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A reality check

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DOI

[10.3233/978-1-61499-820-4-391](https://doi.org/10.3233/978-1-61499-820-4-391)

Publication date

2017

Document Version

Final published version

Published in

Plate Product Lifetimes And The Environment 2017

Citation (APA)

Sumter, D., Bakker, C., & Balkenende, R. (2017). The role of product designers in the transition towards the circular economy: A reality check. In C. Bakker, & R. Mugge (Eds.), *Plate Product Lifetimes And The Environment 2017: Conference Proceedings* (pp. 391-396). (Research in Design Series; Vol. 9). IOS Press. <https://doi.org/10.3233/978-1-61499-820-4-391>

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The role of product designers in the transition towards the circular economy: a reality check

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Keywords

Designer's role
Product design
Practice
Circular economy
Transition

Abstract

This paper examines the role of product designers in the transition towards the circular economy. Both scientific and grey literature show remarkable optimism when it comes to role strategic and coordinating role designers could play in this transition process. However, there has been little examination of the actual role and influence designers have in practice. In this paper we review the roles that designers play in the transition towards a circular economy according to literature. Through semi-structured interviews, we uncover the views of designers themselves, which we then use to make a comparison. Our main conclusion is that designers experience a lack of knowledge and/or work in predetermined solution spaces, which prevents them from taking on the role that is expected in literature.

Introduction

Within literature statements like “Designers have a significant responsibility to shape the current status on how products and services are built” (Moreno et al., 2016:1) are not uncommon. As one of the first to talk about sustainable design, Buckminster Fuller (1969) envisioned that designers should engage in ephemeralization, a term coined to explain that designers should start “doing more with less”, i.e. resource efficiency expanded on this thought Papanek (1971) in his book *Design for the Real World*, where he took an extreme stance against the role of the designer stating that ‘there are professions more harmful than industrial design, but only a few of them’. Andrews (2015) argues that designers helped enable the linear economy and she suggests that they have the potential to facilitate and even lead the development of a circular economy. Finally, in the *What Design Can Do* manifesto 2017 van Lier (2017) claims ‘Designers are pioneers, driving forces, flag bearers for change, active at micro and macro levels’, echoing the perception that they fulfil prominent roles. These statements sparked a further investigation into visions that exist about the role of the designer in the transition towards a more sustainable system. Here we focus on the transition to the circular economy. In addition to a literature review we carried out interviews with designers from practice, addressing (1) their current role (2) their vision on the role designers should fulfil in the transition towards the circular economy and (3) the barriers they experience or foresee. We choose this method as a means to be able to make an objective observation of nuances between the visions in literature and practice.

Method

Literature Review

Using the evidence-focused literature review technique proposed by (Hagen-Zanker & Mallett, 2013), a literature review has been carried out to uncover the different perspectives regarding the roles and activities of designers in the transition process towards a circular economy. Following the protocol of Hagen-Zanker & Mallett (2013), grey literature was included when deemed relevant and snowballing was done via the reference lists of the selected sources. For retrieval initially the following search terms were used: (“role of” AND “product designer*” OR “role of” AND “industrial designer*”) AND (“in transition”) AND (“circular economy” OR “sustainability”) within the timeframe 1950-2017 during October 2016 to February 2017 in Google Scholar.

Even though there is a slight distinction between product designers and industrial designers both are part of the world of so-called ‘object design’. Heskett (2002) describes them as “virtually interchangeable”, because there is a focus on making an ‘object’ in both professions. Therefore, the final search terms include both types of designers.

Semi-structured interviews

Within the research domain of ‘organizational role theory’ (Biddle, 1986), roles in organizations are seen as “social systems that are pre-planned, task-oriented and hierarchical” (Biddle, 1986:73). As the purpose for doing interviews with designers from practice was to learn more about their current and prospective roles, they were queried about their job descriptions, their place in the work hierarchy, and the activities performed as part of their position. In February 2017, eight semi-structured

interviews (Patton, 2002) were conducted. All participants were educated as product designers. Their wide range of positions (from product designer to sustainability manager or CEO of a design agency) ensured different perspectives were included and made it possible to widely reflect on the results from the literature

Results

Literature

The initial search yielded a total of 51 articles. Articles were excluded based on the absence of a vision on the role of designers. This left 12 articles after exclusion, which were used to 'snowball' to 41 articles. Looking at the literature review results, three categories were formulated:

1. The designer's role in general.
2. Developments in the role of the designer over time
3. Visions on designer's roles in the future

The designer's role in general

The role of designers has been described from varying perspectives. Across different fields, the major roles that could be identified were a (1) strategic role (2) coordinating role and (3) a functional role.

Strategic role

Designers operating in a 'strategic role' are, are involved in the development and execution of (company and/or product) policy/strategy, and are responsible for formulating an overall, integrated vision for future solutions (Joore, 2010; Papanek, 1971). This also entails being involved in the product development process early on (Bakker, 1995; Behrisch, 2013), developing the framework within which functional products will be developed (Bakker, 1995), initiating projects and leading the design in the intended direction (Seidel, 2000; Perks et al., 2005).

Coordinating role

Designers in a 'coordinator role' are focused on balancing different interest and ideas among a group of stakeholder (Behrisch, 2013; Battiston, 2015; Manzini & Coad, 2015; Ortiz, 2012; Tan, 2012; Julier, 2007). They facilitated, support and enable the conversations between these actors (Tan, 2012) and form a bridge through which this knowledge transfers and is translated to the design discourse (Battiston, 2015; Verganti, 2008).

Functional role

Within the 'functional role', the "designer's task is to translate a product idea into a concrete product" (Bakker, 1995:43; Behrisch, 2013).

Designers carrying out this role are involved from product idea to an implementable solution (Bakker, 1995) and focus on the materialization of the product rather than the development of the higher level product policy.

Note however, that the roles are not mutually exclusive; one person can fulfill multiple roles.

Developments in the role of the designer over time

Valtonen (2005) is one of the few authors who gives an overview of how the role of the industrial designer has broadened since the emergence of the field in the 1950s. She describes how designers have evolved from creators of objects (functional role) to innovation leaders (strategic role) in the 2000s (Maciver, 2011; Valtonen, 2005). While Valtonen's (2005) research is limited to the Finnish designer, a similar widening in the role is being echoed in other fields (Joore & Brezet, 2015; Meroni, 2007; Thackara, 2006; Gaziulusoy, 2015; Bakker, 1995; Banerjee, 2008; Maciver, 2012; Roth, 1998). Jin (2015) in addition mentions a broader role as coordinator. The evolution to a wider role, seems to be connected to designers having to work on progressively complex problems (Gaziulusoy, 2015; Roth, 1999).

Visions on designer's roles in the future

In the table 1: Future visions of designer's roles we see parallels with the former categorization of roles. Although most authors do not explicitly place the envisioned roles in the context of a transition, the fact that the visions stem from authors within a field that differs from the status quo reflect which roles are assumed in the transition process towards more sustainability/circularity. While authors call on designers to adopt more social and moral responsibility in their work in general (Buckminster Fuller, 1969; Papanek, 1971; Tonkinwise, 2015) some assign specific roles. First of all, the role of coordinator (Thackara, 2006; Morelli, 2007; Jin, 2015; Daalhuizen, 2014). Manzini (2009) and Joore (2010) envision a strategic role in addition to this. In contrast, Emilson et al. (2011) conceptualize that designers should fulfill a functional role in addition. Lastly, there are also authors, who rather only foresee a single strategic role (Joore & Brezet, 2015; Jin, 2015; Bakker, 1995; Smulders & Subrahmanian, 2010).

In short, the overview reflects that there is an overlap in the visions across the three main roles and that these visions stem from a sense of responsibility.

Practice

Background Interviewed Designers

The categorization of owners (participant 1-4, all owning a small consultancy) versus non-owner (participant 5-8, all employed in a large organization) determined whether or not the designer was involved in strategic decision making (table 2: Background Interviewed Designers). Even though the non-owners in some cases mentioned that they were involved in more strategic roles (e.g. building and managing of teams, and leading projects), they are not in the position to determine the overall company strategy regarding sustainable design. Interviewee number 5 and 6 mentioned that depending on the project they alternated between a more strategic role and a functional role.

FUTURE VISIONS OF DESIGNER'S ROLE		
ROLE DESIGNER	QUOTE	CITATION
Facilitators	From thinking of ourselves as the authors of a finished work, we had better evolve toward thinking of ourselves as facilitators whose job is to help people act more intelligently , in a more design-minded way, in the systems we all live in. (Thackara, 2006:214)	(Thackara, 2006)
Social Visionaries	[...] Social Practice Theory demands that designers acknowledge their responsibility for determining how our societies are made durable (to paraphrase Bruno Latour). Tonkinwise (2015)	Tonkinwise (2015)
Intermediary, Solution provider, Coordinator	And agreed, the designer can play a significant intermediary role between a diversity of actors in and around the company. [...] Joore (2010:44;). [...] the role of the designer could be broadened to more of a coordinating role between or above the parties. (Joore 2010: 193)	Joore (2010)
Social and environmental responsible	Victor Papanek (1971) called for designers to integrate more social and environmental responsibility in their work in his manifesto Design for the Real World: Human Ecology and Social Change. (Tan 2012: 113)	Tan (2012); Papanek (1971)
Social and moral responsible	Thirty years ago, Buckminster Fuller (1969) [...] called for designers to adopt more social and moral responsibility in their work. (Tan 2012: 2)	Tan (2012); Buckminster Fuller (1969)
Connectors, Facilitator, Quality Producers, Visualisers, Visionaries, Future Builders, Promoters of new business Models, Catalysers of Change	Understanding the new designer role: designers as connectors and facilitators, as quality producers, as visualisers and visionaries, as future builders (or co-producers). Designers as promoters of new businessmodels. Designers as catalysers of change. (Manzini 2009:11)	Manzini (2009)
Facilitator	Both companies and designers will no longer be proponents of a set of products and services to passive users, but rather the facilitators of a system of value co-production . Therefore, they will loose the central role they had in the previous contextual condition, and become catalysers in a networked system. This requires [...] designers learn new methods and languages to operate in the new context. Morelli (2007:18)	Morelli (2007)
Questioner, Maker	(1) For some of the participants its role should be 'the questioner' , which means that designers should support the stakeholders involved in a process by highlighting issues and key aspects. [...] (2) Other participants stated that the context analysis is not the core competence of design in social innovation, instead they were suggesting 'making': visualizing, prototyping and showing as the ability of designers to bring to life participants' ideas and imagination and support them in prototyping processes for finding opportunities and possibilities. (Emilsson et al, 2011: 26)	Emilsson et al. (2011)
Strategic Role	"Change actors like designers play a strategic role in innovation and transition processes towards a sustainable society." Joore & Brezet (2015:92)	Joore and Brezet (2015)
(Knowledge) Brokers	Jin (2015: 44) refers to Daalhuizen (2014), who suggests designers can act as brokers to bridge different stakeholders and democratize collaboration processes.	Jin (2015); Daalhuizen (2014)
Teamwork leaders	Jin (2015: 44) cites Smulders and Subrahmanian (2010): As coordinators and managers, designers can act as agents to lead teamwork and incite change in stakeholders who aren't necessarily educated in design.	Jin (2015); Smulders and Subrahmanian (2010).
Strategic	Designers have the potential to create innovative solutions for less environmentally damaging products and product systems. [...] The more a designer is involved in strategic planning issues (i.e. determining what product the company will be developing), the more influence he or she will have on the potential environmental impact of the product. (Bakker, 1995: 8)	Bakker (1995)

Table 1. Future visions on designer's roles.

Four interviewees out of eight said that they see it as their responsibility to actively acquire knowledge regarding sustainability (or circularity), while one interviewee mentioned that acquiring and implementing knowledge on sustainability was part of an actual company assignment. This company strategy was employed to create more buy-in within the company the designers were working in. The interviewees, who mentioned that they acquired knowledge based on their intrinsic motivation, did this inter alia to be able to convince clients about their capabilities.

Barriers recognized by designers

The interviewees were also asked to describe an ideal sustainable project that was meant to stimulate the transition towards sustainability and the role that they would envision themselves in. They were then asked which barriers they would realistically foresee regarding this project, based on everyday experiences. This resulted in the overview in table 3: Barriers recognized by designers. Seven out of eight designers envisioned a strategic role for themselves rather than a functional or coordinating role. Within a strategic role, they especially recognized the ability to be a visionary and/or the need

BACKGROUND INTERVIEWED DESIGNERS								
	1	2	3	4	5	6	7	8
Company Type	Design Consultancy	Circular Business Developer	Design Consultancy	Strategy Consultancy	Design Consultancy	Design Company	OEM	OEM
Owner	Yes	Yes	Yes	Yes	No	No	No	No
Position	CEO/Product Designer	CEO/Innovation director/Product Designer	CEO/Product Designer	CEO/Strategic Designer	Product Designer/Project Leader	Senior Designer	Sustainability Manager	Design Lead
Company Size	< 10	< 10	< 10	< 10	> 500	> 500	> 500	> 500
Higher level project activities								
Acquisition of projects	x	x	x	x				
Leading (Design) Projects	x	x	x	x	x	x		x
(Actively) Managing Teams		x		x	x	x	x	x
Making links between projects		x						
Finding Partners	x	x	x					
Guiding clients and guarding design process	x	x	x	x	x	x		
Internal Activities								
Strategic Decision Making	x	x	x	x				
Building Team						x	x	
Transferring knowledge on sustainability and CE (external workshops)	x					x	x	
Design Activities								
Designing Products	x	x	x		x	x	x	x
Designing Strategies				x	x			x
External Activities								
Acquiring knowledge on sustainability and CE	x				x	x	x	

Table 2. Background Interviewed Designers.

to be a role model for other designers. However, two designers mentioned a fear of becoming a 'preacher' (e.g. someone who constantly talks to others inside and outside the company about the absolute and correct way to reach more sustainability/circular).

In terms of barriers, all eight designers foresee problems with the long-term commitment and ability of clients to deal with setbacks during the transition to a circular economy. Overall it is apparent that while the owners of the agencies (participants 1-4) already are fulfilling a role that could be qualified as more strategic, they also foresee more barriers for designers to make the transition to a circular economy.

Discussion

Our results indicate that theory and empirical data only partially overlap. Firstly, literature shows three major roles: strategic, coordinator and functional. While the interviewed designers agree with a vision in which they fulfill a strategic role in the transition, they also foresee barriers within this regard. Some of them being the lack of know-how to find or create the right business case, not knowing how to assess the sustainability/circularity of an idea and not knowing how to apply systems thinking to come to a solution. Additionally, five designers imagined that working in a pre-determined solution space as a result of the functional role (as recognized by Koo (2016)) that they were carrying out, would be a barrier in the transition to carry out the envisioned strategic role. With respect to this, one designer working in a predetermined solution space in a design consultancy mentioned

company culture, client interest and lack of government policy as additional barriers (in literature also recognized by Behrisch (2013)).

Secondly, the group of designers from practice mentioned the coordinating role only once when talking about the envisioned role. Instead, in practice it seems that designers foresee themselves fulfilling a strategic role. However, they foresee quite some limitations and boundary conditions that limits their possibilities. This might be connected to the fact that four of the interviewed designers actually already work in the positions in which they fulfil activities that overlap with those fulfilled in a strategic role. Through this they might have already experienced successes in executing sustainable projects. This in turn could have led them to extrapolate the vision in which they fulfill a strategic role. However, they also seem to be the ones foreseeing more barriers. This can be attributed to the fact that they do indeed have more opportunities to experiment more freely, hence they get confronted with more barriers.

Lastly, the interviewed designers showcased an intrinsic motivation to diminish the negative impact of products they design on the environment and society. They added that designers, apart from the role they already play, should always be critical 'questioners'. Yet, they express concerns of becoming a 'preacher'. This means that the impact of their efforts might be smaller than they would like it to be as they adjust their communication. Instead they might propose incremental sustainable solutions. In comparison, we see that the visions from practice provide

BARRIERS RECOGNIZED BY DESIGNERS								
	1	2	3	4	5	6	7	8
INTERNAL (COMPANY)								
<i>Knowledge/Training - CE Related</i>								
Not knowing how to assess circularity of an idea	x	x		x	x	x		5
Not having the know-how to find or create the right business case	x				x	x	x	5
Not knowing how to use systems thinking to come to a solution		x				x	x	4
Not having access to courses about CE			x		x			2
Not having access to the (right) methods fitting the CE rhetoric	x						x	2
<i>Self Criticism</i>								
Fear of becoming a preacher	x					x		2
<i>Position</i>								
Not being involved in decision making (as a designer)		x	x	x	x			5
Having to work in a predetermined solution space	x	x	x		x		x	5
Not getting the opportunity to acquire and knowledge					x		x	2
Not being involved in the development of company policy					x			1
Having to create your own space as a (CE) designer		x						1
<i>Recruitment</i>								
Finding the right people to work with	x	x	x		x			4
<i>Strategy</i>								
No strategy/scope for CE					x		x	2
<i>Long Term</i>								
Having the patience to deal with setbacks, when committing to CE/sustainability	x	x			x		x	4
EXTERNAL (COMPANY)								
<i>Knowledge/Training</i>								
Not getting the opportunity to transfer knowledge to clients				x				1
<i>Recruitment</i>								
Not finding the right partners to work with			x				x	2
<i>Projects/Clients</i>								
Clients not being interested in (real) CE		x		x	x		x	4
Clients' priorities within sustainability projects		x	x	x				3
Lack of projects with a sustainable focus				x				1
<i>Circular Buy-In</i>								
Ability to bring together a network of partners to develop a CE solution		x	x	x	x	x	x	6
<i>Long Term</i>								
Not having the patience to deal with setbacks, when committing to CE/sustainability	x	x	x	x	x	x	x	8
Not having enough financial resources	x	x			x			3
Clients not being ready to accept (big) change	x	x						2
<i>Examples</i>								
Lack of successful scalable examples to learn from				x				1
CUSTOMER								
Consumers not caring enough about sustainability				x		x	x	3
GOVERNMENT								
<i>Policy</i>								
No policy in place		x						1
Designers not being involved in policy development					x			1
No conditions/incentives created to invest/support CE					x			1
<i>Existing conditions</i>								
Virgin/low-quality resources being cheaper				x	x			2

Table 3. Barriers recognized by designers.

more nuance towards the strategic role of designers and instead add insights regarding the foreseen barriers.

Further Research

The research described here shows that there are promising paths for further research into the role of the designer in the transition towards the circular economy. Future research should deal with the limitations of this investigation. First of all, the small sample size of only eight participants hampers generalization of the results. In addition, the interviewed group did not cover designers working in middle-sized companies, while this could have led to different observations. Further research should therefore focus on selecting a larger and more

heterogeneous sample in terms of designers working in a specific position. Moreover, the external barriers mentioned need to be validated in further research.

Further exploring the designer's role will be particularly relevant for insight in the development of skills, competences and capabilities, required to enable designers to optimally fulfill the various roles that are requested when working in different positions. Lastly, the scope of this research was limited to visions within the design field when it comes to the role of the designer. Future research should show whether other fields also mention that designers should play a specific role.

Conclusion

This paper explored the current role of the designer, visions in literature about the desired role of designers in the transition towards the circular economy and the barriers perceived in practice. Within literature the main visions are that the designer should assume a strategic or a coordinating role. Designers/owners working in small sized agencies agree with the first role, which covers activities that they currently already perform. However, they experience and foresee barriers to be able to fulfill this role, such as having to work in a predetermined solution space and lack of knowledge about assessment.

There seems to be less agreement on the role as a coordinator, which is frequently mentioned in literature,

but not by the interviewed designers working in practice.

This study paves the way to explore the type of skills, competences and capabilities designers need to develop in order to play the most effective role in the transition towards the circular economy.

Acknowledgments

This work has been conducted as part of the Resource Conservative Manufacturing (ResCoM) project that has received funding from the European Union's seventh Framework Program for research, technological development, and demonstration under grant agreement no. 603843. The authors also would like to thank the interviewed designers for their participation.

References

- Andrews, D. (2015). The circular economy, design thinking and education for sustainability. *Local Economy*, Vol 30(3), 305–315.
- Bakker, C. A. (1995). *Environmental Information for Industrial Designers*. Delft University of Technology, The Netherlands.
- Banerjee, B. (2008). Designer as Agent of Change. In *Changing the Change: Design, Visions, Proposals and Tools* (pp. 192–204).
- Battiston, E. (2015). *Designers + Artisans: Solutions for Development*. Politecnico Di Milano Design School, Italy.
- Behrisch, J. (2013). *Incorporating ecological considerations into industrial design practice*. University of Technology, Sydney.
- Biddle, B. J. (1986). Recent Developments in Role Theory. *Annual Review of Sociology*, 12(1), 67–92.
- Buckminster Fuller, R. (1973). *Nine Chains to the Moon*. London: Cape.
- Daalhuizen, J. J. (2014). *Method Usage in Design: How methods function as mental tools for designers*. Delft University of Technology, the Netherlands.
- Emilson, A., Seravalli, A., & Hillgren, P. (2011). Dealing with dilemmas: Participatory approaches in design for social innovation. *Swedish Design Research Journal*, 23–29.
- Gaziulusoy, A. I. (2015). A critical review of approaches available for design and innovation teams through the perspective of sustainability science and system innovation theories. *Journal of Cleaner Production*, 107, 366–377.
- Hagen-Zanker, J., & Mallett, R. (2013). How to do a rigorous, evidence- focused literature review in international development: A Guidance Note. *Overseas Development Institute(ODI) Working Papers*, (September), 27.
- Heskett, J. (2002). *Toothpicks and Logos : Design in Everyday Life*. Oxford University Press.
- Jin, S. (2015). *Sustainability In a Pressure Cooker: Platforms for Multicultural Exploration in Vietnam*. Delft University of Technology, the Netherlands.
- Jin, S., Crul, M., & Brezet, H. (2014). Future Living Studio : Socio-Technical Experiments in Sustainable Design. In *TME CE 2014* (pp. 1209–1224).
- Joore, P. (2010). *New to Improve - The Mutual Influence between New Products and Societal Change Processes*. Delft University of Technology, the Netherlands.
- Joore, P., & Brezet, H. (2015). A Multilevel Design Model: The mutual relationship between product-service system development and societal change processes. *Journal of Cleaner Production*, 97, 92–105.
- Julier, G. (2007). *The Culture of Design*. London, UK: Sage: Publications.
- Koo, Y. (2016). The Role of Designers in Integrating Societal Value in the Product and Service Development Processes, 10(2), 49–65.
- Maciver, F. (2011). *Comprehending the Evolving Leadership Role of the Consultant Designer in the New Product Development Process in Mature Product Categories*. Business and Management. Dublin Institute of Technology, Ireland.
- Maciver, F. (2012). A profession in flux : an era of leadership for consultant designers in NPD. In *DRS, 2012 Chulalongkorn University Bangkok, Thailand* (pp. 1–4).
- Manzini, E. (2009). New design knowledge. *Design Studies*, 30(1), 4–12.
- Manzini, E., & Coad, R. (2015). *Design, when everybody designs: An introduction to design for social innovation*. MIT Press.
- Meroni, A. (2007). *Creative Communities - People inventing sustainable ways of living*. Work. Milano: Edizioni Polidesign.
- Moreno, M., de los Rios, C., Rowe, Z., & Charnley, F. (2016). Guidelines for Circular Design: A Conceptual Framework. *Sustainability*, 1–13.
- Ortiz, N. (2012). La Ruche qui Dit Oui: Reconnecting Communities with Food. *Design Management Review*, 23(3), 30–38.
- Papanek, V. J. (1971). *Design for the Real World: Human Ecology and Social Change*. Pantheon Books.
- Patton, M. Q. (2002). Qualitative Interviewing. In *Qualitative research & evaluation methods* (3rd ed., pp. 339–380). Thousands Oak: CA: Sage.
- Perks, H., Cooper, R., & Jones, C. (2005). Characterising the Role of Design in a New Product Development: An Empirically Derived Taxonomy. *Journal of Product Innovation Management*, 22(2), 111–127.
- Roth, S. (1999). The State of Design Research. *Design Issues*, 15(2), 18–26.
- Seidel, B. V. (2000). Moving from Design to Strategy. *Design Management Journal*, Spring, 35–40.
- Smulders, F. E., & Subrahmanian, E. (2010). Design beyond design: Design Thinking & Design Acting. In *Design Thinking Research Symposium (DTRS8)*. Sydney.
- Tan, L. (2012). *Understanding the different roles of the designer in design for social good: A study of design methodology in the DOTT 07 (Designs of the Time 2007) Projects*. Doctoral Thesis, Northumbria University.
- Thackara, J. (2006). *In the Bubble: Designing in a Complex World*. Cambridge, Massachusetts London, England: MIT Press.
- Tonkinwise, C. (2015). Design for Transitions - from and to what ?, 13(1), 85–92.
- Valtonen, A. (2005). Six decades – and six different roles for the industrial designer . In *Nordes Conference, In the Making, 30-31st May* (pp. 1–10).
- van Lier, B. (2017). It's Time for a Ministry of Creativity & Climate Affairs. Retrieved May 24, 2017, from <http://www.whatdesigncando.com/2017/05/24/time-ministry-creativity-climate-affairs/>
- Verganti, R. (2008). Design, meaning, and radical innovation: A metamodel and a research agency. *Journal of Product Innovation Management*, 15, 436–456.