablished. The OpenStructures slogan "it all works together or it doesn't work at all" also expresses such grand all-or-nothing ambitions, an ambiguity in line with the postcapitalist project of redesigning everything. On the other hand, this attitude is nonetheless counterbalanced by the careful wording of a cautious and modest research programme. The project is defined on its website as an experiment that "tries to find out what happens if" an open modular system is adopted, and "what the opportunities and limitations" are, "and under which conditions it will prove to be most efficient and favourable" (OS, *About*). Similarly, when questioned about his ambitions, instead of proselytising the superiority of open modular systems in order to impose them on everyone, Lommée insists his aim is not to make everything modular. He expresses his wish being to reach to only 1% of designers and makers, which would be for him already an exceptionally diverse and valuable system. The paradox between offering infinite adaptability while avoiding the mainstream is best captured in Lommée's prediction that "The next big thing will be a lot of small things" (Small) – which was a slogan that was immortalised in a mural at the University of Ghent. Perhaps this can be read as a multiplicity of smaller commons replacing one big commodity-machine.

It is in the same spirit that Lommée qualifies his design studio as "pragmatic utopian" (an oxymoron used also by the architect Bjarke Ingels). This is a fitting description for a designer-commoner: while new opportunities and cultures may be emerging, there is no indication of a complete overhaul of the economic system yet in sight —the challenge is then to negotiate a prefigurative pragmatism with a sense of speculative utopianism. Lommée states in no uncertain terms that he does not believe one system will replace the other, claiming "sometimes the commons will do a better job, other times the classical

systems will prevail" ('Esperanto'). This lack of a clear-cut directionality leads Lommée, among others, to endorse and navigate both worlds, expecting that in all likelihood market and commons-based regimes will most likely cohabit. It would seem likely that where the two models overlap and result in hybrid forms, economic mutants with both proprietary and collective characteristics will emerge. This ambivalent stance is indicative of the generalised "identity crisis" that many similar projects experience when they confront the reality of the economy and are dominated by the disciplinary power of the market. While recognising that "the open-source hardware movement is based on a desire to create new economies of production" (qtd. in King), Lommée also celebrates the marketplace as the "ultimate forum" (OS, *About*). At the same time, he affirms that "OS is not something that can be marketed — the moment you market it, it starts to self-destroy" (qtd. in Sacchetti). He is careful to distinguish between "open modularity" and "open-source", suggesting that the modular system is open to anyone to add components, although the existing components may not necessarily be open-sourced themselves. He is not against the intellectual protection of some components, mainly due to the upfront investment costs that are necessary for their development. Lommée questions, however, "what happens if a garage maker open-sources something and a big company downloads it and has the means to pay for that mould, and they get even richer with your idea?" (*interview*). Just like a commoner, he distinguishes between sharing with other commoners for mutual benefit and allowing a free-riding capitalist to steal his labour. This dilemma will be addressed in the next chapter with specific terms of licensing, although it is already apparent that just like any other commons, modalities of inclusivity and access depend on the contribution of participants, protecting the commons against simply "giving away" to free-riders.

This carefully welcoming attitude towards collaboration strikes me as a refreshing stance when compared to how creative workers are usually portrayed. They are presented either as a daring entrepreneurs in cut-throat competition, or a self-exploited and isolated victim of precarity (De Peuter and S. Cohen, in Oakley and O'Connor 305). Instead, it is with attentiveness to the community that the designer-commoner transcends individualism, however deeply engrained that might be. One part of that effort necessitates being able to attract and retain peer producers to the project in the first place, which is a constant challenge for Lommée: "I also have a responsibility towards the users, because

otherwise they just go to another forum. I have to make this platform the most successful, the most attractive, open, transparent vehicle, if not, I won't have a community" (*interview*). In that sense, the community becomes the ultimate asset, or the infrastructure that sustains all the activities, and there needs to be a continuous flow of reasons and benefits for coming back, to keep contributing and bringing in new collaborators. If one challenge is to broaden the base, the other effort is to maintain consistency and harmony within the community. In another interview, Lommée insists that "the use of OS should derive from a shared mindset (...), its users should understand the value of OS and share this kind of common value, or believe in the sense of doing and designing things in such a way" (qtd. in Sacchetti). The normative tone and the insistence on a common understanding and shared values may appear dubious, especially for a system that prides itself in its diversity and modularity. Still, not unlike the grid itself, a coherent social code is necessary to make the openness regenerative and sustainable. What remains undefined is whose values are to be prioritised, and how will the community get to modify and modulate them. There is no indication that the sense of community around such a distributed, modular system would ever evolve into a lasting and reliable cooperative endeavour. That said, there are plenty of reasons why creative labourers would institute worker cooperatives that provide livelihoods, autonomy, solidarity and community all at once, while contributing to cultural commons at large (Sandoval 67).

Throughout this survey of designers as immaterial workers, co-creators and peer producers, I have determined several preconditions for the actualisation of their latent commoner potentials. Firstly, peer-designers need to be able to sustain themselves and maintain viable livelihoods if they are to engage in alternative value practices. Secondly, the establishment of open design cooperatives based on the free association of peer-designers appears to be essential for the reproduction of commoner subjectivities. Thirdly, the success or failure of such commons-producing design communities depends on their capacity to claim an autonomous sphere for the valorisation of their labour. Ultimately, if these institutions of collective action are to tackle collective design problems and co-design an exit from capitalism, an alignment of individual, collective and social goals needs to take place. The analysis of design artefacts and discourses from a labour perspective revealed remarkable developments in the networked, cooperative labour relations that exist among designers and in the reproduction of designer-commoner subjectivities. While they remain

entangled with the commodity-machine, to a certain extent, their latent potentials could still be made legible through the lens of commoning. These case studies inhabit both temporalities simultaneously, and constitute the first instance of postcapitalist design practices in this study. Where the journey of a designer subject ends, the autonomous journey of a design project begins. In the next chapter, I investigate how commoning occurs in the circulation of open-source design projects.

Chapter III. Open Blueprints: Instituting the *"Wikipedia of Things"*

After adopting the designer's point of view in the previous chapter, and considering *peer designing* as a form of collaborative knowledge production, this chapter charts what happens to the fruits of such design labour. To this end, I switch focus to approach design through blueprints, i.e., the documentation made available to access, modify and distribute the knowledge that is produced. Once something is designed, the knowledge of how to produce that thing becomes separated from the labourer and encapsulated in the blueprint. The resulting design knowledge is not merely a series of instructions, but rather a factor of production on its own, and the determinant factor in the valorisation of design, operating in an entirely different class of relations to the economics of design labour. I use the term "design blueprint" distinctly from the previously defined "design project". A design project is understood in the broadest sense as an effort to achieve, build or improve something, an undertaking that may yet be incomplete that involves several actors, stages or outcomes, and that is usually driven by a central idea, principle or interrogation. While design projects are ideal cultural objects that are worthy of research, revealing themselves through discourses, activities and artefacts, design blueprint, on the other hand, is a narrower, more technical term, indicating a visual representation and detailed instructions of all the knowledge needed to build, produce or assemble the desired object. While other techniques have long replaced the chemical process at the origin of the word, the term "blueprint" implies that reproduction has been an essential characteristic of a technical drawing. It would seem then to be appropriate to rejuvenate this term for the digital era, even if the preferred

medium is now computer screens. The distinction is relevant, as a design project contains more than just blueprints, comprising also social relations, institutional frameworks, and legal and financial arrangements, all of which are knitted around the blueprints. A reference book on open design defines blueprints as follows:

> ***Blueprints are representations of objects-to-be of the highest technical order. Combining the technical drawing and the instructions on how to execute that drawing, the CAD file you send and squeeze into any sort of printer can be regarded as such. Blueprints and their derivatives form an essential component of open design, as they are the appearance of design in the form of content-to-be-materialized.*** **(Abel et al.)**

A blueprint is, by definition, a copy. It is meant to be reproduced so that the design can be replicated. If that knowledge is available in a digitally reproducible form, then it is subject to the economics of information, and should cost virtually nothing when abundantly copied. In other words, even under market conditions, a blueprint is meant to have "zero marginal costs" (Rifkin), or to be circulated freely. However, the (re)production, circulation and ownership of information, knowledge and immaterial goods obey an entirely different set of rules under the commodity-machine. While computers facilitate digital reproduction, they do not spontaneously give way to free circulation. Designs remain locked inside computers, not as a result of technical limitations, but because of legal and economic obstacles that are artificially implemented and enforced. Laws regulate the ownership of knowledge and information, and as a result, the ability to set an arbitrarily established market price and the extraction of a commission from every additional copy. Different "intellectual property rights" (IPR) regimes apply depending on the kind of content, with copyrights, patents and trademarks applicable to distinct objects, such as artworks, inventions or identities. If copyright regulates the conditions in which royalties are claimed from every reproduction of an artwork, patents are meant to keep inventions out of circulation, to be licensed only on a case-by-case basis. Design blueprints have historically been rather loosely covered by the iron law of IPR (Boldrin and Levine 69), and it is difficult to categorise what counts as inspiration, imitation or counterfeiting. For the lack of a better word, I use the shorthand "CopyRent" to refer to the IPR applied to design blueprints. Instead of a "right", what is in fact

granted is a "rent" —in an accumulative instead of productive relationship with intellectual property. CopyRenting is foundational to the commodity-machine, as when designs are CopyRented, the designers are expropriated from the fruit of their labour, and what they produce is enclosed by their employer or client, to the expense of everyone else that could benefit from that knowledge.

Patents were originally intended to give relative control to inventors, allowing them to enjoy exclusive rights in the form of returns on their investment for a limited time, thus providing them with sufficient livelihood to pursue further innovations. The creation of a public depository of patents was meant to protect solitary inventors that would otherwise be defenceless against more prominent competitors. Nowadays, however, the situation is reversed, with large multinationals and "patent trolls" who stockpile patents to stave off competition, sue each other in "patent wars", and lobby to expand the prevailing CopyRent laws to own life forms. At the same time, they feel threatened by collective efforts to copy, hack or reverse-engineer their products, to restrict fair use and to delay expiration dates. The combined consequence of all these pursuits is the stifling of innovation (except in legal constructs), cross-pollination of best practices, and ultimately productivity (Boldrin and Levine 69). The second consequence of CopyRent is the introduction of an artificial scarcity that reduces the spread, and therefore, the utility of information. In a vicious circle, the less a blueprint is reproduced, the less useful it is, and the less value it generates. In other words, the entire circuit of ownership and trade, and the resulting scarcity of ideas, renders design blueprints less productive of further valorisation, limiting their full economic potential. This chapter looks resolutely at the opposite paradigm of commoning blueprints, being the case for *open blueprints*, which overcome the limitations of CopyRent, investigating how they constitute a precondition for unsustaining the commodity-machine. The chapter begins by setting the terrain, advancing design blueprint as essential concepts for the theorisation of design in the age of digital reproduction. The second part expands on the qualities of openness of blueprints, and discusses the implications on the design project itself. This midway chapter is pivotal to the thesis in more than one sense, by centring on design projects as an interface between human subjects and material objects, as serving as a bridge between the constraints of late capitalism and the latent potentials of postcapitalism.

A. Blueprints:
Infinite reproduction for digital fabrication

In this section, I make an analysis of OpenDesk as an example of blueprint-driven design practice, following their self-production from the computer screen to the physical object. Do the designs themselves have a steep learning curve, or are they as easy as IKEA assembly? Is there room for modularity, customisation or improvements to the original design? The intention here is to interrogate whether or not the blueprints are sufficiently self-explanatory and easy enough to build, and to look at how additional assembly guides, web platforms and the like are designed to facilitate the diffusion and appropriation of designs. I conclude that more than blueprints are needed if openness is to be achieved.

1. Cakes and Recipes

I am writing this introduction while sitting on my chair in front of my desk. This self-evident statement warrants taking a moment to interrogate the infrastructure that is necessary for me to engage in my work: a computer, a public library, fibre-optic cables running beneath the Atlantic, and at the most physical level, a chair and a desk. I recall once again André Gorz remarking how we live in a civilisation in which one's production and consumption are entirely separate spheres of activities. The statement suddenly makes me sit less comfortably on my ergonomically optimised, elaborately cushioned, petrochemical office chair. I realise that I have no connection whatsoever with the production of the artificial environment that surrounds me. From the political-economy angle of this research, I can conclude that I have very little control over the means of production of my research; they are all produced, owned and managed by anonymous others. What if I had been involved in the production of some of my very means of production? Perhaps the chair and the desk would be the easiest ones to begin with, yet also the most consequential ones in terms of the immediate experience. Instead of engaging in the standard consumer experience of buying and assembling some IKEA furniture —designed in Sweden, manufactured in Poland and tax-evaded in the Netherlands— I could choose to commission a carpenter to produce them for me. Alternatively, I could improvise a clumsy bricolage myself, even though I lack the practical skills. The first two would be embedded in exchange relations, whereas the latter would be a solitary demonstration of self-reliance. The options, however, do not end there. As this section will explore, there may be other ways one can make one's own furniture, in collaboration with others, and yet outside DIY, traditional crafts and the commodity-machine.

OpenDesk promises such a new modality in the form of "Open Making". Facilitated by the Internet, the core vision of Open Making is to liberate design knowledge by placing design blueprints in free circulation. Relying on digital manufacturing techniques, it also adapts generic, essential products to an entirely different supply chain to production, where land and labour are cheap, requiring shipping long distances to retailers. Using only plywood sheets

processed by a CNC machine[i], OpenDesk proposes a range of office furniture that is "designed everywhere, made here" (OD, *Inside*) – a critical reversal of the "designed in California, assembled in China" labels on Apple products. The slogan itself hints at the origins of the project. When the designers at Architecture 00 ("Zero Zero"), the London-based collaborative architecture studio, were commissioned in 2011 to develop a consistent interior for both the London and New York offices of a company, the design team faced the challenge of how to produce the same products on both sides of the Atlantic, without having to ship furniture overseas? The solution was best encapsulated in the saying (often attributed to Keynes) that "it is easier to ship recipes than cakes and biscuits", or in this case, shipping design blueprints instead of objects, to be produced by through digital manufacturing techniques, following the same specifications and standards. Following the principle of "shipping files, not furniture", since the CNC millers required to produce the furniture are also available elsewhere, the same designs could potentially be produced anywhere. By publishing open design blueprints for generic office furniture, the designers could then reach a considerably larger audience than the specific client that commissioned the designs, connecting three communities in a "global platform for local making" (OD, *Open Making*). OpenDesk presents its commercial operations as follows:

> ***Opendesk is an online furniture marketplace built to disrupt the traditional 20th century model of mass production. We don't have a factory or a warehouse, and we don't ship furniture around the world. Instead we connect customers to independent makers from our global network. We're able to kit out workplaces around the world quickly, affordably and locally — all thanks to distributed, on-demand manufacturing.*** **(OD, *Why*)**

In this peculiar marketplace, visitors are provided with several options rather than the ubiquitous "buy now!" button that activates credit cards, warehouse stocks and shipping containers. There is strictly no stocked furniture, with everything being produced on demand, reducing excess and waste. It provides links to the nearest maker-spaces registered in the OpenDesk network where one

[i] CNC, standing for "computer numerical control", is the general term used for digital manufacturing machines featuring the automated control of tools.

can ask for a quote to get it made, with a royalty fee for the designer and the platform included in the price alongside the production costs. Next to this relatively novel yet still conventionally commercial method, the blueprints are freely available for download, intended for self-made, non-commercial use, defined as "with no intention to gain commercial advantage or monetary compensation" (OD, *Non-Commercial*). There are several scenarios of non-commercial use imaginable: a DIY enthusiast making their own furniture for home or office, teachers or students producing for educational purposes, or volunteers manufacturing for a non-profit project. As long as the final users do not outsource production to commercial makers, no money changes hands between the maker and the user (other than to acquire the raw materials and to rent the machines). In this scenario, the designer does not charge for the blueprints either, and anyone can benefit from their content, "whilst also attempting to prevent commercial activity falling outside of their control" (OD, *Non-Commercial*). This non-commercial principle is a model that warrants closer attention, as it opens up a generous space in which commoning opportunities can develop. Finally, if a client needs a customised outfitting of their office instead of generic pieces, it is possible to commission OpenDesk's design studio directly. In this case, the private commission also serves as a research and development phase for new open design blueprints, thus making the market relation work for the commons. Although presented in the most conventional commercial form, this modality appears to be even more productive of shared value than non-market relations, illustrating hybrid economic forms that exemplify postcapitalist practices.

There are some prominent design considerations that are common to most OpenDesk furniture: an assemblage of pieces nested on a plywood sheet with no or little hardware. Designing flat-pack furniture is not a new invention – the technique was popularised (if not perfected) by IKEA several decades ago. Considering the only novelty is adapting the designs to existing digital fabrication methods, the OpenDesk project has made considerable progress in a relatively short time: the website lists more than 30 designs by a dozen designers and hundreds of makers, and has witnessed thousands of downloads. Unlike WikiHouse, which is a foundation, OpenDesk is a company that maintains the platform, provides royalties to designers and generates profit through commissioning clients. The platform also features a "Design Studio" – an online catalogue that gives the user the opportunity to suggest and rate flat pack

furniture designs that they would like to see added to the collection, as well as a Workshop to submit and showcase built examples of OpenDesk designs.[ii] These additional features of the platform replace such traditional market research methods as focus groups and satisfaction surveys. A simple submission form on the website collects suggestions: "I wish OpenDesk would [let me do something I can't do]" (OD, *Wish*). Neither an absolute consumerist wish list, nor a complete self-reliant DIY attitude, OpenDesk seeks to appeal to everyone else in-between. A common misunderstanding is that Open Making is essentially "DIY v2.0" – home improvement with a superfluous high-tech edge. However, Open Making is not meant to preach absolute self-reliance or a return to traditional craftsmanship. Instead, it proposes a "new deal" between designers, makers and users, bypassing the existing market structures and generating new forms of social relations. Open Making may attract several subjectivities. A designer looking for global recognition and distribution without having to go after mass-market consumerism can choose "their own licence terms and retain all the rights to their work" (OD, *Designer*). A maker that seeks to generate a new source of income can produce "well-mastered designs for local customers" (OD, *Maker*). For a potential IKEA customer that prefers a local, fair-priced and personalised alternative (or any consumer who would like to have "designer furniture") but that cannot afford it, OpenDesk can fulfil such needs and desires. Put together, they claim to be "building the world's most equitable & distributed supply chain" (OD, *Designer*).

This radical inclusivity and extreme accessibility demands an appropriate method for the testing of these claims so as to gain a more nuanced understanding. Beyond the study of discourse and visual representations, and the analysis of blueprints and artefacts, it is also possible to engage with the production of the object itself. If Open Making results in a multiplicity of non-industrial, non-market based unique objects with common characteristics, then there is no single supply chain or predominant consumer profile to analyse. Instead, understanding the unmediated subjective experience of the production process can reveal aspects that the mediation of words and images cannot. In this way, the prefigurative possibilities of the project can be grounded in hard facts and current challenges, rather than remaining at the level of theoretical

[ii] Newer versions of the website after 2016 no longer feature the Design Studio, but provide more information for designers and makers to get started with Open Making.

speculation of its future potentials. By building the objects myself, I intend to reveal and explore the social relations that are invisible in the final product. While not a complete practice-based or action research methodology, this self-reflexive exploration can therefore help to bring into focus the subjective processes that shape (and are shaped back by) the technologies employed in the making. Trained as a designer, but a complete beginner as a digital manufacturer, the multiple subjectivities I inhabit will help me engage critically with the project and interrogate the principles of Open Making first hand. First, as a designer, I will study the readily available blueprints and modify and adapt them to my personal use. Once the designs are ready, I will then assume the role of the maker and fabricate the objects with a CNC miller. At the end of the production process, I will finally become the user of the objects, without being a consumer in the market sense. More than a consumer object, an office desk and a chair constitute the minimum physical infrastructure for intellectual labour in which I engage as a researcher. Hence, by producing OpenDesk furniture for my own use, I become a case study for the self-production of the means of production. Following the Marxian dialectic, not only will I be producing an object for myself, but my own subjective relation to the object will also be produced in that process.

2. The Making of OpenDesk

The journey to make one's own OpenDesk starts without an IKEA catalogue or trips to the "big blue box" outlets. Not unlike any other e-commerce experience, the online catalogue is the starting point for the choice of furniture. The website features beautifully photographed workshops in Mexico, Brazil and England, capturing makers operating CNC millers, sanding, gluing or finishing furniture pieces, illustrating the fair, wholesome conditions in which OpenDesk products are claimed to be made. Examples of the various mgels made of birch plywood are presented in airy, contextless photography (with some models also viewable in augmented reality) are presented next to descriptions filled with superlatives. Within the range, two models stand out for personal use. The Layout Table by Josh Worley comes with a single customisable drawer and a reversible tabletop, designed for creative work; while the Studio Desk by Joni Steiner is more appropriate as a computer workstation, featuring a cable tray and a customisable access cover. Both products appear then as designed both by and for the designers themselves. In a sense, as creative and knowledge workers, they become their own target audience. Next to the desks, two chairs are also worthy of mention: the Kerf Chair by Boris Goldberg is striking with its bent surface and use of colours, while the Roxanne Chair by Pierrick Faure seems to be the simplest model with the most efficient use of materials. For the purpose of this study, I have chosen the Studio Desk v1.1.3 together with Roxanne Chair v2.0, which are cut out of two sheets of standard 18 mm thick 2440x1220mm plywood [see fig. 11]. By downloading the cutting files, I was granted a Creative Commons BY-NC license, which allows me to share and modify the designs as long as I provide accurate credit, and produce for non-commercial uses. This is the crucial moment, being without market mediation, marking the beginning of the free circulation of design blueprints, thus enabling further non-commercial instances along the production process.

Since orderly, informative and well-presented documentation is essential for the reproduction of an open blueprint, all of the knowledge made available for potential makers warrants particular attention. The blueprint itself comes as a DXF file (universal format for computer-aided design models) containing the drawings [see fig. 12]. In the course of the project, I identified several errors in

these files[i], and so a detailed study of the blueprints, which are shared "as is", is very important, since the responsibility for any errors resides entirely with the maker, as expressed explicitly in the terms and conditions, with no guarantees provided by OpenDesk. There are also some generic fabrication guidelines explaining the basics of CNC machines, but since the software may vary from one machine to another, it is impossible to cover every eventuality. Once the pieces are cut, however, the rest is supposedly straightforward[ii]: a typical guide in axonometric projection presents step-by-step assembly instructions for the desk, including the required tools (such as a mallet, glue and sandpaper) and explanations of various types of fit and finishing [see fig. 13]. The website also features an extensive FAQ for designers and makers, which covers most of the specifications for the entire process. While the documentation may appear exhaustive and perhaps even intimidating for a beginner, it remains incomplete, as some crucial information is nowhere to be found. For instance, there is no indication of the weight of the final object, no transparently listed cost sheets, and no approximate cutting or finishing time, which are perhaps the essential pieces of information for a professional. In other words, there is no way to "preview" the entire process without a prototype – in short, part of the knowledge is only attainable by experiment.

Before initiating this experiment, I devised an exceptionally convenient scenario. I would borrow a shared cargo bike to pick up the sustainable Baltic birch plywood sheets from the nearest lumber store and take it to the neighbouring maker-space, both situated less than a kilometre away from my home. The local shared machine shop offers, among other digital manufacturing tools, a self-assembled CNC miller. This would have been an ideal prefigurative practice, demonstrating a production process almost entirely disentangled from global markets and industrial infrastructure (with the exception of the engineered wood), although it soon became apparent that this was an overly optimistic expectation. First, since the lumber store was out of stock of the desired material, I ended up visiting three more stores to compare their prices—

[i] The test cutting sheet was not functional, and a pocket to be cut on the reverse face of the tabletop was on the front face instead. These issues have been solved on later versions of the files.

[ii] The assembly guide for the chair was not available at the time of production, but it was relatively easy to put the 10 pieces together.

acting according to the rational market behaviour of a self-interested individual. Between the cheap but uncertified and high quality but expensive options, I chose a middle-range, FSC-certified plywood, which had to be picked up by a van. Another challenge was arranging a place to cut the plywood, since the maker-space nearby lacked the staff to supervise the CNC miller for an entire day; with only a few volunteers who did not yet know how to operate the self-built machine. In the end, a private workshop in Krommenie (25 km north of Amsterdam), shared by six craftspeople, generously offered to facilitate the process. I may have been particularly lucky to find this opportunity to use the machine for free, as it could have cost more than €40 per hour. Maartje, the furniture maker who taught me how to operate the machine, explained that the CNC miller was acquired mainly to obtain curved shapes for their high-end, unique furniture pieces, and said that this would be the first time it was to be used for a low-cost, open design project. It was mutually beneficial to find a common ground of experimentation and learning falling between my technological fascination and her aesthetic interests.

Over two workdays, under the curious gaze of Maartje's colleagues, we operated the machine to cut the two plywood sheets [see fig. 14]. Having studied the files in depth and being very much at ease with computers, I quickly grasped the intricacies of the process. First, the pockets at multiple depths, then the cut-outs, while being careful about whether to cut inside or outside the lines. There are many more parameters that need attention, such as the choice of cutting bits, speed of rotation, number of passes, the inclusion of tabs. In other words, the blueprints do not come "ready to print", as one needs to understand how and where each piece fits, to determine the right face then to cut them. While a less customisable, simplified version of the cutting files suited to quick and standardised production by non-professionals would conceivably be possible, the threshold is currently set to require the knowledge and experience of makers, which is more likely to deliver higher quality results. Simply put, it is similar to the perceived differences between the Linux and Mac operating systems. For some, the full freedom to modify every parameter is considered "more democratic", even though increased complexity ends up excluding most people. Conversely, for others, simplified processes are more accessible for the masses, even though they limit opportunities to hack and master the process — a conundrum requiring strategic choices or balancing acts with possibly more than one solution.

Coincidentally, an hour after having starting to cut the first sheet, OpenDesk's production manager sent me a slightly revised version (v1.1.5) of the desk. For a moment, I felt the same regret experienced when one's latest technological gadget gets supplanted by a newer model, rendering the old one less desirable. In the commodity-machine, this planned obsolescence is a driver of consumption and growth, but in this case, changes are predominantly introduced to improve the manufacturing process rather than the final product, and so my desk, based on that earlier blueprint, remains essentially the same as the new version. Based on the feedback by makers and users, the blueprints for both the desk and the chair have been updated over time (to v2.4.0 and v3.0.0 respectively), with the new versions offering increased material efficiency, a simplified assembly process or minor stylistic changes. In November 2017, a comprehensive "Tailoring" service was introduced for more than a dozen products. Using parametric models, it became possible to generate custom-sized blueprints to suit the exact length and width specified by the end-user, with some workstations shapeshifting between single-person to four-person dimensions, or meeting tables that accommodate from 8 to 14 people. Instead of standardised, one-size-fits-all designs for mass production, on-demand production makes both the blueprint and the artefact adaptive, resulting in an almost infinite number of variations to the original design. This testifies to OpenDesk's approach to blueprints as software; even though artefacts get frozen in time, the blueprint lives on.

Just as the blueprints do not come "ready to print", the cut components are not exactly "plug and play" either. Similar to a stack of printed paper that requires handcraft to be bound into a book, transforming the raw puzzle pieces into a smoothly finished piece of furniture is still the most labour intensive stage of production. The multiple sandings, oiling and assembly took no less than three additional workdays. These were undoubtedly not hyper-efficient, productivist working hours, but more akin to the slow-paced, gratifying time spent by a craft hobbyist. Eliminating stocks and producing on-demand, the time necessary to obtain a finished product is certainly longer than the streamlined assembly line to the big-box retail experience, which explains the high costs associated with commercial production. While I did not take the commercial route, my experience was similarly unlike to DIY – I did not design the furniture myself, nor did I cut the wood by hand or assemble it alone. Thanks

to the commoning of blueprints and machines, my role was one of maker, with a quite distinct set of responsibilities and sense of pride than a designer or a carpenter. Knowing that I used a blueprint created by a designer that worked on it far more than I could do by myself; knowing that I operated a machine infinitely more precise than my hands could ever be; and knowing that it is the product of a voluntary effort by many, the values that were at the forefront were cooperation rather than competition, sharing rather than selling, and joy rather than profit. Far away from the commodified satisfaction of a consumer feeling rewarded by the shopping experience, having witnessed the entire process, having known the wood in its raw form and the blueprint on the screen, I can take non-alienated, non-commodified pride in self-production. The resulting furniture is neither an artisanal object nor an industrial product, being of higher quality than that produced for the mass market, but more affordable than artisanal woodworking. It is yet to be seen how such furniture ages, but it is certainly not of the disposable kind.

3. Putting the pieces together

Whether its democratisation of design, its populist market expansion or its production of commons, the claims and intentions of Open Making are worthy of in-depth study to interrogate their accuracy and the extent to which they make a strong and effective move to unsustain the commodity-machine. After having presented the vision of Open Making and experienced the production of OpenDesk furniture, it is now possible to interrogate how close the claims come to reality. The economic performance of the project is the first aspect to assess, since the comparison of its commercial and non-commercial options as well as the market competition, as exemplified by IKEA, can provide the basis for further speculation on its impacts. Unlike a commercial product that benefits from countless Amazon customer reviews, I had almost nothing to consult to decide whether it would be a sound investment of my time and money. An opinion piece published in Dezeen magazine provided an unambiguous warning of how costly the operation would be: according to the author, the simplest children's stool (OpenDesk's Edie Stool) – stated to be a rather low-quality product – had cost £170 (McGuirk).[i] Undeterred by the estimated price indication of €500 (excluding VAT) for the Studio Desk, I requested quotes from local makers via the OpenDesk website before starting my own production, but received only one response from a workshop in the industrial harbour of Rotterdam matching the estimation, and with more than 20% added for platform fees and honorarium for the designers. It would be safe to state that the commercial production of OpenDesk furniture is far from competitive, let alone affordable. Rather than intimidating potential makers and redirecting them to mass-produced options, this limitation may be a blessing if it encourages consumers to opt for self-production methods.

At the end of the process, the commercial price tag can be compared with the actual costs I incurred in my non-commercial production. The moment of purchase of two plywood sheets in exchange of €150 marked the essential

[i] In reality, the author misrepresents the costs, producing only a single stool from an entire plywood sheet. When produced in a batch of eight, the OpenDesk website estimates €54 per stool.

market-mediated instance of the production[ii]. The acquisition of raw materials constitutes the current limit to non-market relations – a seemingly inevitable stage of monetary exchange that will remain as long as the highly automated wood processing remains a commercial operation. This exchange, however, takes place in the first stage of the production process rather than with the consumption of the finished product. Shortening the commodified value chain and expanding non-commodified relations, the value added in the later non-commercial stages does not translate to higher prices. In other words, putting a value to the labour time and strictly considering the material costs, the cost of self-production is a fraction of the value-added market price—even less than the 20% mark-up for the designers in the commercial method. Self-production is also surprisingly inexpensive when compared to the predominant mass-produced alternatives, and there are no equivalent products at IKEA obtainable for a similar price. Labour is without doubt the main factor in production and leading source of value, and is the most critical piece of the process to be disentangled from the commodity-machine. For the current project, I utilized my own, free and autonomous production rather than employing anonymous, alienated and low-paid wage labour. I was thus able to benefit from the social relations of commoning – I downloaded the open blueprints, I was given access to an idle CNC machine, and a carpenter friend dedicated his time and labour. None of this is accounted for in monetary terms, although there is an indisputable creation of value, as encapsulated by the furniture itself. In his opinion piece, McGuirk dismisses the social value of Open Making, arguing that "there's nothing particularly 'social' about watching a machine drill through plywood to some algorithmic configuration". This misses the point by searching for socialisation in the machinery, while it is precisely during the rest of the process that social relations are meant to occur. In my case, it was fortuitous and ephemeral social relations that enabled this value creation, whereas for McGuirk's children stool, these options must have been unsolicited or absent. The generalisation of such practices requires socialised institutions to provide a viable alternative to commodified relations.

[ii] While the workshop with the CNC machine was offered to me for free, I nonetheless donated €50 to cover some of the expenses, including electricity, milling bit, sandpaper, glue and linseed oil.

Such logistical, financial and social factors serve to highlight the limitations of relying on the power of blueprints alone. However ingenious a design may be, its blueprints may not sufficiently communicate everything about the project from start to finish. While design blueprints can easily be shared, the rest of a project often remains opaque, since many factors are determined locally and cannot be easily generalised. Every replication potentially provides additional insights into making, and yet the knowledge produced by end-makers will remain isolated unless they are encouraged to document and share their findings. The more a design project is encapsulated in a blueprint, or alternatively, the more complete a blueprint becomes (making the entire project predictable), the more likely it will be adopted, circulated and reproduced, and hence the more successful that project becomes in terms of Open Making. In other words, if a project contains no blind spots in publicly available information, then it is more likely to achieve widespread circulation. My personal experience with the OpenDesk project may not amount to much in terms of extrapolating its conclusions to speculative heights, but it nonetheless marks a modest starting point for questioning its economic disruption potentialities. In a video interview featured in the Guardian with the bold title "A revolution in furniture design", Nick Ierodiaconou, co-founder of OpenDesk, is asked the provocative question: "Is this an anarchist furniture movement trying to topple the centralised industry?" The designer responds cautiously, claiming that it "doesn't necessarily need to subvert the existing market (...) the extent in which that will compete or not remains to be seen" (Wainwright). Elsewhere, OpenDesk's goal to reach the mainstream is perhaps best expressed as "[doing to] IKEA what Airbnb is doing to the hotel industry" (Hickey) —unlocking previously untapped distributed potential without massive investments in industrial infrastructure. Indeed, the idle capacity of the CNC-machine in the workshop where I cut my plywood sheet could be repurposed for the manufacture of more affordable furniture than their high-end products. Yet this comparison still obfuscates the crucial differences between Airbnb's rent-extractivist business model and OpenDesk's non-commercial Open Making, which allows and encourages non-market possibilities. In some sense, OpenDesk offers from one platform the non-commercial Couchsurfing-model alongside the commercial Airbnb-model. Asking whether OpenDesk is as disruptive as Airbnb (in both its positive and negative implications) may be misleading, in that disruption through direct competition ends up producing interchangeable commercial enterprises. It may instead be more relevant to see it as a form of détournement, subverting the

platform economy to unleash its commoning potentials. In the case of OpenDesk, some physical and social infrastructure is needed, alongside the digital platform, for its widespread adoption. Maker-spaces offering CNC-machines to public service akin to libraries, and basic universal income schemes liberating labour time would have such effects. In other words, while OpenDesk alone does not constitute a viable alternative all by itself, its combination with other postcapitalist measures could bring it to the same level of convenience and accessibility as libraries and photocopiers.

A welcome statement introduces the assembly guide: "The product you have in your hands is the result of a new model sitting at the union of the internet, new advancements in digital technologies, and age-old making techniques. We call this Open Making" (OD, *Assembly* 3). The first time I read these lines, I had no product in my hands, but only a PDF document on my screen. Why would an assembly guide downloaded together with the blueprints, manifestly before the production of the physical object, make such a factual distortion? Perhaps this amounts to the last vestiges of the typical copywriting devices of marketing. After all, no advertising or packaging precedes the experience of a non-commercial product; and there is no interface other than the assembly instructions to communicate as close as possible the final object. This struck me as a challenge to introduce a textual element to my production. As a modest creative intervention, I decided to engrave the two epigraphs of this thesis on the back support of the chairs [see fig. 15]: *"[We live in] a civilisation in which we produce nothing of what we consume and consume nothing of what we produce"* and *"Apocalypse is always easier to imagine than the strange and circuitous routes to what actually comes next."* With the former quote by André Gorz, the chair itself becomes evidence to the possibility of surpassing such a civilisation, introducing, however small, an instance of reunited production and consumption. The second quote, by Rebecca Solnit, suggests that even though the crisis of the commodity-machine may appear to be inescapable, viable alternatives may be disguised as pieces of a plywood chair, waiting to be assembled. Together, these quotes testify to the intertwined prefigurative and speculative dimensions of postcapitalist design.

The most remarkable statements from OpenDesk surfaced one year after my adventures in self-production, when the company professed their principles and

values in a Charter.[iii] Alongside such expressions as "positive change", "people and planet" and "consciousness and inclusivity" (which are rather commonplace in the literary genre of corporate responsibility), a few others stand out. For instance, "to generate value for our community, rather than replacing jobs through robotic automation" and "replacing 'Business as Usual' with 'Business as Mutual'" strike as novel commitments that are in line with postcapitalist intentions. More notably, there is an entire section dedicated to their learnings in experimentation with open blueprints:

> ***2. Practicing Openness, not just open-source***
> ***2.1 We're committed to Openness in everything we do. For us 'open' isn't just about about intellectual property. We commit to an Openness that is Transparent and Trustworthy; Fair and Equitable; Inclusive and Accessible; Supportive and Empowering; Plural and Inviting.***
> ***2.2 We operate a 'default open' business model. We operate an open and equitable business model for the benefit of makers, designers and customers alike. We commit to share how value is distributed across our network.***
> ***2.3 We believe in supporting the creative commons through freedom of choice. We are huge fans of open-source but we will never impose this on others or moralise about it. We commit to supporting the freedom of our community to choose how their creative outputs are shared in the public domain.*** **(OD, *Charter*)**

These principles cover much more ground than a Creative Commons licence. It would appear that relaxing intellectual property regimes and preaching about the commoning aspect of open blueprints is nowhere near enough to sustain a practice with coherent values – openness must be a much more generalised attitude that transcends the modalities of circulation for open blueprints. It requires foundational engagements that affect every aspect of their enterprise, being at odds with competitive and exploitative markets. In other words, more

[iii] Ironically enough, the Charter itself is not publicly published on their website, but accessible only through a special section dedicated to on-board partnering designers, makers and employees.

than the mere knowledge of how to produce an artefact, it is the blueprint of the entire business model around the product that is meant to be open-sourced. In the next section, I explore the multiple meanings of openness and study OpenDesk's sister project WikiHouse, which presents more elaborate institutional arrangements to engage in long-term endeavours.

B. Openness:
Freely circulating design knowledge

Having explored the technical, economic and social advantages of the digital reproduction and dissemination of design blueprints, I can now turn my attention to the concept of openness and the current debates and practices surrounding its multiple meanings. Are the freely available and accessible blueprints easy to understand? What institutions are supporting the development and dissemination of the project? How do open blueprints achieve circulation without a market? The politics, claims and characteristics of WikiHouse will be subjected to an in-depth study to conceptualise openness beyond commoning blueprints. As the project will demonstrate, openness comes in degrees, with either more or fewer parts of the process being demystified. I evaluate the successes and limitations of WikiHouse and conclude that openness requires custodian institutions if it is to be sustainable.

1. Accessing, using and governing the source

In recent years, openness has become an increasingly vague, catch-all metaphor to describe the emergent political, economic and cultural counter-trends against the predominant regimes of intellectual property, enclosures and privatisations. As the example of OpenDesk testifies, openness has substantial implications for design practices, as a strategy to promote the circulation of blueprints in the absence of market mediation. Before bringing in and problematising other design examples, it is essential to define openness in the broader cultural context. The history of open-source and free software is particularly relevant as a precedent and source of inspiration for the conceptualisation and shaping of the meaning of open design principles. Considered as the predecessor to what is now implied by "open", parallels are to be drawn through the different meanings ascribed to "free". Inspired by Roosevelt's original "Four Freedoms", free software pioneer Richard Stallman proposed equivalent freedoms for software in the 1980s, being to run, to study, to redistribute and to improve the source code. Even though free software is intended to be free as in "free speech" (denoting no restrictions) as opposed to "free beer" (meaning at no cost), this can be considered a simplistic opposition. It is suggested that it may be more accurate to think of "free as in puppies" – it may carry no initial costs, but it still comes with the responsibility of caretaking. Borrowing from other languages, "libre" and "gratis" have been introduced in an effort to remove any linguistic ambiguities and to better differentiate the terminology. For better or worse, the term "free software" came to be eclipsed by "open-source" (coined originally by Christine Peterson), and the open-source Initiative was founded in 1998. Proponents of free software remained critical of open-source, distinguishing the former as an idealist political movement, and the latter a pragmatic development model. To better understand the meanings and implications of open-source, I follow the outline provided by Open Access scholars Pomerantz and Peek, in their broad and meticulous essay entitled, somewhat fittingly, "Fifty Shades of Open", reviewing the uses of the concept:

> ***The word "open" is used to indicate that a resource is accessible for no monetary cost. The word "open" is used to indicate that a resource may be used in any way imaginable. The word "open" is used to indicate that anyone may use a resource. The word***

> ***"open" is used to indicate that anyone may join in a process. The word "open" is used to indicate that artifacts of a process are accessible. The word "open" is used to indicate that a process leads to the creation of resources that are accessible and may be used in any way imaginable. The word "open" is used to indicate that a resource was created by using other open resources.*** **(Pomerantz and Peek)**

With so many meanings, openness can be a blessing as much as a curse. However, in the true spirit of openness, the authors resist the temptation to pit meanings against each other or to suggest a hierarchy between them. Instead, they acknowledge that openness itself is open to interpretation, and that there is an open invitation to reappropriate its meaning. Inspired by the Free Software Foundation's General Public License, but extending the Copyleft (opposite of Copyright) regimes beyond software, an impressive constellation of licences with differentiated legal frameworks have emerged. Most notably, Creative Commons (CC) provides various rights and protections to the producers, distributors and users of raw data, creative works, technical inventions, or any type of cultural artefact or knowledge base. CC liberates the "display, performance, reproduction, distribution" of the content while reserving "some rights", and various combinations of "attribution, non-commercial, share-alike and no-derivatives" specifications fragment the simplistic binary of "intellectual property" versus "public domain". While becoming increasingly popular, CC also has its detractors. Kleiner considers CC to be merely a more permissive subset of copyright, labelling it "Copyjustright". He is also critical of Copyleft, since it indiscriminately allows capitalists to free-ride the commons, putting forward a counterproposal in the form of "Copyfarleft", in which there is "one set of rules for those who are working within the context of workers' communal ownership, and another for those who employ private property and wage labor in production" (Kleiner 42). Inspired by this principle, the Peer Production Licence (or Copyfair) has been developed, providing free access to commons-producing entities (such as commoners, cooperatives and nonprofits), while charging fees to commercial, for-profit companies that would like to benefit from the same goods and services (44–49). This is so far the most relevant licensing tool available for postcapitalist use, since it generates and retains value within the commons.

Principles of openness have been adopted in a wide range of cultural practices, but with particularities in each domain. The similarities and differences between software development and product design are striking: both depend on some kind of "source" material (code for software, blueprints for hardware), but while digital software is frictionless and reproducible, physical hardware is much less so. While what is meant by "open-source hardware" here is mainly electronics, and by extension, it is applicable to any hardware, tool or machine under the general name of Open Design (Abel et al.). Minimally, it denotes that blueprints are available through one of the licences mentioned above, which is "only valuable in the short term" (Pomerantz and Peek). Other open design principles go much further than merely lifting the intellectual property rights of a design, and engage rather in long-term strategies. In a broader sense, designing for openness entails the creation of a community around a product seeking active contributions from users, designers and makers. As we have already seen with OpenDesk, this is not necessarily incompatible with market practices, in that it presents rather a novel approach that goes beyond simple producer-to-consumer relations. Designing for openness therefore means, first of all, designing from scratch, with considerations of how it can be manufactured easily, followed by the release of the blueprints and documentation for broad circulation, and finally facilitating a community that will maintain and improve the project. Not all projects fit this extended definition, with some questionable claims of openness having been labelled "open-washing", as coined by Michelle Thorne, or "fauxpensource" by others (Masson). False claims are relatively easy to identify in software, but it can be difficult to identify what could be considered open-washing in product design. I present two examples below to provide a sense of the range of practices that are up for debate as to whether they constitute an abuse of the term, or are acceptable shortcomings from an idealised definition.

The first case is The GrowRoom, started as a collaboration between Space10 – IKEA's external research and design lab dedicated to "future living" – and Danish architects Sine Lindholm and Mads-Ulrik Husum. Originally conceived as an "artistic exploration" of urban farming, The GrowRoom is a spherical pavilion and a vertical garden, made of multiple layers of stacked plant beds occupying a small footprint [see fig. 16]. A few months after exhibiting a prototype at the CHART Art and Design Fair in 2016, an easier to build and more affordable

version of The GrowRoom was released on GitHub as open blueprints, "to encourage people to develop their own urban growing projects" (IKEA Museum). The reasoning behind this was explained as follows:

> ***From Taipei to Helsinki and from Rio de Janeiro to San Francisco, the original version of The Growroom sparked interest and people requested to either buy or exhibit it. But it doesn't make sense to promote local food production and then start shipping it across oceans and continents. That's why we've released The Growroom as an open-source design and encourage people to build their own wherever they are.*** **(SPACE10)**

To put it more simply, the multinational furniture-maker commissioned a design to address a sustainability challenge, and recognising that commercialising the flat-pack kit through its global production chain would be self-contradictory (if not counter-productive), it chose to release it instead non-commercially for local production. This is remarkably close to the design principles and ethos of OpenDesk (as well as WikiHouse, presented in the next sections), and could also be seen as a remarkable volte-face and an honest admission that only a postcapitalist approach is an appropriate solution, even though there is no indication that the project was intended for the market to begin with. Some might dismiss this yet as another case of greenwashing, since the exquisite pavilion remains a rather costly solution to urban farming. I am still tempted to consider The GrowRoom as compelling, rather than dismissing it as a mere PR exercise, due to the multiple independent replications documented and shared online. Since the design is open, the interest of the recipients in reproducing it has far more significance than the original intent. Following the positive reception received by The GrowRoom, Husum and Lindholm developed a new iteration of their concept with GrowMore, this time creating a modular system made of only six basic elements that can be repeated and bolted in a variety of combinations [see fig. 17]. As seen in the previous chapter, modularity enhances one's ability to adapt, hack or fork the project, as a context-specific application of the pavilion-wall is more suitable than a rigid, perfect sphere. It was more than fitting that GrowMore was first showcased at the 2017 Seoul Biennale entitled "Imminent Commons", as part of a thematic exhibition dedicated to urban, ecological and technological commons. That said, while the designers had expressed their commitment to "sharing the drawings of the

design open-source (...) to participate in, and enhance, the local production and maker movement" (Lee and Anderson), this has not yet materialised. In a personal communication, the designers promised that the drawings would be open-sourced in summer 2020.

The other case is the 2014 pledge by Tesla Motors to apply "the open-source philosophy" to its patents, and not to "initiate patent lawsuits against anyone who, in good faith, wants to use [its] technology" (Musk). The reasoning behind Tesla's decision was that its main competitors were not other electric car makers, but the big car companies with a vested interest in perpetuating a predominantly hydrocarbon-based automotive industry. In other words, choosing not to sue other EV manufacturers that make use of the technologies developed by Tesla is actually beneficial for the company, in that it would eventually beat its main competitors by becoming the electric car standard beyond its direct market reach. However, as is the case with many of the PR moves of Tesla, the devil is in the details. The provision of "acting in good faith" is rather open to interpretation, and determining what counts as "bad faith" is left to Tesla alone. For instance, if a company that makes use of these patents enters into direct competition with Tesla, or that indirectly affects its business negatively, it is entirely Tesla's prerogative to enforce compensation. So far, there has been only one company, a Chinese startup, that has made use of Tesla's patents (Lambert). Once again, it is worth resisting the temptation to dismiss Tesla's move altogether as a masterful combination of greenwashing and open-washing, and to consider it along the lines of IKEA's involvement in The GrowRoom[i]. However incomplete or imperfect they may be, only moves towards postcapitalist business models are consistent with the sustainability objectives. With this in mind, I can now look at WikiHouse, the original project from which OpenDesk derives. Thinking larger than furniture, WikiHouse is an ambitious, long-term project that is still in its early stages. Various facets of WikiHouse are to be analysed as distinct objects of study, with the first constituent elements being the structure and the content of the platform (which at the time of this research consisted of a file depository for projects in-development), the established design principles that guide the project, and the current downloadable design blueprints and the associated licenses. Next to these, the second element to be analysed is the

[i] There will be a similar anecdote given in the next chapter involving Phonebloks and the then-Google owned Motorola.

WikiHouse Foundation itself – the non-profit "custodian" entity that administers the design commons. It is defined and regulated by its "Constitution", being a collaborative document that determines the structure, principles and goals of the project, as well as the "roadmap" of its future development. The elements that are nested into each other will be revealed progressively in the following sections.

2. Principles to build upon

If a wiki is a "website on which users collaboratively modify content and structure" (*Wikipedia*), then a WikiHouse would be a house that would permit the collaborative modification of its design by its users. While this transposition may be somewhat accurate, the actual project offers many more definitions. According to its initiators, it is not meant to be a single house, but "an open-source building system (...) to design, print and assemble beautiful, low-energy homes, customised to their needs" (WH, *Open*). Elsewhere described as a "global design commons" (WH, *Project*) for sustainable homes and neighbourhoods, the project merits extensive analysis in order to interrogate its claims on both commons and sustainability – two core characteristics of postcapitalist design practices. By almost consistently avoiding the word "architecture" in favour of more generic terms such as construction system, WikiHouse positions itself more in affinity with the projects in this study than standalone architectural works. It claims to be "not just one design, or even one technology, but a way of working; a set of principles" (WH, *About*). These provide an early indication that the main activity of WikiHouse is not to produce blueprints, but to maintain an open platform, being the infrastructure that sustains the development of the entire project. My focus on this section is on the design principles and the practicalities of accessing the blueprints, while the institutional arrangements are to be considered separately in the following section.

The origins of WikiHouse date to the summer of 2011, when curator Beatrice Galilee invited Architecture 00 to the 4th Gwangju Design Biennale in South Korea (WH, *Foundation*). Zero Zero brings together designers, programmers and social scientists, claiming to "operate an open business model" that includes professional architecture services, the WikiHouse and OpenDesk projects, and other initiatives (Projectoo). Interest in the WikiHouse project had been raised several months before the exhibition, when science-fiction writer Bruce Sterling—hardly the most kind-hearted critique—blogged an enthusiastic endorsement on the Wired website. His brief comment was both optimistic and personal ("I could quite likely build and inhabit [one]"), and gloomy and pragmatic ("The ideal Favela Chic domicile for areas wracked by climate change"). Appealing to a wide range of audiences, his comment triggered early viral interest, and this interest remains to this day both a blessing and a burden—the failure to deliver the hyped promises before interest wanes away in disappointment (called "vapourware")

puts the credibility of the developers of the project at risk. The initiators of the project admit that "hardware development was driven by a sequence of small exhibition prototypes and events" since the Biennale, and that after four years, "WikiHouse is finally about to 'reach the start line'" (WH, *Where*). Such a slow pace to start a project could be considered a failure in engaging many people instantly, which would have permitted rapid scaling. Yet it could also be seen as an intended strategy to lay firm foundations for a long-term engagement rather than merely being the first to capture an emerging trend in design and technology.

A building system—particularly one that is developed collaboratively — requires a set of rules or broad guidelines on how every component or module fits into the whole structure. For OpenStructures, in the previous chapter, this was the OS Grid, while for WikiHouse, it started with the "Design Principles" that are incorporated into the Constitution. The first principle urges the sharing of information globally, but the manufacture of goods locally, citing the "recipes and biscuits" quip attributed to Keynes. The second principle, this time in the form of a quote by the open-source pioneer Linus Torvalds, advises us to "be lazy like a fox" – implying that instead of reinventing the wheel or starting from scratch, it is better to build upon the work done previously by others (with due credit and proper licensing). Another principle is to "start somewhere" near oneself – that is, instead of attempting or pretending to resolve other people's problems, designing for one's own needs and then sharing the results, which may be more helpful to others. At the same time, designs are supposed to be safe, inclusive and with low thresholds of participation in terms of time, cost, skill, energy and resources. Similarly, the Japanese *"poka-yoke"* principle of designing mistake-proof modules is meant to make the assembly process more accessible and safer. In practice, it means never designing a piece that cannot be lifted by a single person, or making sure that pieces cannot be put in the wrong place. Similar to OpenStructures, other principles include opting for open materials, open standards and modular systems, so that everything is designed for disassembly and circularity.

If the Principles are instructions on how to design, then the Release Notes are instructions on how to build. The "WikiHouse Chassis System Version 4.2.1 — A Guide for Designers" is a document that provides the closest contact with the intricacies of the project. A previous version (v3.0) expresses that "eventually a

design guide should become unnecessary", although this expectation is somewhat ambiguous, in that it suggests that one day the blueprint itself will be so self-explanatory that no additional documentation will be needed. However, currently the only way to acquire all the available knowledge on WikiHouse is through booking a workshop with a member of the Foundation—and not the freely available guide itself. There is a delicate balance between providing too much information, which would intimidate beginners and set the learning threshold too high, and relying more on human contact and social relations than documents, which builds communities rather than promoting strictly self-replicating information. An assistive teaching role demands a time and space where the dissemination of knowledge can take place, while a document that is available anywhere and at anytime is less likely to be picked up. Additionally, such workshops also create livelihoods for the developers, who thus do not rely on the sale of licenses or products. Ultimately, the daunting and equally formidable task of building a house generates such a body of knowledge that may be hard to capture in documentation, let alone transmitted one-on-one.

The design guide is introduced with three considerations; the foundation requirements; the general shape and size of the building; and the exact location of such openings as doors and windows. These factors are location-specific, and are to be determined for each building, while the chassis system itself adapts parametrically to each setting. What is standard to every WikiHouse is the "repetitive grammar of 300 mm long Lego-like" structural plywood modules, which, in combination with spacers and reinforcers, make up the box frames [see fig. 18]. These are the essential elements – CNC-cut from structural plywood sheets, repeating by default every 1.2 m – which are raised and attached to each other with connectors and panels. In this assemblage of standard and custom parts, each piece is carved with a code name, indicating the section of the frame to which it belongs. In this way, no part can be mixed up with another, and the whole naming system "can be understood like a DNA chain along the house: A, A, B, B, A". In the assembly process, some joints are slotted and pegged together, others are "persuaded" into position with a mallet, but no screw or glue is necessary to hold the structure together [see fig. 19]. For the fine tuning of tolerances, the design guide encourages starting with the manufacture of a "Step Up / Test Piece" —both a simple stepping platform, and a small object to test and tweak how loose or tight all the joint types of the WikiHouse fit together. The mallets (referred to euphemistically as "persuaders" in the documentation) can

be made from the same material and using the same machines, alluding to the self-production of the means of production.

The entire project resides in an online file repository of work-in-progress files, all shared under the CC-BY-SA licence. The WikiHouse Foundation provides an unambiguously named "WikiHouse Commons", hosted in a shared Google Drive folder, containing presentations, manuals and 3D files, including design files, cost sheets, prototype photos and any other relevant documentation. The instructions for using the Commons encourage teams to "share by default" every file (WH, *How to*), instead of postponing until a perfected, final version is ready – unfinished works require critical engagement, and not taking anything for granted is a basis for creative contributions. Since openness is meant to encourage collaboration, the folder is structured with distinct sub-projects or forks. Access permissions to these sub-folders function similar to licenses, with everyone free to view (and therefore copy) the designs, but only trusted contributors being able to edit the originals. Previous versions of a project can also be retained in order to track its evolution, and to fork or re-visit elements from any point in time. These principles all appear sound and well, however, the reality seems to be less than ideal; other than the (oo-led) "featured projects", the folder entitled "all projects", containing 350 subfolders, is mostly empty, indicating little activity, let alone collaboration.[i] In fact, the Google Drive folder was active only between 2015 and 2017, after which the database was migrated to the Github repository to take advantage of better versioning and forking. Since 2018, the WikiHouse website has stated only "files coming soon" for an upcoming beta version codenamed Blackbird. The choice to pull down incomplete files is explained as follows: "Although we always seek to publish files as early as possible under a clear disclaimer of warranty, because Blackbird contains some kinds of joint that are entirely new, we are testing the system in early pilot projects before publishing the files" (WH, *Blackbird*). The principle of "share by default" seems thus to have been abandoned in favour of a more conventional approach, and to only release major milestones.

[i] Similarly, while plenty of interest and enthusiasm were expressed in an earlier mailing list, few were taken to further stages of development. Recently, a more active Slack channel has been set up for collaborations.

Such limitations of the project can be encountered at various stages. For instance, all the documentation is "provided on an 'as is' basis", that is to say, without any liability or guarantee (WH, *Terms*). As with all buildings, there is a legal obligation to consult an engineer, and even more so for the early prototypes of an experimental project. When manufacturing the pieces, the speed of the CNC routers can become a potential bottleneck. The design guide advises to expect approximately 5–6 sheets per m2 of floor area and 30 minutes per sheet, equating to 5 days of non-stop CNC cutting for the average floor area per person in Europe. If the fabrication takes place at or near the construction site, then the pieces can be assembled as the rest are being cut, reducing eventual delays and costs. Once the chassis is standing, additional layers, such as a breather membrane and insulation, are required, after which it can be cladded and fitted in various ways. The project's ambition is to integrate the full catalogue of heating, energy, water, waste and connectivity solutions that will envelop the house. These are evidently very modest beginnings for an ambitious project that aims to reach out to 99 percent of the world population, as opposed to most of architecture destined to the 1 percent. A methodological question arises: is it simply too early to study this project? It is easy to discount a project that has barely started, let alone finished. Similarly, it would be unfair to conclude that this represents the failure of a project that is aware of its limitations, and that openly admits its "pre-launch" state. Open projects are, by definition, always too early to launch and are never really complete, and it is precisely the fact that they are premature and open-ended that makes them worthy of study. There is a need to navigate between their prefigurative and practical elements, as presented above, and their speculative potentials, which will be discussed in the following section.

3. Foundations built to last

Let's take a step back for a moment and consider how we got here: driven by fossil fuels and finance capital, the industrial revolution meant that everything had to be redesigned from scratch, with the centralised, mass-manufacture of goods being the basic methodology. With the advent of Fordism, industrial capitalism promised unlimited access to consumer goods, seizing the opportunity to expand its markets. Modern design was a response to this new mode of production, and the drawing boards of designers and engineers came to reconfigure everyday lives, consumption habits and their own social role accordingly. This redirection proved to be successful in attaining the goal of democratising consumption in the West, although with devastating consequences, undermining the very basis of its aspirations. At the late-capitalist end of the globalised circuits of manufacture, information technologies are expected to unleash a new mode of production, one that corrects the mistakes of the industrial one. If such a transformation is underway, then everything must be redesigned, tapping into the latent potentials of digital reproduction and manufacturing techniques. Powered by the internet and other distributed tools, WikiHouse attempts to rise to the challenge, but this time addressing the pitfalls of the previous mode of production. In the words of its founder Alastair Parvin, "If design's great project in the 20th century was the democratization of consumption (...) design's great project in the 21st century is the democratization of production." From one populist vision of design to another, this section appraises WikiHouse as an attempt to render design more accessible through the deployment of openness strategies.

One of the key documents of the WikiHouse Foundation is its Constitution, drafted first in 2015 by Alastair Parvin, and since then open to the public for suggestions as a Google document. Currently on version number 6.4, it contains several sections defining the Foundation, its structure and funding, its design principles, licences and trademark policies, and its development goals. Other than the general objectives of the Foundation, the management of various intellectual rights regimes warrants particular attention for the purposes of this chapter. The three main goals of the Foundation are:

> ***a. Hold knowledge in commons. WikiHouse open knowledge (intellectual property, web-domains and trademarks) is held in***

perpetuity for the common good. It is accessible to anyone.
b. Support the community of individuals and companies using and contributing-to the WikiHouse platform, and host an open, fair marketplace for sale of services over and above the commons (...)
c. Promote the development and dissemination of open-source, high-performance, low-cost, locally-manufacturable, sustainable design solutions for homes, infrastructure, neighbourhoods and cities (...)
(WH, *Constitution*)

These general objectives of the Foundation capture the core values of openness, by maintaining, circulating and producing open blueprints as commons. Not only does it pledge to remain open access forever, it actively pursues business models, sustainable livelihoods and community building to cultivate an open working system for everything. How knowledge is held in commons, how communities are supported and how development is promoted deserve a closer look, as this may elucidate the extent to which these goals are within reach.

In the case of WikiHouse, there are three distinct elements: the hardware, the software and the trademark. Since the software that enables the generation of the exact files is in the early stages of development, its licence is not very elaborate, stating only that it is open-sourced. The hardware on the other hand, consists of all the digital files and instructions required to produce WikiHouse structures, corresponding to the design blueprints conceptualised in this chapter. In an earlier phase of the project, these blueprints were available under a Creative Commons non-commercial licence, explicitly banning their professional, commercial use by designers, with the primary purpose stated as "having as a place to live, not as an asset to sell or rent" (WH, *Design*). While this appears to be true to the principles of commons, it creates an obstacle to its adoption and development. The newer Constitution specifies that both commercial and non-commercial uses are possible, as long as any derivative works carry the same license as the original, which "ensures that knowledge developed in commons remains there forever". The power of open-source is explained as "once solved, each problem will always be solved for everyone,

forever; and will continue to evolve as it is improved and adapted". Similarly, Parvin notes that "once something's in the commons, it will always be there". Having a common solution to a problem eliminates any "reinventing the wheel", saving time, energy and money for those who encounter the same problem again and again. An appeal for donations concludes the design guide with a grand claim: "we work for everyone". Any contribution (monetary or otherwise) to an open-sourced project, unlocks potentials that cannot be restricted to a limited audience, thus actualising the problem-solving promise of more democratic designs than with CopyRent regimes. In other words, it generates value, and "if you have derived value from using the WikiHouse system", the Foundation expects donations from the benefactors. Sharing value leads to shared value creation, and vice versa, and by extension, creating shared value leads to valorising sharing as such.

Remarkably, it is the WikiHouse trademark, comprising the name and the logo, that has the most elaborate protection scheme. At first, only the initiators of the project could legally claim to be WikiHouse – one could not call their structure a WikiHouse, even though it was possible to produce an identical design. This rather arbitrary principle of determining what constitutes a WikiHouse and what is ineligible has since been abandoned in favour of a more permissive policy. The trademark now states "may be used to discuss, attribute and describe the wider project and community" (WH, *Terms*). Accordingly, any team signing the WikiHouse trademark licence can now become a non-commercial WikiHouse Chapter and adopt the WikiHouse name, as well as a "community trademark badge" styled after the original logo. In the original logo, the house outline repeats and branches out in every direction, being the basis of a tangram-like composition for the derivative logos shaped after each country the Chapter is based in [see fig. 20]. Further types of badges to be used by commercial WikiHouse "providers" are intended to be developed in the future, allowing designers, manufacturers, builders and certifiers to benefit from the visibility of the project and to provide complementary services to it.

The opening up and decentralisation towards WikiHouse chapters indicates a growing interest in the project. There are today more than a dozen local chapters, with the most prominent being WikiHouse UK (under project00), WikiHouseRIO (winner of funding from the TEDPrize), and WikiHouseNZ (awarded by the Sustainable Habitat Challenge). It is estimated that around 40

people work on WikiHouse projects as one of their primary occupations. In the earlier phases of the project, these groups were charged with developing any part or combination of the hardware, software or community platform that constituted the project. Moving forward, most chapters became networks of individuals and businesses, working in collaboration to develop WikiHouse-based projects. Since anyone has the right to fork the project to improve or adapt it, some chapters specialise in experimental pavilions, multi-storey structures or post-earthquake housing. While they are expected to operate autonomously, they are bound together by a common purpose: "what they share collectively forms the commons: assets created/owned by individual chapters which are published under open license" (WH, *Where*). Having such clarity in the purpose and principles that guide the project helps to expand it, giving not only stability to the project, but also credibility for the attraction of potential funders, volunteers and supporters. Most importantly, as the project matures and applications expand from tiny houses for leisure to commercially viable and larger housing complexes, partnerships also evolve, from hobbyists to professional collaborations, consolidating the base even further.

The final factor to take into account here is the project's future roadmap. Longer term aspirations and speculations can tell as much as the prefigurative achievements or present-day institutional arrangements of the project. The WikiHouse Constitution states that the "project has no end destination, only a clear direction of travel", and it is a conscious choice to strategise out in the open about where WikiHouse is headed, even though that direction may be constantly reevaluated and the map redrawn. There are documents that shed light on some potential futures: a Version Map (dated 2012), a Development Goals v2 (dated 2014) and a presentation (2016) all provide detailed descriptions of various tracks branching out of timeline diagrams [see fig. 21]. I consider these documents squarely as works of speculative design fiction – they are not to be taken for granted as definitive or evaluated for their accuracy, but as expressions of desire and imagination – a wish-list for the future, and a compass to guide the project. The Development Goals divide the timeline into four main columns as projected stages of expanded influence, headed Now (what's available at that stage); Disruption Point (mission-critical goals in the short term); Scale (impact to achieve in mid-term); and The New Normal (intended paradigm change on the horizon). The boxes meticulously describe various facets of the project:

> ***A Wikipedia of Things: A fully developed and comprehensive system for indexing high-performance, low-cost design solutions. A new global commons democratising industrial knowledge and tools — owned by everyone, accessible to anyone. (...)***
> ***Open governance: Digital governance / decision-making tools allowing WikiHouse community to self-govern commons without any custodianship. (...)***
> ***Open Derivative Economy: Further tools / platforms to support, connect and accredit an open derivative economy; that is all the designers, manufacturers and service providers selling commercial goods and services over and above the commons.***
> **(WH, *Development Goals*)**

These three divisions stand out as indispensable for postcapitalist design: a universal library in which to pool open blueprints; established norms and tools to maintain and govern this commonwealth of design knowledge; and a social and logistical infrastructure that supports the livelihoods of all the contributors. This triad is very much in line with the following note of caution: "the expectation that one can change society merely by producing open code and design, while remaining subservient to capital, is a dangerous pipe dream" (Bauwens and Kostakis 65). In other words, casually open sourcing designs does not lead to a commons-based economy, as the real work comes in the designing and growing of the institutions that infuse them with purpose and value. Given that this "disruption point' has not yet been reached, what needs to happen first? There are some immediate obstacles to be resolved, such as creating a map and documenting all existing WikiHouse-derived projects. Such a depository of blueprints would literally serve as a "Wikipedia for houses", and as living proof of the project's viability. The other pending priority is the development of BuildX, a parametric software for the customisation of the designs, and making them "ready to print", enabling a higher adoption rate. Only then will the promise of WikiHouse to deliver affordable, adaptable and dignified housing to the masses be met to any substantial degree, marking the beginning of tangible impacts for sustainable built environments, (socialised) economics of housing and an architectural practice driven by the grassroots.

Chapter IV. Maker Machines: Providing 'everything for everyone'

The previous two chapters have focused on design labour and design knowledge, both of which are immaterial aspects of production. Now I will turn focus to the physical outcomes of design and the making of artefacts themselves. Accordingly, this chapter tackles more directly the tensions between ecology and technology. It is common for any critique of industrialism to be dismissed as if the only alternative is to "return to the Stone Age" – a cartoonish expression that is indicative of a failure of the imagination. Ever since the time of the Luddites in the 19th century, direct acts of sabotage against "all machinery hurtful to commonality" (qtd. Linebaugh, *Ned Ludd* 15) have marked the collective imaginary (and language) with a skewed, simplistic interpretation of a "rage against the machine". Framing Luddism as a primitivist, technophobic reaction to the shock of the new is intended to downplay and ignore the social and political aspirations that were central to their demands. It wasn't the manufacturing technology itself that was the enemy of the Luddites, but the social relations that deployed it; imposing mechanic time and de-skilling workers, thus tipping power away from labour and towards capital (Jones). This is why distinctions must be made politically, for which I intend to demonstrate that the seemingly irreconcilable opposition of environmental protection and technological progress is an ideological construct that begs to be unravelled, and that alternative futures that synthesise enviro- and techno-politics merit exploration. The literature at the intersection of ecology and technology presents a vast and complex landscape that covers many contested issues, such as labour vs automation, local vs global, limits vs growth, and scarcity vs abundance. I am

aware that any of these dichotomies alone would be a worthy topic for a thesis; and so I will suggest here that there are no simplistic polarities, with ambiguous positions identifiable on either side of a political spectrum.

Before introducing my own framework for a postcapitalist eco-techno synthesis, I need to distinguish it squarely from the predominant ideology of ecomodernism. There have been multiple proposals made of how to correct the mistakes and excesses of the previous paradigms and to put capitalism back on track, including "new" (Marsh), "next" (Hawken), "third" (Rifkin) or "green" industrial revolutions, to name but a few. In contrast, self-professed "ecomodernists" display the most confident Prometheanism, being distinctively uncritical of capitalist growth and managerial control. What sets them apart is their complete faith in technology to overcome any obstacle – endorsing nuclear energy, geoengineering and genetic modification as solutions to ecological crises. By siding unambiguously and unapologetically with market-based and top-down approaches, they represent a dangerous form of techno-optimism (if not downright techno-fetishism) – one that stands at odds with any emancipatory social project. If ecomodernism is techno-utopianism without a social and ecological basis, most ecological politics, in contrast (ecosocialism, degrowth and deep ecology, to name a few), remain distant and reluctant to engage with techno-politics. Localist sufficiency, voluntary simplicity and slowness may all be defensible polar opposites to the capitalist values of efficiency, complexity and instant convenience. However, without identifying the role of technology in achieving social and ecological benefits, there would seem to be little distinction between self-imposed frugality and systematically enforced austerity. As discussed previously, left-accelerationists have more recently attempted to fill that gap by embracing technology as an integral part of an emancipatory social project, but have also attracted criticism for sailing dangerously close to ecomodernist assumptions (Carson, *Techno-Utopianism*). Instead of pitting degrowth and left-acceleration against each other, my interest is in finding productive common grounds between them. This rift between these strands of radical politics (both with valuable postcapitalist outlooks) needs to be bridged if they are to effectively counter the predominant ideology of eco-modernism.

Underlying all techno-utopian projects is the challenge of coming up with a plausible vision of what constitutes wealth, abundance and luxury —a post-

scarcity civilisation providing a good life for all – within the limits of the possible. In this chapter, I conceptualise a "counter-industrial" synthesis of degrowth and accelerationist positions, but I should first put forward my reasons for choosing this term. Postcapitalist technologies, rather than being in favour of an "industrial" (in the sense of hierarchical, centralised, closed, linear) system, would be very much against it. They would however also be very different from anti-industrialism, which implies a categorical rejection of all technologies in favour of simple living. They would also spurn the new/next/third industrial forms of techno-optimist vision, which remain compatible with capitalism. Admittedly, "post-industrial" itself is a problematic term, in that it denotes a society that has supposedly moved on to services and knowledge, but is yet still heavily dependent on outsourced industries and economic growth. The term "counter-industrial" brings a useful ambiguity, since it not only means (anti-)opposition, but also retaliation and rivalry, or doing better than the industries in order to overcome them. Narrowing down the definition, I refer to *maker machines* specifically as the design applications of the emerging counter-industrial paradigm. Since my interest in this chapter is on the artefacts alone, instead of taking maker subjectivities or spaces as the central topic of study, I focus primarily on the machines that are made by or for the makers.

That said, the maker culture needs to be introduced and situated at the intersections of DIY, hacking, crafts and design. The emerging maker figure — extending beyond the solitary inventor, the industrial designer and the factory worker— while certainly not revolutionary, is nonetheless the cultural figurehead in the counter-industrial transformation. A proud manual labourer as much as a "smart" creative entrepreneur, maker subjectivity has yet to transcend the neoliberal individualism of the start-up culture as it advances towards the constitution of expansive cooperative arrangements with comparable political and economic weight as medieval guilds. In this sense, there are vast overlaps between maker subjectivities and the designer-commoners I discussed in earlier chapters when looking at the challenges and possibilities. The critical difference (or rather, additional criteria) that should be considered is in the machines with which the makers are "coupled". Instead of imagining generic "jack-of-all-trades" makers, or considering isolated machines independently of human agency, my preferred approach is to study the pairing of makers and machines. When makers and machines complement each other (as opposed to the manual worker being subordinated to the machine), it is possible to achieve socialised fabrication, or

in the words of Gorz, an "appropriation of technologies by the users for purposes of social transformation" ('Exit'). Compared to the previous examples of household items and flatpack furniture, the two case studies in this chapter stand out with their maker-oriented, appropriate technology choices. They also present the most explicit ecological missions, where sustainability is not an afterthought but the primary purpose, tackling environmental challenges head-on. Through these examples, I intend to offer a glimpse into the great range of cultural transformations that prefigure in the steel, solder and circuits of mundane machinery, reversing the sophisticated austerity of the commodity-machine with a simpler postcapitalist abundance.

A. Machines:
The self-production of the means of production

This section focuses on the themes of self-production and post-scarcity, identifying in what ways critiques of existing industries lead to different approaches to the organisation of manufacturing? To what extent can maker machines deliver a material abundance that is also ecologically sound? Through the study of Open Source Ecology, some shared characteristics of machines that exemplify the counter-industrial paradigm will be introduced. Starting with an analysis of discourse and continuing with a studying the machines themselves, I will conclude the study with a discussion of what I consider to be the failures of this project.

1. Civilising technology with Open Source Ecology

The website of Open Source Ecology (OSE)[i] carries a header: "open-source Blueprints for Civilization. Build Yourself." Open-source and blueprints are familiar concepts in this study, but applied to the vastness of a "civilisation", the slogan comes across as hyperbole. It wants, however, to be taken literally, and the blueprints developed by OSE are in fact not limited to the design of some machines, but claim to provide designs for the entire social infrastructure. In this sense, OSE professes to be the ultimate design project, taking counter-industrial intentions to a meta-level and proposing a complete package. The name itself hints at these broad ambitions: instead of specific tools or machines, it refers to the thing to be open-sourced as "ecology". Given that OSE is slightly older than the other case studies, it has generated much more interest and controversy, and also recapitulates previously discussed dimensions: peer designing and modularity, open blueprints and development roadmaps, and finally, machines and makers. Rather than adopting the same methods that were employed to study the other cases, it is more appropriate to study less its technical specifics, and more its broader politics. This first section of this chapter focuses on these societal discourses of OSE, comprising an analysis of the problem within our current civilisation, as well as the pathways proposed to replace it.

OSE captured considerable attention thanks to the 4-minute TED Talk delivered in 2011 by its founder, which attracted more than 1 million views. In the typical TED Talk fashion, Jakubowski begins his presentation with his personal journey, which took him from a PhD in fusion energy to becoming a "farmer and technologist" (Jakubowski 00:10). Disillusioned by academia, and being an idealist at heart, he stated a farm in Missouri, but soon discovered that the economics of farming did not favour small-scale, sustainable production. The tractor he invested in required expensive repairs, and he could not afford any additional costs at the bootstrapping stage of his project. In his words, "the truly appropriate, low-cost tools that I needed to start a sustainable farm and settlement just didn't exist yet" (01:05). Rather than giving up on his ambitions, he decided to build himself the tractor from scratch —a leap of faith into something in which he had no prior skills. Achieving his objective, he concluded that

[i] Most of the quotes in the following sections are probably written by Marcin Jakubowski, although attributed to Open Source Ecology (shortened OSE).

"industrial productivity can be achieved on a small scale" (01:40), and shared his design blueprints online, with other contributors starting joining him in the design and prototyping of the machine. This experience gave him the confidence to launch the Global Village Construction Set project, expanding the applied principles to other agriculture and construction equipment, energy supplies and manufacturing tools. According to OSE, these machines together constitute "a set of the 50 most important machines that it takes for modern life to exist", or "to build a small, sustainable civilization with modern comforts" (OSE, *Machines*).

The machines themselves will be examined in the next section, but what is meant by civilisation? And why uncritically endorse "modern life" as such? The answers to these questions can found in the "Civilization Starter Kit v0.01" – a 300-page guide released in December 2011 as a "Christmas Gift to the World" (OSE, *Civilization*). The foreword, written primarily by Jakubowski, is the key document explaining the OSE paradigm, and the vision and mission statements of the project. At multiple instances, it is argued that we live in an absolute abundance of natural resources, summarised as "rocks, plants, sunlight, and water" (6), but paradoxically in an artificial material scarcity, and this contradiction is attributed to the failure of centralised production to distribute these resources, in turn leading to deprivation, conflict and suffering (7). Perhaps "modern civilisation" is unable to deliver benefits after all? No motives are given for the artificial scarcity and centralised production, but only vague expressions such as "because of the way human relations have evolved" (OSE, *Practical* 0:11). Such euphemistic expressions reveal a certain reluctance to criticise capitalism explicitly —perhaps as a safeguard against mainstream recognition— which may explain why optimistic mainstream business magazines christening the project "the blueprints for open-source capitalism" (Coren). Nonetheless, the mission statement remains ambiguous, describing this "third economic option beyond capitalism or socialism" as follows: "to create an open-source economy —a collaborative economy that optimizes both production and distribution— while providing environmental regeneration and social justice" (OSE, *Civilization* 6). The choice of the word "optimisation" suggests a scientific approach to determining the most effective way of reaching reach a rational configuration, whereas justice could be understood to refer to a political desire to deliver fairness. Being both pragmatic (intending to tweak the existing parameters) and idealist (standing for ethical and political absolutes), OSE does not want to give up on what has already been acquired through industrial modernisation, but

seeks rather to radically alter its organisation to deliver social and ecological sustainability: "industry no longer needs to occur in the form of toxic wastelands, but instead, eco-industry; on a human scale, serving the needs of people —not centralized industries competing for world domination" (7).

This vision is best encapsulated in the slogan and methodology "Design Global, Manufacture Local (DGML)", which synthesises borderless collaboration in knowledge production and an ecologically responsible relocalisation of manufacturing in micro-factories. Referred to also as "cosmo-localisation", it distinguishes between specific modalities for the sharing of "light", non-rival, immaterial resources globally (building and maintaining a knowledge base for distributed fabrication), while making use of "heavy", rivalrous, material resources locally with "specific local biophysical conditions in mind" (Kostakis, Roos, et al. 928). Geographical proximity to resources and/or end-users is intended to eliminate global transportation of goods and potentially complement an increased stewardship of land and resources (Kostakis, Latoufis, et al.). Instead of becoming extracted from their context and abstracted by the global commodity markets, resources that are grown or salvaged (and waste disposed of) in one's proverbial backyard have a better chance of being responsibly managed than the sustainability roundtables of global conglomerates. Remedying the "rust belt" wastelands and broken working-class prosperity left behind by delocalised factories, this model brings designers and makers together with a sensible rootedness in a place and a community, which goes hand-in-hand with boundless coordination and cooperation opportunities. This combination is available neither to artisanal craftsmen nor to corporate factories (P. Moore 88), but is profoundly transformative for both. Cosmo-localisation implies that "one community of productive commoning on one part of the planet also can and should support other communities of production and commoning in another part of the world, through the development of a global design commons that democratizes production" (Bauwens and Ramos 4).

OSE appears to be prime example of a cosmo-local, counter-industrial ethos, and in fact predates the theorisation of the "Design Global, Manufacture Local" methodology. The concept of openness appears to be familiar as a result of its commonalities with previous case studies: it is conceived as "open access to economically significant information —product designs, techniques, and rapid learning materials for achieving this" (OSE, *Civilization* 6). Such an approach is

meant to accelerate technological innovation and to provide an efficient economy in which resources are not wasted in competition. This open-source economy is described as being "based on widely accessible information and associated access to productive capital, distributed into the hands of an increased number of people" (11). These objectives carry strong similarities with those put forward in the cult counterculture publication Whole Earth Catalog in the late 60s, which promised to provide "access to tools". The decentralisation of the manufacturing infrastructure is the core of this proposal, since it denotes a socialised rather than techno-centric model for the economy. In other words, instead of envisioning the future of manufacturing as solely as machine-driven (as in full automation, Internet of Things, or digital fabrication), it advances a human-scale, maker-driven transition into a new economy. The tone reaches a proselytising (if not New Age) peak when expressing the prospects of an open-source economy:

> ***This work of distributing raw productive power to people is not only a means to solving wicked problems — but a means for humans themselves to evolve. The creation of a new world depends on expansion of human consciousness and personal evolution — as individuals tap their autonomy, mastery, and purpose — to Build Themselves – and to become responsible for the world around them. One outcome is a world beyond artificial material scarcity — where no longer do material constraints and resource conflicts dictate most of human interactions — personal and political.*** **(OSE, *Mission*, para.Vision)**

There are three stages of progress being projected here: technical capacity, personal liberation and material abundance. First, the primary task that lies ahead of OSE is the reorganisation of productive forces by distributing the tools to the makers. Once that is achieved, people are supposed to become better humans, and autonomous, skilful and responsible individuals who seek self-actualisation. This in turn is expected to deliver a sustainable, peaceful and prosperous society. Similarly, it is argued elsewhere that post-scarcity will be achieved "when we're connected more closely to the natural resources from where all the wealth comes, by the fact that we have the means and the tools to transform those resources into the feedstock of modern civilization" (OSE,

Practical 0:53). This is an exceptionally ambiguous affirmation, recognising ecological connectedness and simultaneously endorsing the industrial ideology of nature as mere raw materials. The same problematic relationship is also present in the causal link established between the acquisition of productive power and the lifting of material constraints – if anything, increased productivity leads to an overexploitation of resources. More worryingly, OSE affirms —with little explanation— its belief that the substitution of rare, strategic resources with locally available options is possible, hence the immaterial abundance of productive knowledge could automatically translate into material abundance. That said, there seems to be a step missing in between – a social-political project that negotiates between technology and ecology that is alluded to in the following interrogation: "Survival, with the awesome technology we do have today, should not take a lot of time. (...) What if we could survive and thrive up to a modern standard of living with two hours a day of work and from local resources? How would that be?" (Jakubowski qtd. in Eakin). The liberation of free time is perhaps the only politics OSE unambiguously stands for, with an early synthesis of all these positions best encapsulated in the original version of the project's values statement, dated 2003:

> ***We believe that a highly distributed, increasingly participatory model of production is the core of a democratic society, where stability is established naturally by the balance of human activity with sustainable extraction of natural resources. (...) We are convinced that a possibility of a quality life exists, where human needs are guaranteed to the world's entire population —as long as we ask ourselves basic questions on what societal structures and productive activities are truly appropriate to meeting human needs for all. At the end of the day, the goal is to liberate our time to engage in exactly that which each of us wants to be doing —instead of what we need to do to survive.*** **(OSE, *Mission*, sec.Beginning)**

The liberation of time by guaranteeing the essentials of life through technology is certainly not a novel idea, and will be explored further in following part. In contrast to ecomodernist Prometheanism, in which technological sophistication is out of reach and out of bounds for most humans, OSE does not

champion modern civilisation as such, but rather pursues the goal of civilising technology, of domesticating its feral, unbridled character that is usually taken for granted. To some extent, this may explain the widespread and enthusiastic reception that the project has enjoyed since the TED Talk. At the intersection of sufficiency and convenience, OSE promises "a few critical yet sufficient technologies for survival as a species" (OSE, *Civilization* 26). It cultivates a practical-utopian ethos, appealing simultaneously to DIY ethics and entrepreneurial spirit, half-way between the appropriate technologies and the reappropriation of technologies. More than an engineering challenge, it sees itself as an activist endeavour, claiming that "OSE has a good chance to change the world" (19) and "the goal of OSE as a movement is to produce disruptive change" (20). More than a design project, it professes its desire to "contribute to the creation of open culture, where sharing and collaborative development is valued over greed and exclusiveness. This type of culture promotes life and growth, as opposed to fear-based aggressiveness" (276). Whether these laudable discourses can translate into coherent practices is yet to be explored, which would involve a study of the proposed designs and their working prototypes.

2. Beginner's Guide to the Global Village

The Starter Kit poses the question, "So, You Want to Build a New Civilization?" to makers who are eager to get involved (OSE, *Civilization* 16), but the proverbial Rome cannot be built in a day, and there are multiple challenges ahead. Building a civilisation starts with the arduous task of completing the Global Village Construction Set (GVCS) [see fig. 22], followed by a "viral replication" of the machines by communities around the world. This is undoubtedly a vast enterprise, but then again, so was Wikipedia a little more than a decade ago. This section explores the difficulties encountered in the earliest stages of development of this venture. The GVCS was conceived as an "enabling technology base" in the domains of agriculture, energy, housing, transportation and manufacturing (OSE, *Civilisation* 19), and was limited to 50 essential machines to give the project an achievable goal. These were "selected based on their large economic significance" (13), which was determined on the basis of a technique involving the meticulous scoring of different parameters, such as market or affected population size, livelihood creation, time liberation and localisation potential (OSE, *Wiki*, pt. "Product Selection Metric"). It remains nonetheless an arbitrary selection, which excludes, for instance, the sewing machine, a key technology for women's economic emancipation, both historically and around the world. When asked about its rationale, Jakubowski deflects the question, stating that he would rather be building the machines than discussing his list (Reversing). He elsewhere admits that the list is not meant to be an authoritative selection, but rather as a trigger for the imagination. By any measure, 50 machines remains an unapologetically ambitious objective, with which both "a shining example can be set, and a solid economic foundation can be laid" (OSE, *Civilisation* 26). Ultimately, instead of being regarded as strictly individual machines, the set must be appraised as a synergetic whole, "because new machines can be built from existing machines, the GVCS is intended to be a kernel for building the infrastructures of modern civilization" (OSE, *Mission*). In a technological recursion, some of the machines are essential tools for the building the next ones. Machines are meant to give makers the power to build distributed productive capacity, thus enabling a broader adoption of a more widespread maker culture.

A few clarifications on what is meant by "means of production" are fundamental for understanding the counter-industrial paradigm outlined here.

The means of production consist of the instruments of labour (tools, machines, buildings, infrastructure) and the subjects of labour (knowledge, energy, materials, land), which together with labour and capital, constitute the factors of production. The main preoccupation of this chapter falls under the "instruments of labour" category, in which the "means of production" are considered, in the narrow sense, as tools and machines, as design products themselves. In an industrial mode of production, machines occupy a highly influential position, determining the productive investment of capital, the relentless exploitation of resources and the erosion of the primacy of labour in production. Since machines tilt the (im)balance between labour and capital towards the latter, the modalities of how the means of production are themselves produced deserve particular attention. As exemplified by OSE, the preferred counter-industrial strategy to revolutionising the mode of production is the self-production of the means of production. What is meant by self-production is decreasing dependence on conventional means, and increasing the autonomy and self-reliance in the provision of these means. As an overly simplified comparison, if controlling the means of production in the 19th century implied the takeover of factories by the workers themselves, the 21st-century equivalent can be seen as the creation of a multiplicity of micro-factories by the makers. The challenge that OSE attempts to respond to with its GVCS machines is the creation such micro-factories from scratch without having access to the factories in the first place.

An extensive list of 49 criteria are provided as the guiding design principles behind GVCS machines, ranging from the predictable ones like open-source, modular or closed-loop, to more original ones such as "permafacture", "appropriate automation" and "nonviolence" (OSE, *Civilisation* 276-290). The principles of low-cost, simplicity and sufficiency are demonstrated through a comparison with industrial standards. On average, the material cost of GVCS machines (minus labour) are estimated to be one-eighth of the market price of their commercial counterparts [see fig. 23], although at the same time it is yet to be seen if they can all deliver the high performance and efficiency required for their adoption. Another crucial aspect is the principle of the division of labour, as opposed to individual production and the use of the machines: "all of the technologies may be adapted to an individual's use, but division of labour is more desirable for achieving a complete economy in a community" (278). Following Dunbar's number (the number of people who can sustain stable and meaningful face-to-face relationships), the recommended size of the community is the

"village scale of about 200 people" —hence the name Global Village. In other words, just like the blueprints, the machines themselves are meant for sharing, which in turn may imply that their uses and benefits are also to be shared among the community. One of the early adopters of the tractor LifeTrac 5 – Our School within the Blair Grocery urban farming community project in New Orleans – attests to such collective use. The school's students claim that before the arrival of the tractor, everyone was reluctant to engage in composting, but the rugged and robust machine made them all motivated to take on the task (Reversing). As another example, the machine closest to completion – the Compressed Earth Block (CEB) Press prototype 7 – produces up to 10 bricks per minute that are used for the building of walls, and by extension, the construction of habitat. As of the end of 2014, 100 GVCS machines had been replicated —a modest start for a new civilisation.

The first page of the Civilization Starter Kit proclaims over a technical drawing: "Documentation is how we teach other people how to do this all over the world" [see fig. 24]. The thing to do —to start a civilisation— is literally put in the hands of makers, machine builders that follow the instructions manual. Of course, next to the rather static medium of a PDF file, more up-to-date and collaborative channels are used to distribute the blueprints of GVCS, namely a Wiki and a YouTube channel. Once complete, the documentation is expected to demonstrate "a replicable, open-source, social production model for a given machine" (OSE, *Machines*). This requires much more than only sharing the blueprints, as the complete know-how must be provided if financially sound and socially viable business models are to be created around the machines. OSE calls this Distributive Enterprise: "a transparent enterprise that promotes —at the core of its operational strategy— the capacity for others to replicate the enterprise without restrictions" (Thomson and Jakubowski 62). It should be noted that this "distributive" model is not merely "distributed" (in the sense of decentralised), as the primary purpose is to share knowledge, to create livelihoods and to spread the wealth. The success of such an enterprise is measured not in terms of the units sold or the profits made, but by the number of replications. OSE has an ambition to scale GVCS and lead the way for open-source enterprises to become nothing short of the "next trillion dollar economy" (OSE, *Community* pt.Support). This is based not on a belief that such enterprises can effectively compete for a larger share of the market, but on their ability to short-cut of how business expansions traditionally occur. Since "openness is compatible with the common

good" (OSE, *Development* pt.Economics), this model presents an ethical advantage that can be expected to encourage contributors also to share their best practices. The proposed OSE Licence, covering both the design blueprints and business models, waives all rights, and puts the knowledge in public domain, but with the additional condition of adherence to the ethics of Distributive Enterprise. Considering the level of detail that manifests elsewhere in the project, this legal framework appears surprisingly imprecise and incomplete, when compared, for instance, to the Peer Production License explored in the previous chapter.

What has been the progress over the years? How close to completion is the GVCS, and how widespread its adoption? The explosive interest that followed the TED Talk must have boosted confidence in the project so much that the Civilization Starter Kit professes unrealistically high ambitions. Raising $5.5M in funds, developing all the machines in parallel, releasing a beta version of the full set by the end of 2012, and even more optimistically, "if things continue as they are now, we may be done ahead of schedule" (OSE, *Civilisation* 21). The first (and so far only) Annual Report, published in 2012, pushed back the completion date to the end of 2015, while also promising to develop documentation standards and to streamline collaborative design principles by that date, however none of this materialised in the following years. While the existing machines have been improved, very few others have been taken forward, and the network of the thousands of communities replicating the machines has failed to materialise. One of the obstacles encountered (that still remains unresolved) is the realisation that open blueprints alone are not enough for replication, as the learning curve is still too steep and intimidating for beginners. OSE recently attempted to remedy this situation by initiating one-day replication workshops. "One day is a metaphor — a sign of hope, a sign of radical efficiency," confesses Jakubowski (qtd. in Eakin). While this approach displays a better outreach potential to producers and users, it falls short of making them any more capable of designing and developing the machines further. Without continuously broadcasting the knowledge and collecting feedback, engaging decentralised contributors in the improvement of the blueprints remains an unsolved issue. In comparison, initiatives like L'Atelier Paysan or FarmHack (both specialised in open-sourced farming equipment and machines), which strictly document existing grassroots innovations, appear to be much better followed and up to date than OSE. In this regard, it would seem that nobody actually needs any of these brand new machines designed from scratch,

as rather than satisfying immediate necessities, they would appear to respond rather to some hypothetical needs.

Judging by the state of the online documentation, the project seems to be suffering from a general state of neglect: the forums are unused, the blogposts are sparse, and the wiki lacks updates. Does all this imply that the OSE project has failed? In a TED interviewed in 2014, Jakubowski admitted "... it's more like a two-decade project than the two-year project I initially imagined" (qtd. in Eng). Since then, attention seems to have shifted away from the machines to the development of eco-housing and aquaponic greenhouses, under the banner of "Open Building Institute". That said, there is no giving up on the excessive ambitions. A roadmap graph recapitulates the milestones until 2015, and anticipates future achievements every year until 2035. It projects the viral replication of more than 1,000 machines by 2017, the entire GVCS blueprints to be completed by 2023, and the first self-sufficient OSE Campus prototyped in 2026 and replicated around the world by 2030. The final five year plan is nothing short of a great leap into utopia: "artificial scarcity is eradicated", "end of resource conflicts" and "earth's ecosystems are regenerated" [see fig. 25]. As much as I appreciate the vision of the project in prose, without any distinctions between past achievements and future objectives, I find this linear roadmap to be rather misleading (if not downright dishonest). Considering the glaring mismatch between the current state and future roadmap of OSE, between what is prefigured and what is speculated, this should cast serious doubt on the reliability of the project. These not only indicate technical difficulties in getting OSE off the ground, but also a lack of self-reflection and path correction, revealing organisational troubles that can be best understood by studying, in the following section, the design of the project itself.

3. Bootstrapping the Factor e Farm

The short video "Build Yourself" opens with a tracking shot of mouldy walls, rusty pipes and broken windows —a haunting Rust Belt landscape left behind by off-shored manufacturing [see fig. 26]. Meanwhile, a voice-over by Jakubowski describes the bleak landscape of the commodity-machine: "Right now, the world's productive power is controlled by a few giant corporations. Products are expensive, their designs are secret and to make things worse, we're now seeing the same companies engineer their products to fail over time, simply to increase profits" (OSE, *Build* 00:11). As Jakubowski voices his critique of monopolies, intellectual property and planned obsolescence, a sunset over a derelict factory fades out, and is replaced by a new, spacious workshop where GVCS is being tested, "From our location in Missouri, we're developing low-cost modular tools that anyone can build, and we're sharing our designs on the Internet, free of charge" (00:45). Time-lapse shots of volunteers welding machine parts are complemented with digital blueprints of yet to be realised machines. Meanwhile, Jakubowski praises the advantages of open-source: "you produce the plans, you give a lot to the community and then stuff starts coming back, then the products get better and better, everybody wins" (01:40). To illustrate this point, the video introduces a lush green setting in Indiana featuring a duplicate of the CEB Press – one of the first GVCS prototypes. Its maker, accompanied by what seems to be his partner and newborn child, claims: "I've never built a house before, I've never done hydraulics before, but it seems to be working" (02:23). Not only had he built a working machine, he also suggested some improvements to its design. The video concludes with Jakubowski's call to arms, encouraging potential makers to unite and overcome their perceived limitations:

> ***A lot of times we think [it] is impossible to build your own living environment. For me, it's been the most transformative experience. I've learned that I can do it and I want to show it to others. What if everybody were to join together to make the best, most robust products that are open-source, that everyone has access to producing them and therefore we can run an economy on a collaborative way as opposed to a competitive wasteful way? (...) This mythology of incompetence got us to think that we can't do things for ourselves —but we have the***

***power, so I would inspire people to go out and build yourself.* (02:30)**

Dispel the illusion of incompetence, Jakubowski argues, and both personal and social change are within reach. If we would only build and use these machines, he suggests, we would become all-round maker subjects at the intersection of inventor, designer, engineer, craftsperson and repairperson, and could thus overcome the limitations imposed on us. With no mention of systemic inequalities or different abilities (and the solidarities among them), "building oneself" sounds first and foremost as self-improvement advice for "self-made men", as if their can-do attitude is a precondition and their collaboration is merely incidental. Instead of recognising interdependence as a principle and engaging in distributed peer production, priority seems to be given to self-reliance and entrepreneurial leadership. This strikes me as being more of an individualist-libertarian stance and less of a vision of collective emancipation through the building and growing of social relations. Considering OSE's preoccupation with being exemplary and prefigurative, it is even more pertinent to identify the organisational characteristics of OSE and the meta-design of the project. The point here is certainly not to reveal the tiniest of inconsistencies in order to discredit the entire project, but to assess if its social infrastructure stands as a blueprint —however imperfect— for communities seeking to follow its vision and replicate its principles.

How is OSE structured? How are decisions made? How are conflicts resolved? To understand OSE as an organisation, there is no better place to begin than the Factor e Farm (FeF) in Missouri, where the project was initiated and is still being pursued. The 12 hectares of arable land bought by Jakubowski himself is the main development facility for GVCS, where the prototypes are built and tested first-hand, along with the feasibility of the "rebuilding communities from the ground up" claim (OSE, *Civilisation* 13). Neither a hippie commune nor a high-tech start-up, it has been likened to "a living science fiction novel, a combination of a return to roots and a futuristic vision" (Thomson and Jakubowski). This is where OSE is supposed to spill over its core technical mission to become a comprehensive social project:

We are much more than a farm. At Factor e Farm, we grow ideas, and put them into practice. Factor e Farm is a socio-technical

> ***experiment. (...) We are experimenting with what it would look like if a small group of people were able to achieve a full resilient lifestyle, by tapping solar power (direct and indirect) and appropriate industrial technology — to master infrastructure maintenance at no more than a few hours per year — to attain raw industrial productivity with appropriate, heirloom and modern technology — to ascertain production of food, housing, energy, and technology from local feedstocks. This implies significant technology, productivity and efficiency levels — essentially removing waste from the unstable model of centralized industrial production, and converting to a more congruent and ethical open-source economy.*** **(OSE, *Factor e Farm*)**

Described as being "in the middle of nowhere" (Eakin), the choice of location for the Farm does not seem to have been made with any strategic considerations, such as being close to a particular demographic of potential collaborators. Instead, it is no exaggeration when the project describes itself as "an experiment of trying to recreate civilization from scratch" (OSE, *Practical* 01:51), at a remote location (and yet, conveniently, near enough to an international airport). This choice is described as a "neo-subsistence lifestyle" (OSE, *Civilization* 278), an off-the-grid, autarchic ethos that is certainly more widespread in the United States than elsewhere. Jakubowski's preference for setting a pure example over practical considerations is reported by multiple collaborators. There are cases of being strictly dependant on solar energy stored in batteries rather than being connected to the grid (even when the batteries are depleted and the work is brought to a halt), refusing the provision of water from the grid, and digging a difficult and unreliable well, which was responsible for making everybody ill (Vance). In the words of a former collaborator, "[Jakubowski] was so stuck on being off the grid that it was becoming an obstacle to work" (qtd. in Eakin). This uncompromising attitude conjures up an image of survivalists "prepping" for the imminent collapse of civilisation – if you have your land and your machines, you can endure any crisis. This "lifeboat ethics" experiment would have been an interesting test of the viability of the machines once the GVCS is complete, but until then, being integrated and interdependent is a precondition for bringing the project success. In some sense, trying to bootstrap such an audacious project

in isolation is like starting to write Wikipedia in a secluded monastery —a counterintuitive choice for what is presented as a distributive enterprise.

All these could be considered as tolerable hiccups or missteps if the community living and working together demonstrated exemplary cohesion and harmony. However, it is widely reported that the Farm (and hence the project) has suffered from multiple mass departures of volunteers and contributors (Bauwens, 'Crisis'). One collaborator observed that "with a focus on machines and not on people, the vision has suffered" (Copley-Smith). Expecting contributors to dedicate themselves full-time to voluntary work under the pressure of extreme workload, with long days of labour and a lack of basic comforts —life at FaF has been a far cry from the projected goal of living with two hours of daily labour. The project has relied on the most idealist (but inexperienced) of followers until they are burnt out, as professionals with much-sought skill sets have been reluctant to commit to its unaccountable structure. In fact, for all the desirable vision of democratising production, there has never been any commitment to prefiguring such an ideal on-site. The project was hierarchically structured around the magnetic pull of a personal vision, never around any principles in which everyone is included and respected. Remarkably, responsibilities are organised like a conventional workplace: there are multiple titles, such as directors, managers and product leads, who all have specific duties and supervisory roles, and there is no mention of any kind of democratic principles, whether on-site or remotely. A Board of Directors has absolute control over the entire project, as defined in the bylaws of the non-profit corporation, but lacking the institutional forms in line with its professed goals, it could not establish a reliable and sustainable organisation with democratic control. Repeatedly, the reason given for quitting has been a conflictual relationship with Jakubowski – the de facto leader of the project and effectively the owner of the Farm itself. Some call his leadership "dictatorial" (Eakin), and note that his lack of (or unwillingness to develop) skills in growing a community has deeply damaged the project:

> ***After several fallouts with OSE collaborators, he became seen as unappreciative of the community and the organization evolved into a one-man show where credit for the work of many seemed to be going only to Marcin. This was obviously harmful to the***

***collaborative environment, and led to an unhealthy, disempowering dynamic within the community*. (Copley-Smith)**

According to multiple sources, OSE succumbed to a toxic mix of a male-dominant culture, a cultish hierarchy, exploitative work and lack of accountability —a fate that is a far cry from its initial lofty ideals. In a review of what went wrong with the project, one researcher remarked that "OSE's over-emphasis on technology ignores the ways in which power is maintained through infrastructure and its inequitable tolls" (Pasek). Similarly, after having endorsed and promoted OSE in its early years, Bauwens later commented that it never grow into a "true global open design project, since it was dependent on the leadership of one person in a particular locale" due to "the design of the project itself" (Bauwens, 'Crisis'). Not only has Jakubowski never acknowledged the fallouts publicly, he has also never felt the need to explain delays, changes of course or complete abandonments of objectives. OSE could have made a commitment to communicate honestly and learn from its failures, which would have been the greatest gift for designer and maker communities in allowing them to avoid potential pitfalls, as well as a way of eventually (re)gaining the trust of new collaborators. In the words of one ex-volunteer, "a vision as complex and ambitious as Open Source Ecology can only be achieved through debate, rigorous experimentation, genuine collaboration and a little love" (qtd. in Bauwens, 'Crisis'). Civilising technology does not come in a box, ready to assemble; it has to be grown from the ground up with people, and with civility.

Ultimately, it would be fair to conclude that OSE sought to do too many things at once. It could all at once be seen as a self-sufficient farm and an off-the-grid communal living experiment (but without a thriving community), as a peer-design studio and R&D network (while lacking widespread collaboration), as a start-up under a "visionary" leadership (though lacking a viable business model), and as an educational enterprise (for those who could afford it). Rather than dismissing OSE altogether due to its failure to meet its unreasonably grandiose ambitions, it would be much more valuable to consider it as a cautionary tale for future counter-industrial endeavours. In this light, it is particularly worrying that an overwhelming majority of media coverage of OSE has lacked any in-depth investigation, featuring only uncritical, positive portrayals of the project, which is presented as a shining example of maker machines. The same could be said about its appearance in exhibitions, such as the Istanbul Design Biennial, which

featured a built tractor. It was devoid of context, with no relativisation made of its viability, and not having been used at all, it was more of an art piece in the white cube rather than a functioning prototype in the mud. Still, thanks to its unique exposure, OSE has been influential and motivational for many other projects, allowing them to gain confidence and to carry their ambitions further. While the Farm is certainly not the first experimental intentional commune to fall short of its promise, the vision seeded by OSE has flourished in other places.

B. Makers:
Crafting the tools of liberation

I begin this section by sketching the contours of the broader debates on technological sophistication and material abundance, most notably, the long-standing controversy of technological unemployment. This allows me to reject particular perspectives of the post-work politics of full automation, and to focus rather on machines that enable makers in unprecedented ways rather than rendering them redundant. I follow the evolution of Precious Plastic to explore the emergence of a new breed of crafts that provides both social livelihood and ecological benefits.

1. The spectre of Fully Automated Luxury Communism

To provide some context to the perceived opposition between ecology and technology, I open this section with a closer look at an essay by Ayn Rand. As one of the leading ideologues of neoliberalism, the objectivist philosopher provides an emblematic expression (if not the main contemporary origin) of discourses that pit the eco- and the techno- against each other. Written in 1971 at the peak of the environmental movement, "The Anti-Industrial Revolution" encapsulates Rand's dismissive as well as terrified attitude towards the New Left in general, and environmentalism in particular.[i] The essay opens with a fictional account of a successful anti-industrial revolution in the 1970s. A bleak regime of eco-austerity (imposed by the government) has taken all everyday modern comforts away from the average Americans: no electric home appliances or entertainment devices; no private automobiles or shopping malls; no plastic bags, diapers or cosmetics; no canned or frozen foods. This speculative introduction allows Rand to illustrate her hyperbolic argument that only an unrestrained technological free enterprise can provide abundance, and that regulating industries will inevitably return civilisation to a state of savagery. The essay pursues at full steam its crusade against environmentalism with uncannily familiar arguments, deeply engrained in Western exceptionalism and colonial thinking. Just to name a few, Rand compares the land area covered by industries to the vastness of "untouched wilderness", discounts indigenous rights in the name of progress, and perhaps most disturbingly, presents one of the earliest examples of climate denialism. The essay reaches its crescendo with a remarkably unapologetic celebration of air pollution: "anyone over 30 years of age today, give a silent 'Thank you' to the nearest, grimiest, sootiest smokestacks you can find" (138).

Rand puts great effort into not only conflating environmentalism with technophobia, but also equating technological progress with free enterprise: "Make no mistake about it: it is technology and progress that the nature-lovers are out to destroy" (138). She then goes further to declare in a conspiratory tone that "the immediate goal is obvious: the destruction of the remnants of capitalism in today's mixed economy, and the establishment of a global

[i] All quotes in this section are from Ayn Rand, "The Anti-Industrial Revolution" (alternatively called "The Return of the Primitive")

dictatorship" (140). By introducing such equivalences, Rand conveniently draws a line dividing socialism, ecology, scarcity and despotism on one side, and capitalism, technology, abundance and freedom on the other. These associations enable her to spell out the core ideological narrative of the essay: "that collectivism is an industrial and technological failure; that collectivism cannot produce" (140). In other words, collectivism (here understood as a conveniently broad container for any non-capitalist regime, including but not limited to, traditional communalism, a centrally planned economy, commons-based peer production) cannot "deliver the goods" and is likely to end up in disaster. Rand states with absolute confidence that capitalism "is the only political system capable of producing abundance" (141). While she admits that there may be some local instances of actual pollution, she reassures her readers that pollution "is a scientific, technological problem —not a political one— and it can be solved only by technology" (142). While all the previous claims may appear as Cold War oddities, this final argument has not only managed to stand the test of time, but has become the central doctrine in the post-political management of environmental affairs and the erasure of ecological conflicts.

Beyond her rhetorical exaggerations and conflations, Rand deserves credit for accurately describing some of the characteristic environmentalist discourses of the New Left. She observes that "instead of their old promises that collectivism would create universal abundance and their denunciations of capitalism for creating poverty, they are now denouncing capitalism for creating abundance. Instead of promising comfort and security for everyone, they are now denouncing people for being comfortable and secure" (141). Indeed, there is a stark contrast between the optimistic early socialist promises of "heaven on earth" and the bleak predictions of the Limits to Growth, published a year after Rand's essay (Meadows et al.). Rand and her neoliberal followers benefited considerably from the simple and irresistibly attractive promise of infinite economic growth, and in this light, the ecomodernists appear as direct descendants of Randian ideology. In contrast, arguing to "leave well enough alone" (as Rand beseeches multiple times in the essay) remains a "hard to sell" political project, a problem that persists in the imprecise (if not misleading) naming of "degrowth" itself (Carson, *Degrowthers & Ecomodernists*). Part of the challenge lies in the difficulty in formulating an alternative and equally compelling use of technology without capitalist mediation, which is bound to remain speculative unless the conditions are created for its realisation.

But what is so special about the capitalist use of technology that it ambiguously generates both a sophisticated scarcity and disastrous abundance? Conversely, what is so inherently wrong with seeking a simple abundance of "everything for everyone"? These interrogations have recently triggered a new wave of engagement with techno-utopianism in the left, imagining radical politics that put technological advances into the service of social progress[ii]. Extrapolating the current possibilities towards the desired outcomes, left-accelerationists suggest that a post-scarcity future is both desirable and achievable. The promise of "fully automated luxury communism" (Bastani) may not be a spectre haunting the world yet, but it has certainly established a viral status and attracted academic debate in recent years. At first sight, the term comes across as an oxymoron: surely, luxury is synonymous with exclusivity and commodification, while communism is meant to stand for the exact opposite? For those who inherited the Randian ideology that "collectivism cannot produce", an egalitarian and abundant future would appear to be a nostalgic throwback to an earlier age with somewhat naive expectations. To counter these reflexes, Mark Fisher reinterprets the term Luxury Communism (the theme of the 2016 Digital Bauhaus Summit) as "Designer Communism", arguing that while both "luxury" and "design" are concepts that are captured by capitalist imagination, coupling them with communism implies putting the sophistication of design in the service of a universal, shared basis of production. This is similar to what Mike Davis calls "public affluence" (43), being an abundance of shared goods, spaces and infrastructures, rather than the private affluence of the few and the public poverty of the many.

What distinguishes luxury communists from Randian ecomodernists is their critique of capitalist automation, which makes them potentially compatible with ecological thought. Contrary to the popular (yet unfounded) belief, technological unemployment does not advance indiscriminately, nor does it prioritise replacing dirty, dangerous or degrading jobs (Greenfield, chap.7); it is in fact selectively applied according to capitalist interests. Machines may require high upfront costs and some subsequent maintenance, but they never call in sick,

[ii] I have previously cited several authors (Bauwens; Fisher; Mason; Srnicek and Williams), but the broader debate includes enthusiastic endorsements (Bregman; Frase), critical engagements (Greenfield; Noys) and polemical provocations (Sharzer; Phillips).

they don't unionise to negotiate better conditions, and most importantly, they never go on strike. Simply put, mechanisation eliminates troublesome workers, not the troublesome work as such. That said, rather than the reliability of machines, economic factors are even more influential in determining which jobs are to be sacrificed to mechanisation. It is more profitable to invest in machines that eliminate high-skilled, specialised and well-paid jobs, while there is little incentive for the capitalist to replace low-skilled, replaceable and poorly paid workers with sophisticated machinery. The interests of workers are rarely on the table where decisions are taken, designs commissioned or investments made, which is why the most dreaded activities (whether they are tedious, dangerous or meaningless) have not disappeared over centuries of mechanisation. This critique results in the following observations: first, the ever-increasing productivity under industrial capitalism has failed (or rather, didn't even try) to deliver humanity from work; in fact it has become more precarious and less fulfilling than ever (Graeber, 'Of Flying Cars'). Second, the working week and/or retirement age have not decreased any further in the post-war period; and, even free time is becoming colonised by work with the advent of instant communication (Crary). Third, with current rampant unemployment, chronic underemployment and precarious employment, the idea of full employment seems to be an unworkable (if not delusional) undertaking (Srnicek and Williams chap.5).

Combining these observations, luxury communists ask an entirely different set of questions to those Ayn Rand's would-be anti-industrialists would be expected to ask. If technological unemployment is a given, how can it be beneficial to anything other than capital? What happens to automation when capitalism is taken out of the equation? For luxury communists, the political demand to improve employment conditions needs to be superseded by the demand to infuse automation with an emancipatory purpose: abandoning employment altogether and establishing an intentional, quantitative reduction of work time. While the emphasis on "full" automation could be understood as entirely autonomous robots requiring no human intervention, it is meant more as the opposite of "full" employment, implying a desire to advance towards a society where most (if not all) work is automated and wage labour is eradicated altogether. Luxury communists build upon the legacy of the undercurrent of the anti-work ethic that runs through radical thought, from William Morris and Paul Lafargue to the situationists and autonomists (Black; Frayne), and follow more

closely the post-work politics of André Gorz (*Paths*; *Reclaiming*). Distinctively, luxury communists profess a greater appreciation of cybernetics and planning than their predecessors. Confirming Rand's worst nightmares, they do not shy away from expressing the need to reign over the "commanding heights of the economy" —and to build power accordingly.

If the hyperbolic discourse of fully automated luxury communism is meant to provoke thought and imagination, it may be both well-meaning and strategically effective. However, it needs to be seriously nuanced and confronted with environmental considerations, which often appear as an afterthought to techno-utopianism. It would be unfair to deny that electronics and computing are extremely resource- and energy-intensive, particularly due to their dependence on the extraction of rare earth minerals with heavy environmental consequences (Vansintjan). Without acknowledging and factoring in ecological limits, speculating on a high-tech future without empirical evidence is at best a false promise, and at worst a neo-extractivist project that is not so different to eco-modernism. Similarly, the simplistic demands of "full" automation also fail to recognise what forms of labour will be indispensable within an ecological transition, and would therefore need to be valorised. Consider some of the tasks at hand: installing renewable energy infrastructure, retrofitting the built environment (to withstand or adapt to the impacts of climate), feeding the world population (with small-scale sustainable agriculture), expanding education and health services, remediating pollution, salvaging waste and regenerating resilient ecosystems, to name but a few. All require human labour at its best: working with care, creativity and collaboration. Technologies can facilitate and empower these daunting tasks immensely, can remove the burden from workers and reduce the necessary work time, without devalorising human intervention. It is, however, very likely that some of these activities are better left non-automated, as human labour can be less energy-intensive than sophisticated machinery doing the same or equivalent tasks.

Beyond primitivist rejection and superfluous application, it is possible to combine some of the compatible elements of degrowth and accelerationist positions. Such a counter-industrial paradigm can critically endorse automation, and negotiate its socially and ecologically beneficial reorientation. Instead of uncritically declaring that automation spells the end of work, it is possible to conceive intentional, selective automation while recognising that there will be

plenty of valuable work to do for generations to come. This would not be governed by what capital deems fit, but would instead follow what liberated workers find desirable, hence the need to specify what the transitory forms of work may look like, and how they can be complemented with machines. Repurposing William Morris' distinction between two kinds of labour, an intentional application of automation that destroys strictly "useless toil" while encouraging and enabling "useful work" can shift work away from its alienated, precarious and extractivist forms. Intentionally counter-industrial automation may turn the destruction of jobs into an opportunity to liberate time for creative work (Thompson). With this perspective in mind, it is now possible to look at present-day practices that rely on machines to empower makers. While the aim may not be full automation, the following case study provides a glimpse of how even existing technologies can be repurposed in a humane, socialised, communal ways.

2. All that is solid waste melts into Precious Plastic

A gallery of colourful plastic objects are on display: a spinning top, various plates and flower pots, hand-woven hats and lampshades, clipboards and 3D printer filaments [see fig. 27]. They could belong to any fashionable gift shop, filled with endless plastic junk, far detached from self-proclaimed world-saving design projects that are of interest to this research. After all, up-cycling single-serving plastic bottles, bags or cups were the first reflex of sustainable design, and such objects are once again conceived as consumer goods, mainly for decorative purposes, with limited usefulness and therefore of rather insignificant value. Crucially, these approaches have little to no effect on plastic pollution, since they piggyback industrial processes without challenging their ever-growing and accelerating rate of extraction and consumption. Focusing on recycling rather than reduction strategies remains a palliative effort at best, and a distraction at worst. To make things worse, recycling rates are not at all satisfactory, as less than 10% is looped back into production, and about the same amount is incinerated and ends up in landfill and the oceans (Geyer et al.). There is a technical reason (or rather, excuse) for this low rate: big manufacturers employ highly efficient, sophisticated and expensive industrial machinery with low error thresholds, but these machines require virgin plastic pellets with no imperfections or irregularities, which excludes most recycled plastic. In other words, industries usually lack the time for recycling.

Given this context, the particular set of recycled plastic objects mentioned above are worthy of mention, as they are not really end-products, but rather by-products of the project in question. The showcased creations are made by Precious Plastic machines developed by Dave Hakkens as part of a design project aimed at increasing the rate of plastic recycling, without prescribing in advance what objects ought to be produced. Not unlike the previous case studies, which were more than products (OpenStructures can be seen as a protocol, and OpenDesk as a platform), what sets Precious Plastic apart is its outcome: a set of machines. Instead of designing goods for "end-users", Hakkens designs machines for "end-makers" – a tool with no frivolous visual appeal, but strictly bare-bones engineering; not a product, but an enabler of production. Precious Plastic is a paradigmatic and perhaps even pathbreaking case, in that it responds to ecological needs with machines. It is nonetheless not an industrial techno-fix, but a community tool that brings makers together. It intervenes in plastic pollution

neither by austere nor disciplinary means (as bans and fines usually are), but by enabling a brand new craft and promising a responsible yet luxurious repurposing of plastic waste. As the final sections of this chapter will explore, Precious Plastic is thus the ultimate example of what counter-industrial maker machines are meant to be: a self-produced means of production, and a substitute to the industrial commodity-machine.

A closer look at the designer's intentions, and the making of the machines and their impact may clarify these claims. Born in 1988, Dave Hakkens studied at the Design Academy in Eindhoven, and received rare exposure in 2013 with Phonebloks – a graduation project that envisioned a modular design for mobile phones. Rather than launching a start-up company and courting investors, he instead approached the potential users of such a hypothetical phone directly in an attempt to perpetuate the idea that such a phone is worth producing. His campaign was an unprecedented viral success, gaining nearly a million supporters and an audience of almost 400 million social media users. Instead of monetising this success, however, he encouraged the community of interested parties to take on the responsibility of looking after the project, turning his attention back to Precious Plastic, his other graduation project, which "was a proof of concept, something that worked as a prototype but was not ready for scaling it up yet" (PP, *Micro Recycling*). The machines themselves are made with basic tools that are widely available around the world, and the components are kept as simple and accessible as possible, making them affordable in price and easy to build, repair or customise. This makes Precious Plastic especially relevant for developing countries, where industrial facilities are unavailable and low-income trash collectors can only resell plastic in bulk. While this approach remains faithful to the ethics of appropriate technologies, as later experiences demonstrate, assembling machines out of salvaged parts does not necessarily deliver the same quality everywhere in the world.

The first machine is the shredder, for the production of plastic flakes to be fed to the other machines. The blades themselves are meant to be digitally manufactured – cut out of a sheet of steel, while the framework, electronics and hopper are handmade, and the motor is salvaged. The other three machines process the plastic flakes through compression, injection and extrusion. The compressor is the easiest and cheapest machine to build, comprising essentially a reclaimed oven with improved electronics, and a jackscrew to press the melted

plastic into a mould (that fits inside the oven). The injection machine melts and injects the plastic into any small mould, producing objects mainly in series. Finally, the extrusion machine, as the most difficult to assemble, comprises a drill rotating inside a heated tube, producing a continuous string of plastic that can be given shape immediately by hand, or used as filaments for 3D printers (still in development). These are unlike the high-tech machines that most people are used to, and are neither superfluous consumer electronics nor the industrial infrastructure that produces them. They are an essential piece of equipment, simplified, and "reverse engineered" [see fig. 28]. This methodology is in direct opposition to the proverbial "reinventing the wheel": rather than a brand-new invention, it is a liberation of already existing technologies away from specialised industries into the hands of makers.

It takes approximately two weeks and costs up to €1000 to build all the machines, depending on the amount of components that are to be salvaged from a scrapyard rather than bought from a hardware store. Some of the electronics are acquired from eBay, and hence not procured locally, but are available from a wide range of suppliers. Intended for the widest circulation and broadest adoption, the machines are designed for self-production, although it is also possible to seek help from more experienced makers. In any case, Precious Plastic does not sell the machines, but encourages other machine builders to do so, without asking for any licensing fee or share of the profits that can be made; all the blueprints, know-how and learnings are shared freely online. The mission to recycle plastic trumps all other considerations, and success is not measured by monetary income, but the replication of machines. The more machines are made, and the more knowledge is acquired about recycling plastic, the more the waste is valorised. What was once an externality (plastic waste, undesired and uncared for) is looped back into a valorisation process. This may paradoxically appear as a palliative solution, as the machines may actually justify sustaining plastic waste rather than eliminating it. In fact, the machines function only as a gateway to community-building, and machine-building becomes the material consolidation of people's engagement in the recycling of plastic. In a way, the strict separations between design, engineering, manufacturing and consumption collapse, and give way to overlapping ways of making, with machine-making, pellet-making, mould-making, craft-making and community-making all melting into each other.

Hakken's approach was well received right from the start – he was awarded a Social Design Talent prize and a Keep an Eye grant, both worth €10,000, to take the project forward, and offered to donate the money to someone who could help him improve the designs and launch Precious Plastic v2.0. Once again, he was given back more than he had initially offered – not only did an experienced machine builder join him, but many others offered their help in various aspects of the project, such as web development and logo redesign. The logo captures the irreverent reversal of values, being a white plastic bag, proudly waving on a flagpole – a mundane and worthless object standing in for the heavenly symbolism of a flag[i] [see fig. 29]. Less than three years after the original project was launched, the new designs were published in 2016, complete with instructional videos, design blueprints, electronic schematics and bills of quantities. At the time of relaunch, Precious Plastic had by far the most comprehensive project documentation among the case studies herein, as well as a growing, vibrant community. There has been a steady flow of images from every continent, capturing proud makers with their self-built machines and their recycled creations [see fig. 30].

Precious Plastic employs the same strategy as Phonebloks for its diffusion, relying on viral online content creation that delivers a rapid outreach to a broad follower base on social media. The website is full of encouragement to spread the good news: "Let people in every corner of the world know they can start their own local plastic workshop", "We've developed machines to recycle plastic, let's make sure people know they exist!" (PP, *Home*) However, there would be little motivation to share unless visitors find the project relevant and feasible in the first place. Hence the commitment to open-sourced documentation (appropriately called "blueprints"), which "will always be freely available online, for anyone to access and use", makes sure the project is reliable enough to initiate long-term engagement. Finally, considerable emphasis is given to how easy it is to produce the machines, "made with basic tooling and materials that should be easily available, wherever you live" (PP, *Machines*). The simple language, neutral visuals and complete documentation stand as an almost evangelical effort to spread Precious Plastic, through both the reproduction of the designs and the production of the machines. The goal is not simply to have people build

[i] Note the distant resemblance with the Pirate Party logo, also a flag on a pole, also shaped like the letter P.

the machines in isolation, but to "create a worldwide community of like-minded plastic savers" (PP, *Plan*). After all, the makers are not customers, but collaborators of Precious Plastic; a forum brings them together to improve the designs, to develop new uses for the machines and to showcase their plastic creations. There is a triple process that Precious Plastic puts in motion: the designer open-sources a machine set, the makers replicate the machines and moulds, and the craftspeople make use of the machines. Of course, these roles are not necessarily separate, but melt into one another, just as the plastic flakes from multiple sources are melted together to take new forms. Pushing that logic further, the ultimate success of the project would be for Hakkens to be only one maker among many within a project that is entirely managed "by the makers, for the makers". While no project has yet reached that stage, as the focus shifts from the machines to products, the initial work of the designer fades into the background and the makers take the stage.

Wrapping up this first stage of Precious Plastic, a few challenges stand ahead of the project as it expands and matures. There seem to be at least three main factors that will determine its future. The first is to see these machines put to good use in the production of relevant, useful, valuable creations, as this will be the main motivation for the widespread adoption of the machines. If the community develops and shares its own open-sourced moulds, the utility of the machines will keep expanding. The second factor is the level of incentive the machines will generate for the collection and sorting of plastic, or in other words, its actual contribution to "cleaning up the mess". Precious Plastic wholeheartedly embraces this challenge: "Whether we like it or not, plastic is our inherited toxic legacy. Let's use it as a resource to create new value and social innovation" (PP, *Plan*). Crucially, identifying and separating plastic waste remains the most laborious stage, and this cannot be achieved solely by an informal community of "plastic savers", requiring a much larger social cooperation of multiple actors, associating with households, factories, street collectors, municipalities and junkyards. This is why the value created by Precious Plastic must exceed the strict utility of the creations and create livelihoods across its entire value chain. The last factor for success is the viability of the project's business model. The website confesses that "we haven't really figured out a proper way to fund this yet. Our priority is to find a solution to plastic waste, not to create a business" (PP, *Donate*). It is yet to be seen if the project can be effective in running without a sustainable plan.

3. Makers of the world, unite!

Emboldened by the interest Precious Plastic v2.0 generated, Hakkens and his collaborators moved forward to develop a Version 3 in early 2017, calling for support with two things: money and people. For financial support, they set up a Patreon account, which provides them with a modest but regular income, allowing them to maintain their own livelihoods. Crowdfunding is particularly appropriate for a project with a social mission that navigates between precarity and autonomy, "to make sure we can always stay focussed and move forward without having to do side jobs in the weekend" (PP, *Creating*). Unlike the corrupting influence of venture capital or start-up acquisitions, crowdfunders do not expect financial return, but rather participate in a gift economy where the reward is staying true to the social purpose. There is, however, only so much money can buy, and attracting talent on a voluntary basis is more valuable than cash. Several designers have joined Hakkens to carry out material experiments and to develop a series of creations that demonstrate various applications for the machines, and these collaborations resulted in a range of finished products (sunglasses, phone cases), works of art (sculptures or jewellery), building materials (bricks, beams, 3D printer filaments) and domestic items (both decorative and functional). These testify that there is more to Precious Plastic than a futile cycle of "garbage in, garbage out" —a closed-loop of recycled junk. To promote this wide range of possibilities, an online "bazaar" has been established, not just for selling finished consumer products, but also for moulds, plastic flakes and machine parts for the makers themselves. Fully aware that a market place does not create a community, greater emphasis is given to the online interactive map on which plastic workshops, machine builders and anyone who would like to get involved in plastic recycling can subscribe and connect with like-minded neighbours. This map gives a sense of how Precious Plastic has already reached every continent, and how much more potential there is to engage the uninitiated.

Version 3 also provides better support for the setting up of new workspaces. The complete workshop covers every stage of production (from waste collection to the showcasing of finished products) inside a generic shipping container,

which can be set up on a landfill, a remote beach or a city square[i] [see fig. 31]. The documentation estimates €3000 in costs and a month of work to establish one from scratch; such micro-factories require much less investment, expertise and infrastructure than highly sophisticated, centralised and integrated plastic recycling facilities. The project confidently claims that "over 200 plastic recycling workspaces have already been set up and a new one is opening up somewhere around the world every week" (PP, *Creating*). Having streamlined the process and proven its compatibility with diverse locations and contexts, Precious Plastic presents a concrete counter-industrial model for the transformation of an environmental liability into economic viability. One example of this dual benefit is an initiative launched during the 2016 Olympic Games in Rio de Janeiro. Trash collectors from the favelas came together to form a cooperative, to recover plastic waste from the competition venues and to immediately process them in collaboration with Remolda – a mobile recycling factory – to produce souvenir items to be sold to the tourists, as the very source of the waste. The project carried the slogan "plastic is worth gold" and their presentation video discloses the numbers: "Mixed plastic: R$0.90/kg. Separated, crushed and cleaned: R$4.00/kg. Final product: R$15[ii]" (*Plástico*, 2:40-2:48). The profit was returned to the cooperatives to pursue their efforts to clean up Guanabara Bay and the surrounding national parks (Pontes).

The new version also provides more insight into the evolving discourse of the project. Over and above the casual encouragements on the website, Precious Plastic seized the opportunity to launch v3.0 during the 2017 Dutch Design Week and presented a full-fledged manifesto to the public [see fig. 32]. Beyond mere statements, the manifesto was accompanied by a series of artefacts: "Five objects crafted with a lot of effort (...) Pushing the limits of plastic recycling. They tell the story about how we value plastic" (PP, *Series*). The first statement, entitled "Dawn of cheap", tells an origin story for plastic, explaining that it was initially invented as a cheap and easy replacement to ivory, which was in high demand but scarce and expensive. A plastic replica of a massive elephant tusk accompanies the story, made up of layers of plastic, deposited as if it had grown over the years,

[i] The first pilot for the integrated workshop was launched in Kisii, Kenya in collaboration with UN-HABITAT, followed by two more pilots; one in Patagonia (led by a women-only crew) and the other in the Maldives.

[ii] The souvenir item weights merely 30g, making the added-value several hundred-fold.

with a gradient from raw roots to a smooth tip. While no explicit reference is made to the violence of ivory poaching, the striking presence of a realistic imitation prompts the viewer to consider plastic in a better light, as a (relatively less violent) substitute for the qualities attributed to ivory. The second statement shifts the status of scarcity from ivory onto plastic itself: "Plastic is made from oil – a fossil fuel that took thousands of years to be created. Yet, we trash plastic in a matter of minutes. Once we burn it, is is gone. Forever. (...) It is time to treat this scarce material as a valuable, scarce and finite resource." This echoes Victor Papanek's dictum, "That which we throw away, we fail to value" (Papanek 78), indicating that things designed for single use are, by definition, given no value at all. This time the accompanying display is Precious Plastic ingots in multiple colours, stacked like a pyramid of gold bullion. Here, the literal imitation of precious metal is meant to question the illusory abundance and worthlessness of oil derivatives. That said, the gold metaphor implies constant value (as the gold standard used to be), overlooking the unpredictable value fluctuations of oil.

Perhaps the ambiguity of the concurrent overvaluation and undervaluation of plastic is better expressed in the third statement: "Plastic is one of the longest lasting materials on the planet. It does not decompose and will stick around for hundreds of years. Yet we use it to make the cheapest, most disposable products. (...) An incredible waste of potentials" (PP, *Series*). This is perhaps the key paradox of plastic: discarded as waste, it is abundantly available for free, while creating poverty by damaging ecosystems. By transforming un-precious, unwanted, wasted plastics into valuable, useful and desirable raw material and finished goods, Precious Plastic seeks to eliminate the abundance of waste, putting the discarded plastic into good use, and generating value and livelihoods in the process. The demonstration piece for this statement is a monumental crystalline sculpture weighing 17 kg, cut like a precious stone, freckled in marble-like colours, polished to a high gloss finish. Dubbed an "anthropocenic gem" (PP, *Making*), it could be a future geological formation deposited over millennia if plastic pollution goes unchecked, and a logical extension of the already-documented "plastiglomerate" plastic-rock composites (Robertson). Alternatively (and on a more optimistic note), this otherworldly monolith testifies to the inherent beauty of the material like no other application, perhaps inviting its admirers to imagine such monuments on every beach that has been cleaned of its plastic waste. This abstract nature of the artefact elevates plastic and celebrates its aesthetic qualities without any symbolic mediation, without resorting to the direct

imitation of anything culturally valuable like the previous examples. This piece served the project particularly well when it was displayed in the shop window of a major department store on a major commercial street in Amsterdam. One window was filled with all kinds of plastic trash with the word "PRECIOUS" under it, while in the next window, the object of art sat on a pedestal in front of a white background, subtitled simply "PLASTIC" – a simplified yet effective expression of the paradox for the countless passers-by to reflect upon [see fig. 33].

The last two statements and their corresponding objects relate to the craft, time and effort that makers put in Precious Plastic objects. "We try to push the boundaries of plastic, how it is produced, reproduced, viewed and consumed by society. We like working with plastic in a more human way —on a smaller scale with room for details and love. Like a craftsman" (PP, *Series*). An imposing vase illustrates this point. Made out of recycled DVD boxes, handcrafted with a textured surface, it stands in stark contrast to the industrially standardised objects that emerge perfectly identical from a single mould. The re-emergence of crafts (Sennett) is often thought of as a return to traditional artisanal techniques, but what Precious Plastic proposes is nothing short of creating a new kind of craft for the 21st century. As a field previously monopolised by industry, being a craftsperson in plastic would be an essential trade similar to working with wood, metal or ceramic, with great expressive potential and economic viability. This economic dimension is discussed in the final statement: "Plastic isn't cheap by nature —it's how we, as humans, deal with it. Products are mass-produced in huge quantities to keep prices low with very little care placed on each individual plastic object. That same object could quickly gain value and preciousness by dedicating some extra time and effort to it" (PP, *Series*). Indeed, Precious Plastic does not really intend to beat the plastic industry in their efficiency; aiming for small-scale production, the goal is to seize a value chain that mass production is unable or unwilling to occupy. The final object captures the contrasting aesthetics of crafts and industries in a single piece: a standard Monobloc white plastic chair, but with intricate lace and cutwork textures. This time it is not the physical properties of the material that gives its value, but the sheer time and effort spent manually transforming it that makes the final object so singular and infinitely more precious than its universally ubiquitous copies, which are estimated to exist in their billions. If the Monobloc (and everything else that is

made out of plastic) is here to stay on this planet, better they be treated with more care, and by extension, with the value they deserve.

Some years after building the very first prototype, Hakkens and his team show no sign of stopping, and are working on yet another version. After all, how could one pretend the project had reached its goals? Hakkens admits that "it's hard to just deny this massive global plastic problem and move on" (PP, *Creating*). Emboldened by more than 6,000 people from around the world wanting to get started, they announced in summer 2018 plans for "creating an army to fight plastic waste" (PP, *Version 4*). Military metaphors aside, they have good reason to step up their ambitions, having been granted a vast workshop space in Eindhoven city centre by the city, and even more impressively, they have been awarded €300,000 by a foundation that will be spent entirely on developing v4.0, representing an almost tenfold increase in budget when compared to the previous version. Having operated on a voluntary basis to date, they openly express their resistance to professionalisation: "We could employ six people full time paying normal salaries for a few months. Or we could invite 40+ dedicated people from around the world and cover all the basic expenses (...) We like to think the second option is the most efficient and beneficial for the project" (PP, *v4 Plan* 11). More than 600 people have applied from around the world to fill 46 well-defined roles that include engineers (to improve the safety, efficiency, washing, sorting and automation of machines), product designers (to explore and create useful and valuable products for the community to reproduce), web developers (to rebuild a community platform to meet, collaborate and share online) and community builders (called "the cherries on the cake"). The latter also includes activists to "develop different strategies or actions that people can peacefully take to push humanity beyond plastic into a new sustainable era away from petrochemical mass suicide" (PP, *Version 4*).

It is perhaps fitting that precisely when my role as an academic researcher studying Precious Plastic was coming to an end, I was invited to become one of the two in-house activists with responsibility for strategising, mobilising and designing activities and for lobbying politicians. The triple subjectivities I announced in the introduction —as researcher, designer and activist— once again meet and merge in a new configuration. I would admit that the boundaries have remained blurred throughout my investigation: I became friends with the Precious Plastic team, urged them not to name the bazaar a "marketplace"

(fearing it would undermine my argument), and even motivated them to join a mass civil disobedience action against coal extraction. They too have embraced their permeable and interchangeable roles, accepting that creating a postcapitalist alternative through design practices alone is not enough, and understanding that political interventions, ecological resistance and civil disobedience are necessary and integral to creating effective and lasting change. In this sense, Precious Plastic is certainly more of a social movement than a design studio, and my involvement has become a more or less conscious attempt to develop a synthetic design/action/research methodology. There may be no other way to engage with a postcapitalist project than to become part of it by breaking disciplinary chains, and uniting as makers without borders.

Conclusion: Designing Postcapitalism, a Proof of Concept

In this study, I have explored how design practices can contribute to a postcapitalist transition. Just as the transition into capitalism was a gradual, complex, and uneven process, the way out of capitalism also proceeds by "strange and circuitous routes". This complexity notwithstanding, it is possible to espy some similarities and differences between these two epochal shifts from the vantage point of my threefold design analysis. To me, the early-industrial inventor is an archetypical figure of design labour. The inventor combines creativity, experimentation, and innovation, and is marked by their isolation from their peers. Under the commodity-machine, design labour has been subordinated to capitalist interests and is increasingly enlisted in the service of late-capitalist global brands. The ways in which design knowledge is treated have undergone a similar process. If once pre-capitalist guilds guarded trade secrets to protect their members' interests, today the legal framework of intellectual property is reinforced in parallel with tech and media monopolies. Finally, whereas artisanal crafts were meant to respond to individual needs, sweatshop workers toil for no other reason than that of generating profit for multinationals.

With this, we arrive at a triple dead end. Postcapitalist design strives to overcome the impasse by way of commoning. In this context, commoning entails (re)valorising collaborative design processes, facilitating the circulation of

blueprints, and rendering local productive infrastructure accessible to anyone. The counter-industrial paradigm, like the periods preceding it, exhibits a degree of internal coherence and self-reinforcement. Accordingly, I have been able to recapitulate correspondences and diverges among key aspects of design cultures in different eras in the following table:

	pre-capitalist pre-industrial	capitalist industrial	postcapitalist counter-industrial
design labour	isolated inventors	commodified brands	collectivised peer to peer
design knowledge	secretive guilds	exclusive patents	inclusive open source
design artefact	individual use crafts	for profit sweatshops	shared use maker spaces

Table 4. Major paradigm shifts in design

In substantiating this shift in design cultures, I argued in the first chapter that the commodity-machine faces multiple crises and that greenwashing has essentially become the general condition of contemporary sustainable design. Although products are endowed with supposedly future-proof qualities, right down to their minute details, the overall objectives, priorities, and urgency of sustainability are lost in the process. Piecemeal attempts to address unsustainability result in manufacturers attending myopically to products' technical performance or the "footprint" of their production cycle. In focusing narrowly on material performance (often in tandem with misleading aesthetic presentation), predominant sustainable design principles do not respond adequately to the severity of the crises at hand. As such, they disregard the social and economic dynamics that determine how and why these products are made in the first place.

Based on this critique, I concluded that sustainable design must involve more than focusing on the material impacts of products alone. Indeed, confronting unsustainability means recognising that products' materiality is entangled with the unsustainable social relations of the commodity-machine. The upshot of this is that it is only possible to address the unsustainability of artefacts by redesigning the social and economic relations that condition them. Design in itself, in other words, is neither the problem nor solution. Problems and solutions

are to be found instead in the social relations that govern design practices. If reconfigured according to commoning principles, design can contribute towards a postcapitalist transition.

These insights led me to focus on contemporary design projects that practice commoning and stand out as potentially being early pioneers of postcapitalist design. I have attended closely to everyday tools, building systems, and fabrication machinery that are emblematic of peer production, open-sourcing, and the maker movement. Although commoning covers a vast and complex field of collaborative practices and collective action, I have identified three main ways in which it manifests in design. First, designers practice *shared creation* by working in common and identifying as designer-commoner subjects. Second, open blueprints are held in common in platforms that allow *shared governance*, clearing the way for the institution of universal design libraries. Third, makers seek *shared access* to the means of production to allow the provision of "everything for everyone". Just as market valorisation reproduces itself in and through the commodity-machine, these combined commoning practices also produce and expand themselves through their own momentum. Across the case studies analysed in this study, commoning in design creates shared value, upholds institutional arrangements, and provide a simple abundance of sustainable goods. In negotiating creative work and political action, the case studies also display a productive tension between speculative discourses and prefigurative practices. Together they constitute an ecology of subjectivities, practices, and discourses that can be summarised in this table:

	transformative subjectivities	prefigurative practices	speculative discourses
peer designing	co-designers, co-creators	shared creation	becoming "designer-commoners"
open blueprints	platform facilitators	shared governance	instituting the "wikipedia of things"
maker machines	makers, builders	shared access	providing "everything for everyone"

Table 5. Synthesis of postcapitalist design practices

In the second chapter, I introduced collaborative practices that are nothing less than transformative for those who design, fabricate, and use the products in

question. Boundaries among these subjectivities dissolve as users become makers, makers become designers, and designers become facilitators. Most importantly, all of those engaged in design become commoners, who produce, reproduce, govern, and replicate shared design projects. Commoners all across the production chain of postcapitalist design generate shared value, which not only benefits the parties involved but also physically realises an alternative value system. *Peer designing* comes into play in collaborations among designer-commoners not only at the design stage but throughout the value chain. Whereas WikiHouse and Open Source Ecology require massively distributed collaborative principles, OpenDesk and Precious Plastic provide platforms through which individual designers and makers can participate in fair business practices. By establishing institutions and communities of collective action based on free association, peer designers can become more resilient. What is more, they have a better chance of securing their livelihoods and socialising their design labour than they otherwise might if they remain in loose networks of peer-designers. The organisational and business models of such communities prefigure postcapitalist relations while still being strategically integrated into market practices. In designing processes of commoning around a product, these projects become points of convergence around shared political goals.

In the third chapter I investigated *open blueprints*, the cornerstone of postcapitalist design practices. Although all of the case studies featured in the study make their blueprints available through commons-based licenses, these are of varying levels of sophistication. Whereas some projects have simply uploaded drawings, others present detailed knowledge and provide documentation on sourcing materials, instructions for processing them, source code for electronic components, bill of materials, assembly guides, and forums for troubleshooting. The work is not over when blueprints are made available online. Encouraging diffusion and replication, coordinating improvements and support, and facilitating derivatives and adaptations all constitute essential aspects of commoning, in the sense of shared governance over design knowledge. This, in turn, requires institutional arrangements that can guarantee quality and continuity in open-source projects, as well as keep the process inclusive and accountable. Whereas OpenDesk, WikiHouse, and Precious Plastic showcase successful approaches to documentation and community-building, OpenStructures (and its derivatives) and Open Source Ecology appear to have experienced more difficulties in commoning knowledge. There may be no silver

bullet for viral replication, but projects that focus on single, complete products achieve more as compared with vast open-ended systems.

The final chapter combines these insights with strategies for delivering eco-social technologies on which many postcapitalist design practices depend. These strategies all subscribe to low-tech or appropriate-tech ethics with small material and energetic footprints. In enabling hacking by design, they invite DIY cultures and maker movements to repair, customise, or reconfigure the products freely. The end products are seldom consumer goods but tools for a community: *maker machines* that themselves constitute infrastructure for localised fabrication. Whereas Precious Plastic and Open Source Ecology capture the essence of this means of production, I would suggest that OpenStructures household items, OpenDesk furniture, and WikiHouse constructions also contribute to basic infrastructure. These approaches are in line with a counter-industrial project of decentralising and autonomously generating means of production. That said, none of the projects is strictly autonomous in relation to existing industrial infrastructure in that they rely on preexisting machines, components, and supply chains. Beyond constituting absolute limits, these challenges indicate some directions for further initiatives to take. Given that the counter-industrial paradigm shift is still far from complete, postcapitalist design practices recognise that projects cannot be 100% circular while they remain dependent on the commodity-machine. Instead of fetishising meticulously sourced raw materials only to churn out green commodities, they seek sustainable social relations so as to build fair, resilient, and thriving communities.

Throughout this study, I have analysed how commoning takes place in design practices. Commoning democratises design, not because everybody magically becomes a designer overnight, but because it generates livelihoods for makers everywhere. Commoning enables people to produce quality goods and fair jobs, and participate in localising, improving, and adapting products to suit an enormous array of needs, possibilities, and desires. This conclusion remains descriptive, though, in that it does not tease out the potentials latent in these practices. Each of the case studies that I have presented is unique, displaying distinct strengths and weaknesses. OpenStructures encourages new ways of working for designer-commoners and proposes a platform for everything. That said, its derivatives remain modest and have struggled to make a lasting impact. OpenDesk may pursue smaller aims, but delivers exactly what it promises: a

cosmo-local model for flatpack furniture making. WikiHouse, in contrast, does not hesitate to engage in wide-ranging speculation. In this way, it has laid the foundations for a complex endeavour that can only disrupt existing housing practices over the long term. Although Open Source Ecology's harbours spectacular ambitions, it lacks any structure through which it might realise them in any meaningful way. Finally, Precious Plastic strikes a fine balance in that it encourages the building of machines and communities alike. Each iteration of its products narrows the gap between speculation and prefiguration, between daily practice and grand design.

Several years after they were launched, many of the case studies remain active in one way or another. OpenStructures has significantly overhauled its website, which now gives prominence to recent applications; OpenDesk has fully reviewed and updated their Terms of Service to allow makers more autonomy; WikiHouse had a large-scale application in Hackney, housing 1'000 m2 of low-cost studios for local creative businesses; and Precious Plastic has launched its version 4.0, which includes semi-industrial machines, tools to set up recycling businesses, and an extensive community platform. The continued viability of these projects has inspired countless similar initiatives, ranging from beehives and washing machines to prostheses and firearms. However, questions might be raised about the future impact of even Precious Plastic, arguably the most compelling project featured in this study. Considered in isolation, this clutch of loosely-related case studies might be deemed niche, quirky, or insular. Do these projects merit the label of "postcapitalist", ambiguous and controversial though it may be? What would it take to connect up this nascent archipelago of practices and make it truly disruptive and counter-hegemonic? Attending to one final project will help synthesise my findings and conclude this study.

In late summer 2015, two collectives from Berlin and Paris (Open State and OuiShare) hosted POC21, which they described as an innovation camp for "eco-hacking the future" (POC21, *Home*), in Château de Millemont, some fifty kilometres outside of Paris [see fig. 34]. For five weeks, more than a hundred "makers, designers, engineers, scientists and geeks" (POC21, *Home*) gathered on the sixteenth-century estate, where they co-designed and open-sourced disruptive and appropriate technologies. An early announcement described the camp's political and ecological context and ambitions in stark terms:

Global warming, resource depletion, species extinction. Growing inequality, social stratification, political dead-end. Isolation, burnout and despair. We sign petitions, eat organic, recycle and drive hybrids — and yet the overall negative trends keep accelerating. Scientists say our civilization is nearing collapse, advancing into a perfect storm of combined crises.
Since the COP15 climate conference in 2009, little has changed: political leaders seem to be going in circles, and protest culture lacks a clear blueprint for the future.
In 2015, it is time to move from protests to prototypes. Instead of a Conference Of Parties, we propose a Proof Of Concept. We call it POC21.
(POC21, *Accelerating 2*)

POC21 sets itself apart through its explicitly critical stance towards mainstream environmentalism (signing petitions), ethical consumerism (eating organic food), false solutions (recycling), and green capitalism (hybrid cars). What is more, it connects the dots between political, financial, ecological, and mental breakdowns. More remarkably still, the diagnosis extends to the inability to develop "a clear blueprint for the future" on the part of political leadership and social movements alike. POC21 understands this disconnect between resistance and alternatives as stemming from an absence of design in (climate) politics. Instead of negotiations and protests, POC21 proposes a prototype, "a proof of concept that the future we need can be built with our own hands" (POC21, *Proof*). Inverting COP21 (the acronym for the 2015 Conference of the Parties, widely known as the Paris climate summit), POC21 presents itself as the opposite of diplomatic talks and claims to "move from talking to building a better tomorrow" (POC21, *World*). Given the pressing timeline of climate breakdown, this preference for deeds over words is more appropriate than promises about distant sustainable futures that neglect the present.

To appraise the significance of POC21, the term "proof of concept" must be seen as more than a witty branding exercise. Broadly speaking, a prototype signifies all of the early forms of a product from which improved and definitive versions may derive. A proof of concept denotes a more specific stage in a product's development: it involves a focused experiment aimed at testing

assumptions. A proof of concept marks the transition from a project's conceptual, theoretical, or speculative phase to its first iteration. Although incomplete, this first attempt at realising the concept demonstrates—indeed "proves"—its feasibility in the real world. Put differently, a proof of concept is simultaneously prefigurative and speculative: negotiating between the possible and the necessary, it pushes a project to the next stage. In this light, this study can also be considered a proof of concept. By extrapolating the logic of each disparate initiative and connecting the dots among them, I was able to tease out a blueprint for an ecological and social transformation of the economy that involves moving away from market relations and towards socialised ones, from exchange to sharing.

Much as I am interested in disentangling the commodity-machine, POC21 also places great emphasis on "maximum diffusion" and "mainstreaming" in various statements. It aims to achieve the widespread adoption of products that are "sexy like Apple but open like Wikipedia" (POC21, *Vision*). This provocative juxtaposition suggests that it is not only desirable, but essential to synthesise user-friendly technologies and open-source collaboration. In another succinct expression of its hypothesis, POC21 foregrounds "the disruptive impact that collaborative production, open-source and the maker movement can have on mainstreaming the means of sustainable living" (POC21, *Vision*). It is striking how closely the three disruptive ingredients listed here overlap with my threefold commoning framework. Similarly, POC21's plans to "prototype the fossil free, zero waste society" and "overcome the destructive consumer culture and make open-source, sustainable products the new normal" (POC21, *Home*). The ambitions can be paraphrased used terms established in this study: the goal is "to prototype postcapitalist society, overcome the destructive commodity-machine, and make commoning products the new normal". It would seem that lessons drawn from POC21 are also applicable to this study, and vice versa.

POC21 professes "to build the tools we need for the world we want" (POC21, *Proof*). That world certainly requires more tools than can be developed in five weeks. They initially received two hundred applications for projects at various stages of development, encompassing "the areas of energy, housing, food, mobility, communications and circular economy" (POC21, *Vision*). The twelve projects chosen as part of POC21 were divided into four categories [see fig. 35]. "Energy For All" covered domestic, urban, and rural applications. There was a

portable solar-powered generator for remote locations, energy efficiency monitoring system, and cargo bike that generates energy through pedalling. "Design for Sustainable Living" grouped water-related technologies. This category featured a 3D-printed antibacterial water filtering cap for bottles, biomimetic hot water kettle, and energy-saving, self-filtering, circular shower. "Open-source for Autonomy" focused on off-the-grid solutions, namely a solar concentrator for thermal energy, low-tech pedal-powered farming machine, and $30 Wind Turbine made from reclaimed material. Finally, "Reclaim Food Production" presented food-centric systems. There were snap-fit kits for urban agriculture, an automated permaculture and aquaponics greenhouse, and an integrated kitchen with fridge substitute, composting, and herb garden. Some significant categories were missing from this selection, such as transport, shelter, and communications. Nevertheless, the organisers' did not aim to provide a comprehensive package of products (unlike Open Source Ecology, they avoided that pitfall). Instead, their curatorial approach meant to encourage cross-pollination among design experiments.

In the following passage, POC21 describes the qualities that they sought out in selecting and developing these products. These come remarkably close to the characteristics of my case studies:

> ***This new breed of open sustainable products shares the following attributes:***
> ***— they share freely the information required to make them, improve them, and distribute them, allowing for maximum diffusion, replicability and adaptability to local needs***
> ***— they are long-lasting, robust, modular, easy to repair, upgrade or dismantle, with less consumption of raw materials, to close the loop of material flows***
> ***— they can be manufactured locally, with more sustainable supply chains***
> ***— they foster behavioral change, from passive consumer to active architects of a truly sustainable lifestyle.***
> ***— they enable new economic models that share value fairly***
> **(POC21, *Vision*)**

Such a strong speculative vision would be far-fetched if not it was not put into practice in the present. This is why the innovation camp itself was designed in the most prefigurative way possible. Dubbed "proof of living" (POC21, *Report* 81) and the "13th project" (91), the event functioned as a "hybrid between a festival and the maintenance of a small village" (79). Decisions were taken collectively and responsibilities were shared among all of the participants. These prefigurative practices extended to material flows: fresh produce was grown nearby, consumables were chosen for zero waste, and the workspaces were equipped with OpenDesk furniture. Finally, the event's timeline and budget were documented, along with the lessons learned. In this way, organisers of future POCs could draw on participants' experiences.

To facilitate the dissemination of this knowledge, the whole experience was condensed in a report, a documentary, and two exhibitions. The first exhibition, which served as the camp's grand finale, took place in a large wooden geodesic dome built for the occasion [see fig. 36]. The second exhibition coincided with the COP21 climate summit in Paris. It was hosted in the same venue in which thousands of climate justice activists had converged. For a fleeting moment, designers and activists shared a physical space. Nevertheless, the two groups' practices could have been more closely interwoven. The task of finding mutually reinforcing common ground between growing resistance and creating alternatives continues to confronting designers and activists alike.

Beyond distinct products, camps, and exhibitions, POC21 was a meta-project in which a number of practices converged. It was a milestone event that marked an evolution from individual prototypes towards designing an integrated proof of concept. Postcapitalist design gave way to *designing postcapitalism*. In this sense, POC21 intends to design nothing short of a vast societal project, an entire way of life. These ambitions are explicitly articulated in its central design objective, namely to build "the most functional and replicable cell of a sustainable society" (POC21, *Vision*). Since I consider commoning the cell-form of postcapitalism, promoting its replicability represents a sound strategy for the eco-social transition. POC21 provides an exceptionally clear description of this transition:

> ***Imagine people and communities producing their own energy, food, goods and housing. Using local resources, accessible tools***

> ***and open-source blueprints. Connected with each other across the globe, sharing their discoveries in a global commons of knowledge for the transition.*** **(POC21, *Accelerating*, 6)**

Redesigning the entire infrastructure of energy, food, goods, and housing remains a daunting logistical task, which POC21 does not mean to carry out alone. This transition can only be designed successfully if the principles of collaboration, openness, and accessibility displace the commodity-machine's culture of competition, secrecy, and exclusivity. Given the scale of the task at hand, design's latent political potential appears to be much the same as that of any other social practice: designers can contribute to prefigurative activities that produce shared value—in short, they can engage in commoning. Becoming commoners incites designers, makers, and users to take creative, productive, and collective action. It empowers communities to address the world's greatest challenges "in the shortest possible time, with spontaneous cooperation and without ecological damage or disadvantage of anyone" (Fuller qtd. in Sieden 51).

If a designed world transmits and organises power relations, then recognising design's potential for commoning opens up a broad range of possibilities for organising the postcapitalist transition. Nevertheless, postcapitalist design is not a silver bullet that can fix everything. Commoning practices may expand organically by reinforcing and replicating themselves, but they do not systematically replace commodified relations with socialised ones. Postcapitalist design cannot disrupt the commodity-machine or bring about a rapid and comprehensive transformation on its own. Just as designers are to participate in postcapitalist politics, organisations and institutions that lead the postcapitalist transition need to embrace designers, makers, and hackers as constituents in their broader movement. Postcapitalist design can be seen as one front in the struggle for the eco-social transition among many. Ultimately, its impact depends on the energy and resources of the social movements that support and sustain it. Other struggles for a postcapitalist transition include defending and regenerating (land-based) commons against resource extractivism; expanding and valorising social services and reproductive care work; and abolishing intellectual property regimes and publicly funding innovation. Recent debates propose a combination of postcapitalist demands, such as introducing a shorter work week, an Unconditional Basic Income and a

Green New Deal. These policies could be legislated for “from above” so as to supercharge ad hoc, organic efforts “from below”.

Just as design (in the larger sense, including engineering and planning) was a potent—albeit controversial—component of previous industrial revolutions, so it can be central in the counter-industrial revolution. A peer-producing, open-source, maker-driven, cosmo-local, counter-industrial, postcapitalist mode of production entails a particular way of organising technology, logistics, and social relations. This new organising logic would be compatible with ecological imperatives and indeed contribute towards fulfilling them. A postcapitalist mode of production would have to uncouple manufacturing from industries, set just deindustrialisation in motion, undertake massive ecological remediation efforts, and yet still be able to "make the world work for 100% of humanity". This is no small challenge, but it must be overcome if a rapid postcapitalist transition and, by extension, a fair, sustainable basis for civilisation are to be accomplished. If given enough space and support to flourish, these newly open, distributed, and collaborative principles can surpass the closed, centralised, and competitive systems of the old world. Only then can capitalism’s sophisticated scarcity (and disastrous abundance) be replaced with a simple abundance. "We are called to be architects of the future," Fuller proclaims, "not its victims." That future urges us to reconcile design with politics, resistance with alternatives, speculation with prefiguration, and technology with ecology. An intentional and just Anthropocene is calling us —

to make what we love, love what we share, and share what we make.

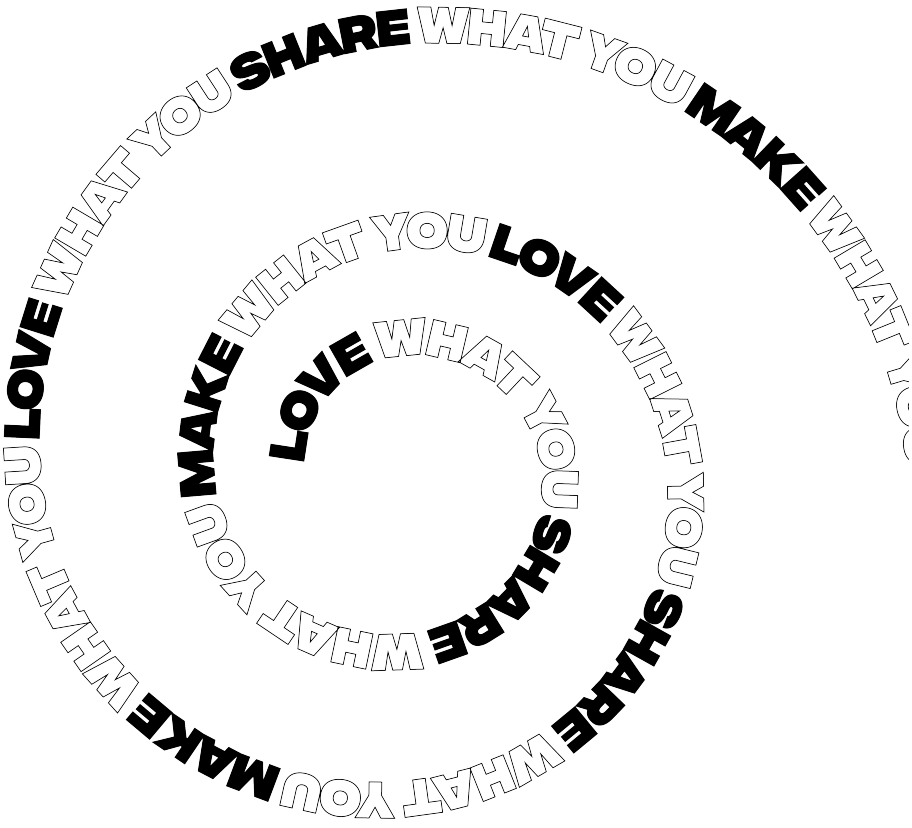

Table 6. cycles of commoning in design

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Summary

Unsustaining the Commodity-Machine: *Commoning Practices in Postcapitalist Design*

This thesis surveys the ways in which design practices can contribute to a postcapitalist transition. I study several contemporary product design projects that develop everyday tools, building systems, and fabrication machinery. Together, they encapsulate peer production, open-sourcing, and the maker movement. To me, these trends constitute a coherent methodology of *commoning*, which manifests itself in three ways: *shared creation* (designing in common), *shared governance* (managing designs in common), and *shared access* (holding the means of production in common). I describe how this shared valorisation of labour, knowledge, and artefacts radically alters the political economy of design practices. To what extent can design be disentangled from its unsustainable condition? Might the project of what I call *peer-designing the open-blueprints of maker-machines* prefigure a resilient and sustainable basis for material production? Do commoning strategies disrupt late capitalism or merely remedy its shortcomings? How might postcapitalist politics conceive a rapid eco-social transition so as to tackle the great challenges posed by our times and provide pathways towards a sustainable future? In four chapters and a concluding discussion, this study responds to these pressing questions.

The Commodity-Machine: Sustaining the unsustainable

In Chapter I, I follow the trail of commodities in late capitalism. In this context, design is configured as an unsustainable *commodity-machine*, producing market goods and thereby reproducing exchange relations. Drawing from design and ecological critique, I extend this diagnosis to include prevailing green capitalist design practices, which remain inadequate when it comes to realising an eco-social transition. I conclude that it is less commodities' materiality than relations of exchange that remain the main obstacle to establishing sustainability beyond the commodity-machine. It is not designed objects in themselves that are unsustainable, but the economic relations in which they are embedded. Design

practices can be sustainable only if they are decoupled from this mode of production.

On the basis of this critique, I construct a framework for *postcapitalist* design practices that are situated outside exchange relations and market mediation. These practices produce shared value, as opposed to exchange value. Theorising how capitalism might end, I put forward the concepts *peak carbon* and *peak capital* to distinguish current postcapitalist imaginaries from its historical predecessors. Approaching the eco-social transition from a variety of spatial, temporal, and political angles, I discuss contemporary discourses around how a counter-hegemonic project for an alternative political economy might be built. This allows me to hone in emergent design practices that could contribute to a broader postcapitalist project, but require deployment at a greater pace and scale. As an alternative to conventional object-centric analysis and critique, I elaborate a threefold framework for studying and practising sustainable design. This framework foregrounds value processes that practice commoning.

Peer Designing: Becoming 'designer-commoners'

In Chapter II, I identify organisational characteristics of emergent design practices, exploring the conditions under which designers put productive capacities to common ends and co-produce shared value. Three overlapping subjectivities are considered: the *designer* in its current state of entanglement in market relations; the *peer* as the emergent model of the worker beyond hierarchy and competition (originating in software development), and; ultimately the *commoner* as shared value creators engaged in collective action. After establishing affinities between scholarship on the commons and P2P, I investigate OpenStructures as a prime example of how peer production can be adapted to product design projects. Analysing modular domestic appliances made with OpenStructures reveals a range of challenges and limitations. These are traceable in tensions between designers' practices on the one hand and their discourses on the other, as expressed in publicly available media and conversations with myself.

Peer designing not only manifests itself in collaborations among designer-commoners at the design stage; it also implies designing for commoning throughout the value chain. These collaborations are transformative for designers, makers, and users alike: boundaries among these subjectivities

dissolve as users become makers, makers become designers, and designers become facilitators. Most importantly, all of those engaged in design become commoners, who produce, reproduce, govern, and replicate shared design projects. By establishing institutions and communities based on free association, peer designers can become more resilient. What is more, they have a better chance of securing their livelihoods and socialising their design labour than they otherwise might if they remain in loose networks of peer-designers. Such communities' organisational and business models prefigure postcapitalist relations while remaining strategically integrated into market practices. In designing processes of commoning around a product, these projects become points of convergence for collective action.

Open Blueprints: Instituting the 'Wikipedia of Things'

In Chapter III, I explore the technical, economic and social advantages of the digital reproduction and dissemination of design blueprints. Looking at OpenDesk as an example of design practice based on *open blueprints*, I adopt their methodology of self-production and follow the production process from the computer screen to physical object. I establish whether the blueprints themselves are accessible, freely available, self-explanatory, and easy to build. Further, I consider how additional assembly guides, web platforms, and the like are designed to facilitate the diffusion and appropriation of designs. Much more than blueprints are needed, I argue, in order to achieve openness. While there may be no easy way of precipitating viral replication, projects that focus on single but complete products achieve more than vast open-ended systems.

Although all of the case studies featured in the study make their blueprints available through commons-based licenses, these are of varying levels of sophistication. Whereas some projects have simply uploaded drawings, others present detailed knowledge and provide documentation on sourcing materials, instructions for processing them, source code for electronic components, bills of materials, assembly guides, and forums for troubleshooting. The work of commoning is still far from over when blueprints are made available online. Encouraging diffusion and replication, coordinating improvements and support, and facilitating derivatives and adaptations all constitute essential aspects of commoning, in the sense of shared governance over design knowledge. In turn, this requires institutional arrangements that can guarantee quality and

continuity in open-source projects, as well as keep the design process inclusive and accountable. I conclude that openness requires custodian institutions that support a project's development and dissemination so as to achieve sustainability and circulation without a market.

Maker Machines: Providing 'everything for everyone'

In Chapter IV, I focus on some characteristics shared by machines that exemplify the counter-industrial paradigm of decentralising and autonomously producing the means of production. These strategies all subscribe to low-tech or appropriate-tech ethics and necessity of leaving small material and energetic footprints. In enabling hacking by design, they invite DIY cultures and maker movements to repair, customise, or reconfigure products freely. These end products are seldom consumer goods but tools for a community: *maker machines* that facilitate further localised fabrication. To explore the challenges of autonomous production and post-scarcity, I analyse the discourses and machines of Open Source Ecology and discuss the project's successes and failures.

Sketching the contours of broader debates over technological sophistication and material abundance allows me to reject certain visions of post-work politics that imagine full automation. Rather, I focus on machines that enable makers in unprecedented ways instead of rendering them redundant. I follow the evolution of Precious Plastic to explore the emergence of a new breed of crafts providing both social livelihoods and ecological benefits. That said, none of the projects is strictly autonomous in relation to received industrial infrastructure in that they rely on preexisting machines, components, and supply chains. Postcapitalist design practices embrace the incompletion of the counter-industrial paradigm shift: instead of fetishising meticulously sourced raw materials only to churn out green commodities, they foster sustainable social relations so as to build fair, resilient, and thriving communities. Beyond constituting absolute limits, these challenges indicate some directions for further initiatives.

Prefiguring commoning

In this study, I have analysed how commoning takes place in design practices. Commoning in design covers a vast and complex field of collaborative practices

and collective actions that create shared value, uphold institutional arrangements, and provide a simple abundance of sustainable goods. Commoning democratises design – not because everybody magically becomes a designer overnight, but because it generates livelihoods for makers everywhere. Commoning enables people to produce quality goods and work fair jobs, to participate in localising, improving, and adapting products to suit an enormous array of needs, possibilities, and desires. When considered as instances of commoning, these practices stand out as early emblematic pioneers in postcapitalist design. Together, they constitute an ecology of subjectivities, practices, and discourses. In every case study I analysed, this strategy of commoning is riven by a productive tension between speculative discourses and prefigurative practices. Through this tension, these practices negotiate creative work and political action.

Given the scale of the task at hand, design's latent political potential appears to be much the same as that of any other social practice. This potential consists in the fact that designers can contribute to prefigurative activities that produce shared value—in short, they can engage in commoning. Becoming commoners incites designers, makers, and users to take creative, productive, and collective action. It empowers communities to address the world's starkest challenges. The conclusion to this study remains descriptive, though, in that it does not tease out the potentials latent in these practices. Considered in isolation, this clutch of loosely-related case studies might be deemed niche, quirky, or insular. By extrapolating the logic of each disparate initiative and connecting the dots among them, it is possible to tease out a blueprint for the ecological and social transformation of the economy. Through this transition, the economy would move away from market relations and towards socialised ones, from exchange to sharing.

Speculating postcapitalism

Redesigning the entire infrastructure of energy, food, goods, and housing remains a daunting logistical task. This transition can only be designed successfully if the principles of collaboration, openness, and accessibility displace the commodity-machine's culture of competition, secrecy, and exclusivity. Recognising design's potential for commoning opens up a broad range of possibilities for organising the postcapitalist transition. Nevertheless,

postcapitalist design is not a silver bullet that can resolve everything. Commoning practices may expand organically by reinforcing and replicating themselves, but they do not systematically replace commodified relations with socialised ones. Ultimately, do any of these practices merit the ambiguous and controversial label of "postcapitalist"? My final case study, POC21 innovation camp indicates that this nascent archipelago of practices is evolving from an attempt to design individual product prototypes towards designing an integrated proof of concept for postcapitalism itself.

Postcapitalist design cannot disrupt the commodity-machine or bring about a rapid and comprehensive transformation on its own. Just as designers are to participate in postcapitalist politics, organisations and institutions that lead the postcapitalist transition need to embrace designers, makers, and hackers as constituents in their broader movement. Postcapitalist design can be seen as one front in the struggle for the eco-social transition among many. Ultimately, its impact depends on the energy and resources of the social movements that support and sustain it. Other struggles for a postcapitalist transition include defending and regenerating (land-based) commons against resource extractivism; expanding and valorising social services and reproductive care work; abolishing intellectual property regimes; and, publicly funding innovation. Such policies legislated for "from above" can supercharge ad hoc, organic efforts "from below". If given enough space and support to flourish, these newly open, distributed, and collaborative principles can surpass the closed, centralised, and competitive systems of the old world. Only then can late capitalism's sophisticated scarcity (and disastrous abundance) be replaced with a simple abundance of common goods. Simply put, postcapitalist design is an invitation to unsustain the commodity-machine, urging us to reconcile design with politics, resistance with alternatives, speculation with prefiguration, and technology with ecology.

Samenvatting

Voorbij de Koopwaarmachine: *Commoning-praktijken in Postkapitalistisch Design*

In dit proefschrift onderzoek ik hoe design kan bijdragen aan een transitie naar postkapitalisme. Ik bestudeer hiervoor het huidige design van gereedschappen, bouwsystemen en fabricagemachines. Tezamen omvatten ze peer-productie, open-sourcing en de *maker movement*. Deze trends laten daarnaast ook een coherente methodologie zien, namelijk *commoning*, die zich mijns inziens op drie manieren manifesteert: gedeelde creatie (gemeenschappelijk design), gedeeld beheer (gemeenschappelijk managen van design) en gedeelde toegang (gemeenschappelijke productiemiddelen). In mijn onderzoek beschrijf ik hoe deze gedeelde valorisatie van arbeid, kennis en artefacten de politieke economie van designpraktijken radicaal verandert. In hoeverre kan design worden losgekoppeld van onhoudbare productievormen? Is *peer-ontwerp van open-source design voor maker-machines* een voorbode van een meer veerkrachtige en duurzame productievorm? Kunnen strategieën met *commoning* het laatkapitalisme verstoren, of verzachten ze hoogstens de meest schadelijke tekortkomingen ervan? Kan postkapitalistische politiek de grootste uitdagingen van deze tijd aanpakken door middel van eco-sociale transitie, en zo de weg effenen naar een daadwerkelijk duurzame toekomst? In vier hoofdstukken en een afsluitende discussie geef ik in dit onderzoek antwoord op deze prangende vragen.

De commodity-machine: het onhoudbare behouden

In hoofdstuk I bestudeer ik de status van koopwaar in laatkapitalisme. In deze context is design geconfigureerd als een niet-duurzame 'commodity machine', die marktgoederen produceert en daardoor uitsluitend ruilwaarde en -relaties reproduceert. Op basis van zowel ontwerp- als ecologische kritiek breid ik deze diagnose verder uit door te kijken naar prevalente groenkapitalistische designpraktijken, die ontoereikend blijken als het gaat om het realiseren van een eco-sociale transitie. Ik concludeer dat niet zozeer de materialiteit van koopwaar maar ruilrelaties het belangrijkste obstakel blijven voor duurzaamheid.

Ontworpen objecten kunnen op zich gewoon duurzaam zijn, de economische relaties waarin ze zijn ingebed echter niet. Designpraktijken kunnen daarom alleen echt duurzaam zijn wanneer ze losgekoppeld worden van de productie van ruilwaarde.

Op basis van deze kritiek maak ik een raamwerk voor postkapitalistische designpraktijken die zich buiten ruilrelaties en marktbemiddeling plaatsen. Deze praktijken produceren gedeelde waarde, in tegenstelling tot ruilwaarde. Door te theoretiseren hoe het kapitalisme zou kunnen eindigen, presenteer ik de concepten *peak carbon* en *peak capital* om huidige postkapitalistische denkbeelden te onderscheiden van zijn historische voorgangers. Ik benader de eco-sociale transitie vanuit verschillende ruimtelijke, temporele en politieke invalshoeken en bespreek hedendaagse debatten over hoe een tegen-hegemonisch project voor alternatieve politieke economie zou kunnen worden gebouwd. Hierdoor krijg ik beter beeld van opkomende designpraktijken en hoe die kunnen bijdragen aan een omvangrijk postkapitalistisch project, maar die in een hoger tempo en op grotere schaal moeten worden ingezet. Als alternatief voor conventionele objectgerichte analyse en kritiek, werk ik een drievoudig raamwerk uit voor het bestuderen en beoefenen van duurzaam design. Dit raamwerk legt waardeprocessen op de voorgrond die *commoning* toepassen.

Peer Designing: 'designer-commoners' worden

In Hoofdstuk II identificeer ik organisatiekenmerken van opkomende designpraktijken, waarbij ik de voorwaarden onderzoek waaronder ontwerpers productieve capaciteiten voor gemeenschappelijke doelen stellen en gedeelde waarde co-produceren. Er worden drie overlappende subjectiviteiten beschouwd: de hedendaagse ontwerper en zijn verstrengeling in marktrelaties; de peer als een opkomend model voor arbeidsrelaties voorbij hiërarchie en concurrentie (ontstaan uit softwareontwikkeling), en uiteindelijk *commoners* die gedeelde waarde scheppen en zich bezighouden met collectieve actie. Nadat ik de affiniteiten heb vastgesteld tussen wetenschap over de *commons* en P2P, onderzoek ik OpenStructures als een goed voorbeeld van hoe peer-productie kan worden toegepast op productdesign. Het analyseren van modulaire huishoudelijke apparaten, gemaakt met OpenStructures, laat zowel uitdagingen als beperkingen zien. Deze zijn terug te voeren op de spanningen tussen de

praktijken van designers enerzijds en hun vertogen anderzijds, zoals blijkt uit openbaar beschikbare informatie en door mijzelf uitgevoerde gesprekken.

Peer design manifesteert zich niet alleen in samenwerkingen tussen designer-commoners in de ontwerpfase; het impliceert ook ontwerpen voor *commoning* in de hele waardeketen. Deze samenwerkingen zijn transformatief voor zowel ontwerpers, makers als gebruikers: de grenzen tussen deze subjectiviteiten vervagen naarmate gebruikers makers worden, makers ontwerpers worden en ontwerpers facilitators worden. Het belangrijkste is dat designers ook *commoners* worden die gedeelde ontwerpprojecten produceren, reproduceren, besturen en repliceren. Door instellingen en gemeenschappen op te richten op basis van vrije associatie, kunnen peer designers veerkrachtiger worden. Bovendien hebben ze dan een betere kans om in hun levensonderhoud te voorzien dan als ze in losse professionele netwerken blijven. De organisatie- en bedrijfsmodellen van dergelijke gemeenschappen vormen een voorbode van postkapitalistische relaties, terwijl ze strategisch geïntegreerd blijven in huidige marktpraktijken. Bij het ontwerpen van processen van *commoning* rondom een product, kunnen deze projecten convergentiepunten worden voor meer collectieve actie.

Open blauwdrukken: een institutie voor de 'Wikipedia of Things'

In hoofdstuk III onderzoek ik de technische, economische en sociale voordelen van de digitale reproductie en verspreiding van designblauwdrukken. Ik neem OpenDesk als voorbeeld van blauwdrukdesign en pas ook hun methodologie van zelfproductie toe, door het productieproces van computerscherm tot fysiek object te volgen. Ik probeer hiermee vast te stellen of zulke blauwdrukken inderdaad toegankelijk en gebruiksvriendelijk zijn. Ook onderzoek ik of de aanvullende montagehandleidingen en webplatforms de verspreiding en toepasbaarheid van zulk design inderdaad vergemakkelijkt. Ik concludeer dat er veel meer nodig is dan blauwdrukken om echte openheid te bereiken. Hoewel het waarschijnlijk moeilijk is om virale replicatie te versnellen, concludeer ik wel dat projecten die zich richten op enkele maar complete producten meer kunnen bereiken dan grote open systemen.

Hoewel alle casestudy's in mijn onderzoek hun blauwdrukken beschikbaar stellen via commons-gebaseerde licenties, zijn deze van verschillende kwaliteit en omvang. Terwijl sommige projecten eenvoudige tekeningen hebben geüpload,

bieden andere gedetailleerde kennis en documentatie over materialen, instructies voor het verwerken ervan, broncodes voor elektronische componenten, stuklijsten, montagehandleidingen en forums voor probleemoplossingen. Het werk van *commoning* is dus nog lang niet klaar als de blauwdrukken online beschikbaar worden gesteld. Het aanmoedigen van verspreiding en replicatie, het coördineren van verbeteringen en ondersteuning, en het faciliteren van afgeleiden en aanpassingen zijn allemaal essentiële aspecten van *commoning*, in de zin van gedeeld beheer over designkennis. Dit vereist op zijn beurt instituties die de kwaliteit en continuïteit van open-sourceprojecten kunnen garanderen en het ontwerpproces inclusief en verantwoordelijk houden. Ik concludeer dat echte openheid 'bewaarinstellingen' vereist die de ontwikkeling en verspreiding van een project ondersteunen, om duurzaamheid en circulatie zonder marktinmenging te bereiken.

De Maker Machine: biedt 'alles voor iedereen'

In Hoofdstuk IV richt ik me op algemene eigenschappen van machines die het contra-industriële paradigma illustreren van gedecentraliseerde en autonome productie. Deze strategieën onderschrijven allemaal een low-tech of 'appropriate-tech'-ethiek en de noodzaak om kleine materiële en energie-voetafdrukken achter te laten. Door *hacking by design* mogelijk te maken, maken deze strategieën het mogelijk voor doe-het-zelfculturen en makerbewegingen om producten vrijelijk te repareren, aan te passen of opnieuw te configureren. Deze eindproducten zijn zelden consumptiegoederen en veel eerder hulpmiddelen voor gemeenschapsvorming: *maker machines* die lokale fabricage mogelijk maken. Om de uitdagingen van autonome productie en post-schaarste te onderzoeken, analyseer ik de vertogen en machines van Open Source Ecology en bespreek ik de successen en mislukkingen van het project.

Na een contourschets te hebben gegeven van debatten over technologische vooruitgang en materiële overvloed, wijs ik bepaalde visies van post-werkpolitiek af, die volledige automatisering voorstellen. Ik concentreer me daarenteges op machines die makers op ongekende manieren helpen in plaats van overbodig maken. Ik volg de evolutie van Precious Plastic om de opkomst van een nieuw soort ambacht te onderzoeken, die zowel in levensonderhoud als ecologische voordelen kan voorzien. Dat gezegd hebbende, geen van deze projecten is strikt genomen autonoom met betrekking tot de bestaande industriële infrastructuur,

aangezien ze afhankelijk blijven van reeds bestaande machines, componenten en toeleveringsketens. Postkapitalistische designpraktijken omarmen de onvolledigheid van de contra-industriële paradigmaverschuiving: in plaats van zorgvuldig ingekochte grondstoffen te fetisjeren om alleen groene goederen te produceren, bevorderen ze duurzame sociale relaties om eerlijke en veerkrachtige gemeenschappen op te bouwen. Deze uitdagingen vormen niet alleen absolute grenzen, maar geven dus ook aanwijzingen voor verdere initiatieven.

Prefiguratie van Commoning

In dit proefschrift heb ik geanalyseerd hoe *commoning* plaatsvindt in design. *Commoning* in design bestrijkt een enorm en complex gebied van samenwerkingsvormen en collectieve acties die gedeelde waarde creëren, institutionele regelingen handhaven en een overvloed aan duurzame goederen verschaffen. *Commoning* democratiseert design - niet omdat iedereen op magische wijze van de ene op de andere dag een ontwerper wordt, maar omdat het makers in hun levensonderhoud voorziet. *Commoning* stelt mensen in staat hoogwaardige goederen te produceren en eerlijke banen te leveren, om deel te nemen aan het lokaliseren, verbeteren en aanpassen van producten aan een enorm scala aan behoeften, mogelijkheden en verlangens. Wanneer ze worden beschouwd als voorbeelden van *commoning*, vallen deze praktijken op als voorbeeldige pioniers in postkapitalistisch design. Samen vormen ze een ecologie van subjectiviteiten, praktijken en debatten. In elke case study die ik heb geanalyseerd, wordt deze strategie van *commoning* gekenmerkt door een productieve spanning tussen speculatieve debatten en prefiguratieve praktijken. Door deze spanning onderhandelen deze praktijken over creatief werk en politieke actie.

Gezien de omvang van de taak die voorhanden is, lijkt de latente politieke potentie van design vrijwel hetzelfde te zijn als dat van elke andere sociale praktijk. Deze potentie bestaat uit het feit dat ontwerpers kunnen bijdragen aan prefiguratieve activiteiten die gedeelde waarde produceren - kortom, ze kunnen deelnemen aan *commoning*. *Commoner* moedigt ontwerpers, makers en gebruikers aan om creatieve, productieve en collectieve actie te ondernemen. Het stelt gemeenschappen in staat om de grootste uitdagingen ter wereld aan te pakken. De conclusie van deze studie blijft echter beschrijvend in die zin dat het de sluimerende mogelijkheden van deze praktijken niet nader belicht. Afzonderlijk

beschouwd, kan deze verzameling losjes gerelateerde casestudy's als niche, eigenzinnig of zelfs insulair worden beschouwd. Door de logica van elk afzonderlijk initiatief te verduidelijken en met de andere initiatieven te verbinden, is het mogelijk om een blauwdruk te maken voor de ecologische en sociale transformatie van de economie. Door deze transitie zal de economie zich verplaatsen van marktrelaties naar gesocialiseerde relaties, of van ruilen naar delen.

Speculerend postkapitalisme

Het opnieuw ontwerpen van de volledige infrastructuur van energie, voedsel, goederen en huisvesting is en blijft een enorme logistieke taak. Deze overgang kan alleen met succes worden vormgegeven door middel van samenwerking, openheid en toegankelijkheid, die tezamen de cultuur van concurrentie, geheimhouding en exclusiviteit van de commodity machine kunnen verdringen. Het erkennen van de potentie voor *commoning* van design opent een breed scala aan mogelijkheden voor het organiseren van een postkapitalistische transitie. Desalniettemin is postkapitalistisch design geen wondermiddel. *Commoning* kan organisch uitbreiden door zichzelf te versterken en te repliceren, maar ze kunnen systematisch gecommodificeerde relaties niet vervangen door gesocialiseerde. Verdient een van deze praktijken uiteindelijk het dubbelzinnige en controversiële label "postcapitalist"? Mijn laatste casestudy, het innovatiekamp POC21, geeft aan dat deze ontluikende archipel van praktijken evolueert van een poging om individuele productprototypes te ontwerpen naar het ontwerpen van een geïntegreerd *proof of concept* voor het postkapitalisme zelf.

Postkapitalistisch design kan op zichzelf de commodity machine niet ontwrichten of een alomvattende transformatie bewerkstelligen. Net zozeer als dat ontwerpers moeten meedoen aan postkapitalistische politiek, moeten organisaties die de postkapitalistische transitie leiden, designers, makers en hackers als deelnemers zien aan hun bredere beweging. Postkapitalistisch design kan worden gezien als één front tussen velen in de strijd voor een eco-sociale transitie. Uiteindelijk hangt de impact ervan af van de energie en middelen van sociale bewegingen die deze transitie ondersteunen. Andere worstelingen voor een postkapitalistische transitie zijn onder meer het verdedigen en regenereren van (op het land gebaseerde) *commons* tegen extractivisme van hulpbronnen; het uitbreiden en valoriseren van sociale diensten en reproductieve zorg; afschaffing

van intellectuele eigendomsregimes; en publieke financiering van innovatie. Dergelijk beleid dat is vastgelegd "van bovenaf" kan organische inspanningen "van onderaf" een boost geven. Als ze voldoende ruimte en steun krijgen om te bloeien, kunnen deze nieuwe samenwerkingsprincipes de gesloten, gecentraliseerde en concurrerende systemen van de oude wereld overtreffen. Alleen dan kan de doorgeslagen schaarste (en rampzalige overvloed) van het laatkapitalisme worden vervangen door een overvloed aan gemeenschappelijke goederen. Simpel gezegd, post-kapitalistisch design is een uitnodiging om de commodity machine niet langer te laten draaien, en een uitdaging om design te verzoenen met politiek, verzet met alternatieven, speculatie met prefiguratie en technologie met ecologie.

About

Born in Ankara and studied in Strasbourg, Selçuk Balamir is a postcapitalist designer, commoning researcher and climate justice organiser. He works at the intersections of creative production, radical politics and ecological transition. He co-developed *Climate Games* (transmedia event enabling peer-to-peer disobedience) and *Shell Must Fall* (grassroots campaign targeting shareholder meetings). He co-initiated the housing projects *NieuwLand* (postcapitalist urban commune), and *de Nieuwe Meent* (cooperative based on commoning). He teaches *New Earth* (eco-social design) at Willem de Kooning Academy in Rotterdam and lives in Amsterdam. He can be reached at selj@selj.net.

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Appendix *Figures 4 — 36*

Image Credits

Introduction
Fig. 1. own photo, taken in Amsterdam, December 2010.
Fig. 2. Dilznacka, 2007. https://www.deviantart.com/dilznacka/art/Helios-House-01-66204084
Fig. 3. U.S. Navy photo by Mass Communication Specialist 2nd Class Clifford L.H. Davis/ Released 31 March 2010. https://commons.wikimedia.org/wiki/File:US_Navy_100331-N-9565D-071_President_Barack_Obama,_with_the_Navy's_F-A-18_Green_Hornet,_announces_today_additional_measures_to_boost_domestic_energy_production_for_the_Nation_to_include_strategic_efforts_by_Department_of_Defens.jpg

Chapter II
Fig. 4. HomeMade Modern http://www.homemade-modern.com
Fig. 5-7. Jesse Howard and OpenStructures
http://jessehoward.net
https://www.openstructures.net/histories/h044
http://unfold.be/assets/images/000/118/455/large-openstructures-waterboiler-by-unfold_2.jpg
Fig. 8. https://vimeo.com/106824084
Fig. 9. https://vimeo.com/124926692
Fig. 10. http://intrastructures.net/Intrastructures/Analysis_files/flyer_final-ENG.pdf

Chapter III
Fig. 11-13. OpenDesk https://www.opendesk.cc
Fig. 14, 15. own photos, taken February 2016
Fig. 16, 17. Growroom & GrowMore
https://www.husumandlindholm.com
https://github.com/space10-community/the-growroom
https://medium.com/space10/space10-open-sources-the-growroom-aa7ca6621715
https://architizer.com/projects/growmore
Fig. 18-21. Wikihouse http://wikihouse.cc, http://pinterest.com/WikiHouse

Chapter IV
Fig. 22-25. Open Source Ecology http://opensourceecology.org
Fig. 26. https://vimeo.com/51764445
Fig. 27-33. Precious Plastic & Dave Hakkens https://preciousplastic.com, https://davehakkens.nl

Conclusion
Fig. 34-36. POC21 http://poc21.cc

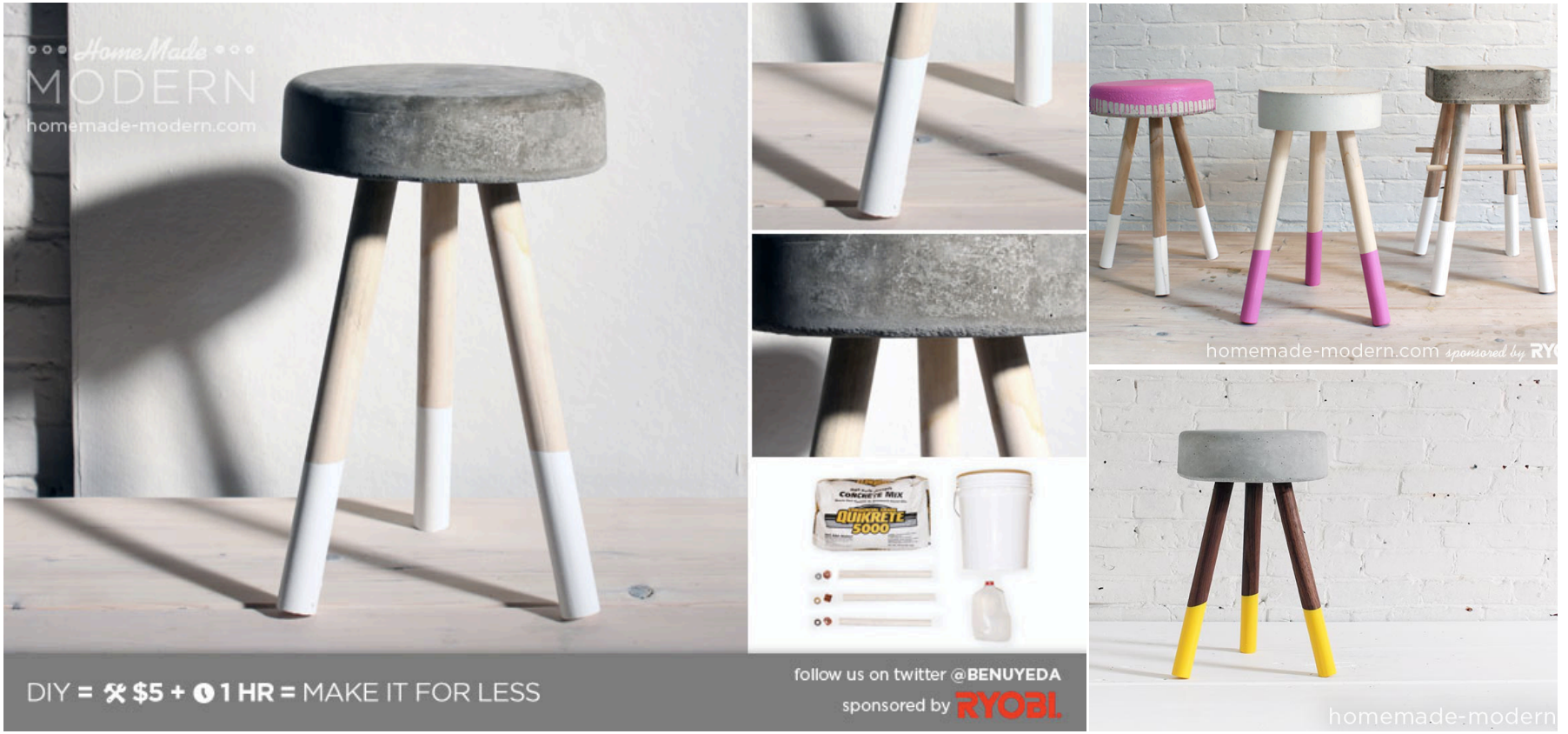


Fig. 4. “$5 Bucket Stool” and its variations, by Ben Uyeda for HomeMade Modern

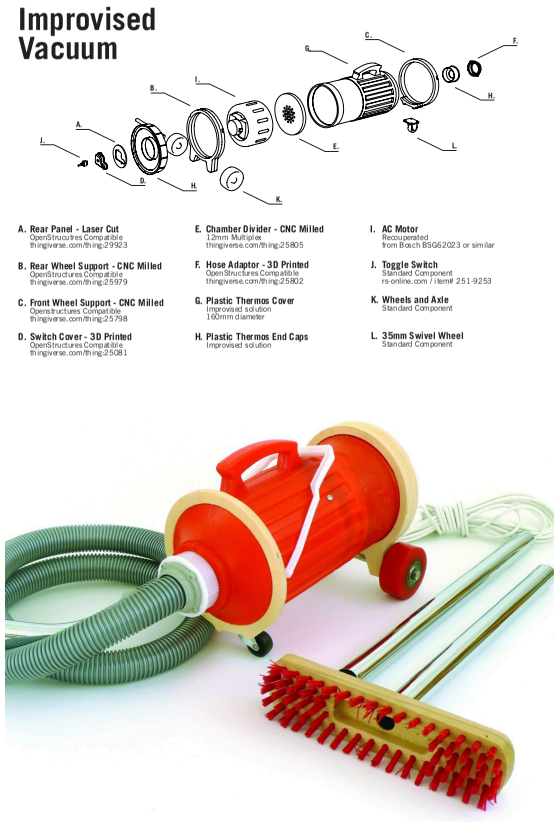


Fig. 5. Improvised Vacuum, by Jesse Howard for OpenStructures

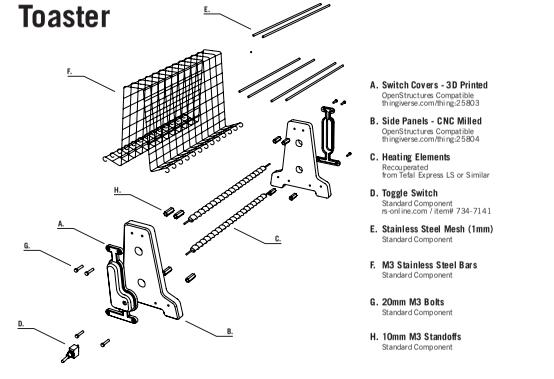


Fig. 6. Transparent Toaster, by Jesse Howard for OpenStructures

Fig. 7. OS WaterBoiler, by Jesse Howard for OpenStructures

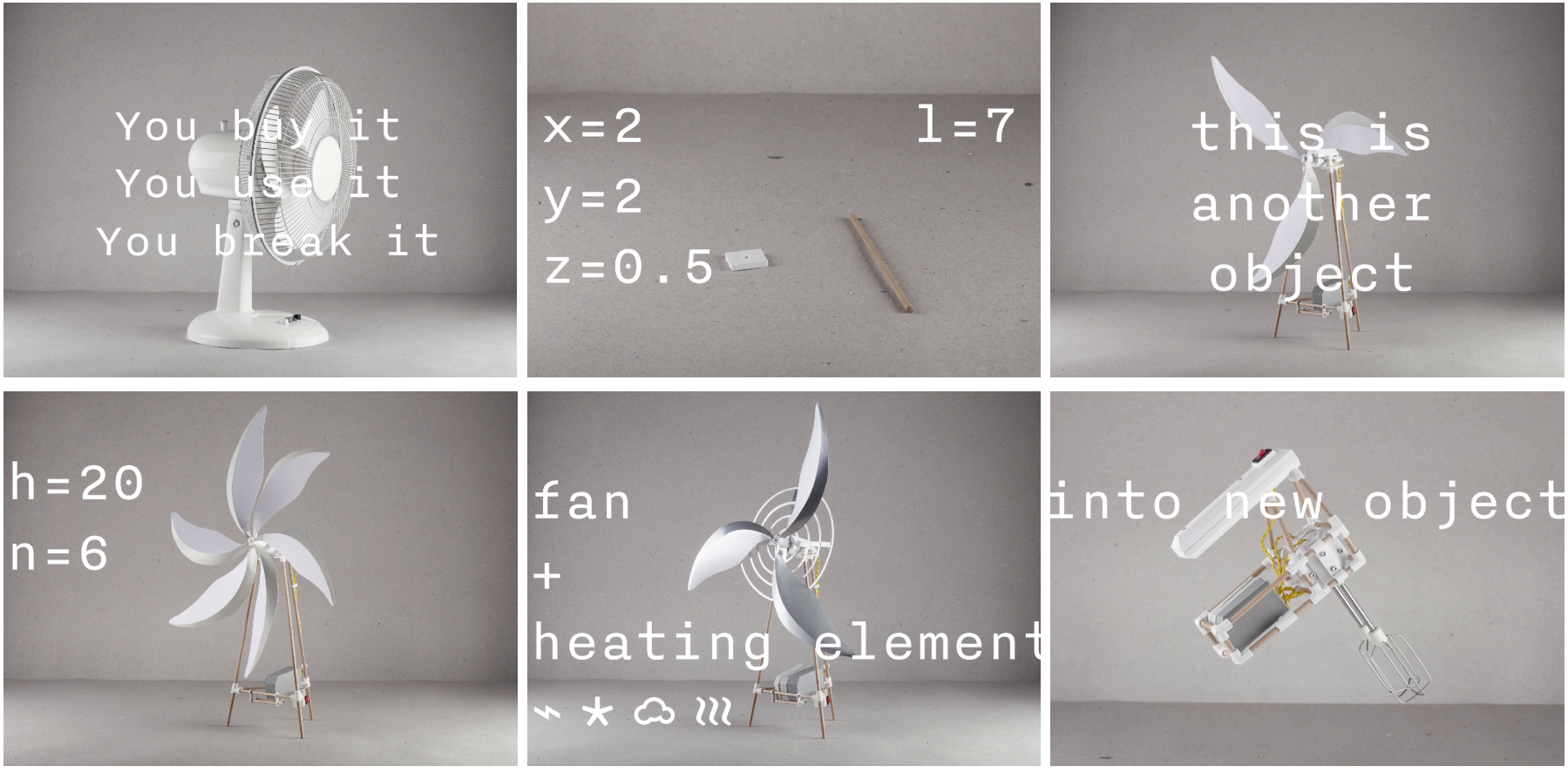


Fig. 8. Still shots from Hacking Households video

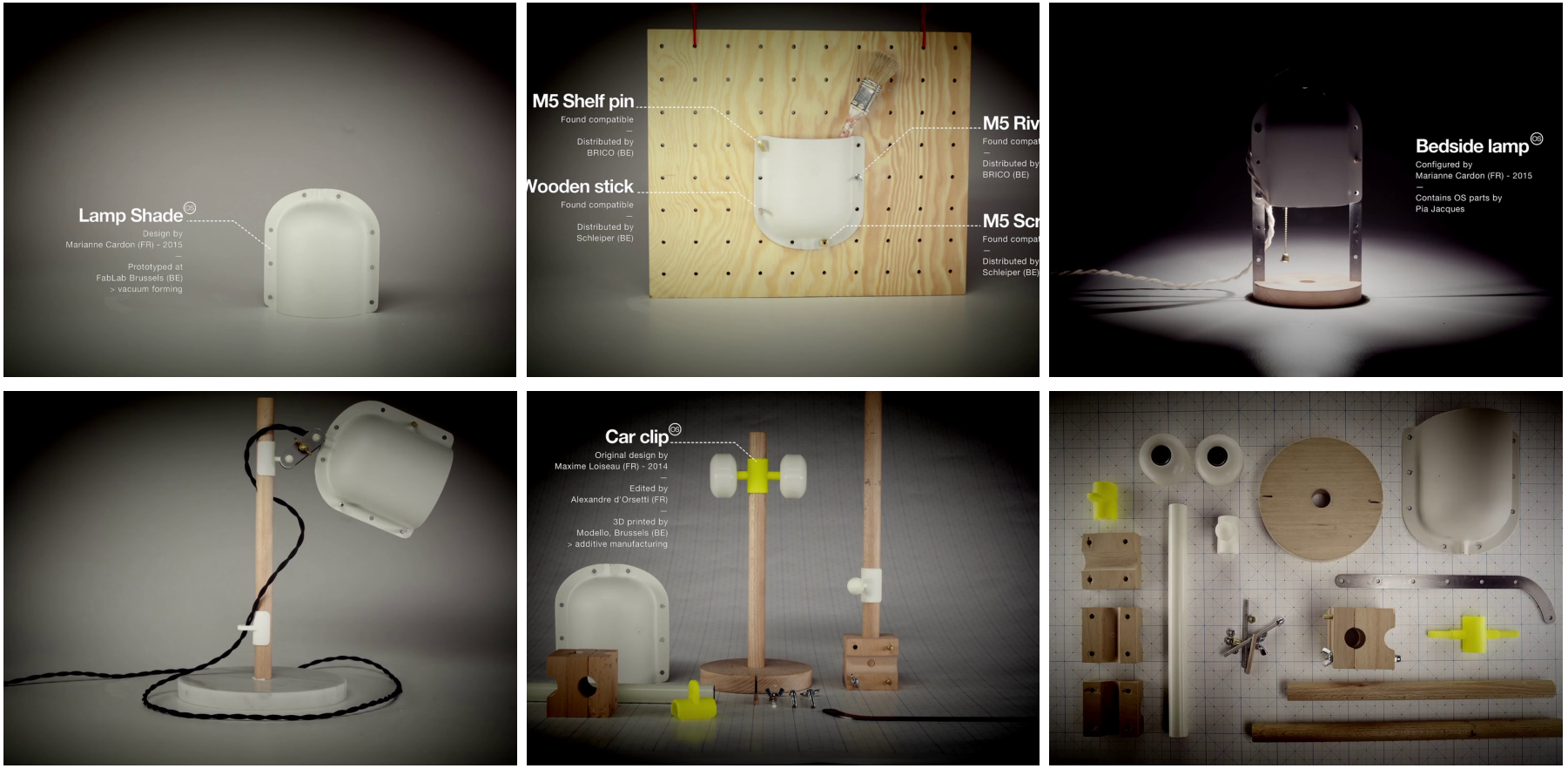
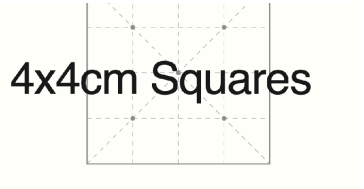
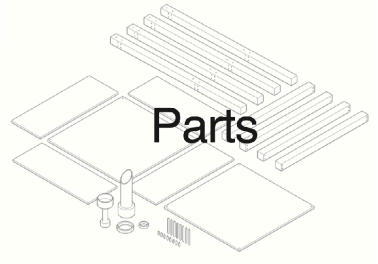


Fig. 9. Still shots from OpenStructures video



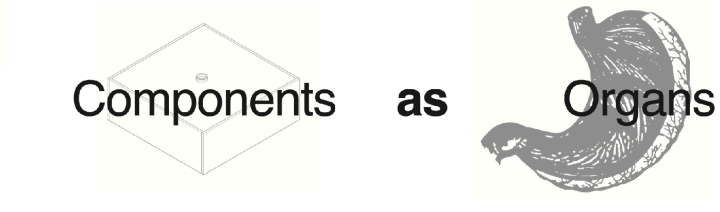
The 4□4cm square can be understood as the basic building block of the OS system. It is the central metrical unit that is shared among all OS designers which allows them to design compatible OS components independently from each other.

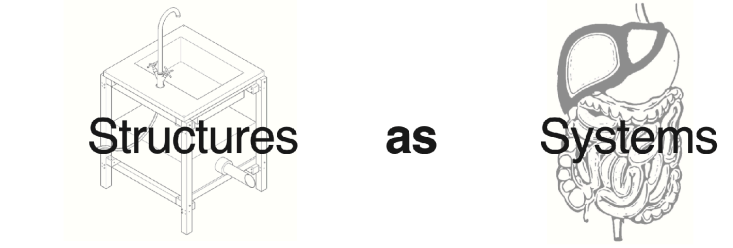
This is analogous to a biological cell, which is considered the structural and functional unit of all known living organisms. It is the smallest unit of an organism that is classified as living and is often called the building brick of life.



An Open Part, like a panel or beam, can be understood as a specific configuration of 4x4cm squares, resulting in various building blocks that are all generated within the OS dimensional framework. They have no function on their own but become functional in combination with other parts.

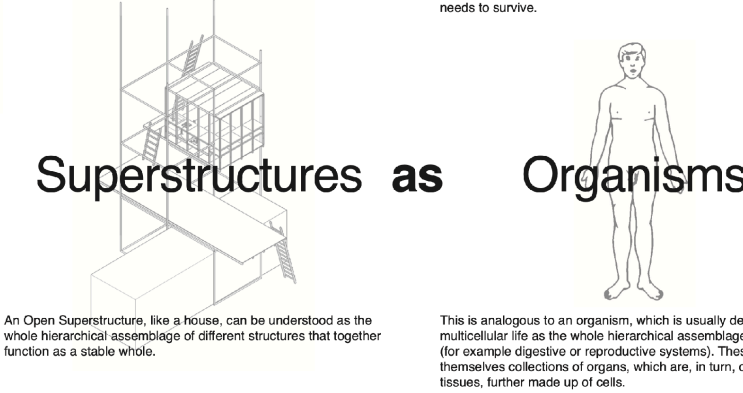
This is analogous to a tissue, a cellular organizational level which intermediates between cells and a complete organism. Hence, a tissue is an ensemble of cells, not necessarily identical, but from the same origin, that together carry out a specific function.





An Open Structure, like a kitchen, can be understood as an assembly of parts and components that work together as a functional system.

This is analogous to a group of related organs or an organ system. For example the digestion system is comprised of organs that work together to digest our food and transform it into the energy our body needs to survive.



An Open Superstructure, like a house, can be understood as the whole hierarchical assemblage of different structures that together function as a stable whole.

This is analogous to an organism, which is usually described in multicellular life as the whole hierarchical assemblage of systems (for example digestive or reproductive systems). These systems are themselves collections of organs, which are, in turn, collections of tissues, further made up of cells.

Fig. 10. “Anatomy of an open modular system”

Fig. 11. Promotional shots of Studio Desk by Joni Steiner and Roxanne Chair by Pierrick Faure

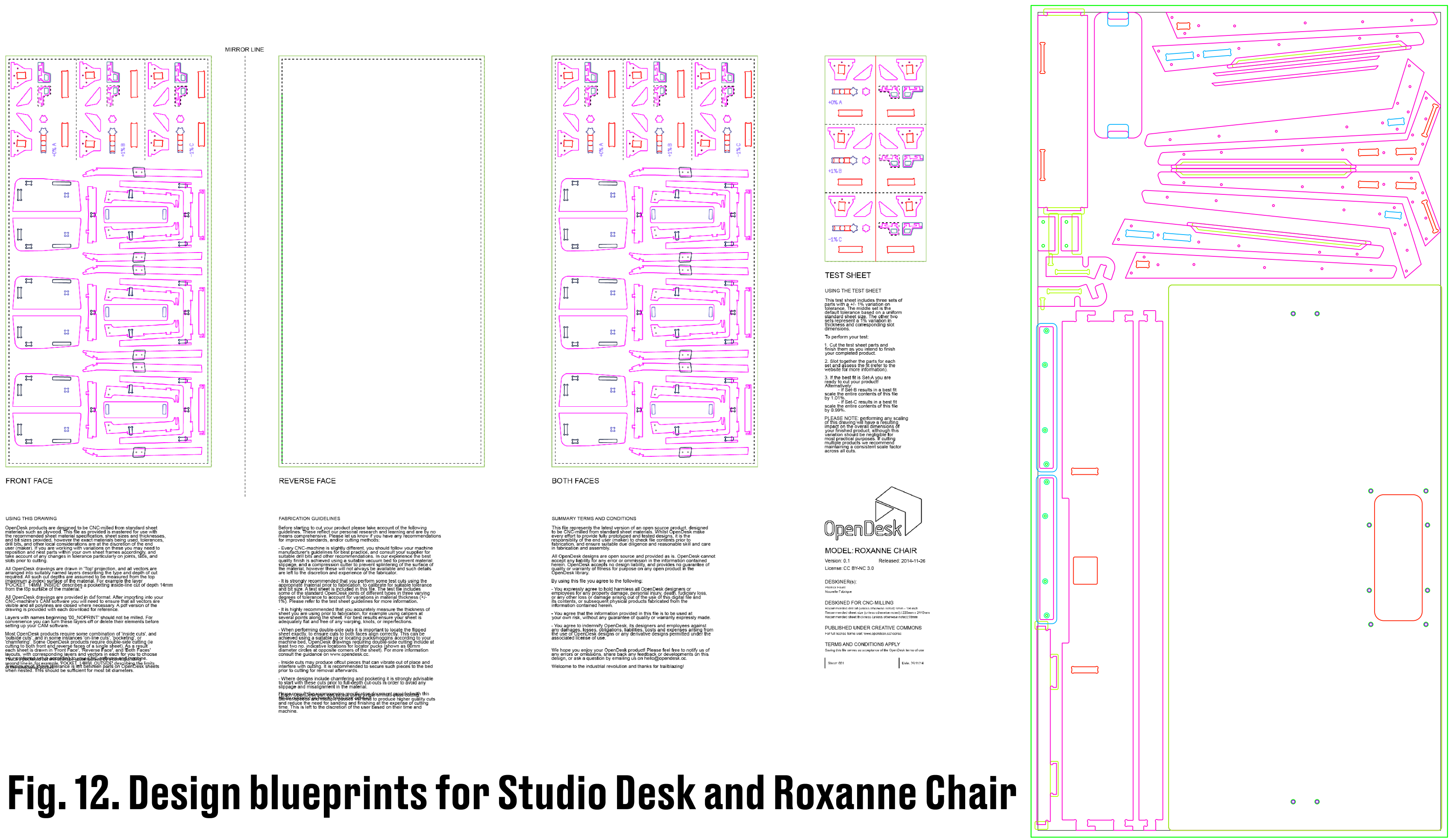


Fig. 12. Design blueprints for Studio Desk and Roxanne Chair

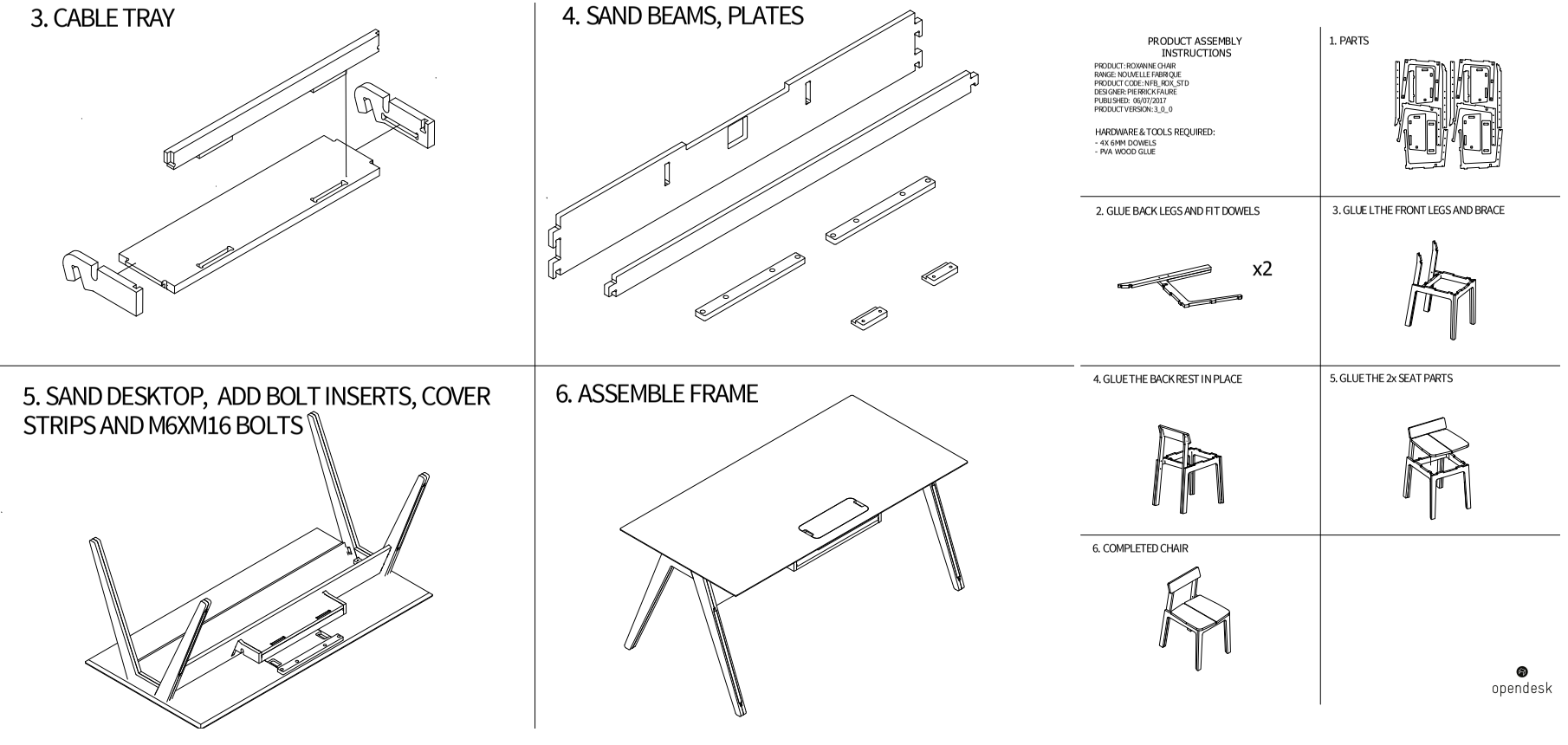


Fig. 13. Assembly instructions for Studio Desk and Roxanne Chair

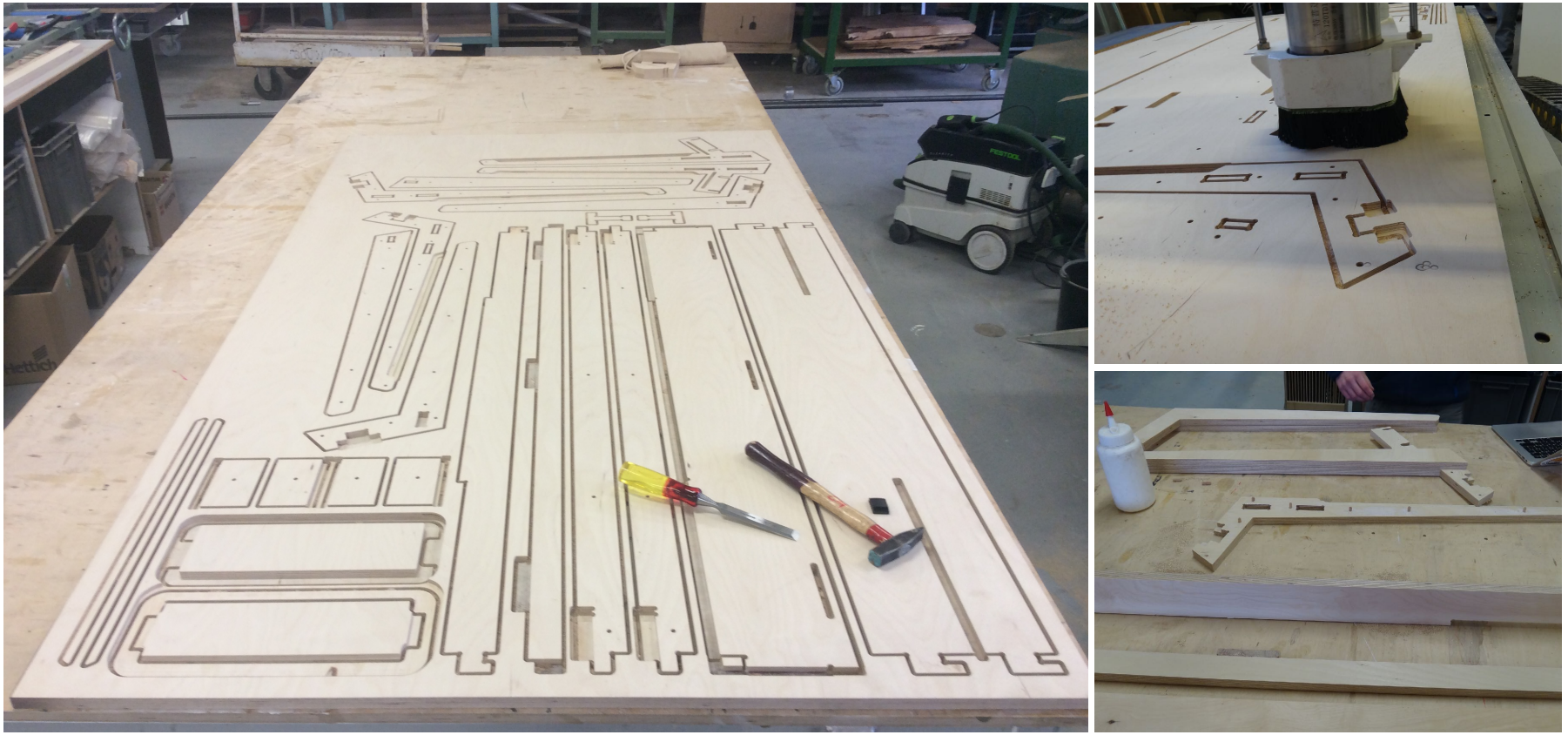


Fig. 14. Self-production process of Studio Desk and Roxanne Chair

**Fig. 15. Self-produced versions of Studio Desk and Roxanne Chair.
CNC-cut in Blik op Hout, laser-etched in ZB45 Makerspace.
Quotes by Rebecca Solnit and André Gorz.**

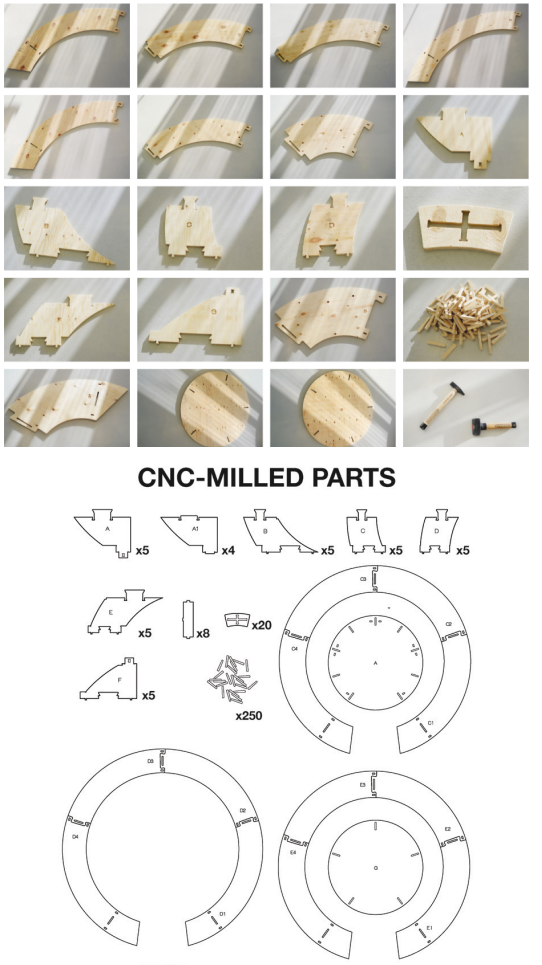
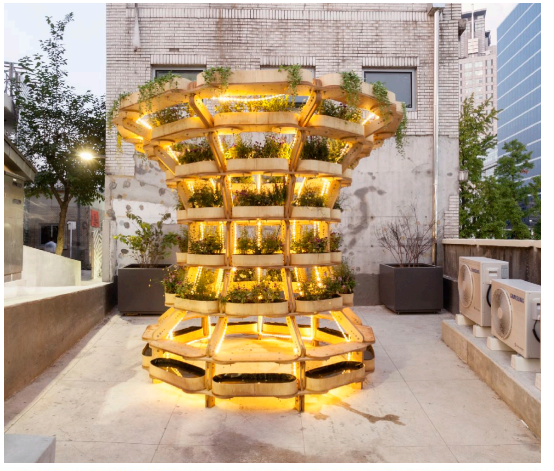


Fig. 16. The Growroom, by Husum&Lindholm for Space10



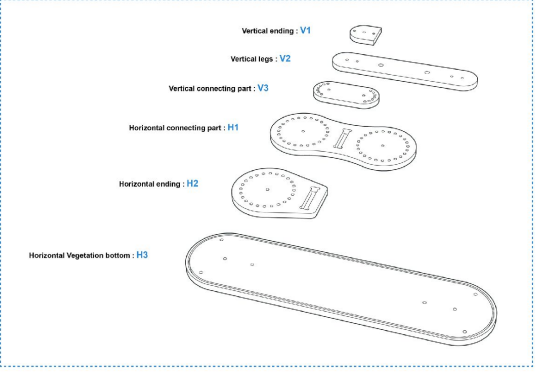


Fig. 17. GrowMore, by Husum&Lindholm

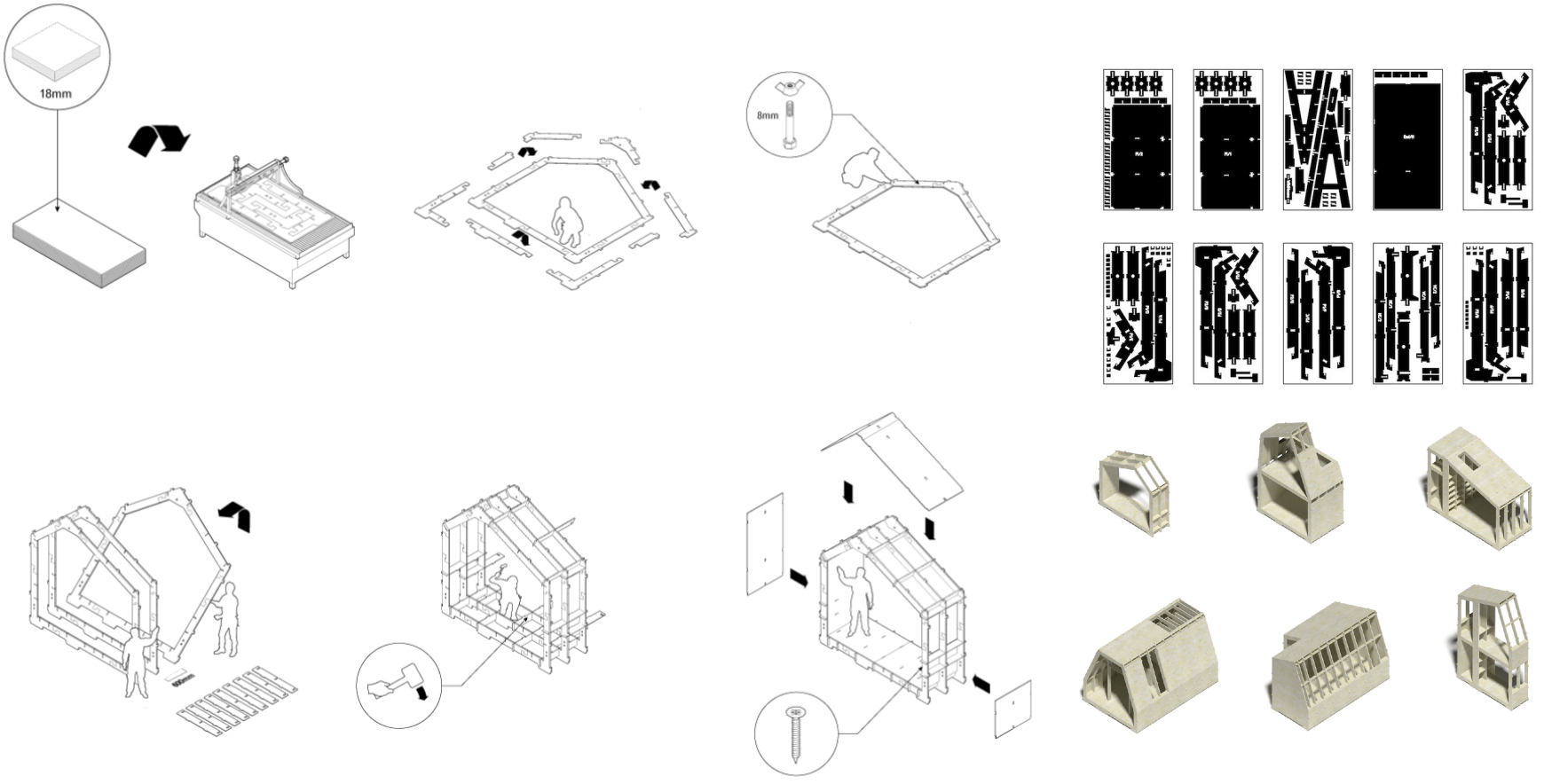
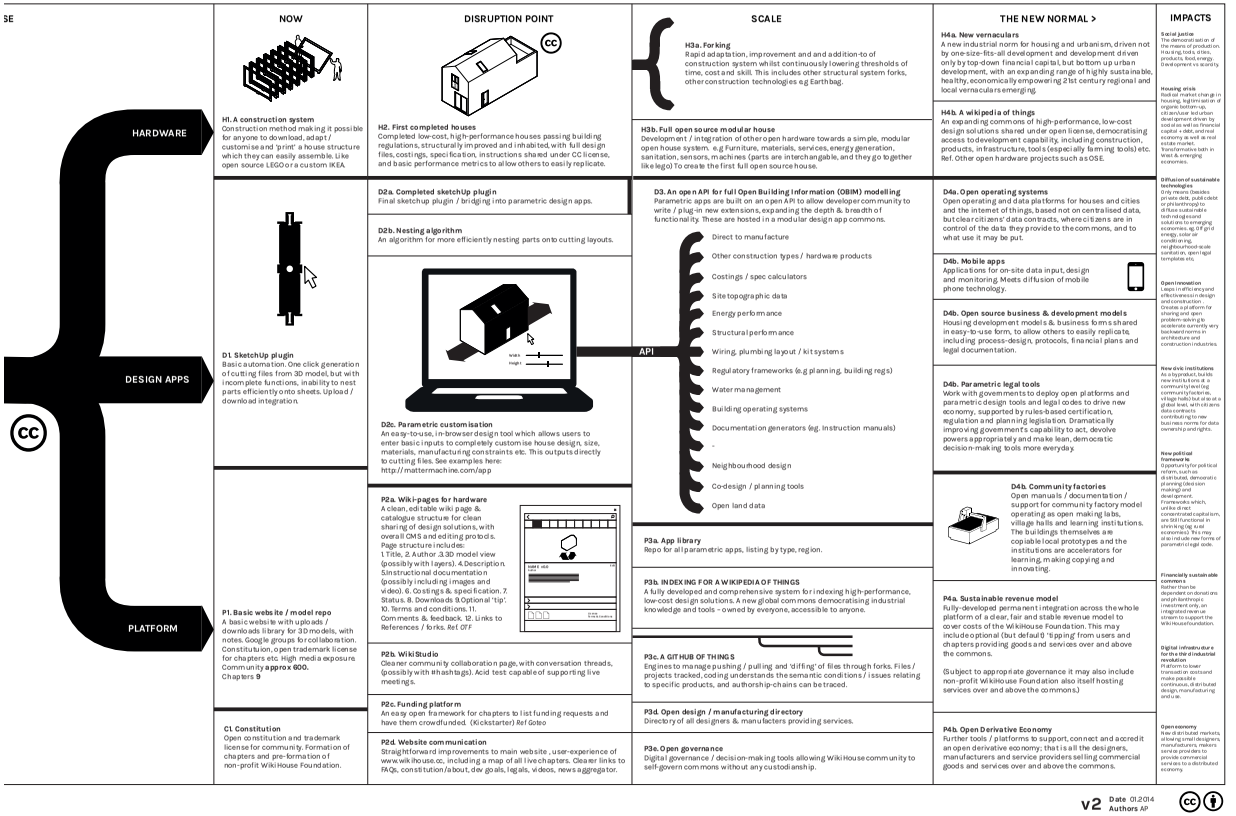


Fig. 18. WikiHouse blueprints, production, assembly and finishing stages

Fig. 19. Construction of the “Farmhouse” WikiHouse, Warwickshire, UK, 2017

Fig. 20. Logo of WikiHouse and various chapters (Netherlands, Mumbai, UK, Rio)



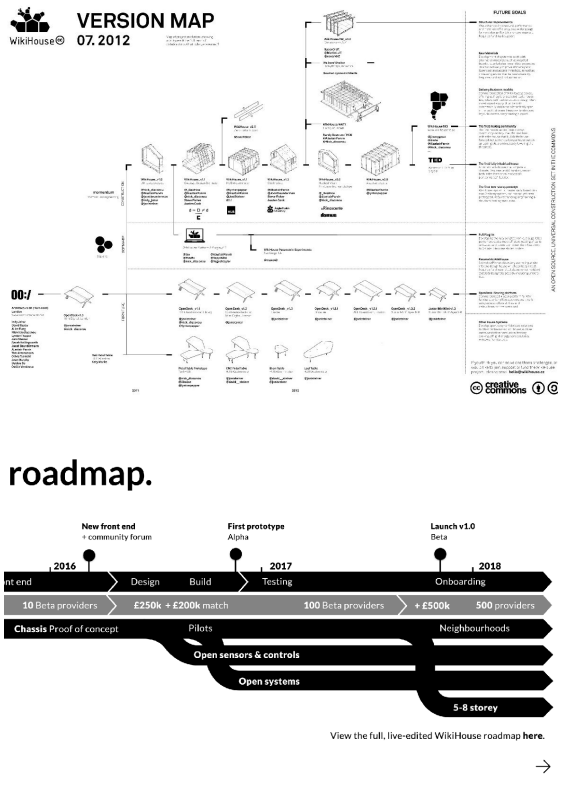
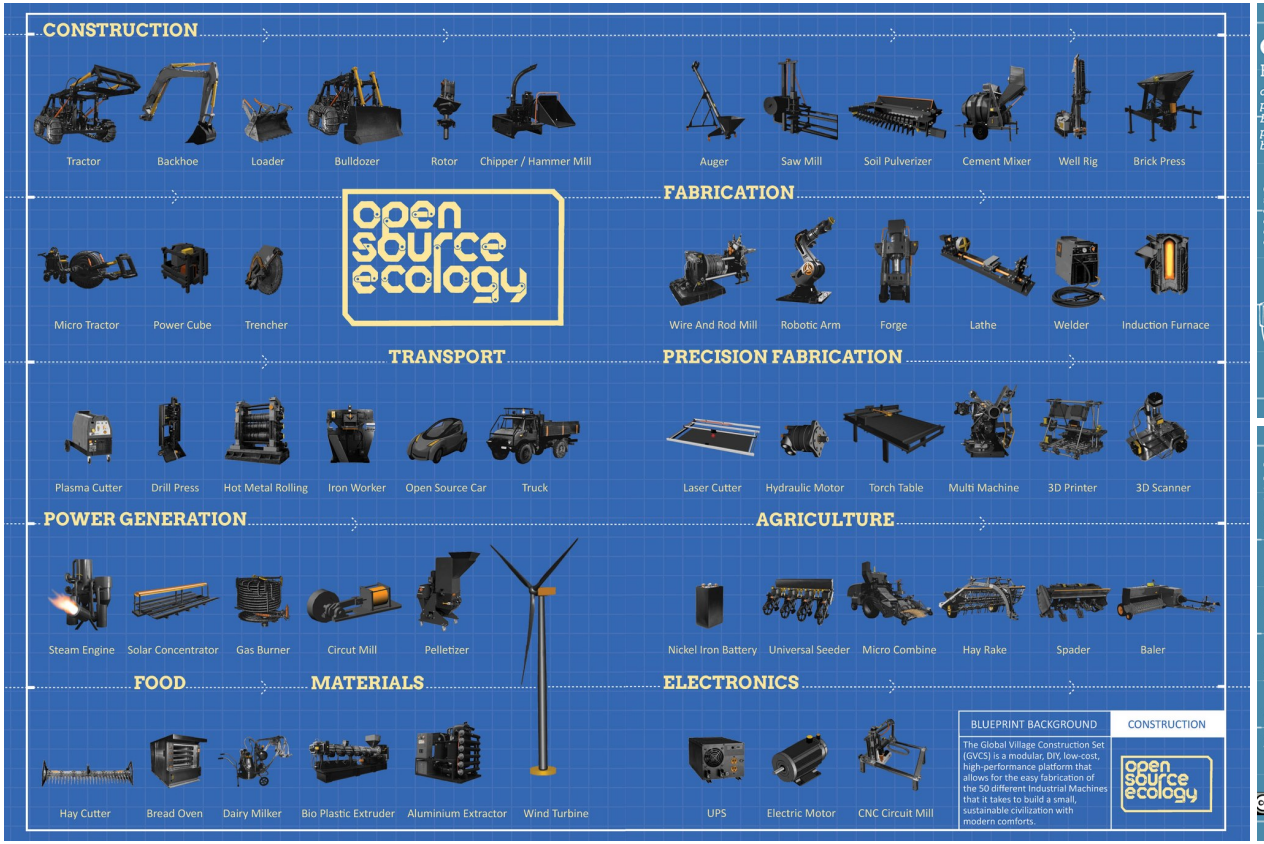
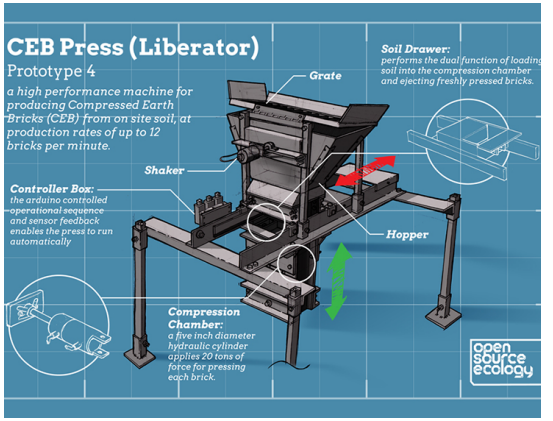


Fig. 21. Diagrams on the evolution of WikiHouse, 2012, 2014, 2016





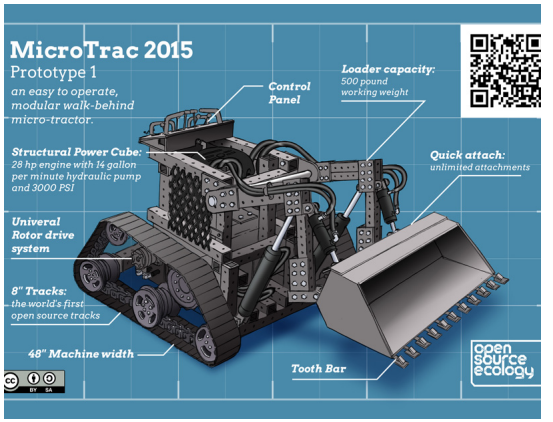
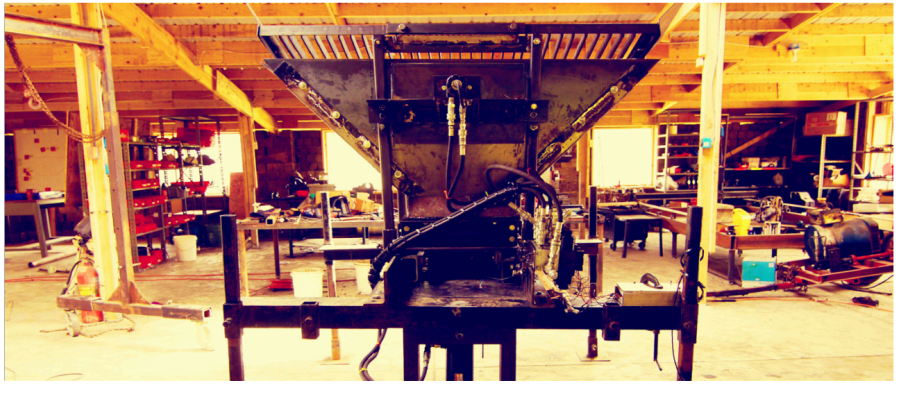


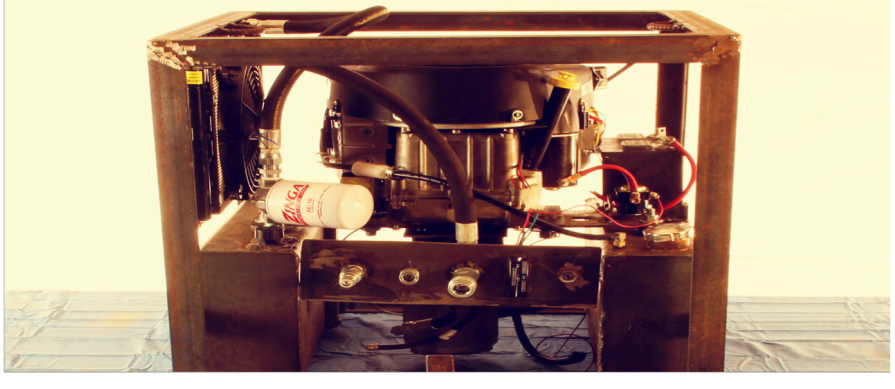
Fig. 22. Blueprints of the Global Village Construction Set

OSE Tractor ($6,000 in materials) *vs* **John Deere 4320 Compact Utility Tractor** ($29,700)

OSE Sawmill ($8,000 in materials) *vs* **Mobile Manufacturing Mobile Dimension Saw** ($34,250)



OSE Brick Press ($4,000 in materials) *vs* **Powell & Sons PGA-600-12** ($52,500)



OSE Power Cube ($2,000 in materials) *vs* **27hp Portable Hydraulic Generator** ($8,000)

Fig. 23. Prototypes in 2012

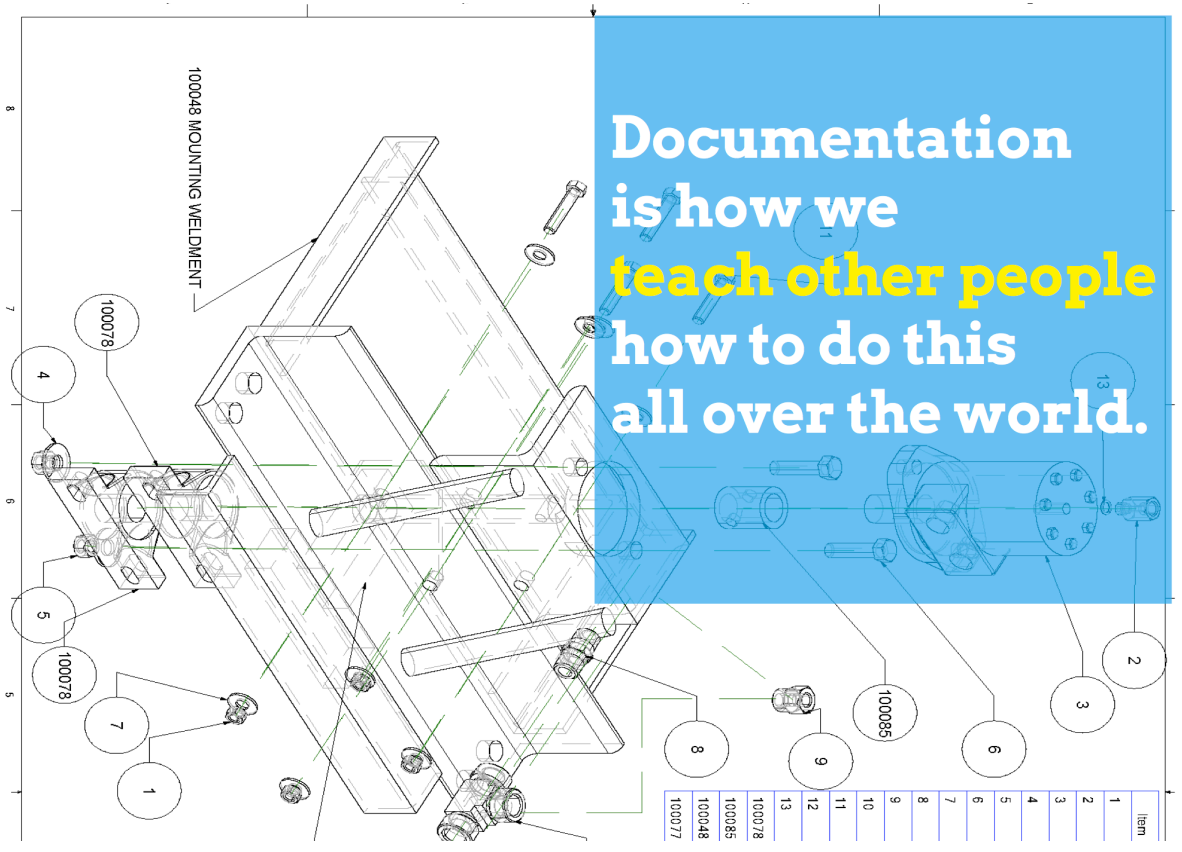


Fig. 24. Opening page of the Civilisation Starter Kit

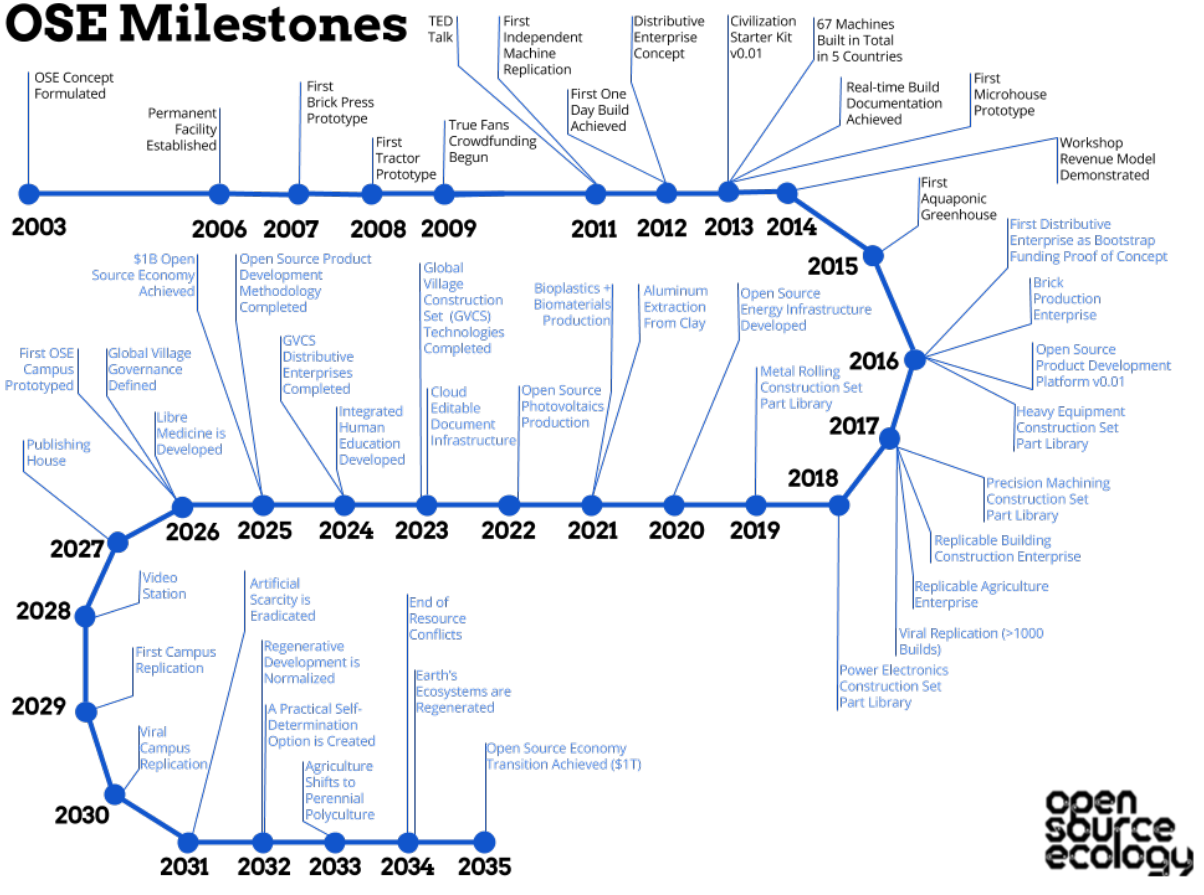


Fig. 25. OSE Milestones, as envisioned in 2015

Fig. 26. Still shots from Build Yourself video

Fig. 27. Overview of Precious Plastic v2.0 creations

Fig. 28. Precious Plastic v2.0 machines: shredder, extruder, injector and compressor

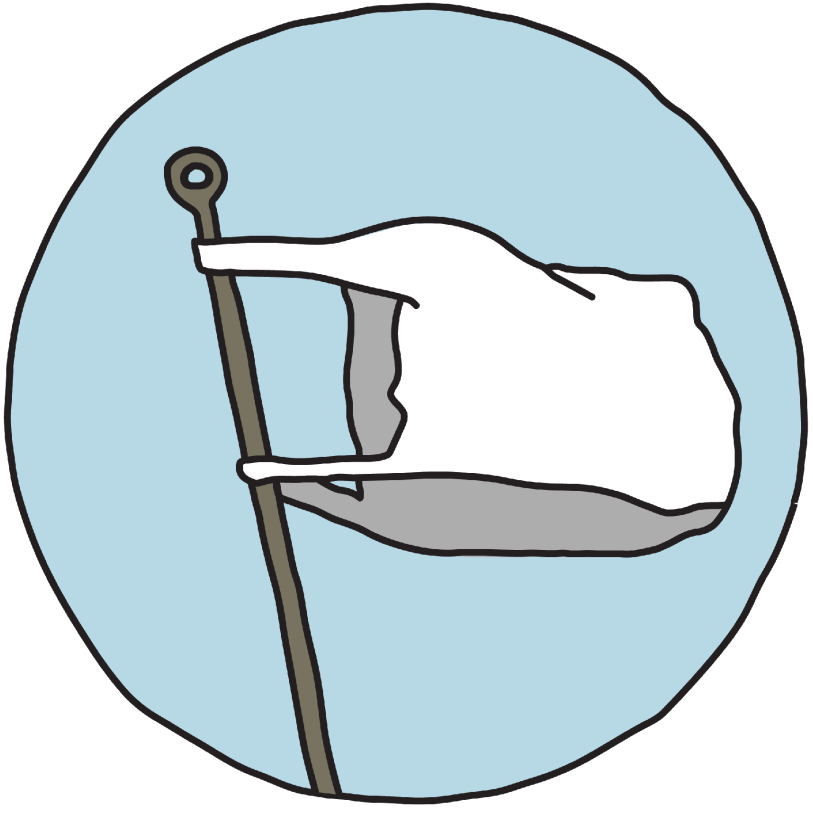


Fig. 29. Precious Plastic logo

Fig. 30. Precious Plastic community logos and activities

Fig. 31. Precious Plastic container workspace

Fig. 32. Series of art objects that embody the Precious Plastic v3.0 manifesto

Fig. 33. Bijenkorf Amsterdam shopwindow, July 2017

Fig. 34. POC21 as envisioned in early 2015

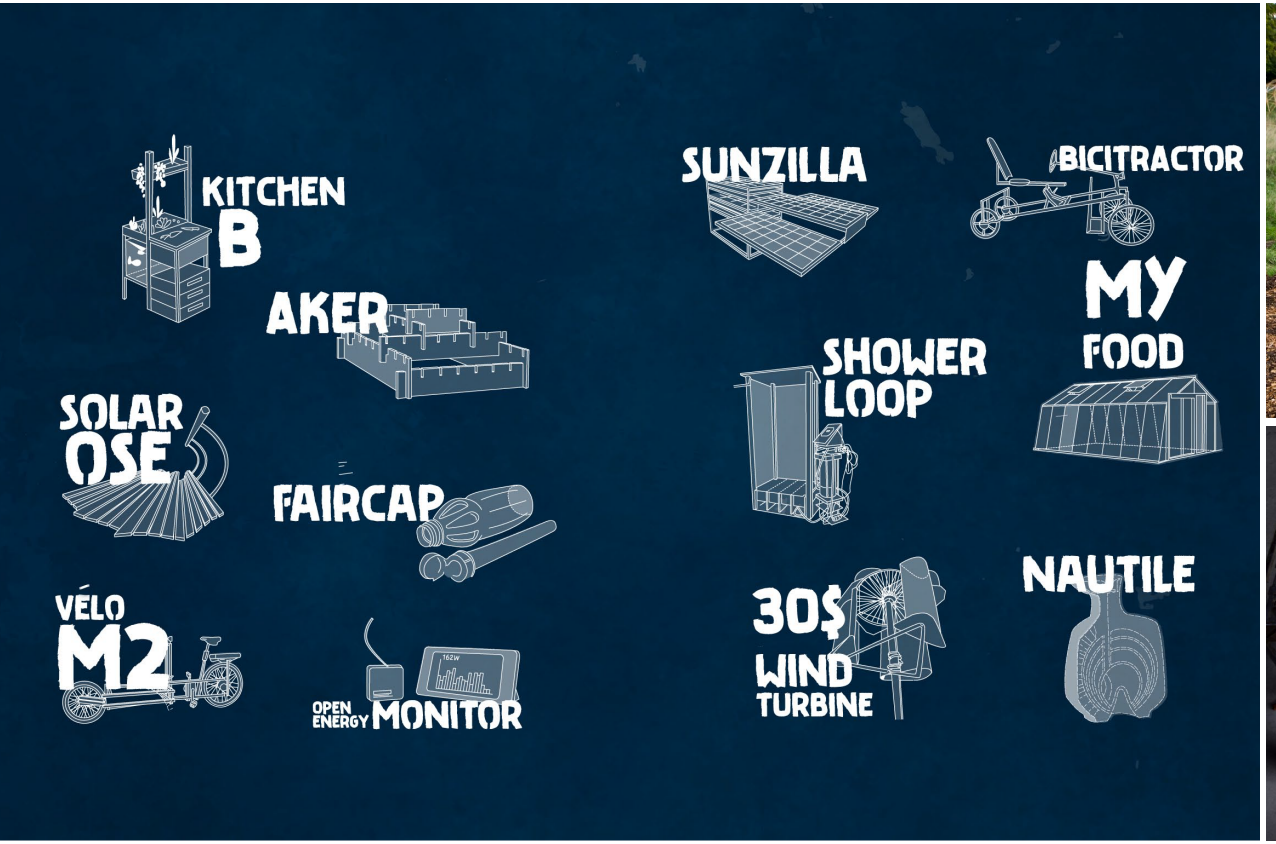
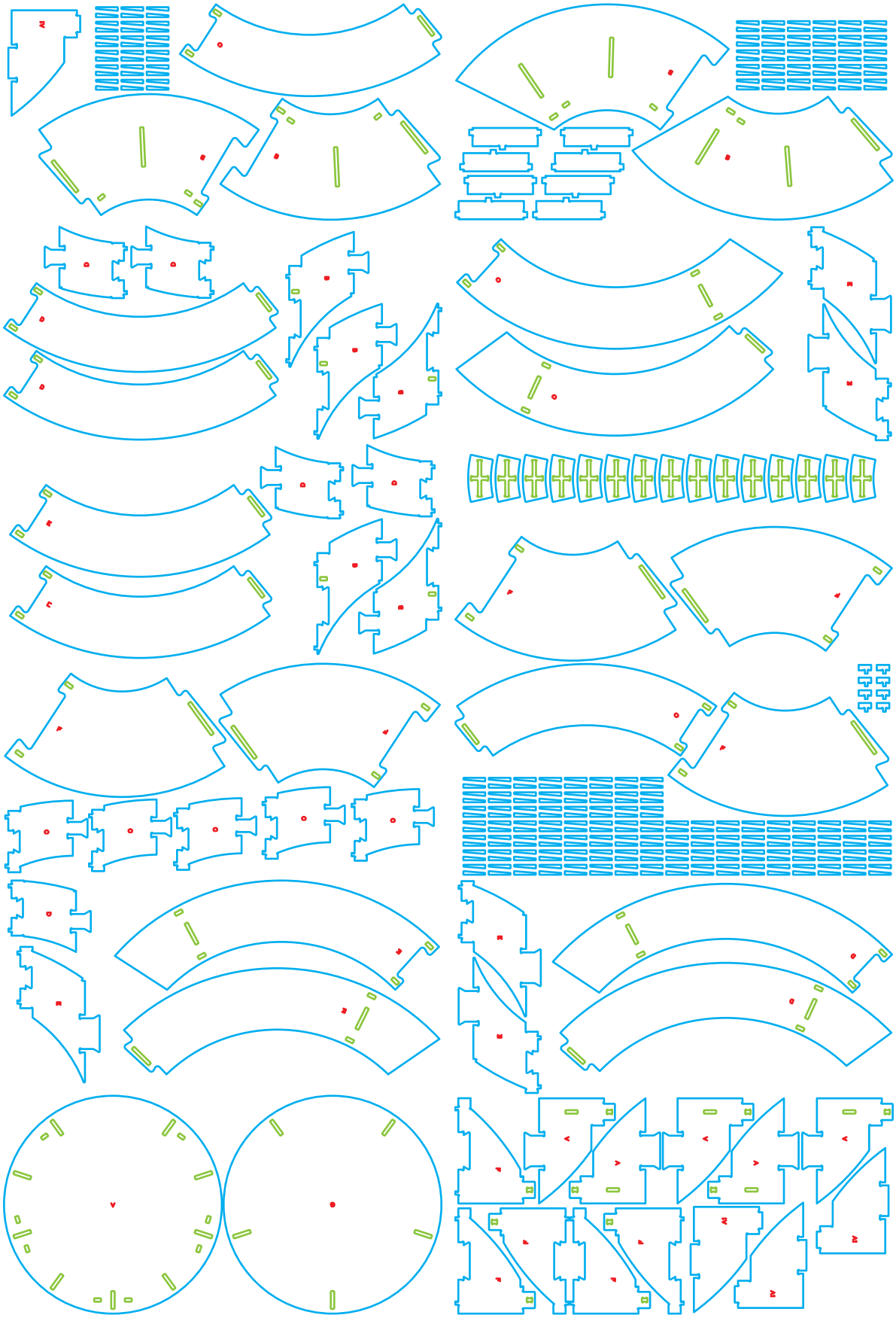
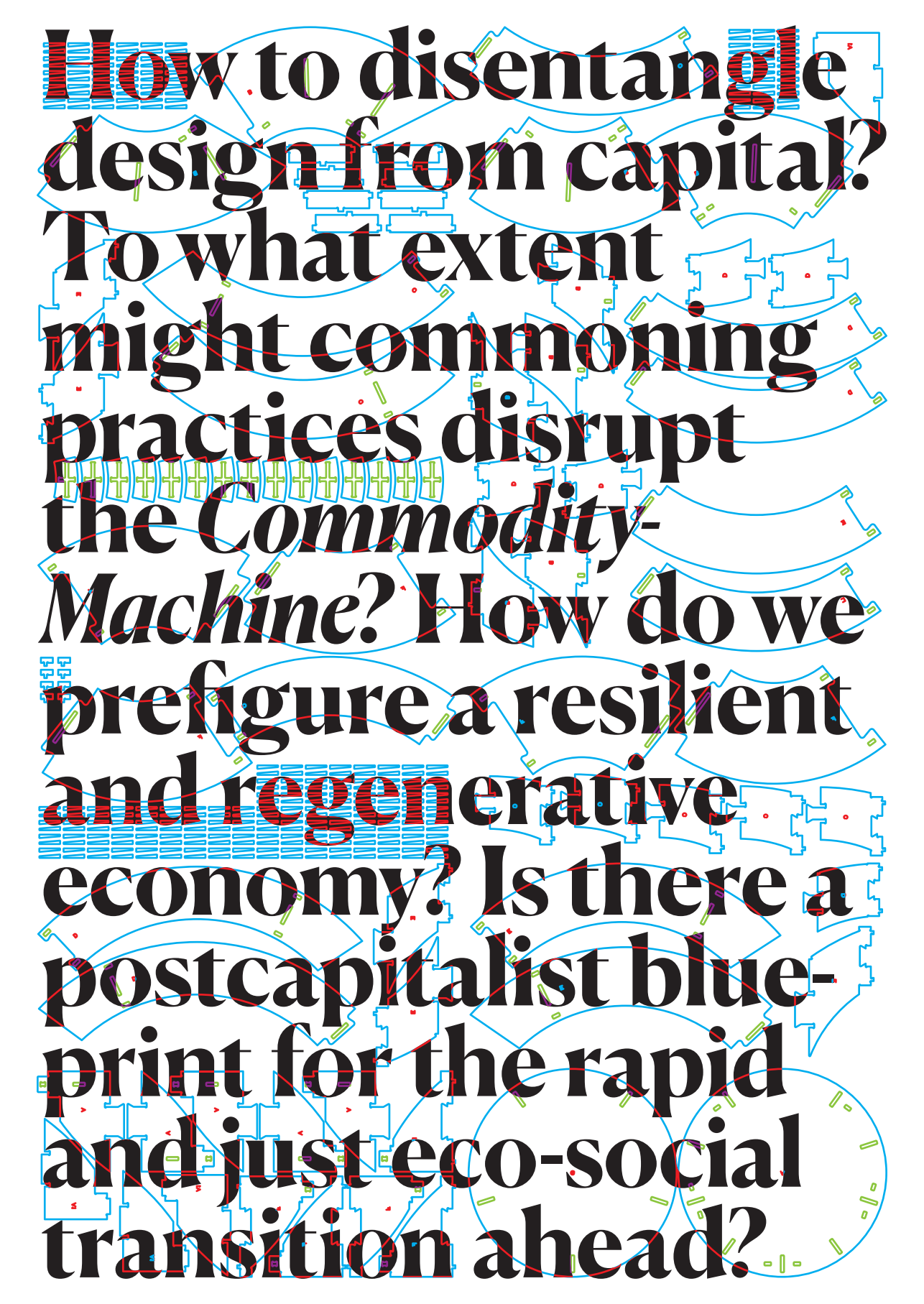


Fig. 35. Overview of POC21 projects and the Bicitractor

Fig. 36. Geodesic dome built for the POC21 exhibition




How to disentangle design from capital? To what extent might commoning practices disrupt the *Commodity-Machine*? How do we prefigure a resilient and regenerative economy? Is there a postcapitalist blueprint for the rapid and just eco-social transition ahead?