The Fifth Order of Design: The Value of Design in Times of Transition

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Failures in achieving sustainability are being recognised worldwide. Approaches to tackling sustainability challenges often fail to address the roots of these challenges. This paper contributes to a necessary discussion of an emerging necessity, a research agenda that encompasses the transformative strategic role and value of design in (co-)shaping sustainable and equitable futures. It draws attention to drivers of unsustainability and their complex interplay of design, environmental, economic, societal and individual values that govern our modern society. Richard Buchanan's four orders of design model is reviewed in the process, with a fifth order being suggested to deal with the change of paradigm that sustainability requires. This comprehensive view is critical to getting to grips with global challenges (United Nations Sustainable Development Goals) since the shift towards sustainability needs to address the root causes of systemic and interrelated problems that cannot be overcome by reactive marketing and technocratic approaches. Implications for design value, education, skills, and ways of designing are pointed out.

Unsustainability drivers: beyond a design perspective

Greenhouse gas (GHG) emissions are considered one of the main causes of climate change and they have increased 50-fold since the mid-1800s (Climate Watch 2018). Economists argue that GHG emissions are a side-effect of market failure and that

> *…most impacts are (still) not affecting those responsible for the emissions. Instead, these impacts fall on future generations and people in developing countries" (Bowen, Dietz, and Hicks 2012).*

This problem has been recognised since 'Our Common Future' (or the Brundtland report, WCED 1987) by the World Commission on Environment and Development (WCED), a report which also notes disparities in resource consumption:

> *Some consume the Earth's resources at a rate that would leave little for future generations. Others, many more in number, consume far too little and live with the prospect of hunger, squalor, disease, and early death. (WCED 1987, 28)*

From an economic perspective, this is justified by the lack of economic incentives for businesses and consumers to reduce their emissions. In this context, any commitment to sustainability relies on an ethical position. Hence, policy interventions are necessary to make a decrease in emissions economically attractive (Bowen, Dietz, and Hicks 2012).

Moreover, the deep interconnection between poverty and unsustainability is supported by the reasoning that disadvantaged communities tend to "destroy their immediate environment in order to survive" (WCED 1987, 28). Instead of 'destroy', the word 'sell' is more appropriate considering that those who create the bases for these destructive systems, leveraging them for economic gain often escape culpability often escaping culpability and are not mentioned in reports such as these.

Donella Meadows, Jorgen Randers, and Dennis Meadows (2021) demonstrate that early policy interventions are critical to introducing fundamental changes towards sustainability, contributing to humanity's long-term future. They point out that 'the business-as-usual scenario' will only lead us to global collapse, including a shortage of food and health services around 2030. The authors also highlight the need for a societal shift to reach sustainability, explaining that

> *… technology and markets are unlikely to prevent overshoot and collapse" because "society's implicit goals are to exploit nature, enrich the elites, and ignore the long term, then society will develop technologies and markets that destroy the environment, widen the gap between rich and poor, and optimize for short-term gain. (Meadows, Randers, and Meadows, n.d., 5).*

Therefore, there is the need (1) for a widespread change in consciousness among our societies, with the abandonment of worldviews connected to exponential industrial and economic growth that drive unsustainability (Meadows, Randers, and Meadows, n.d.) and (2) the co-creation of responsible worldviews for sustainable and equitable futures by incorporating feedback (Meadows 1994).

Design and (un)sustainability in the four orders of design

Richard Buchanan defines design as "… the human power of conceiving, planning, and making products that serve human beings in the accomplishment of their individual and collective purposes" (Buchanan 2001, 9). The category 'products' in this definition refers to tangible and visible information (e.g., words, images and physical artefacts) as well as services, experiences, interactions and the integration of all these into environments or human systems that shape our way of "living, working, playing and learning" (Buchanan

2001, 12). He further explains that although systems cannot be experienced (as people can only experience their personal pathway through a system), people's lives are strongly influenced by those. This design definition synthesises the evolvement of design knowledge and education in the twentieth century into what Buchanan refers to as the four orders of design (Figure. 1). Each order is a place for (re)discovery (Buchanan 2001).

Design has responded to sustainability challenges in different places of (re)discovery. In industrial design, the ecodesign approach brought attention to diverse methods for designing and manufacturing products considering all the product life cycle in the early stages of product design, such as Design for Manufacture and Assembly (Boothroyd, Dewhurst, and Knight 2002), and for reducing materials employed in products.

However, the result of consumption or the discarding of post-consumer products is only the 'tip of the iceberg', because "the product itself contains on average only 5 per cent of the raw materials" involved in manufacturing and delivering it (McDonough and Braungart 2002) and the obsolescence of products by design accelerates consumption cycles making the reduction of materials irrelevant (Luttropp and Lagerstedt 2006; Karlsson and Luttropp 2006; Petrina 2000). Hence, ecodesign approaches in isolation were proven to be insufficient. Thus, the idea that design and production must be rethought, eliminating the concept of garbage (Dogan and Walker 2003; Dijkema, Reuter, and Verhoef 2000) underpinned the rise of such ideas as circular economy and industrial ecology in the 2000s (Dogan and Walker 2003; Dijkema, Reuter, and Verhoef 2000), calling for a change towards a systemic and holistic view on the part of designers and design, marking a transition in focus from things to human systems.

In the 2000s, global consumption was still considered very high and unequal. "Twenty per cent of the world population consumed about eighty per cent of the world's resources" (Manzini 2007; Tukker et al. 2008). Therefore, the design discourse emphasised the demand side of sustainability issues, arguing the need to understand the sociological nature of sustainability problems regarding culture production and consumption and to break the untenable cycle of wastefulness perpetuated by Western cultures (Petrina 2000). The implications for design expanded into interaction and environmental design, including the need for:

1. A change in the concept of well-being and quality of life disassociated from the idea of consumption along with a behavioural change (Manzini 2007; Tukker et al. 2008) and,

2. Radical innovations in the development of new products and ideas as required (Manzini 2007; Sherwin and Bhamra 1999; Tukker et al. 2008).

Despite these advancements in design for sustainability research, there was little change in design practices for sustainability. Industrial design is criticised due to its reckless impacts on the environment and society. In the preface of *Design For The Real World*, Victor Papanek (Papanek 1972) alerted us to the pitfalls of design in the context of mass production:

There are professions more harmful than industrial design. But only a very few of them. And possibly only one profession is phonier. Advertising design, in persuading people to buy things they don't need, with money they don't have, in order to impress others who don't care, is probably the phoniest field in existence today… And skills needed in these activities are carefully taught to young people… (Papanek 1972, ix)

Other problems include exploitation at work with the payment of low wages for an excessive number of hours worked. For example, about 65 hours

per week, including the use of child and female labour, and the relocation of industries motivated by the cheapness of the workforce (Jeswiet and Hauschild 2005; Petrina 2000; Walker and Dorsa 2001) found usually in "least- and less-advanced" countries. These are still common practices. The example of inequality in the distribution of monetary value throughout the value chain is provided by Stephen Petrina who breaks down the price of one pair of Nike sneakers[1] sold for $100.00 as follows, see figure 2 (Petrina 2000, 223).

In this context, design contributes to creating brand and product values that are not fairly distributed throughout the value chain, attesting to the insidious nature of the accumulation of capital and the extent to which design can be regarded as an unethical practice .

The designer must not merely try to adapt to cover incompatible proposals, pitting industrial capital against vision of sustainability, but "must acquire new skills" by exploring experimental pathways, harnessing local resources and traditional knowledge (Walker 2002). Transition Design also reinforces the importance of place-based knowledges, including indigenous knowledges, design skills and experimental approaches that may continuously evolve to "design within uncertainty, ambiguity, chaos and contradiction" and to address the complexity of systems (Irwin, Kossoff, and Tonkinwise 2015, 7). Beyond skills, ethics is a critical factor as Victor Papanek highlights:

> … *when everything must be planned and designed, design has become the most powerful tool with which man shapes his tools and environments (and, by extension, society and himself)*. *This demands high social and moral responsibility from the designer. (Papanek 1972, ix-x)*

Ethics is the main incentive to embrace sustainability according to economists (Bowen, Dietz, and Hicks 2012) and a necessary value for sustaina-

bility that requieres social change towards equity (see Meadows, Randers, and Meadows, n.d.; WCED 1987). Since the 1970s (Papanek 1972) designers have been warned about their unethical practices that contribute to "unsustainable ways of being and doing things" (Manzini 2015, 3) and the importance of ethics connected to ways of *being* (our values, beliefs, principles, and meanings) that form the basis for our reasonings and practices has also been emphasised (Ehrenfeld 2019; Walker 2014; Irwin, Kossoff, and Tonkinwise 2015; Willis 2006). However, the education and capabilities of designers have not advanced enough to tackle complex social challenges (see Manzini 2015) and incorporate ethics into their practices in a more robust fashion. Therefore, there is the need to bring empathy into human ways of being, putting "caring about others and the world[2] as a basic value for change" (Ehrenfeld 2019). Nonetheless, intersectionality issues are still not fully addressed in design education, practice, and research. Particularly, the idea of race and its implications have been overlooked even in people-centred design (design thinking) and only recently has critical thinking aimed at transforming design practices and research begun to emerge.

In this matter, Sylvia Wynter's work provides a compelling critique of modern thought, especially on the ethical implications of the European colonial project, clarifying racial difference as a human signifier that informs the idea of humanity itself through coloniality and its associated principles and values. Modern thought posits and designates "Man"[3], the product of modern philosophical and scientific projects, as the human being. Statements of the human are based on dualisms derived from the religious ethics of Scholastic thought and the civic ethics of modern thought, that divide the world into "Grace" and the "geographies outside Grace"[4], pure and impure, European and non-European, the coloniser and the colonised, rational and irrational[5], naturally selected and naturally de-selected by evolution, the human and the inhuman (Ferreira

da Silva 2015, 90-94; see also Ansfield 2015). These secularised tenets of the natural and rational man inform the development of sciences and of juridical, political, societal and economic architectures, power relations and principles (see Ferreira da Silva 2015). Those subjected to colonial power and domination occupy the "space of otherness", "outside Grace", they are disavowed through the deployment of institutional accounts that continue to influence 'human' systems and their power relations.

Initiatives towards an education in Art and Design that can contribute to tackling these complex social challenges by decolonising design education, knowledge and profession are starting to emerge (see table 1 for examples).

It is worth noticing that beyond admitting and hiring black, indigenous and people of colour (BIPOC), the question is how to retain and integrate diverse backgrounds and cultures, creating structures which enable their value to be recognised instead of erased, to fit in historical *privilege boxes*. The disadvantages that BIPOC need to overcome require privileged groups to recognise and to be conscious of their own privileges beforehand.

Table 1: Examples of decolonisation initiatives in design.

Initiatives	Examples
Creation of new courses.	Transdisciplinary Design MFA at Parsons
Change in or creation of design curriculum.	Programme framework of the School of Design at Carnegie-Mellon University (as of June 14, 2021 on the Carnegie Mellon Design's website). 'Race' and Space new curriculum in the UCL Faculty of the Built Environment at The Bartlett (Zewolde et al. 2020). OCAD University design curriculum (Tunstall 2018). Film Studies MA at Lancaster University (as of June 14, 2021 on the LU's website).
Report.	Sofia Ackel's report on decolonising Lancaster University (Ackel 2018)
Communities, tools, and projects dedicated to diversity and decolonisation of design knowledge and education.	DRS Pluriversal Design SIG (as of June 14, 2021 on the Design Research Society's website). Critical Alphabet (Noel 2021). Future Education and Literacy for Designers (FUEL4Design 2020).
Industry initiatives	Diversity in Design (DID) collaborative (Keh 2021)
Implementation of policies that enable to hire minority groups in academia.	See OCAD University (2018).

Neoliberalisation, design and (un)sustainability

Inequalities are being exacerbated worldwide while institutional mechanisms keep communities marginalised and in poverty, a fact which has been observed by economists (Acemoglu and Robinson 2012; Chetty 2021; Sen 1999). Social mobility and peoples' capabilities are usually hampered in these circumstances. What becomes clear is that the principles of neoliberal economics have proven themselves to be unsustainable, effective maintaining the privilege of a few groups. Tenets of capitalism (production, accumulation of capital and competition as they operate) cannot coexist with sustainability.

Design corroborates changes in neoliberal economics throughout history, a process illustrated by Guy Julier (Julier 2017). With progressive deregulations in global trade and the privatisation of state industries and services (e.g., Reaganomics in the USA and Thatcherism in the UK), design works as a response to *global competition.* In the New Economy (the 1990s), design becomes a *core company competence* with 'faster, better and cheaper' practices based on (1) the evolvement of digital information technology networks that changed the structuring of supply chains (e.g., Amazon.com, eBay.com), (2) the possibility of focusing on organisations' core capabilities *through design*, innovation, and brand building, (3) the exploitation of Eastern Europe manufacturing and service bases that provided cheaper labour and material costs.

In the 1990s and 2000s, financialisation was intensified with the rise of shareholder value within corporate governance, *the rise in profit through financial* rather than commodity production systems and the rise of financial trading. Tangible and intangible assets are in continuous exchange. In financialisation, "design contributes to value creation and is used strategically to differentiate and provide protection on assets

through law" (e.g. licensing out of designs for others) (Julier 2017), thereby contributing to "the competitive advantage of organisations and accumulation of capital".

In the 2007-8 global financial crisis and economic recession, governments struggle to decrease their deficit and encourage the private sector by cutting their own spending (Julier 2017). There is the emergence of "social design" programmes for collective benefit within two streams: the development of cheaper and more user-focused services in regional and national governments, as well as the strengthening of politicised activist design practices which propose alternative economic and social frameworks to confront the regime of austerity (Julier 2017).

Within the context of neoliberalism, design contributes to unsustainability when it plays a part in the obsolescence of products (Luttropp and Lagerstedt 2006; Karlsson and Luttropp 2006; Petrina 2000) and in the exploitation of workers (Jeswiet and Hauschild 2005; Petrina 2000; Walker and Dorsa 2001) when under the commercial pressure to maximize competitive advantage and profit. These also contribute to perpetuating unsustainable consumption, waste and poverty. The latter is considered cause and effect of unsustainability (WCED 1987). On the other hand, the austerity regime reinforces the social role of design,which becomes a resource for policy making and social innovation with the plummet in public budget.

Although social design and innovation have the potential to enhance the public good, structural inequalities impact people's *beings* and their potential deployment (see Sen 1999). Consequently, policies play a crucial role in enabling political freedoms, economic facilities, social opportunities, transparency guarantees and protective security that can create conditions for people to act and bring about change (Sen 1999).

Creative and innovative answers and economies are necessary not only to respond to our local and global complex challenges but to proactively promote change, rethinking, reflecting, envisioning, strategizing and acting upon sustainable futures[6]. This requires a shift in current worldviews to adopt sustainable forms of growth and *purposes* that can "be accommodated by the sources and sinks of the earth" and address the root causes of inequity (Meadows, Randers, and Meadows, n.d., 16).

The value of design

Design which was initially concerned with the tangible world of products and communication has expanded its scope of work into services, and its influence into matters of organisational strategy, competencies, and attitudes (Boland and Collopy 2004; Borja de Mozota and Valade-Amland 2020; Buchanan 2015; Brown 2009; Michlewski 2008; Zurlo 2019). In the process, it has become an important asset to bring about change and innovation (Borja de Mozota 2006; D'Ippolito, Miozzo, and Consoli 2014; Heskett 2016; Junginger 2008).

In the public sector, experimental design approaches and practices have gained attention due to their ability to tackle complex challenges in uncertain environments, navigating ambiguity. This is important,for instance, when the circumstances require creative solutions instead of pre-set answers provided through conventional policy-making processes (see Junginger 2014). In doing so, the value of design for private and public organisations relies on its capabilities, approaches, methods and processes rather than on its outputs (Borja de Mozota 2011; Borja de Mozota and Valade-Amland 2020; Julier 2017).

These transitions reflect on the growth of design specialisations (see Julier 2017) and on the need to incorporate design capabilities into *different worlds* (e.g., citizens, policy makers, civil servants, and other professional cultures) (Bason 2014; Boland and Collopy 2004; Julier 2017; Junginger 2014; Manzini 2015, 2019; Mortati et al. 2016).

The synthesis of an interdisciplinary literature review on qualitative and quantitative dimensions of the value of design in the fields of economics, marketing, business, management and design is illustrated in figure. 3.

This is not a static framework as new dimensions can emerge, as well as quantitative and qualitative approaches can be found regarding the same variable depending on the methodology used to understand and 'measure' value and performance. Moreover, despite the categorization of key stakeholders from users to society, the benefits identified can influence diverse categories.

Research on the value of design is still failing to address the transformative role of design, especially at a societal level. Furthermore, although the value of design and its potential have been justified and explored in diverse fields, there is still confusion and lack of evidence on the value that design can create at different levels and 'layers' (as per the four orders of design, particularly at the systemic level).

This is partially justified by the fact that successful design does not happen in isolation, a phenomenon which has not escaped the notice of design management studies. It is integrated with other organisational and external conditions and capabilities (Gorb and Dumas 1987; Fonseca Braga and Zurlo 2018; Pilditch 1990; Westcott et al. 2013; Zurlo 2019). Hence, it is difficult to precisely distinguish the design contribution from other variables that may also impact a firm's performance (Chiva and Alegre 2009; Gemser and Leenders 2001; Roy and Riedel 1997). The strategic adoption of design is related to organisational culture aspects rather than economic reasonings, and design deployment is seen as a matter of choice at the micro-level (Fon-

seca Braga 2017). However, at the macro-level (e.g., political and socio-economic systems) the value of design remains obscure and hotly debated (see Bason 2014; Julier 2017; Mortati et al. 2016).

The fifth order of design: Ethical design

The story we tell about modernity (our current social paradigm) is leading us astray. We are living within institutions based on flawed beliefs and norms… The persistence of these ideas can be attributed to the strongly conservative nature of societal reproduction, and the lack of any serious intellectual revolt in the West. (Ehrenfeld 2019, 107)

After an era of human-centred design which emphasised empathy as the main principle and capability of designers in contrast to the mainstream of Western design, it is now, more than ever, necessary to recognise that this discourse and its related practices are insufficient to address unsustainability and inequity issues. Besides, people are not users, consumers, customers, or clients of the planet.

Richard Buchanan proposes the four orders of design that show the places for design discovery in the 20th century. These design orders have been often dominated by human-centred perspectives, especially that of design thinking[7], with a few exceptions such as design-driven innovation[8], product-service systems, beyond human-centred design[9], design futures[10]. Furthermore,

Western design approaches and methods often neglect the "space of Otherness"[11] and all other ways of "conceiving, planning and making" (Buchanan 2001), thinking, articulating, learning and creating knowledges that evade and exceed Western political, societal, juridical, scientific and economic paradigms.

Under these Western paradigms, 'human beings' legitimise the domination and exploitation of the Earth, nature and even of other human beings and their systems. However, these conceptions are "leading us astray" (Ehrenfeld 2019, 107).

This model needs to be reviewed considering the transformative role of design in light of the need to address unsustainability and its interconnected issues of inequity in the twenty-first century, taking into account of:

1. The political, social, and economic institutions that govern peoples' and, thus, organisations' lives and which can limit the deployment of human capabilities (see Sen 1999).

2. The need to change the values of modern Western society (Manzini 2015; Meadows, Randers, and Meadows, n.d.; Papanek 1972).

3. The foundations of power relations amongst *human beings* (see Ferreira da Silva 2015; Ansfield 2015).

4. The need to reconnect humans to conditions that determine all life (beyond human lives) to thrive on the planet Earth (Ehrenfeld 2019).

Therefore, design education, ways of thinking and working need to be rethought in accordance with a strong commitment to:

1. Influencing institutional arrangements[12] that determine people's socio-economic conditions (see Acemoglu and Robinson 2012; Chetty 2021; Sen 1999).[13]

2. Reconnecting people, place, and planet (see Ehrenfeld 2019).

3. Decolonising design: empathising with and/or being open to different ways of being and living, especially cultures that successfully live in harmony and connection with nature's times and scales[14] and learning from them (Irwin, Kossoff, and Tonkinwise 2015; Walker 2002).

4. Rethinking and repositioning value creation and distribution by design at different levels (individual, organisational, and societal). The contribution of design is still questioned at the societal level, and the idea of race is customarily neglected in design fields, only recently receiving proper attention (see table 1).

5. Expanding the *products* of design and hence, of organisations and systems. New systems, ways of being and thinking may be learnt from other life experiences and cultures neglected in design. These are still to be discovered as it is not possible to anticipate neglected and disavowed worldviews, their purposes, values and concepts.

In the fifth order, we find design fields that require trans-, inter-, and multidisciplinary collaboration and traverse different orders and have the potential to drive change in the fifth order, such as:

1. Biomimicry (with particular attention to Earth's and nature's time, scales, and systems),

2. design activism (e.g., through social and entrepreneurial initiatives such as *slow* and *km 0* movements),

3. design futures (forecasting impacts considering spaces that human activities and systems do not take into account), and

4. participatory design (Sanoff 2008) and co-design (Sanders and Stappers 2008) initiatives which traverse different orders and have the potential to drive change in the fifth order.

Although policy design has been bridging the gap between policy planning and implementation of conventional policy making (see for instance Junginger 2014), bringing different stakeholder groups (including citizens) together in preliminary stages of policy development, there are still several challenges in influencing institutional mechanisms and bringing equity to infrastructures of juridical, political, societal, and economic governance that have their foundations in modern philosophical and scientific projects (see Ferreira da Silva (2015) for these foundations and their implications). Figure 4 synthesizes the concept of the fifth order of design

Implications of and research agenda for the fifth order

Ethics must lead all design orders. The notion of humanity still needs to be refigured (see Ferreira da Silva 2015) to liberate and value other ways of "conceiving, making, and planning", thinking, knowing, learning, visioning, living and *being* that can provide meaningful alternatives to design values and strategies disconnected from the accumulation of capital, exploitation of vulnerable communities and ultimately the institutional and societal values that perpetuate unsustainability and inequity.

In the fifth order, design education and practice need to integrate other knowledges and to have critical thinking and ethics at their core to be transformational and play a role in preparing designers for the challenges of the twenty-first century . These are the premises upon which we can begin (re-)discovering, reflecting on, envisioning and experimenting with design values and strategies that encompass people(s), place(s) and planet(s)

in building sustainable and equitable futures. The ramifications of this are illustrated below.

It is misleading to assume that designers and privileged groups can empathise with neglected or disavowed lived experiences when they have neither been in those places nor have they been educated to recognise and oppose privilege. Therefore, empathy is crucial when possible and genuine. What if everyone could be educated from an early age to be empathic? In the meantime, rather than taking empathy for granted, how can design education contribute to forming designers who are able to (1) actively listen to others, (2) recognise privilege and its harmful impacts, (3) advocate and care for others and about the world?

It is necessary to talk about inequity, diversity and about care for the world in a way that contributes to reflection and to a responsible and respectful *design of the world*. A *dialogic design pedagogy based on mutual learning* (Freire 1970) - rather than top-down teaching that patronises - is key in moving towards equity, social justice and sustainability through design education. The practice of envisioning as a *way of sharing* visions (see Meadows 1994) is a promising way of building upon dialogical educational practices that can unlock different worldviews (and so unimaginable *products* of design may emerge in this openness to *otherness*, unknown worlds and their purposes), stimulating reflection that can inform the building of responsible and respectful *worlds* and values by incorporating ideas and feedback[15] from others.

Designers do not need more tools for *designing a better world* - these will certainly evolve through situated, contextual, dialogical, responsible and respectful education and practices. Designers need to change their values and incorporate critical thinking and envisioning, as well as other forms of "conceiving, planning and making"[16]. Designers are very well-equipped to envision, especially the long-term vision that is required

for sustainable worlds[17] and to the co-design of this vision. Can envisioning and co-design skills be utilised to bring reflection, the fostering of plurality (Escobar 2018), equity and sustainability values to design education? Which design capabilities, knowledge, methods and practices can bring the lived experience of diverse peoples to the design of a better world and to new ways of designing?

Undoubtedly, this change of paradigm in modern society requires not only effort on the part of design and designersand a change in values on a broader scale to be transformational but calls for inter-, trans- and multi-disciplinary knowledge, coherenceand collaboration as well as multi-stakeholder involvement and commitment to tackling these complex challenges that require deep institutional and decision-making changes at local and global levels to support a proactive change towards sustainable and equitable futures. So, design education needs to address the (in)ability of designers to work with trans-, inter- and multidisciplinary teams. Designers need to be able to actively listen, clearly communicate with people(s) beyond designers' circles (utilising accessible language) and collaborate with diverse stakeholder groups, including but not limited to experts from other fields and sciences, communities of practice, policy makers, civil servants, citizens, entrepreneurs, neglected peoples and cultures in order to (co-)design caring, respectful and responsible worldviews.

Acknowledgements

Graphic design	Industrial design	Interaction design	Environmental design
Symbols. The communication of information in words and images.	Things. Physical artifacts.	Experiences. Services. Activities.	Human systems. The integration of information, physical artifacts and their interaction in the
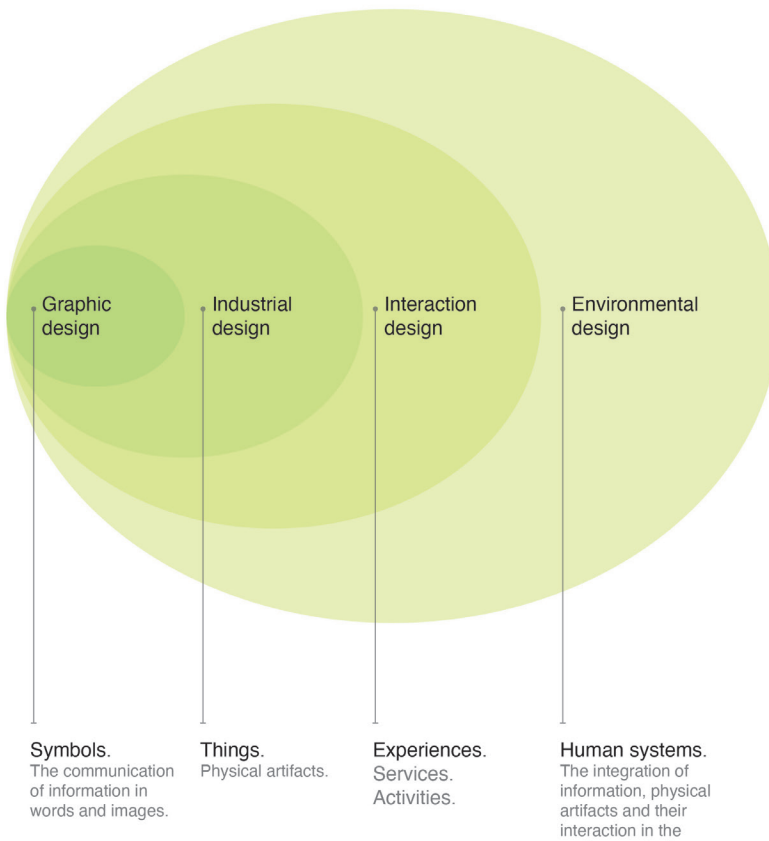
Figure 1: Four Orders of Design. *Source: Adapted from Richard Buchanan (Buchanan 2001, 12).*

factory wages, $0.40
transport and taxes, $5.00
factory, $11.60
store, $50.00
Nike, $33.00

■ store ■ Nike ■ factory ■ factory wages ■ transport and taxes
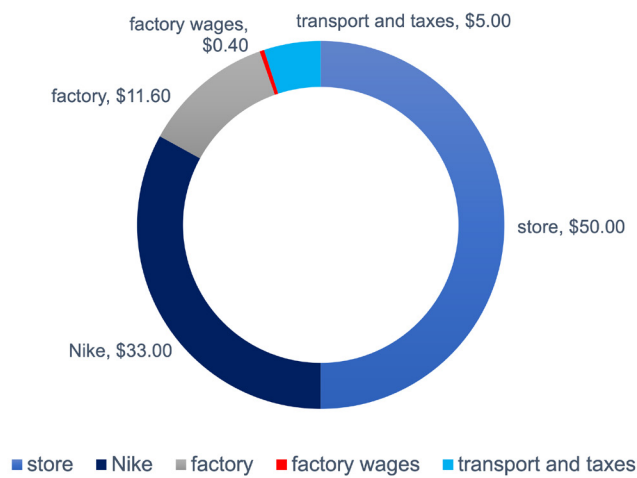
Figure 2: The breakdown costs of a pair of Nike sneakers. *Source: Adapted from Stephen Petrina (Petrina 2000, 223).*
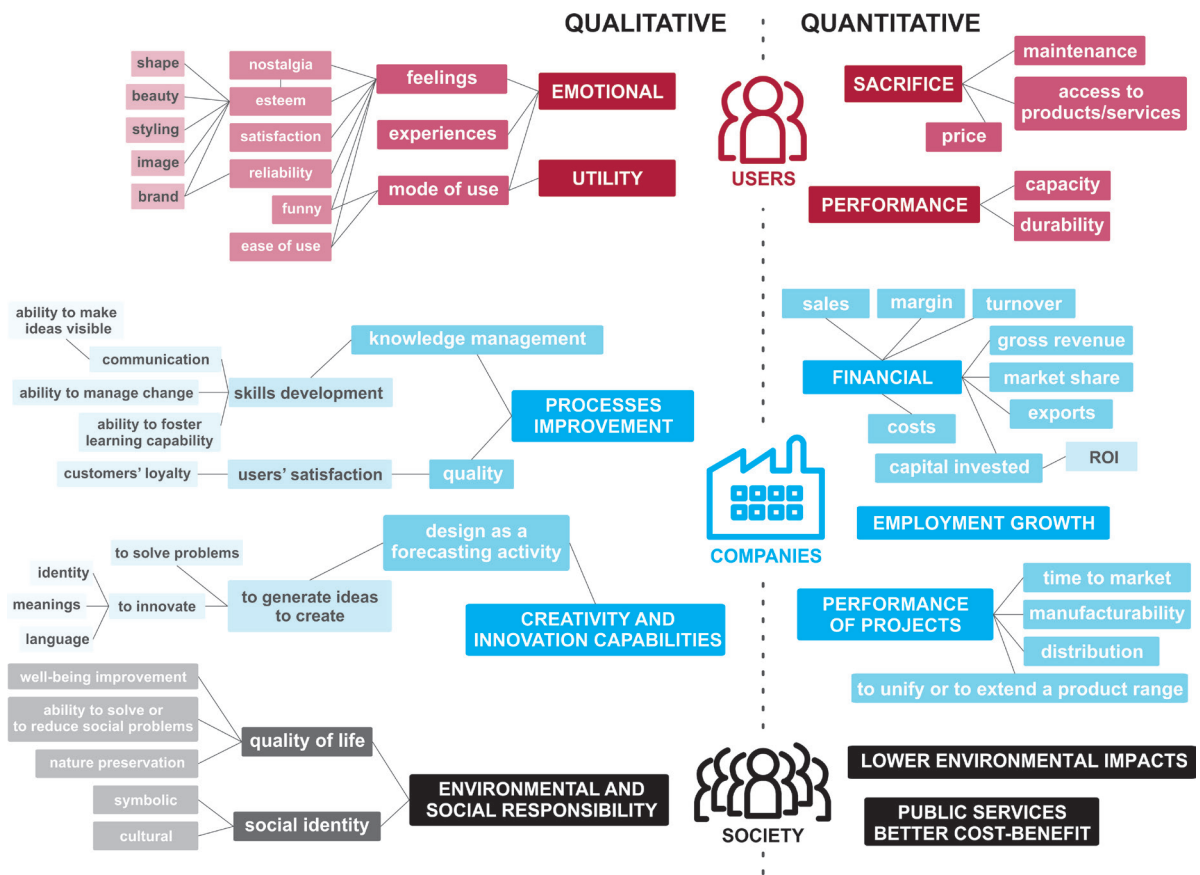
Figure 3: Qualitative and quantitative dimensions of design value. *Source: Adapted from Mariana Fonseca Braga (Fonseca Braga, 2016, 1874).*
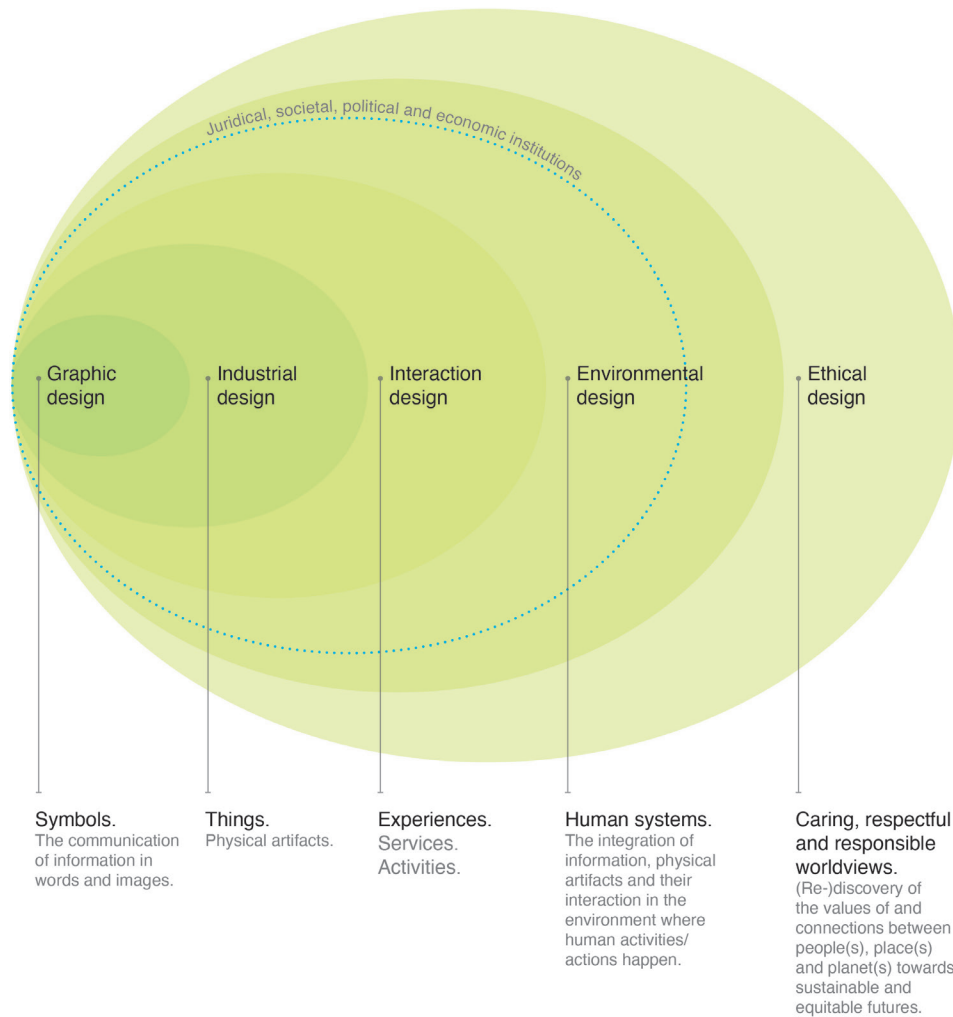
Figure 4: The fifth order of design: Ethical design. A review of Richard Buchanan's (Buchanan 2001, 2015) four orders of design. *Source: author.*

Notes

1. The sneakers last on average less than a year, ending in a landfill (Petrina 2000).

2. John Ehrenfeld redefines sustainability as the conditions for all forms of life to flourish and achieve their potential "on the planet for generations to come" (Ehrenfeld 2019, 106-107).

3. See also Bench Ansfield on the concept of the feudal European men, the "we" of Western European, Christian, heterosexual, aristocratic (and soon bourgeois) men" that creates "racialized human classificatory models in the production and meaning of self / other" (Ansfield 2015, 124).

4. Referring to the secularisation of Judeo-Christian narrative that divides the earth into Jerusalem-centred and "outside this Grace", territories which are expected to be uninhabitable.

5. Related to "the ideological shift away from medieval Christian man and the shift toward secularized rational man as the inhabitants of the Americas, those residing in what was formerly considered to be "outside Grace," were rendered irrational" and are disavowed (Ferreira da Silva 2015, 94).

6. See Meadows 1994 for the importance of envisioning as a way of building responsible worldviews by sharing visions.

7. e.g., Brown 2008.

8. e.g., Verganti 2008.

9. e.g., Cruickshank and Trivedi 2017.

10. e.g., speculative design and design fiction (Dunne and Raby 2013; Sterling 2009).

11. See Ferreira da Silva (2015, 91, 94, 98).

12. e.g., policies, rules, and social norms.

13. See Meadows, Randers, and Meadows (n.d.) for the relevance of sustainability policies, as well as Ferreira da Silva (2015) and Ansfield (2015) for the foundations of institutions and their relations to structural inequalities.

14. e.g. indigenous peoples' ones and traditional local knowledge.

15. See Irwin, Kossoff, and Tonkinwise (2015) for the posture and mindset of designers that may raise new ways of designing.

16. See Willis (2006) and Irwin, Kossoff, and Tonkinwise (2015) for the influence of designers' values, and Noel (2021) for incorporating critical thinking into design education.

17. See Meadows (1994) about the crucial role of long-term 'envisioning' and Meadows, Randers, and Meadows (n.d.) for the importance of considering long-term benefits and costs.

Bibliography

Acemoglu, Daron, and James A. Robinson. *Why Nations Fail: The Origins of Power, Prosperity and Poverty*. New York: Crown, 2012.

Akel, Sofia. "Decolonising Lancaster University." Report, Lancaster University, 2018. http://wp.lancs.ac.uk/decolonising/files/2020/07/Decolonising-Lancaster-An-Introduction-by-Sofia-Akel-2018.pdf.

Ansfield, Bench. "5 STILL SUBMERGED: The Uninhabitability of Urban Redevelopment." *Sylvia Wynter: On Being Human as Praxis*, edited by McKittrick Katherine, 124-141. Durham; London: Duke University Press, 2015. https://doi.org/10.2307/j.ctv11cw0rj.8.

Bason, Christian. "Introduction: The Design for Policy Nexus." *Design for Policy*, edited by Christian Bason, 1-8. Abingdon: Grower Publishing, 2014.

Boland, Richard J., and Fred Collopy. *Managing as designing*. California: Stanford University Press, 2004.

Bonsiepe, Gui. *Design, cultura e sociedade* (Design, culture and society). São Paulo: Blucher, 2011.

Borja de Mozota, Brigitte. "Design Economics–Microeconomics and Macroeconomics: Exploring the Value of Designers' Skills in Our 21st Century Economy." Paper presented at the 1st International Symposium for Design Education Researchers, Paris, May 2011.

Borja de Mozota, Brigitte, and Steinar Valade-Amland. *Design: A business case. Thinking, Leading and Managing by Design*. New York: Business Expert Press, 2020.

Borja de Mozota, Brigitte. "The Four Powers of Design: A Value Model in Design Management." *Design Management Review* 17, no. 2 (Spring 2006): 43-53. https://doi.org/10.1111/j.1948-7169.2006.tb00038.x.

Boothroyd, Geoffrey, Peter Dewhurst, Winston A. Knight. *Product Design for Manufacture and Assembly*. New York: Marcel Dekker, 2002.

Bowen, Alex, Simon Dietz, and Naomi Hicks. "Why do economists describe climate change as a 'market failure'?" The Grantham Research Institute at London School of Economics and Political Science and The Guardian. Updated April 5, 2012. https://www.theguardian.com/environment/2012/may/21/economists-climate-change-market-failure.

Brown, Tim. *Change by design: how design thinking transforms organizations and inspires innovation*. New York: Harper Collins Publishers, 2009.

Brown, Tim. "Design thinking." *Harvard Business Review* 86, no. 6 (2008): 84-92. https://hbr.org/2008/06/design-thinking.

Buchanan, Richard. "Design Research and the New Learning." *Design Issues* 17, no. 4 (Autumn 2001): 3-23. http://www.mitpressjournals.org/doi/pdf/10.1162/07479360152681056.

Buchanan, Richard. "Worlds in the Making: Design, Management, and the Reform of Organizational Culture." *She Ji: The Journal of Design, Economics, and Innovation* 1, no. 1 (Autumn 2015): 5-21. http://dx.doi.org/10.1016/j.sheji.2015.09.003.

Chetty, Raj. "Improving equality of opportunity: new insights from big data." *Contemporary Economic Policy* 39, no. 1 (January 2021): 7-41. DOI:10.1111/coep.12478.

Chiva, Ricardo, and Joaquín Alegre. "Investment in Design and Firm Performance: The Mediating Role of Design Management." *The Journal of Product Innovation Management* 26, no. 4 (July 2009): 424-440. https://doi.org/10.1111/j.1540-5885.2009.00669.x.

Climate Watch. "Historical GHG Emissions." Updated 2018. https://www.climatewatchdata.org/ghg-emissions.

Cruickshank, Leon and Nina Trivedi. "Beyond Human-Centred Design: Supporting a New Materiality in the Internet of Things, or How to Design When a Toaster is One of Your Users." *The Design Journal* 20, no. 5 (2017): 561-576 https://doi.org/10.1080/14606925.2017.1349381.

Dijkema, Gerard. P. J.; Markus Andreas Reuter, and E. V. Verhoef. "A new paradigm for waste management." *Waste management 20*, no. 8 (2000): 633-638. https://doi.org/10.1016/S0956-053X(00)00052-0.

D'Ippolito, Beatrice, Marcela Miozzo, Davide Consoli. "Knowledge systematisation, reconfiguration and the organisation of firms and industry: The case of design." *Research Policy* 43, no. 8 (2014): 1334-1352. https://doi.org/10.1016/j.respol.2014.03.013.

Dogan, Cagla and Stuart Walker. "The best of both: A study of the feasibility of integrating scales of design and production for sustainable products." *The Journal of Sustainable Product Design* 3, no. 3-4 (December 2003): 135-147. https://doi.org/10.1007/s10970-005-3924-x.

Dunne, Anthony and Fiona Raby. *Speculative everything: design, fiction and social dreaming*. Cambridge, MA, USA. MIT Press, 2013.

Ehrenfeld, John. "Flourishing: Designing a Brave New World." *She Ji: The Journal of Design, Economics, and Innovation* 5, no. 2 (Summer 2019): 105-116. https://doi.org/10.1016/j.sheji.2019.03.001.

Escobar, Arturo. *Designs for the pluriverse: radical interdependence, autonomy, and the making of worlds*. Durham and London: Duke University Press, 2018.

Ferreira da Silva, Denise. "BEFORE MAN: Sylvia Wynter's Rewriting of the Modern Episteme." In *Sylvia Wynter: On Being Human as Praxis*, edited by McKittrick Katherine, 90-105. Durham; London: Duke University Press, 2015. https://doi.org/10.2307/j.ctv11cw0rj.6.

"Film Studies MA: Course Structure," on the Lancaster University's official website, accessed on June 14, 2021. https://www.lancaster.ac.uk/study/postgraduate/postgraduate-courses/film-studies-ma/?gclid=Cj0KCQjw5auGBhDEARIsAFyNm9E64CPmkJ1lNvN7LAamP6L6ow_xE5nLdmKKquBzjaNQEEMpkJFoxgYaArydEALw_wcB#structure.

Fonseca Braga, Mariana. "The choice of design. From businesses' conditions to businesses' attitudes." *The Design Journal* 20, sup 1(2017): S635-S646. https://doi.org/10.1080/14606925.2017.1353011.

Fonseca Braga, Mariana. "The value of design: an issue of vision, creativity and interpretation." In *Future-Focused Thinking - DRS International Conference 2016 Proceedings*, edited by Peter Lloyd and Erik Bohemia, 1865-1881. London: Design Research Society, 2016. https://doi.org/10.21606/drs.2016.12.

Fonseca Braga, Mariana, and Francesco Zurlo. "Introducing design-driven innovation into Brazilian MSMEs: Barriers and next challenges of design support." In *Proceedings of the Design Research Society 2018: Catalyst*, edited by Cristiano Storni, Keelin Leahy, Muireann McMahon, Erik Bohemia, and Peter Lloyd, 2987-3006. London: Design Research Society, 2018. https://doi.org/10.21606/drs.2018.442.

Freire, Paulo. *Pedagogy of the oppressed*. New York: Herder and Herder, 1970.

FUEL4Design. "Considering design futures literacies." Future Education and Literacy for Designers. Updated 2020. http://www.fuel4design.org/.

Gemser, Gerda, and Mark A. A. M. Leenders. "How integrating industrial design in the product development process: impacts on company performance." *The Journal of Product Innovation Management* 18, no. 1 (2001): 28-38. https://doi.org/10.1111/1540-5885.1810028.

Gorb, Peter and Angela Dumas. "Silent Design." *Design Studies* 8, no. 3 (July 1987): 150-156. https://doi.org/10.1016/0142-694X(87)90037-8.

Heskett, John. "National Design Policy and Economic Change." In A John Heskett Reader: Design, History, Economics, edited by Clive Dilnot, 229-232. London: Bloomsbury, 2016.

Irwin, Terry, Gideon Kossoff and Cameron Tonkinwise. "Transition Design Provocation." *Design Philosophy Papers* 13, no. 1 (2015): 3-11. http://dx.doi.org/10.1080/14487136.2015.1085688.

Jeswiet, Jack. and Michael Hauschild. "EcoDesign and future environmental impacts." *Materials & Design* 26, no. 7 (2005): 629-634. https://doi.org/10.1016/j.matdes.2004.08.016.

Julier, Guy. *Economies of design*. London: Sage Publications Ltd, 2017.

Junginger, Sabine. "Product Development as a Vehicle for Organizational Change." *Design Issues* 24, no. 1 (2008): 26-35. https://www.jstor.org/stable/25224147.

Junginger, Sabine. "Towards Policy-making as Designing: Policy-making Beyond Problem-solving and Decision-making." In Design for Policy edited by Christian Bason, 57-69. Abingdon: Grower Publishing, 2014.

Karlsson, Reine and Conrad Luttropp. "EcoDesign: what's happening? An overview of the subject area of EcoDesign and of the papers in this special issue." *Journal of Cleaner Production* 14, no. 15-16 (2006): 1291-1298. https://doi.org/10.1016/j.jclepro.2005.11.010.

Keh, Pei-Ru. "New collaborative initiative promotes diversity in design." Updated June 15, 2021. https://www.wallpaper.com/design/diversity-design-collaborative-initiative.

Luttropp, Conrad, and Jessica Lagerstedt. "EcoDesign and The Ten Golden Rules: generic advice for merging environmental aspects into product development." *Journal of Cleaner Production* 14, no. 15-16 (2006): 1396-1408. https://doi.org/10.1016/j.jclepro.2005.11.022.

Manzini, Ezio. "Design, social innovation and sustainable ways of living: Creative communities and diffused social enterprise in the transition towards a sustainable network.

society." DIS- Indaco, Politecnico di Milano, August-September 2007. https://www.scribd.com/document/122762793/Ezio-Manzini-Design-Social-Innovation-and-Sustainable.

Manzini, Ezio and Carlo Vezzoli, C. *O Desenvolvimento de Produtos Sustentáveis: Os requisitos Ambientais dos Produtos Industriais*

[The Development of Sustainable Products: The Environmental Requirements of Industrial Products]. São Paulo: Editora da Universidade de São Paulo, 2005.

Manzini, Ezio. *Design, When Everybody Designs: An Introduction to Design for Social Innovation*. Cambridge, MA, USA. MIT Press, 2015.

Manzini, Ezio. *Politics of the Everyday*. London: Bloomsbury, 2019.

McDonough, William and Michael Braungart. *Cradle to Cradle: remaking the way we make things*. New York: North Point Press, 2002.

Meadows, Donella. "Envisioning a sustainable world." Essay written for the Third Biennial Meeting of the International Society for Ecological Economics, San Jose, Costa Rica, October 24-28, 1994. https://donellameadows.org/archives/envisioning-a-sustainable-world/.

Meadows, Donella, Jorgen Randers, and Dennis Meadows. "A Synopsis: Limits to Growth: The 30-Year Update." The Academy for Systems Change. Accessed June 15, 2021. https://donellameadows.org/archives/a-synopsis-limits-to-growth-the-30-year-update/.

Michlewski, Kamil. "Uncovering Design Attitude: Inside the Culture of Designers." *Organization Studies* 29, no. 3 (2008): 373-392. https://doi.org/10.1177/0170840607088019.

Morelli, Nicola, Amalia de Götzen, and Luca Simeone. *Service Design Capabilities*. Cham: Springer, 2021.

Mortati, Marzia, Beatrice Villari, Stefano Maffei, and Venanzio Arquilla. *Le politiche per il design e il design per le politiche. Dal focus sulla soluzione alla centralità della valutazione* [Policies for design and design for policies. From focus on solutions to evaluation centrality]. Santarcangelo di Romagna: Maggioli S.p.A., 2016.

Noel, Lesley-Ann. "Critical Alphabet." Updated 2021. https://criticalalphabet.com/about/.

OCAD University. "OCAD University hires five new permanent Indigenous faculty." Updated June 20, 2018. https://www2.ocadu.ca/keyword/decolonizing-the-curriculum.

Papanek, Victor. *Design for the Real World: Human Ecology and Social Change*. New York, NY: Pantheon Books, 1972.

Petrina, Stephen. "The Political Ecology of Design and Technology Education: An Inquiry into Methods." *International Journal of Technology and Design Education* 10, (2000): 207-237. https://doi.org/10.1023/A:1008955016067.

Pilditch, James. "Using design effectively." In Design management: papers from the London Business School, edited by Peter Gorb, 13-23. London: Architecture Design and Technology Press, 1990.

"Pluriversal Design Sig," on the Design Research Society official website, accessed June 14, 2021. https://www.designresearchsociety.org/cpages/sig-pluriversal-design.

"Program Framework," on the Carnegie Mellon Design's official website, accessed June 14, 2021. https://design.cmu.edu/content/program-framework.

Roy, Robin and Johann C. K. H. Riedel. "Design and innovation in successful product competition." *Technovation* 17, no. 10 (1997): 537-548. https://doi.org/10.1016/S0166-4972(97)00050-3.

Sanders, Elizabeth B.-N., and Pieter Jan Stappers. "Co-creation and the new landscapes of design." *Co-Design* 4, no. 1 (2008): 5-18. https://doi.org/10.1080/15710880701875068.

Sanoff, Henry. "Multiple Views of Participatory Design." *Arch-Net-IJAR: International Journal of Architectural Research* 2, no. 1 (2008): 57-69.

Sen, Amartya. *Development as freedom*. Oxford: Oxford University Press, 1999.

Sherwin, Chris and Tracy Bhamra. "Beyond Engineering: Ecodesign as a proactive approach to product innovation." Paper presented at the First International Symposium on Environmentally Conscious Design and Inverse Manufacturing, IEEE Computer Society, Tokyo, February 1-3, 1999.

Sterling, Bruce. "Design Fiction." *Interactions* 16, no. 3 (May 2009): 20-24. https://doi.org/10.1145/1516016.1516021.

"Transdisciplinary Design MFA," on The New School Parson's official website, accessed June 14, 2021. https://www.newschool.edu/parsons/mfa-transdisciplinary-design/.

Tunstall, Dory. "Respectful Design. Design anthropologist Dr. Dori Tunstall shares how she's decolonizing the design curriculum at OCAD University." *Communication Arts*, 2018. https://www.commarts.com/columns/tunstall.

Tukker, Arnold, Sophie Emmert, Martin Charter, Carlo Vezzoli, Eivind Sto, Maj Munch Andersen, Theo Geerken, Ursula Tischner, and Saadi Lahlou. "Fostering change to sustainable consumption and production: an evidence-based view." *Journal of Cleaner Production* 16, no. 11 (2008): 1218-1225. https://doi.org/10.1016/j.jclepro.2007.08.015.

Verganti, Roberto. "Design, meanings and radical innovation: A meta-model and a research agenda." *The Journal of Product Innovation Management* 25, no. 5 (2008): 436-456. https://doi.org/10.1111/j.1540-5885.2008.00313.x.

Walker, Stuart. "A journey in design an exploration of perspectives for sustainability." *The Journal of Sustainable Product Design* 2, no. 1-2 (March 2002): 3-10. https://doi.org/10.1023/B:JSPD.0000016463.39296.99.

Walker, Stuart and Ed Dorsa. "Making design work: Sustainability, Product Design and Social Equity." *The Journal of Sustainable Product Design* 1, no. 1 (March 2001): 41-48. https://doi.org/10.1023/A:1014412307092.

Walker, Stuart. *Designing Sustainability: Making Radical Changes in a Material World*. Abingdon: Routledge, 2014.

Westcott, Michael, Steve Sato, Deb Mrazek, Rob Wallace, Surya Vanka, Carole Bilson, and Dianne Hardin. "The DMI Design Value Scorecard: A Design Measurement and Management Model." *Feature DMI Design Value Scorecard*, (Winter 2013): 10-16. https://cdn.ymaws.com/www.dmi.org/resource/resmgr/pdf_files/13244SAT10.pdf

Willis, Anne-Marie. "Ontological Designing." *Design Philosophy Papers* 4, no. 2 (2006): 69-92. http://dx.doi.org/10.2752/144871306X13966268131514.

World Commission on Environment and Development, Report of World Commission on Environment and Development: Our Common Future, transmitted to the General Assembly as an Annex to *Document A/42/427*- Development and International Co-operation: Environment (United Nations, 1987), accessed April 14, 2021. https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

World Resources Institute. "Global Historical Emissions." Updated 2018. https://www.climatewatchdata.org/ghg-emissions.

Zewolde, Solomon, Adam Walls, Tania Sengupta, Catalina Ortiz, Yasminah Beebeejaun, George Burridge, and Kamna Patel. "'Race' and Space: What is 'race' doing in a nice field like the built environment?" London: The Bartlett, UCL Faculty of the Built Environment, 2020. https://www.ucl.ac.uk/bartlett/about-us/our-values/equality-diversity-and-inclusion/race-and-space.

Zurlo, Francesco. "Designerly way of organizing: the design of creative organization." *AGATHÓN | International Journal of Architecture, Art and Design*, no. 5 (2019): 11-20. https://doi.org/10.19229/2464-9309/522019.

Bio

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