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Revisiting Rittel and Webber's Dilemmas: Designerly Thinking Against the Background of New Societal Distrust

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Abstract

In this article, we posit designerly thinking as a family of design approaches that some believe are able to effectively respond to wicked problems. We will scrutinize this premise by revisiting Horst Rittel and Melvin Webber's 1973 article in which the notion of wicked problems was originally introduced. In it, Rittel and Webber note the emergence of a general sense of distrust in professionals in the 1960s and interpret it as a loss of confidence in the then leading approach to addressing societal problems: systems-based planning. Rittel and Webber formulated three dilemmas that societal problems pose, of which the second is their wickedness, and argued that planning does not resolve these dilemmas. In the 2010s, an emerging distrust in professionals has arisen once more, raising the question of whether designerly thinking is equipped to address societal issues. Our review and discussion of Rittel and Webber's three dilemmas reveals that designerly thinking currently does not resolve any of them, as there can always be groups that will oppose certain solutions. We argue that designerly thinking cannot overcome societal pluralism, but that designers can and should interpret social distrust as an invitation to discuss the consequences and their societal equity.

1   Horst W. J. Rittel and Melvin M. Webber, "Dilemmas in a General Theory of Planning," *Policy Sciences* 4, no. 2 (1973): 155–69, DOI: https://doi.org/10.1007/bf01405730.

2   Horst Rittel, "On the Planning Crisis: Systems Analysis of the 'First and Second Generations,'" *Bedriftsøkonomen* 8 (1972): 390–96, available at http://www.ask-force.org/web/Discourse/Rittel-Planning-Crisis-First-Second-Generation-1972.pdf.

Introduction

Since the 1990s, designerly thinking has been developed in design research as an approach that not only serves product design, but also aims to effectively address societal problems. A central claim is that designerly thinking can effectively deal with "wicked" problems, a class of issues introduced by Horst Rittel and Melvin Webber in their 1973 article "Dilemmas in a General Theory of Planning,"[1] as a means of capturing key characteristics of timely societal problems. Rittel and Webber note that a general sense of distrust in professionals emerged in the 1960s, and surmise that this was due to a loss in confidence in the then leading approach among professionals toward addressing societal problems: systems-based planning. Rittel and Webber formulated three dilemmas societal problems pose, of which the second is their wickedness, and argued that planning does not resolve these dilemmas.

Rittel and Webber's article has become a classic in policy and design research and has once again become a timely read, because in the 2010s that distrust in professionals emerged once more, exemplified in the general skepticism evinced toward the results of scientific research on climate change and COVID-19, and in the popular resistance to expert policies towards societal issues. This new distrust raises questions as to whether present-day professional approaches are equipped to address societal challenges and can effectively deal with wicked problems.

In this article, we take our cue from that current wave of distrust to verify the claims made by proponents of designerly thinking as a means of addressing societal issues. We do so by exploring to what extent designerly thinking can resolve Rittel and Webber's three dilemmas. While the second of these dilemmas concerns dispelling the wickedness of societal problems — and there is ample discussion in the literature about how designerly thinking aims to do just that, including early contributions by Rittel himself[2] — the other two dilemmas have largely gone unnoticed. Rittel and Webber formulated them, in terms of planning, in the final sentences of their article. To wit: planning has no theory that can locate societal goodness, and planning has no theory that addresses the problems of equality that societal plurality engenders.

We argue here that designerly thinking has yet to effectively contend with Rittel and Webber's dilemmas and cast doubts upon its effectiveness at addressing wicked problems. To us, that conclusion does not mean we should lose confidence in designerly thinking; rather, we should refine its approaches in response to pervasive societal distrust. Designerly thinking should not be advanced as a panacea for every societal ill. We must acknowledge openly that it can generate responses that carry undesirable consequences for particular societal groups, and take responsibility for those discrepancies. To do this, designers should actively take public discontent on board, and interpret it as an invitation to discuss the social equity of any solution they put forth. To bolster societal trust in the responses generated from designerly thinking, designers should take responsibility for those consequences and track them with as emphatic a commitment as they show toward the original societal problem.

3 Robert Farrell and Cliff Hooker, "Design, Science and Wicked Problems," *Design Studies* 34, no. 6 (2013): 681–705, DOI: https://doi.org/10.1016/j.destud.2013.05.001.

In this article, first we revisit Rittel and Webber's analysis of the distrust in professional planning in the 1960s. Second, we discuss designerly thinking as a present-day paradigm for addressing wicked problems. After that, we explore whether designerly thinking provides an answer to Rittel and Webber's three dilemmas. And finally, we go through Rittel and Webber's characterization of wicked problems in detail to assess whether designerly thinking can deal with these problems.

The 1960s Distrust in Planning Professionals

Rittel and Webber's analysis of the distrust toward planning professionals had its context in the societal turmoil in the U.S. in the 1960s. Societies in the U.S. and across the Western world had evolved towards pluralism, meaning that different social groups were advancing different values and had begun to understand societal problems differently. Moreover, concerns had emerged about the consequences of earlier planning solutions: the fairness of the distribution of these consequences across different social groups was challenged, and their impact on the environment contested.

In their article, Rittel and Webber considered two models of planning. The first is a model in which experts address the problems of society by diagnosing them and then creating their solutions. Rittel and Webber position the origin of this planning approach in the 19th century industrial age, and characterize it as a model in which experts apply their knowledge to engineer solutions for society. These solutions were guided by the value of efficiency: they were cheap and would require a minimum of resources. This first 'engineering-solutions' model of planning effectively addressed early, pre-1960s societal problems, as they were "definable, understandable and consensual." Its application led to the realization of society's basic needs, including paved roads, clean water, and hospitals.

With this initial planning approach, Rittel and Webber continue, professionals typically interpret policy problems as "tame" problems with well-defined goals, descriptions, and rules. It turned problems into puzzles that could be resolved using existing knowledge and deductive reasoning. However, not all societal problems can be approached as if they are puzzles, given the finitude of our cognitive capacity and of our resources, the complexity of societal issues, and the normativity that is intrinsic to both problem formulation and problem resolution.[3] When society harbors different groups that all claim their validity, there can be no consensus about normativity. Furthermore, earlier planning had led to unintended environmental consequences that had already begun to emerge in the 1960s.

To cater these remaining societal problems—Rittel and Webber refer to urban renewal and improving education—the first planning model was less suited. The second planning model is one in which professionals of all sorts—from social workers to highway engineers—analyze societal problems and resolutions within their broader technical and social contexts. This 'systems-based' model of planning emerged after World War II, and aimed at identifying the causes of societal problems within the broader sociotechnical system of society. Moreover, it aimed at assessing possible resolutions by more

4 Nigel Cross, *Designerly Ways of Knowing*
   (Basel: Birkhäuser, 2007).

5 Tim Brown and Barry Katz, "Change
   by Design," *The Journal of Product
   Innovation Management* 28, no. 3 (2011):
   381–83, DOI: https://doi.org/10.1111/
   j.1540-5885.2011.00806.x; Roger Martin,
   *The Design of Business: Why Design Think-
   ing Is the Next Competitive Advantage*
   (Cambridge, MA: Harvard Business Press,
   2009); Hasso Plattner, Christoph Meinel,
   and Ulrich Weinberg, *Design Thinking:
   Innovation Lernen — Ideenwelten Öffnen*
   (Munich: mi-Wirtschaftsbuch, 2009);
   Roberto Verganti, *Design Driven Innova-
   tion: Changing the Rules of Competition
   by Radically Innovating What Things
   Mean* (Cambridge, MA: Harvard Business
   Press, 2009); Kees Dorst, *Design Inno-
   vation: Create New Thinking by Design*
   (Cambridge, MA: The MIT Press, 2015).

6 Richard H. Thaler and Cass R. Sunstein,
   *Nudge: Improving Decisions about Health,
   Wealth, and Happiness* (London: Penguin,
   2009).

7 For example, see Nynke Tromp and Paul
   Hekkert, *Designing for Society: Products
   and Services for a Better World* (London:
   Bloomsbury Publishing, 2018); Tim Brown
   and Jocelyn Wyatt, "Design Thinking for
   Social Innovation," *Development Outreach*
   12, no. 1 (2010): 29–43, DOI: https://doi.
   org/10.1596/1020-797X_12_1_29.

8 Richard Buchanan, "Wicked Problems
   in Design Thinking," *Design Issues* 8,
   no. 2 (1992): 5–21, DOI: https://doi.
   org/10.2307/1511637.

9 See also Richard Buchanan, "Systems
   Thinking and Design Thinking: The
   Search for Principles in the World We Are
   Making," *She Ji: The Journal of Design,
   Economics, and Innovation* 5, no. 2 (2019):
   85–104, DOI: https://doi.org/10.1016/j.
   sheji.2019.04.001.

10 For example, see Don Norman, *The
   Design of Everyday Things*, revised and
   expanded ed. (New York: Basic Books,
   2013).

societal values than just efficiency, and not only in terms of inputs but also by their outputs for managing the consequences that resolutions may have.

Rittel and Webber start their article by acknowledging that the second model of planning was also inadequate for the societal problems of their days. They pointed out that society had rejected the solutions produced by systems-based planning, leading to a loss in confidence in the planning approach among professionals and in society, which called for an analysis of where it was falling short. In their analysis, Rittel and Webber labelled complex societal problems "wicked," to contrast them with well-defined (tame) ones, and introduced ten characteristic properties of these wicked problems. They used these properties to argue that the two planning models were ill-equipped to address societal problems, and formulated three dilemmas that planning faces when it is used to address societal issues. In the coming sections, we discuss these dilemmas after introducing a characterization of designerly thinking.

Designerly Thinking

As of the end of the twentieth century design has emerged as a general approach to addressing problems of all sorts. Having proved its potential in innovative engineering and product development, Nigel Cross[4] introduced design as a separate third designerly culture to be acknowledged besides C.P. Snow's two cultures of the natural sciences and humanities. Under the label of design thinking it acquired further momentum as an approach to innovate commercial firms and societal institutions,[5] and evolved to a rather heterogenous paradigm for addressing also societal problems, as exemplified by nudging[6] and social design.[7]

In an early characterization of design thinking,[8] Richard Buchanan discerns four areas of design: the design of *symbolic and visual communications* (including traditional graphic designing but currently comprising more than that), *material objects* (for example industrial designing, but again not limited to that), *activities and organized services* (including traditional management), and *complex systems or environments for living, working, playing, and learning* (including, for example, architectural designing and urban planning).[9] Rittel and Webber's second systems-based model of planning may be positioned within Buchanan's fourth area of complex systems design. Yet, what Buchanan takes as specific to design thinking is that it is not confined to one of the design areas but typically evolves through all four. Design thinking arrives at outcomes that draw from and integrate knowledge and practices in all these areas including, therefore, those of systems-based planning. A task of developing a new product, for instance, is not just a task in the material objects design area, but also one about how to signal to users (communication design) how the product is to be handled (activities design).[10] It is this flexibility of design thinking that (systems-based) planning lacks, and which gives design thinking its advantages. One of these advantages is supposed to be that design thinking can deal with wicked problems. In fact, wicked problems are presented in the literature as problems to which design thinking should be applied rather than engineering,

11 For example, see Buchanan, "Wicked Problems in Design Thinking"; Linda Nhu Laursen and Louise Møller Haase, "The Shortcomings of Design Thinking When Compared to Designerly Thinking," *The Design Journal* 22, no. 6 (2019): 813–32, DOI: https://doi.org/10.1080/14606925.2 019.1652531.

12 Some recent cases are Laursen and Haase, "The Shortcomings of Design Thinking"; Ameer Sarwar and Patrick Thomas Fraser, "Explanations in Design Thinking: New Directions for an Obfuscated Field," *She Ji: The Journal of Design, Economics, and Innovation* 5, no. 4 (2019): 347, DOI: https://doi.org/10.1016/j. sheji.2019.11.002. In Nigel Cross's classic *Designerly Ways of Knowing*, design is taken as resolving ill-defined problems, which are wicked. See Cross, *Designerly Ways of Knowing*, 23.

13 Michael Lewrick, Patrick Link, and Larry Leifer, *The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems* (Hoboken: John Wiley & Sons, 2018), 51.

14 C. West Churchman et al., "In Memoriam: Horst W.J. Rittel," *Design Issues* 22, no. 4 (2007): 89–91, available at https://www. jstor.org/stable/25224093; Rittel, "On the Planning Crisis," 394.

science, or planning. Wicked problems are presented as the subject matter of design[11] and statements that design aims at solving or resolving wicked problems can be found in the literature.[12] Often weaker formulations are given, as that "design thinking helps to make wicked problems graspable,"[13] which means that design thinking can give responses to wicked problems that do not precisely solve them, but that can be considered as adequate and satisfactory. In this article we avoid talking about solutions or resolutions for wicked problems and align with the weaker formulation by systematically referring to responses to wicked problems and about approaches — design or otherwise — that address or deal with those problems. By using this terminology we keep our analysis open to what we believe is a central point in Rittel and Webber's arguments: wicked problems cannot be solved (even though Rittel and Webber themselves do speak about problem solvers and (re)solutions in their 1973 article and elsewhere).[14]

The term *design thinking* currently refers to a variety of approaches that, one might say, bear Wittgensteinian family resemblances. To better capture the thrust of the notion, in this article we write about *designerly thinking* as the generalized design approach to developing responses to problems, and use six characteristics that regularly recur in the literature to stipulate what we mean with this approach.

1   Designerly thinking starts by understanding problems beyond their descriptions, which may include experiencing problems from the perspectives of the people who have them, and doing background research on how the problems emerged and why previous attempts to address them failed.

2   Designerly thinking involves working on problems with multidisciplinary teams of designers, thus ensuring that problem definitions and responses both draw from a variety of knowledge and practice bases.

3   In designerly thinking, the perspectives of customers, users, and stakeholders are welcome, as is their active participation in the design process.

4   Designers add their own perspectives by contributing their values, and choosing specific interpretations — frames — which inform potential response directions.

5   Problems co-evolve with interpretations and the response directions that designers choose. This means that problems' original descriptions are not written in stone — they change through the understanding designers acquire as they attempt to arrive at responses.

6   Designerly thinking experiments are ongoing throughout the process, to further understanding of the problems and to continuously collect feedback about whether potential responses are delivering satisfactory results.

Designerly Thinking, and Rittel and Webber's Three Dilemmas

Rittel and Webber formulated three general dilemmas planners face when seeking to resolve societal problems. In this section, we describe these

15 Manuel Castells, *Networks of Outrage and Hope: Social Movements in the Internet Age*, 2nd ed. (Hoboken: John Wiley & Sons, 2015).

16 John S. Dryzek, *Discursive Democracy: Politics, Policy, and Political Science* (Cambridge, UK: Cambridge University Press, 1994); James Bohman, "Survey Article: The Coming of Age of Deliberative Democracy," *Journal of Political Philosophy* 6, no. 4 (1998): 400–425, DOI: https://doi.org/10.1111/1467-9760.00061; Frank Fischer, "Technological Deliberation in a Democratic Society: The Case for Participatory Inquiry," *Science and Public Policy* 26, no. 5 (1999): 294–302, DOI: https://doi.org/10.3152/147154399781782293.

17 Jacquelien van Stekelenburg and Bert Klandermans, "In Politics We Trust. . . or Not? Trusting and Distrusting Demonstrators Compared," *Political Psychology* 39, no. 4 (2018): 775–92, DOI: https://doi.org/10.1111/pops.12464.

18 Udo Pesch and Pieter E. Vermaas, "The Wickedness of Rittel and Webber's Dilemmas," *Administration & Society* 52, no. 6 (2020): 960–79, DOI: https://doi.org/10.1177%2F0095399720934010.

19 For example, see Dorst, *Design Innovation*.

dilemmas, discuss their relevance in contemporary society, and explore whether designerly thinking provides a way out of them.

Dilemma 1: Societal Goodness

The first dilemma that Rittel and Webber gave is that there is no theory of societal goodness that can guide professionals as they resolve societal problems; different members of society harbor different conceptions of good and bad, as became abundantly clear in the 1960s in the U.S. And whereas in the 1960s pluralism and societal unrest could be connected to societal groups that felt disenfranchised and organized themselves around visible representatives and leaders, current manifestations are intrinsically evasive: individuals take on different roles, having no trouble going from satisfied consumer to angry protestor. Instead of being represented by a certain organization or feeling as though they belong to a certain class, people take part in a heterogeneous and fluid networks of coalitions and movements.[15]

This contemporary instability is visible in the French social movement *les gilets jaunes*, which translates in English to "yellow vests."[16] These massive protests in France emerged in November 2018, ultimately spilling over to other European countries. Societal manifestations of discontent like the *gilets jaunes* are very much intangible, as they seem to be mainly directed against systemic features rather than individual professionals. The yellow vest movement lacks a permanent organizational structure, and may disappear just as suddenly as it surfaced.[17] The yellow vest movement, moreover, illustrates that it is hard to pinpoint the exact nature of public discontent, despite its clear presence.[18] An accurate assessment may be that any authoritative decision can raise the vocal opposition of societal groups that were not mobilized earlier.

To approach such slippery societal pluralism, designerly thinking uses research methods that reveal the existing goals and values of social groups, and it has practices that *propose* new goals and values that groups may endorse in the future. Hence, when different groups are involved in societal problems and their existing goals and values clash, designerly thinking can propose new goals and values as a way out of the conflict and produce responses to the problems that are acceptable for all groups. Whether this revelation-and-proposition approach is an adequate means of dealing with the societal goodness dilemma is still a matter of debate. Designerly thinking does have a track record of responses that were accepted by many social groups.[19] But no argument exists that designerly thinking can determine generally endorsable goals and values for all societal problems. Any such argument should take into account that present-day social groups are far from stable, as noted above. The constellation of social groups for which designerly thinking determines goals and values may rapidly change, possibly in reaction to the determination of goodness by designers. Hence, when one wants to argue that designerly thinking can deal with this first dilemma, one should also show that the empathy and propositions it generates are resilient to rapid societal change.

20 Farrell and Hooker, "Design, Science and Wicked Problems," 685.

21 Udo Pesch, *The Predicaments of Publicness: An Inquiry into the Conceptual Ambiguity of Public Administration* (Delft: Eburon, 2005).

22 Compare with Ibo van de Poel, "The Introduction of Nanotechnology as a Societal Experiment," in *Technoscience in Progress: Managing the Uncertainty of Nanotechnology*, ed. Simone Arnaldi, Andrea Lorenzet, and Federica Russo (Amsterdam: IOS Press, 2009), 129–42; Javier Lezaun, Noortje Marres, and Manuel Tironi, "Experiments in Participation," in *The Handbook of Science and Technology Studies,* 4th ed., ed. Ulrike Felt et al. (Cambridge, MA: The MIT Press, 2016), 195–222.

23 Gina Neff and David Stark, "Permanently Beta: Responsive Organization in the Internet Era," in *Society Online: The Internet in Context*, ed. Philip N. Howard and Steve Jones (Thousand Oaks, CA: Sage, 2004), 173–88.

24 Dryzek, *Discursive Democracy*; Fischer, "Technological Deliberation," 294.

Dilemma 2: Dispelling Wickedness

The second dilemma is that there is no theory for dispelling the wickedness of societal problems. According to Rittel and Webber, ten properties define the character of wickedness (see the next section of this article for more on these). One means of understanding its more general nature is to consider the properties in relation to one another. Scholars Robert Farrell and Cliff Hooker, for example, state that wickedness derives from three sources: our limited capacity to fully grasp the impact of societal problems and our responses to them; the fundamental unpredictability of the effects of those responses; and the intertwined nature of human values and norms—which often conflict—with the problem definition and the responses to it.[20]

These problems align with a number of developments. First, the emergence of designerly thinking has been happening in parallel to another development: the halls of government have lost their place as the (natural) forum for societal problem solving.[21] Policy deliberation has been replaced by market forces, and the entrepreneurial spirit of innovation. One might even call this development the seventh characteristic of designerly thinking. Within this new context, thanks to the structure of the competitive market, the responses designerly thinking generates are flexible and adaptive. Practitioners do not need to grasp the full impact of the wicked problem nor exhaustively anticipate the ramifications of their proposed responses: the market establishes those limits.

Second, society itself has become the locus of experimentation,[22] which further emphasizes the conditional, open-ended character of responses to societal problems. The unpredictable nature of a response's impact is assessed and accommodated via ongoing user feedback loops. This development has had two effects. On the one hand, designerly thinkers are able to continuously iterate and improve upon product and service designs. But on the other, that room to maneuver has given rise to what some have called the "permanence of beta"—the introduction of a final result is endlessly postponed.[23] A sense of experimentation reigns.

Finally—again in line with the trend toward inviting members of the public to contribute to policymaking[24]—designerly thinking approaches invite customers, users, and stakeholders to participate in co-production, co-creation, deliberative planning, participatory planning, and so on. Human values and norms, conflicting or not, are in that way immediately incorporated in problem definitions and possible responses.

Whether designerly thinking can effectively deal with the wickedness of societal problems remains in doubt, as our discussion on the properties of wickedness later in this article will illustrate. Even if designerly thinking approaches might enable us to identify the short term consequences implied by a proposed response, they cannot help us assess the desirability of that response over the long term, where (once a certain threshold has been crossed) its effects may be profound. Moreover, incorporating stakeholder normativity into designerly thinking approaches may not preclude a response being rejected by some societal faction. No single normative outlook can satisfy every societal group, as we note in our discussion of the first dilemma. This absence of normative consensus is especially problematic in

25 Udo Pesch et al., "Energy Justice and Controversies: Formal and Informal Assessment in Energy Projects," *Energy Policy* 109 (October, 2017): 825–34, DOI: https://doi.org/10.1016/j.enpol.2017.06.040.

26 In their review of the ten properties, Rittel and Webber talk about "problem-solvers" and "solutions." Since there is no claim that designerly thinking can completely solve or resolve wicked problems (see our earlier note), we phrase our assessment in terms of "designers" finding appropriate "responses" to wicked problems.

27 For example, see Gerhard Pahl and W. Beitz, *Engineering Design: A Systematic Approach*, trans. Ken Wallace, Luciënne Blessing, and Frank Bauert, ed. Ken Wallace (London: Springer, 2013).

light of designerly thinking's experimental nature, which allows decision makers and designers to postpone liability for their choices.

Dilemma 3: Social Equity

The third dilemma is that there is no theory of equity between social groups that can guide professionals as they address societal problems. What this dilemma adds to the first is that there are no means of determining a fair distribution of the consequences of a response across societal groups.

This lack of a theory about fair distributions of consequences dovetails with the plurality and volatility of societal protest introduced above. The public collectively calls for equity and fairness, but its members may adhere to different notions of justice, and these are frequently in direct opposition to each other.[25] This clash is particularly manifest in the way people perceive themselves to be excluded, both as individuals and as societal groups. In a context characterized by plurality, the task of designing policy that does not exclude or negatively affect a certain group seems impossible.

Designerly thinking has in our view not developed an approach to dealing with the third dilemma. Hypothetically, that approach would provide a means of determining all the consequences of a response to a societal problem, plus a stakeholder in anticipating and adjusting the consequences to make them acceptable to every stakeholder in society. It seems unreasonable to expect designerly thinking capable of establishing such a model, given that no discipline seems to have a validated means for doing this.

Designerly Thinking and Wicked Problems

Rittel and Webber used the ten properties of wicked problems to help them assess whether planning approaches can be used to address those problems. In a similar vein, we will use them to assess whether designerly thinking can identify appropriate responses.[26] A number of caveats are important to note here. First, Rittel and Webber's list of properties is not a checklist—it does not allow us to assess a response as one that "ticks all the boxes." Instead, it is better to take each characteristic property as an entry point into a deeper understanding of the problem. Second, our representation of designerly thinking is an analytical reconstruction; empirical manifestations of its approaches may relate in many different ways to this conceptual inquiry. As such, the aim of our exploration is to develop an initial understanding about the extent to which designerly thinking is able to cope with wicked problems. An overview of our explorative assessment is given in Table 1.

1   There is no definite formulation of a wicked problem.
The first property of wicked problems is that their formulations lack the information required for us to adequately understand them and formulate responses to them. The problem formulation evolves in tandem with our exploration of possible responses to it.

Designerly thinking affords this co-emergence of problem and response. Although methods for incremental engineering design[27] may call for definitive problem formulations before designing starts, ever since Donald Schön's

Table 1   **Designerly thinking and the ten properties of wicked problems.**

Property	Designerly thinking	Remark
1. no definite problem formulation	can handle	co-evolution of problem and response
2. no stopping rules	can handle	satisficing and other criteria can determine satisfactory responses
3. solutions are not true or false	cannot handle	no theory to determine societal goodness and social equity
4. no tests for solutions	cannot handle	design testing does not exhaustively reveal social and long term consequences
5. solutions are one-shot operations	cannot handle	one single design can have significant long term consequences
6. no exhaustive set of solutions	can handle	grant designers the authority to identify responses
7. problems are unique	can handle	accept problems as unique to a given context
8. problems are symptoms of other problems	can handle	utilize insights to explore alternative responses
9. dependence of solution on explanation of the problem	can handle	take problem definition as an opportunity to explore alternative responses
10. no right to be wrong	cannot handle	designers are not liable for the consequences of their responses

28 Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (New York: Basic Books, 1983).

29 Kees Dorst and Nigel Cross, "Creativity in the Design Process: Co-evolution of Problem-Solution," *Design Studies* 22, no. 5 (2001): 425–37, DOI: https://doi.org/10.1016/S0142-694X(01)00009-6.

30 Herbert A. Simon, *The Sciences of the Artificial*, 3rd ed. (Cambridge, MA: The MIT Press, 1996).

31 Pieter Vermaas, Kees Dorst, and Clementine Thurgood, "Framing in Design: A Formal Analysis and Failure Modes," in *Proceedings of the 20th International Conference on Engineering Design (ICED15)*, vol. 3, ed. Christian Weber et al. (Glasgow: The Design Society, 2015), 133–42, available at https://www.designsociety.org/publication/37717/.

analysis of how design problems change alongside attempts to understand and address them,[28] the notion that the problem and response co-evolve[29] has become a central tenet of designerly thinking and core to methods for innovative design.

2   Wicked problems have no stopping rule.

For wicked problems there are no criteria to determine what *the*, or even *a*, proper response is. Since the understanding of wicked problems evolves and depends on the response directions under exploration, and since there are no criteria that enable us to understand wicked problems sufficiently, it is always possible to explore whether other response directions lead to better results.

The no stopping rule property does not pose much difficulty to designerly thinking. Engineering design has criteria to determine the end of a design process, such as time and money spent and the minimum requirements to be met. Designing is, moreover, aimed at finding *a* (satisficing) response, not *the* best response.[30] And one can extend designerly thinking to include criteria that help determine whether satisfactory responses have been found. The co-evolution of problem and response, for example, may lead to multiple results, but any final response will still need to be recognized as a satisfactory response to the (evolved) problem.[31]

3   Solutions to wicked problems are not true-or-false,
*   but good-or-bad.*

For wicked problems there are no criteria to objectively determine whether responses are correct or incorrect. Different groups may be stakeholders in the problem, and each group may judge a response as good or bad depending on their goals and values.

This normative diversity is explicitly taken into account in designerly thinking. Designers may chart social groups that are related to a problem, identify them as direct and indirect stakeholders, and explore their goals

32 For example, see Dorst, *Design Innovation*.

33 Bloomberg Business Staff, "Steve Jobs: 'There's Sanity Returning,'" *Bloomberg.com*, May 24, 1998, https://www.bloomberg.com/news/articles/1998-05-25/steve-jobs-theres-sanity-returning, online.

34 For example, see Renee Wever and Joost Vogtländer, "Design for the Value of Sustainability," in *Handbook of Ethics, Values, and Technological Design*, ed. Jeroen van den Hoven, Pieter E. Vermaas, and Ibo van de Poel (Dordrecht: Springer, 2015), 513–43, DOI: https://doi.org/10.1007/978-94-007-6994-6_20-1.

35 Oliver L. de Weck, Daniel Roos, and Christopher L. Magee, *Engineering Systems: Meeting Human Needs in a Complex Technological World* (Cambridge, MA: The MIT Press, 2016).

and values to gain a better understanding of the problem. Designers can then decide which goals and values they will use to identify responses. Direct users, for instance, are central in participatory design, while institutional design focuses on coalitions of powerful stakeholders.[32] Innovative designerly thinking takes distance from regular stakeholders—a notion epitomized in the now-famous statement by the late Apple CEO Steve Jobs, "A lot of times, people don't know what they want until you show it to them."[33] Innovative companies such as Apple, Google, and Tesla create their designs for tech savvy consumers, and those who want to keep up with cutting-edge innovations.

This focus on the goals and values of groups does not imply that designerly thinking always reconciles the interests of every stakeholder in a problem. As discussed in the previous section, designerly thinking currently does not provide a way out of the first and third of Rittel and Webber's dilemmas. Designers may, however, arrive at deeper understanding of a problem through background research and by seeking to experience the problem from the perspectives of different groups. The deeper understanding those experiments yield may include a better grasp of shared values and goals, but due to the lack of theories to frame societal goodness and social equity, designers cannot always establish the values and goals that every stakeholder group will agree on. Designers even typically ignore specific groups. Focusing on coalitions of powerful stakeholders means overruling others, and designing for tech savvy consumers cuts out those who have difficulty with new technologies.

4   *There is no immediate and no ultimate test of a solution to a*
     wicked problem.

When it comes to wicked problems, there is no way of validating the quality of an implemented response, since its repercussions over the long term cannot be predicted.

In design research, progress has been made toward improving the predictability of the consequences of new designs, for instance through extensive life-cycle assessment.[34] Yet, these predictions still hinge on assumptions that limit their validity. Moreover, tools for predicting the social effects of designs and understanding their impact on networks of existing technologies, social groups, and governance are less developed.[35]

An approach that designerly thinking has added to deal with unpredictable consequences consists of testing them among customers and society at large. Responses are, at that point, not fully developed—they are beta-versions, living labs, handed over to the wider public to test and report what repercussions they may have. Some may liken these handovers to societal experiments in disguise, even if they are framed as open innovation or open design practice.

5   *Every solution to a wicked problem is a "one-shot operation,"*
     because there is no opportunity to learn by
     trial-and-error—every attempt counts significantly.

Implementing responses to wicked problems will have irreversible consequences on society, especially when responses concern large scale public initiatives such as infrastructure redesign.

36 For example, see Nigel Cross, "Creative Cognition in Design II: Creative Strategies," in *Designerly Ways*, Chapter 5, 63–75; and Verganti, *Design Driven Innovation*. For an evaluation of the emphasis on expertise in designerly thinking, see Pieter Vermaas, "A Logical Critique of the Expert Position in Design Research: Beyond Expert Justification of Design Methods and towards Empirical Validation," *Design Science* 2 (2016): e7, DOI: https://doi.org/10.1017/dsj.2016.6.

37 For example, see "Design Thinking Bootcamp Bootleg," *d.school.stanford. edu*, accessed April 13, 2020, https://dschool.stanford.edu/resources/design-thinking-bootleg.

38 Also see Evan Barba, "Cognitive Point of View in Recursive Design," *She Ji: The Journal of Design, Economics, and Innovation* 5, no. 2 (2019): 147–62, DOI: https://doi.org/10.1016/j.sheji.2019.04.003.

39 Schön, *Reflective Practitioner*.

Designerly thinking does not provide a way out of this irreversibility of responses to wicked problems. Consumer products such as the iPod or smart phone may initially have been gadgets with only a limited impact on the consumers who freely chose them. Yet by their success users cannot ignore them anymore, or stop using them. Both products had consequences beyond their impact on early adopters—the advent of the smartphone ushered in a new technical and social age of digital communication. For infrastructure this point holds even more. Smart cities are not just open innovation projects but establishing sensory infrastructure that will stay for long.

6   *Wicked problems do not have an enumerable (or an exhaustive describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated in the plan.*

There are no criteria we can use to prove that all possible response directions have been identified. Any responses considered will depend on the judgment and creativity of the people addressing the problem. And the selection of specific responses depends on the expertise of the designers and their ability to create trust in the responses.

Designerly thinking embraces this property of wicked problems and their consequences. Given that no complete characterization of the responses to a wicked problem can exist, designers can use their expert judgement and creativity to identify responses to wicked problems and convince the stakeholders involved to adopt those responses. Steve Jobs's statement cited earlier illustrates this convincing aspect of designerly thinking. And in the literature, innovative design case studies are typically related biographically, often with much admiration about the expertise of the designers that arrived at the given outcomes.[36]

7   *Every wicked problem is essentially unique.*

Wicked problems do not come in classes—this means that we cannot build on existing responses to similar problems when exploring responses to novel problems. Designers therefore have to be sensitive to the particulars of a problem before attempting to discern a direction for a response to it.

This property is incorporated into designerly thinking as a basic approach to innovation. Designers should explore the context of problems and experience the problems from the perspective of the people who have them. And the step of choosing a specific response is, in designerly thinking, an act of interpretation, of adopting a specific point of view.[37]

8   *Every wicked problem can be considered to be a symptom of another problem.*

Wicked problems are symptoms of other "root" problems. Such root problems can be "higher level" problems—crime in the streets can be taken as a symptom of general moral decay, for instance. The search for the root of a wicked problem may never end, since there are no logical basis we might use to limit the effort.[38]

In designerly thinking, seeing problems as related to other problems is

40 Farrell and Hooker, "Design, Science and Wicked Problems," 681.

common and that point of view is actively promoted. Schön reports that a problem's systemic boundaries are flexible and can be broadened to enable further exploration of response directions.[39] Designerly thinking is also lauded for its capacity to arrive at game changing outcomes and disruptive innovations. To achieve the latter, designers do not limit themselves to responses that merely address a problem, they aim to create wider impact. This wider impact may cause new problems, yet in designerly thinking these need not be seen as problems but as tokens of success.

9   *The existence of a discrepancy representing a wicked problem*
     can be explained in numerous ways. The choice of explanation
     determines the nature of the problem's resolution.

The existence of wicked problems can be explained in different ways, and each explanation leads to a different response. And since it is not possible to put responses to the test, every explanation and response is permissible. Whichever explanation and response is adopted depends on the preferences, or world view, of the designer.

This property is embraced in designerly thinking. Just as with the sixth and eighth properties, we interpret it in terms of the freedom designers naturally have—the freedom to innovate. The world view adopted to identify responses can be a neoliberal one—aimed at unlocking the future and generating financial gain—but, increasingly, the lens of social engagement has been used to further goals such as sustainability and a better world for all.

10   *The planner has no right to be wrong.*

Wicked problems do not allow designers to come up with responses that turn out to be wrong. Implementations of responses to wicked problems have real-life consequences, making the designers liable for their choices.

This idea seems not to have sunk in with designerly thinkers, and has not received much attention in recent work. Farrell and Hooker say it is unclear whether this property truly constitutes a property of wickedness, as its relationship to the other nine properties may not be fully coherent.[40] They may be right, yet the tenth property still emphasizes the need for actors who make decisions pertaining to society to be held accountable. Designerly thinking however seems to allow designers to be exempted from this public scrutiny.

One clear manifestation of this is how it has become virtually impossible to hold large companies liable for their actions. The disparity in resources is just too great, and the networked character of companies such as Apple, Google, and Microsoft fosters monopolistic tendencies. Less salient, but certainly pervasive, is that the experimental label adopted in designerly thinking renders designers invulnerable to public scrutiny. New responses are introduced as experiments in which consumers willingly take part, while there may be no mechanisms for holding designers responsible for any mishaps.

Conclusion

In 1973, Rittel and Webber formulated three dilemmas faced by planning when addressing societal problems. One of these dilemmas is that societal

41   Udo Pesch, "Engineers and Active
     Responsibility," *Science and
     Engineering Ethics* 21, no. 4 (2015):
     925–39, DOI: https://doi.org/10.1007/
     s11948-014-9571-7.

42   Eefje Cuppen et al., "Normative Diversity,
     Conflict and Transition: Shale Gas in the
     Netherlands," *Technological Forecasting
     and Social Change* 145 (August 2019):
     165–75, DOI: https://doi.org/10.1016/j.
     techfore.2016.11.004.

problems are wicked problems, and Rittel and Webber argued in detail that planning is not equipped to resolve wicked problems. Designerly thinking is regularly presented in the literature as capable of responding to wicked problems. In this article we reviewed this claim, concluded against it, and argued more generally that, at present, designerly thinking does not resolve any of Rittel and Webber's three dilemmas.

Rittel and Webber used their critique of planning to interpret the loss of trust in professionals in the 1960s, and the related loss of confidence among professionals in planning. In this article, we note that in the 2010s a general sense of distrust in the way current professionals respond to present-day problems also exists, including in the people who address societal problems by design. We do not conclude from our critique of designerly thinking, however, that designers should lose confidence in their thinking as well. We see that this confidence is present among many designers and others, and we believe designerly thinking is an effective and viable approach to addressing societal problems. Yet we believe that our results justify further development in designerly thinking approaches, and in the way it is presented more broadly. We will end this article with four suggestions for improvement.

First, it is better not to present designerly thinking as the approach to resolving wicked problems, and hence our societal problems, unconditionally. By lacking a theory of societal goodness, designerly thinking (as any other approach to societal problems) does not escape Rittel and Webber's first dilemma. Hence, there may be societal problems where designerly thinking is incapable to determine goals and aims that can be endorsed by all social groups.

Second, designers should recognize their responsibility for the consequences of the designs they generate. Beta testing and using living labs shifts the responsibility for potentially negative consequences away from the designers on to the shoulders of the users. Moreover, designerly thinking advocates multidisciplinary teams, which may give rise to the so-called problem of the many hands, meaning that individual designers may relinquish their individual responsibility by deferring to the group. Given these issues, designerly thinking should look for possibilities to re-appropriate the responsibility for its products and the allocation of responsibilities within teams, for instance, by creating new models for liability and by stimulating responsible practices within design teams.[41]

Third, potential eruptions of public anger about responses to societal problems proposed by designers should not be conflated with societal distrust in designerly thinking. Designerly thinking is not immune to Rittel and Webber's third dilemma, and so its proponents must accept that it will not always arrive at a fair distribution of a design's potential consequences. Public anger should be received as an invitation to discuss these consequences and their societal equity.[42]

Fourth, designerly thinking should extend its focus from the problem's front end to its back end, where the consequences of designs surface. Just as software designers and chemical engineers remain involved when an application launches or an industrial plant begins to run, designers should assess the impact of their responses to societal problems as and when they are implemented. Kees Dorst has recently argued that when it comes to social

43 Kees Dorst, "Design beyond Design,"
    *She Ji: The Journal of Design, Economics,
    and Innovation* 5, no. 2 (2019):
    117–27, DOI: https://doi.org/10.1016/j.
    sheji.2019.05.001.

design, designerly thinking should no longer be taken as project-like in its approach—by starting with a problem and ending with a response—but more as a set of activities that aim at the continuous transformation of systems in the right direction.[43] Adopting this perspective on designerly thinking would drive designers towards a greater investment in their analysis of and professional commitment to the repercussions of their design responses. That level of ongoing analysis and concern would only strengthen societal trust in designerly thinking.

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There are no conflicts of interest involved in this article.

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