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A Cyclic Narrative: Will we See a Return to Rationalistic Design Thinking in the 21st Century?

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Introduction

In the last 100 years many influential theorists have researched how designers think. The aim of these investigations has been to understand how design practice may be able to solve wide-ranging problems in society. The term Design Thinking is used by design researchers when they discuss how designers think. Though researchers have been investigating how designers think for some time, this term has not been in use for the whole period. It was coined in 1987 by the architectural researcher Peter Rowe.[1]

The design philosopher Richard Buchanan[2] groups Design Thinking theories into two categories which he defines with respect to time frames. Buchanan[3] terms the first approach the »design theory of the early and middle decades of the twentieth century«. Buchanan[4] terms the second the »new approach[...] to design thinking«. Buchanan argues that the two modes of Design Thinking are oppositional in character. Buchanan is not alone in putting forward a theory of two distinct, contrasting approaches to Design Thinking. This form of classification based on time-spans is common amongst contemporary design theorists.[5] In this chapter I will use the term ›Design Thinking of the Early and Middle Decades of the Twentieth Century‹ to describe the design theory put forward in the early and middle parts of the last century. I will use the term ›Contemporary Design Thinking‹ to describe how modern-day design theorists classify Design Thinking. Fundamentally, the two approaches to Design Thinking differ greatly on the place of mathematics and natural science in enabling designers to solve wide-scale problems in society.

The Design Thinking of the Early and Middle Decades of the Twentieth Century

Buchanan[6] argues that the incarnation of the Staatliches Bauhaus helped to initiate the Design Thinking of the Early and Middle Decades of the Twentieth Century. The Bauhaus was formed in Weimar, Germany, in 1919 by Walter Gropius (1883–1969). Gropius' design philosophy distils the development of Design Thinking of the Early and Middle Decades of the Twentieth Century. Gropius was born in Berlin into a wealthy family which was influential in prestigious fields including politics and the military, and his uncle Martin Gropius designed the Kunstgewerbemuseum in Berlin.

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1 Dorst, Kees: »The Nature of Design Thinking«, in: *Proceedings of the 8th Design Thinking Research Symposium* (DTRS8), Sydney, 19–20 October, 2010, 131–139.

2 Buchanan, Richard: »Design Research and the New Learning«, in: *Design Issues* 17 (2001) 4, 3–23.

3 Ibid., 13.

4 Ibid., 13.

5 For example, Cross, Nigel: »Designerly ways of knowing: Design discipline versus design science«, in: *Design issues* 17 (2001) 3, 49–55.

6 Buchanan: *Design Research and the New Learning*.

Though a successful architect and industrial designer, arguably, Gropius is best remembered for forming the Bauhaus. This institution began its life on the campus that had formerly housed the Grand-Ducal Saxon School of Arts and Crafts in Weimar. In 1926 the School moved premises—to a building designed by Gropius in Dessau. Gropius developed a radical philosophy of design which came in reaction to what he saw as the prevailing aesthetic tastes of his era. At the time, affluent consumers sought highly decorative, hand-crafted artefacts which were expensive so only wealthy people could acquire them. Gropius[7] criticised this elitism, claiming it to be a sign of growing inequality in society. Referring to himself as a social reformer, Gropius stated his aim was to provide people of all social strata with access to what he believed to be good design.

Gropius argued that designers play a significant part in fuelling elitism. He believed that designers have an irrational thinking process which leads them to input their emotions into the design process, which ultimately leads to an excessive amount of decorative additions to products. Gropius argued that to provide everyone with access to good design, the thinking around design had to alter significantly. He called on designers to refrain from including any emotions into the design process. In view of this, Gropius argued that design practice should be: »preceded by the elimination of the personal content of […] designers and all otherwise ungeneric or non-essential features«[8]

Gropius argued that changing design practice into a rational process would eliminate emotions from it. To make design practice rational, designers should be guided by »impersonal [mathematical] standard[s]«[9], numerical measurements that would dictate the form of all artefacts. According to Gropius, the most successful method of effecting transition in the way designers think was to limit designers' use of hand-crafting techniques. Designers should instead create artefacts which can be manufactured using mechanised processes. A revolution in the way designers think would enable them to work for a higher cause, solving social problems: »Mechanisation can have only one object: to abolish the individual's physical toil of providing himself with the necessities of existence in order that hand and brain may be set free for some higher order of activity.«[10] Gropius argued that steering designers to think in a rationalistic manner would make all artefacts more cost-effective to produce. This would in turn allow more people access to good design, thereby improving their lives. Gropius also believed that his philosophy of design would create a situation where all objects would fit effortlessly into the context of a rationally designed modern home or city. In this way, Gropius' rationalism would have a cumulatively

7 Gropius, Walter: *The New Architecture and the Bauhaus*, London: Faber and Faber 1935.

8 Ibid., 26.

9 Ibid., 26.

10 Ibid., 25.

positive effect in »enhanc[ing] civic dignity and coherence«[11], thereby creating social cohesion. Gropius argued that increased social cohesion would lead to a decrease in elitism, thereby successfully tackling the prevailing large-scale problem of the time. He claimed that becoming familiar with scientific ways of thinking would enable designers to create social cohesion. Gropius believed that scientific knowledge is important for two reasons. Firstly, it enables designers to create the objectively correct generic objects which facilitate social reform. Secondly, scientific knowledge helps designers to collaborate with fellow professionals in multidisciplinary practice. The following quote provides insight into these points:

> [A designer] has to absorb a scientific knowledge of objectively valid optical facts, a theory which guides the shaping hand and provides a general basis on which a multitude of individuals can work together harmoniously.[12]

The focus on rationalism and the adoption of natural scientific principles are the foundations of the Design Thinking of the Early and Middle Decades of the Twentieth Century.

In the late 1920s and 1930s, the Bauhaus attracted unwanted attention from the far-right political movement which was growing in dominance in Germany at the time. The far-right believed the radical principles espoused by the Bauhaus challenged their own political beliefs. Political pressure prompted Gropius to leave the institution and the School was closed in 1933 by the ruling Nazi administration. Academics, architects and designers associated with the Bauhaus fled Germany. To illustrate, after a brief period in England, Gropius located to the USA to teach at Harvard and to continue practicing architecture. Former Bauhaus tutor László Moholy-Nagy established the New Bauhaus design school in 1937 in Chicago.[13] The New Bauhaus was created as a spiritual successor to the Bauhaus and further advanced the Design Thinking of the Early and Middle Decades of the Twentieth Century.

o The Post-WW2 Era

The advent of WW2 slowed the progress and dissemination of Design Thinking of the Early and Middle Decades of the Twentieth Century. The eventual end of WW2 however saw renewed interest in advancing values associated with it. WW2 caused an unprecedented level of destruction of infrastructure, creating large-scale social problems. Problems included rebuilding cities and manufacturing goods in sufficient quantities to meet the demands of consumers. Paralleling discussion in the Pre-WW2 era, leading design theorists argued that the subjective decision-making process of designers would limit their ability to solve these large-scale social problems. Echoing the philosophy first set down in the Bauhaus, leading design theorists therefore

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11 Ibid., 27.

12 Gropius, Walter: *Scope of Total Architecture*, New York: Collier Books 1962, 24.

13 Findeli, Alain: »Moholy-Nagy's design pedagogy in Chicago (1937–46)«, in: *Design Issues* 7 (1990) 1, 4–19.

rejected traditional craft methods in favour of automated processes.[14] The post-WW2 era became influenced by an ever more increased focus on rationalistic, natural scientific ways of thinking.

o The *Hochschule für Gestaltung*, Ulm

The *Hochschule für Gestaltung*, Ulm (HfG)—(The Ulm School of Design) is for many a landmark in the renewed effort to forge the Design Thinking of the Early and Middle Decades of the Twentieth Century.[15] Founded in Ulm, Germany in 1953, the HfG aimed to train designers to rebuild German infrastructure. One of the founders, Max Bill, was a graduate of the Bauhaus and aimed to propagate the design philosophy that Gropius had introduced to him. Bill met resistance from Tomas Maldonado, a far more radical thinker. Maldonado stressed even more focus on scientific principles in design. Maldonado's philosophy was accepted in the School and he rose to become its long-serving director. Maldonado's influence meant that HfG framed design as an »applied science«.[16] Maldonado was influenced by the emerging field of ergonomics.[17] Ergonomics was conceived as a natural science as its methods revolve around measurement (of the human body and objects) and subsequent statistical analysis.[18] Ergonomic methods then directly inform the design of artefacts. Indeed, Maldonado argued that ergonomics was an objective discipline which led to the creation of »exact knowledge […] based on the human being«.[19] For Maldonado, the exactness of ergonomics meant that designers across disciplines could view humans as a set of numerical data. Framing them as data would help designers solve design problems: »…men are being transformed into things so that it will be easier to administer them. Instead of working with men, one can work with schemes, numbers, and graphs that represent men«.[20] Maldonado believed that the act of registering people as numerical data would lead to the creation of a better society. On this point, Koskinen et al.[21] argue that Maldonado was convinced that his advancement of Design Thinking of the Early and Middle Decades of the Twentieth Century could end post-WW2 suffering: »By turning design into a science, one could get rid of 'subjective interference' and pave the way to a world of plenty«.[22]

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14 Jones, John C.: *Design Methods: Seeds of human futures*, London: John Wiley & Sons 1970.

15 Krippendorff, Klaus: The semantic turn: A new foundation for design, Boca Raton: CRC Press, 2006.

16 Findeli: »Moholy-Nagy's design pedagogy in Chicago«, 9.

17 Valtonen, Anna: »Six decades – and six different roles for the industrial designer«, Nordes Conference, Copenhagen, 30–31 May, 2005.

18 Dreyfuss, Henry: *Designing for People*, New York, Simo & Schuster 1955.

19 Cited in Valtonen: »Six decades«, 4.

20 Maldonado, Tómas: *Design, nature, and revolution. Toward a critical ecology*, New York: Harper & Row 1972.

21 Koskinen, Ilpo/Zimmerman, John/Binder, Thomas/Redstrom, Johan/Wensveen, Stephan: *Design Research Through Practice: From the Lab, Field, and Showroom*, Waltham, MA: Morgan Kauffman 2011.

22 Ibid., 33.

o The Design Methods Movement

The influence of natural scientific ways of thinking in the formation of the Design Thinking of the Early and Middle Decades of the Twentieth Century is further evidenced in the growth of the Design Methods movement in the 1960s.[23] The Design Methods movement framed design as a formulaic process in which creativity could be reduced to numerical data.[24] In view of this, the Design Methods movement promoted 3-stage process for solving complex design problems.[25] The English industrial designer Chris Jones, the leader of this group of practitioners and theorists, claimed that his model would make the emotions of designers obsolete in the design process.[26] At the time, Design Methods theories were »widely accepted« both in design research and practice.[27] Influenced by the work of the Design Methods movements, the Nobel laureate philosopher and mathematician Herbert Simon attempted to determine numerical formulae to describe the design process.[28] The ultimate ambition of the movement was to completely remove designers from the design process, thereby eliminating all subjective human error from Design Thinking in order to solve social problems. The emotional human could be replaced by a rational computer:

> If the steps in a designer's processes could be identified, examined, and understood, they could be improved, or corrected and in the best circumstance, the designer could be replaced by a mechanical process or a machine – the then emerging computer.[29]

The Rejection of Design Thinking of the Early and Middle Decades of the Twentieth Century

o The Issue of ›Wicked Problems‹

In the early 1970s, the German academic Horst Rittel taught urban planning at the University of California, Berkeley, USA. Rittel was a graduate of the HfG Ulm and so had been schooled in theory which specified that framing people as numerical data could enable designers to solve design problems. Rittel had come to question this principle. Rittel and his collaborator Melvin Webber[30] argued that it is not always possible to frame people as numerical data when tackling design problems. They used the term Wicked Problems to describe problems that cannot be solved using design philosophy that is influenced by ways of working set down in the natural sciences. Rittel and Webber compared problems tackled in the natural sciences

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23 Bayazit, Nigan: »Investigating design: a review of forty years of design research«, in: *Design Issues*, 20 (2004) 1, 16–29.

24 Cross: »Designerly ways of knowing«.

25 Jones: *Design Methods*.

26 Ibid.

27 Downton, Peter: *Design Research*, Melbourne: RMIT University Press 2003, 41.

28 Cross: »Designerly ways of knowing«.

29 Downton: *Design Research*, 41.

30 Rittel, Horst. W./Webber, Melvin. M.: »Dilemmas in a general theory of planning«, in: *Policy Sciences* 4 (1973) 2, 155–169.

with those undertaken by city planners. They argued that problems in the former are expressible as numerical data. Rittel and Webber define these kinds of problems as being tame. The fact that tame problems can be expressed as numbers makes them »definable and separable«[31]. Once described as numerical data, tame problems become solvable though statistical analysis. Statistical analysis can make it possible to discover definitive solutions to tame problems. The following illustrates examples of tame problems:

> consider a problem of mathematics, such as solving an equation; or the task of an organic chemist in analyzing the structure of some unknown compound; or that of the chessplayer attempting to accomplish checkmate in five moves. For each the mission is clear. It is clear, in turn, whether or not the problems have been solved.[32]

In contrast, Rittel and Webber argued that city planning problems are not definable and separable. This is because they involve many stakeholders with different but valid lived experiences. It is therefore impossible to express them as numerical data. There are »no ›solutions‹ [to planning problems] in the sense of definitive and objective answers«[33]. The characteristics of planning problems make them wicked. Rittel and Webber's argument problematises principles set down by leading design philosophers of the Early and Middle Decades of the Twentieth Century. The idea of Wicked Problems critiques Gropius' reliance on impersonal mathematical standards. It also questions the legitimacy of Maldonado's dependence on ergonomics. Furthermore, the notion of wicked problems unpicks the validity of Simon's search for numerical formulae to describe the design process. Resultingly, for designers and researchers of the time, Rittel and Webber's concept highlighted problems with Design Thinking of the Early and Middle Decades of the Twentieth Century. Indeed, mindful of the significance of Rittel and Webber's argument, Design Methods theorists ended the search for universally applicable formulae which could characterise the design process.

o The Idea of Reflective Practice

A decade after Rittel and Webber published their contribution, Donald Schön, an educational theorist, philosopher and professor in urban planning at the Massachusetts Institute of Technology, developed what for many is a defining theory in the story of research into how designers think. Influenced by the idea of Wicked Problems, Schön argued that each design problem is unique.[34] Because each design problem is unique, it is impossible to fully comprehend a design problem when initially faced with it. Design problems instead need to be constructed during the design process.

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31 Ibid., 160.

32 Ibid., 160.

33 Ibid., 155.

34 Schön, Donald: *A: The Reflective Practitioner*, London: Temple-Smith 1983.

This characteristic makes them »puzzling, troubling, and uncertain« in nature.[35]
In contrast Schön believed that scientific problems are not unique—it is therefore possible to comprehend scientific problems when faced with them. Schon therefore argued that design problems are fundamentally different to scientific problems. Because of this »scientific theory and technique«[36] cannot adequately describe design practice. Schön argued that the ambiguous nature of design problems forces designers to think in particular ways. To solve design problems, designers need to engage in a reflective conversation with issues they face when constructing design solutions: »[…] the [design] situation talks back, the practitioner listens, and as he appreciates what he hears, he reframes the situation once again […].«[37]
Schön argued that this conversational way of solving problems is fundamentally different to the way that scientists solve problems. The conversations mean that designers solve problems in an iterative manner. Schön believed that most of the research into problem-solving had ignored the fundamental difference between the way designers think and the way scientists think. He called for the development of a body of work which focusses on fully understanding the way designers think,

> an epistemology of practice implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict.[38]

Schön's research into the way designers think presents a stark departure from principles associated with the Design Thinking of the Early and Middle Decades of the 20th Century. Koskinen et al. argue that Schön's contribution created a perceptible turn in the way Design Thinking would come to be understood.[39] Today, many design researchers view the way designers solve problems as being diametrically opposed to the way that natural scientists solve problems. Many design researchers currently argue that the way that designers think is more beneficial in the quest to solve large-scale societal problems than the way that natural scientists think.

Contemporary Design Thinking

Leading contemporary design researchers argue that the way designers think allows them to be open-minded when tackling problems. This, claim researchers, is because the design problem only becomes truly apparent during the course of the design process. To illustrate this position, Dorst argues that designers work to identify the problem through undertaking a series of cyclic steps in which they iteratively return to the problem in order understand different elements of it.[40] As the problem remains

35 Ibid, 40.

36 Ibid, 21.

37 Ibid., 131-132.

38 Ibid., 49.

39 Koskinen/Zimmerman/Binder/Redstrom/Wensveen: *Design Research Through Practice*.

40 Dorst: »The Nature of Design Thinking«, 131–139.

open in the design process, designers must remain open-minded in order to solve it:

> [Designers] know that bringing the full force of evaluation to bear upon a fledgling idea is a very effective way of killing it, blocking any further exploration and stifling any progress in the project.[41]

The focus on finding an appropriate solution leads Nigel Cross, the former head of the Design Research Society, to term designers solution-focussed individuals.[42] Cross argues that, unlike designers, natural scientists attempt to identify a problem fully early on in the problem-solving process and then work to solve it.[43] The focus on identifying a problem leads Cross to term scientific thinking as a problem-focussed process.[44] Once scientists have identified the problem, they apply rational, evaluative frameworks to solving it.[45] According to contemporary design researchers, this focus early on in the problem-solving process limits both exploration of problems and idea generation and leads to unsatisfactory solutions.[46]

Design researchers argue that the way that Contemporary Design Thinking—known in the design literature simply as Design Thinking—is extremely valuable to society. To illustrate, Dorst claims Design Thinking is an »exciting new paradigm for dealing with problems in many professions«.[47] Similarly, Razzouk and Shute claim that Design Thinking can solve problems »across disciplines«.[48] Design Thinking researchers claim that, with training, non-designers can become versed in Design Thinking.[49] This is because Design Thinking enables professionals to take into account the views of a range of stakeholders. In view of this, Meinel and Leifer claim that Design Thinking can enable individuals from diverse disciplines such as »engineering, medicine, business, the humanities, and education [to collaborate to] solve big problems in a human centered way«.[50] According to Sanders and Strappers the wide-scale applicability of Design Thinking has led to it being »acknowledged in mankind's drive to address the challenges of global, systemic issues«.[51] The United Nations advocates

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41 Ibid., 133.

42 Cross, Nigel: »Expertise in design: an overview«, in: *Design Studies* 25 (2004), 427–441.

43 Ibid.

44 Ibid.

45 Dorst, Kees: »The core of ›design thinking‹ and its application«, in: *Design Studies,* 32 (2011) 6, 521–532.

46 Cross: »Expertise in design«.

47 Ibid., 521.

48 Razzouk, Rim/Shute, Valerie: »What Is Design Thinking and Why Is It Important?«, in: *Review of Educational Research* 82 (2012) 3, 331.

49 Manzini, Ezio: »Design Schools as Agents of (Sustainable) Change: A Design Labs Network for an Open Design Program«. Paper presented at: CUMULUS // DRS SIG on Design Pedagogy 1st International Symposium for Design Education Researchers La Bourse du Commerce, Paris 18–19, May, 2011, 9–16.

50 Meinel, Christof/Leifer, Larry: »Design Thinking Research«, in: Hasso Plattner/Christof Meinel/Larry Leifer (eds.), *Design Thinking: Understand – Improve – Apply*, London: Springer 2011, xiii-xxi.

51 Sanders, Elizabeth. B. N./Stappers, Pieter. J.: »Co-creation and the new landscapes of design«, in: *Co-design* 4 (2008) 1, 14.

the use of Design Thinking in improving a range of public services.[52] Some Design Thinking researchers argue that the potential of Design Thinking means that is one of the most vital »21st century Skills« which everyone should possess.[53] In view of this instruction in Design Thinking is available for learners of all ages and from all backgrounds and occurs at both non-assessed and assessed levels. To illustrate, Stanford University and IDEO have recently collaborated to create open-source teaching material with the aim helping teachers across the world to educate children in Design Thinking.[54] Stanford University and IDEO also run unassessed online crash courses in Design Thinking. Stanford University claim that novices of all ages and from all backgrounds can use the online material to benefit their »personal and professional routines«.[55]

The narrative presented in this chapter seems to suggest that, in the century-long history of research into how designers think, Contemporary Design Thinking has been shown to more effective than Design Thinking of the Early and Middle Decades of the 20th Century in tackling large-scale societal problems. Case closed. End of story... Well, perhaps not quite. Design practices and philosophies of design do not sit outside of socio-political contexts. Indeed, like any human thought or activity, design is intrinsically embedded in them. (The aforementioned closure of the Bauhaus by the Nazi regime in 1933 is a stark testament to the connection between design and socio-political contexts.) There are emerging clues that current socio-political contexts may provide an additional turn in the saga of Design Thinking.

The Beginning of an Era of Diminished Interest in Contemporary Design Thinking?

Recently, some researchers have criticised ideas which are fundamental in promoting wide-scale adoption of Design Thinking by both businesses and public institutions. Maciver et al. critique the extent to which Design Thinking may be useful in enabling interdisciplinary problem-solving: »While in theory the design thinking approach emphasises the value of interdisciplinarity in each phase, in practice this has been problematic«.[56]

Going further, the psychologists Robert Farrell and Cliff Hooker question the validity of a fundamental principle which has allowed design researchers to promote the

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52 Allio, Lorenzo: *Design Thinking for Public Service Excellence*, Singapore City: United Nations Development Programme 2014.

53 Razzouk/Shute: »What Is Design Thinking?«, 331.

54 https://www.designthinkinginschools.com/ [17 January 2020].

55 Stanford University: Welcome to the Virtual Crash Course in Design Thinking, https://dschool.stanford.edu/dgift/ [17 January 2020].

56 Maciver, Fiona/Malins, Julian/Kantorovitch, Julia/Liapis, Aggelos: *United We Stand: A critique of the design thinking approach in interdisciplinary innovation. Proceedings of DRS 2016*, Design Research Society 50th Anniversary Conference, held, Brighton, UK, 27–30 June, 2016, 9.

efficacy of Design Thinking.[57] Design researchers have long argued that the way that designers think both differs from, and is more effective, than the way natural scientists think. Farrell and Hooker claim this is not the case. They claim that both scientific problems and design problems can be wicked in nature. Farrell and Hooker therefore argue that both types of professionals routinely tackle Wicked Problems. In view of this, Farrell and Hooker suggest the existence of an intrinsic relationship between the way designers and scientists think, for both are the »product of a common core cognitive process«.[58]

Research from academics can be influential. The actions of governments however tend to have more sway. Governments tend to use allocations of funding to signal both their support for certain philosophies and practices and their criticism of other. In the UK, the government has focussed on funding STEM subjects (STEM is an acronym for Science, Technology, Engineering and Mathematics) at university level. The government began this course of action by removing all funding to universities which do not teach STEM subjects.[59] Building on this strategy, it allocated an additional »teaching capital fund« of £200 million in the 2015–16 academic year to universities to further promote teaching and research in STEM subjects.[60] High level government officials have consistently reiterated their support for STEM subjects. When in post, the one-time Education Secretary Nicky Morgan argued the rationale for supporting STEM subjects is clear: »the subjects that keep young people's options open and unlock the door to all sorts of careers are the Stem subjects«.[61]

In contrast to the positive effects of studying a STEM discipline, Morgan argued that the future prospects for those studying arts-based subjects may be quite limited—in some cases it may hold people back for the rest of their lives.[62] The UK government classes design as an arts subject, therefore design subjects do not receive additional funding. This has influenced greatly reduced provision in art and design foundation courses.[63] The government's move away from funding design subjects has also affected provision at secondary school (high school) level. The subject ›Design and Technology‹ has been axed from almost half of secondary schools in the UK.[64] The reduction in foundation course places and the decrease in teaching of design

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57 Farrell, Robert/Hooker, Cliff: »Design, science and wicked problems«, in: *Design Studies* 34 (2013) 6, 681–705.

58 Ibid., 701.

59 Prince, Rosa: »Higher education – universities with arts courses bear the brunt«, in: *The Telegraph* [5 November 2010].

60 *Higher Education Funding Council for England Policy Guide: Science, technology, engineering and mathematics* (STEM), [27 January 2015].

61 Morgan cited in, Paton, Graeme: »Nicky Morgan: pupils ›held back‹ by overemphasis on arts«, in: *The Telegraph* [10 November 2014].

62 Ibid.

63 Young-Powell, Abby/Gil, Natalie: »Students occupy Central St Martins in Protest against Cuts«, in: *The Guardian* [24 March 2015].

64 Turner, Camilla: »Design and Technology GCSE Axed from Nearly Half of Schools, Survey Finds«, in: *The Telegraph* [10 March 2017].

and technology at school level may negatively affect the future of design degrees at university level and the status of the design professions. The UK government is not alone in showing reluctance when it comes to supporting design. In 2017, the US government attempted to slash arts funding dramatically. The proposal was eventually overturned by the US Senate. In contrast, the US administration did not recommend a cut to STEM funding. Had the proposal to cut arts funding advanced into legislation, it was predicted to cut the number of teachers of creative subjects in schools.[65]

Conceivably, the trend in the UK and the USA for reduced emphasis on design subjects may lead to a reduced emphasis placed on the value of Contemporary Design Thinking in the quest to solve large-scale problems in society. In contrast, it is conceivable that the focus on STEM funding may precipitate a renewed interest in Design Thinking of the Early and Middle Decades of the 20th Century. Emerging socio-political contexts may therefore play an important part in precipitating a further turn in the 100-year old story of Design Thinking. In an ironic and unfortunate twist of fate, it is possible that the relentless push by a legion of design theorists across the last 40 or so years to distance Contemporary Design Thinking from Design Thinking of the Early and Middle Decades of the 20th Century may have helped to influence the UK government in classing design as an arts-based subject and not a STEM-based subject.[66] Conceivably, decades from now, we may be able to reflect on the idea that design researchers have been partly responsible for the demise of Contemporary Design Thinking. (Although in decades from now, Contemporary Design Thinking will be anything but contemporary.)

Potential Ramifications of a Renewed Interest in Design Thinking of the Early and Middle Decades of the 20th Century

When Walter Gropius sowed the seeds of Design Thinking of the Early and Middle Decades of the 20th Century, he did not see the need to involve users of design in the design process. As this form of Design Thinking progressed, design theorists continued to believe that their own expertise in the use of natural scientific methods would enable them to speak on behalf of users. When experts influenced by Gropius created spaces for living, they assumed that people residing in homogenised tower blocks would behave as the experts thought they should. However, the »social decay, drug use and family breakdown« linked with Sheffield's Park Hill Estate and many similar high-rise architectural schemes around the world evidence that this was not always

65 Miller, Hayley: »U.S. Students Are Struggling in The Arts. Donald Trump's Budget Would Make the Problem Worse«, in: *The Huffington Post* [28 April 2017].

66 Ghassan, Aysar: »Design Thinking: A Rod for Design's Own Back?« Paper Presented at The 50th Anniversary Design Research Society Conference, Brighton, UK, 27–30 June, 2016.

the case.[67] Times have changed a great deal since Gropius' era. More than 50 years of poststructuralist philosophy has consistently critiqued the legitimacy of top-down authority. Citizens in many parts of the world reject the idea that decisions should be made for them. Instead, they expect to be able to have agency in their own lives. The change in times would present a significant limitation to any move to return to philosophies associated with Design Thinking of the Early and Middle Decades of the 20th Century.

The issue of artificial intelligence further complicates discussion on possible directions for 21st Century problem-solving philosophies. When the Design Methods movement of the 1960s attempted to replicate the problem-solving abilities of designers, theorists did not envisage writing code that could ›learn‹ human traits. Their aim was merely to create formulae that could accurately describe human activities. The advent of artificial intelligence has made the prospect of non-human forms mimicking certain human activities a reality. The jury is currently out on whether artificially intelligent beings will, in the foreseeable future, be able to react with humans in a way which enables these forms to pass the famous Turing Test. The closer artificially intelligent forms get to being ›like us‹, the more necessary it will be to consider where they will stand on the issue of problem-solving philosophies. The progress of artificial intelligence may therefore prove to be the ultimate test of how the legacy of Gropius' problem-solving philosophies will be perceived.

Bibliography

Allio, Lorenzo: *Design Thinking for Public Service Excellence*, Singapore City: United Nations Development Programme, 2014.

Bayazit, Nigan: Investigating design: a review of forty years of design research, in: *Design Issues* 20 (2004) 1, 16–29.

Buchanan, Richard: »Design Research and the New Learning«, in: *Design Issues* 17 (2001) 4, 3–23.

Cross, Nigel: »Designerly ways of knowing: Design discipline versus design science«, in: *Design issues* 17 (2001) 3, 49–55.

Cross, Nigel: Expertise in design: an overview, in Design Studies, 25, 2004, 427-441.

Dreyfuss, Henry: Designing for People. New York, Simo & Schuster, 1955.

Dorst, Kees: The core of ›design thinking‹ and its application, in: *Design Studies* 32 (2011) 6, 521–532.

67 Dobraszczyk, Paul: »Sheffield's Park Hill: the tangled reality of an extraordinary brutalist dream«, in: *The Guardian* [14 August 2015].

Dorst, Kees: »The Nature of Design Thinking«, in: *Proceedings of the 8th Design Thinking Research Symposium* (DTRS8), Sydney, 19–20 October, 2010, 131–139.

Dobraszczyk, Paul: »Sheffield's Park Hill: the tangled reality of an extraordinary brutalist dream«, in: *The Guardian* [14 August 2015].

Downton, Peter: *Design Research*, Melbourne: RMIT University Press 2003.

Farrell, Robert/Hooker, Cliff: »Design, science and wicked problems«, in: *Design Studies* 34 (2013) 6, 681–705.

Findeli, Alain: »Moholy-Nagy's design pedagogy in Chicago (1937–46)«, in: *Design Issues*, 7 (1990) 1, 4–19.

Ghassan, Aysar: »Design Thinking: A Rod for Design's Own Back?« Paper Presented at The 50th Anniversary Design Research Society Conference, Brighton, UK, 27–30 June, 2016.

Gropius, Walter: *The New Architecture and the Bauhaus*, London: Faber and Faber 1935.

Gropius, Walter: *Scope of Total Architecture*, New York: Collier Books 1962.

Higher Education Funding Council for England Policy Guide: Science, technology, engineering and mathematics (STEM), 27 January 2015.

Jones, John C.: *Design Methods: seeds of human futures*, London: John Wiley & Sons 1970.

Krippendorff, Klaus: *The semantic turn: A new foundation for design*, Boca Raton: CRC Press 2006.

Koskinen, Ilpo/Zimmerman, John/Binder, Thomas/Redstrom, Johan/Wensveen, Stephan: *Design Research Through Practice: From the Lab, Field, and Showroom*, Waltham, MA: Morgan Kauffman 2011.

Maciver, Fiona/Malins, Julian/Kantorovitch, Julia/Liapis, Aggelos: *United We Stand: A critique of the design thinking approach in interdisciplinary innovation. Proceedings of DRS 2016*, Design Research Society 50th Anniversary Conference, Brighton, UK, 27–30 June, 2016.

Maldonado, Tómas: *Design, nature, and revolution. Toward a critical ecology*, New York: Harper & Row 1972.

Manzini, Ezio: »Design Schools as Agents of (Sustainable) Change: A Design Labs Network for an Open Design Program«. Paper presented at: CUMULUS // DRS SIG on Design Pedagogy 1st International Symposium for Design Education Researchers La Bourse du Commerce, Paris 18–19 May, 2011, 9–16.

Meinel, Christof/Leifer, Larry: »Design Thinking Research«, in: Hasso Plattner/Christof Meinel/Larry Leifer (eds.), *Design Thinking: Understand – Improve – Apply*, London: Springer 2011, xiii-xxi.

Miller, Hayley: »U.S. Students Are Struggling in The Arts. Donald Trump's Budget Would Make the Problem Worse«, in: *The Huffington Post* [28 April 2017].

Paton, Graeme: »Nicky Morgan: pupils ›held back‹ by overemphasis on arts«, in: *The Telegraph* [10 November 2014].

Prince, Rosa: »Higher education – universities with arts courses bear the brunt«, in: *The Telegraph* [5 November 2010].

Razzouk, Rim/Shute, Valerie: »What Is Design Thinking and Why Is It Important?«, in: *Review of Educational Research*, 82 (2012) 3, 330–348.

Rittel, Horst. W./Webber, Melvin. M.: »Dilemmas in a general theory of planning«, in: *Policy Sciences* 4 (1973) 2, 155–169.

Stanford University: Welcome to the Virtual Crash Course in Design Thinking, http://dschool.stanford.edu/dgift/ [no date].

Sanders, Elizabeth. B. N./Stappers, Pieter. J.: »Co-creation and the new landscapes of design«, in: *Co-design* 4 (2008) 1, 5–18.

Schön, Donald: A: *The Reflective Practitioner*, London: Temple-Smith 1983.

Spitz, René: »›Design‹ Becomes an Issue in Germany, in: *The Design Journal* 8 (2005) 3, 2–12.

Turner, Camilla: »Design and Technology GCSE Axed from Nearly Half of Schools, Survey Finds«, in: *The Telegraph* [10 March 2017].

Valtonen, Anna: »Six decades - and six different roles for the industrial designer«, Nordes Conference, Copenhagen, 30–31 May, 2005.

Young-Powell, Abby/Gil, Natalie: »Students occupy Central St Martins in Protest against Cuts«, in: *The Guardian* [24 March 2015].