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RESEARCH NOTE

The enduring challenge of 'wicked problems': revisiting Rittel and Webber

Kate Crowley[1] · **Brian W. Head**[2]

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Abstract There is, in the twenty-first century, an intense interest in the nature of wicked problems and the complex tasks of identifying their scope, viable responses, and appropriate mechanisms and pathways towards achieving improvement. This preoccupation is timeless, but the discussion over several decades has benefited from Rittel and Webber's (Policy Sci 4(2):155–169, 1973) path breaking conceptualisation of wicked problems *and* the political argumentation needed to resolve them. This review revisits Rittel and Webber's work and its enduring significance, reflecting upon its broad uptake and impact in the policy sciences, an impact that continues to grow over time. We revisit how the classic 1973 paper came to be published in *Policy Sciences*, its innovative depiction of social problems, its rejection of rationalistic design, its acknowledgement of the subjectivities involved in problem identification and resolutions, and the consequent need for argumentative-based solution processes. We find great resonance in the paper with contemporary problem solving preoccupations, not least that the political context is crucial, that argumentation must be transparent and robust, and that policy interventions may have consequences that cannot be easily controlled in open and highly pluralised social systems.

Keywords Wicked problems · Horst Rittel · Melvin Webber · Systems theory · Policy solutions

✉ Kate Crowley
Kate.Crowley@utas.edu.au

Brian W. Head
brian.head@uq.edu.au

[1] School of Social Sciences, Politics and International Relations, Private Bag 22, Hobart, TAS 7000, Australia

[2] School of Political Science, University of Queensland, St Lucia, QLD 4072, Australia

The impact and origins of 'wicked problems'

Horst Rittel and Mel Webber's paper 'Dilemmas in a general theory of planning' (1973), which introduced the concept of wicked problems to a general audience, is the most highly cited paper published in *Policy Sciences.* It had achieved over 3137 citations and 13,000 downloads by 2017. Google Scholar, based on a wider set of sources, recorded 10,682 citations to late 2017. The paper is highly significant on three *Policy Sciences* indicators: *citations* and downloads; an increasing *trajectory* of citations, which achieved double figures annually in the 1990s, and over 100 annually from the late 2000s; and a strong cross-disciplinary *uptake* across a broad range of journals.[1] Of the fifty journals with papers citing Rittel and Webber, there are five times as many in environmental journals (focused, for example, on environment, marine and oceans, sustainability, energy, and cleaner production) than in systems and design, or policy and planning journals. The *Policy Sciences* journal alone includes twenty-two papers to date that cite Rittel and Webber in two key areas: (i) policy theory, design, and practice and (ii) environmental problems, governance, management, conflict, and reforms. The only such contribution to substantively extend the notion of wicked problems, in a theoretical and applied sense, is again one with a broad environmental focus, Levin et al.'s (2012) paper on 'Overcoming the tragedy of super wicked problems'.

The story of how such a paper came to be published, and how its themes were anchored in the academic debates of the late 1960s, has been sketched in several reflections published by their colleagues and students. It is clear that Horst W. J. Rittel was the principal architect of the 'wicked problem' conception (Churchman 1967; Protzen and Harris 2010). He was a design theorist at the University of California, Berkeley, who taught rather than practised design and architecture; and he also had interests in broader design aspects of planning, engineering, and policymaking. As a 'design planner', he linked the fields of design and politics and, with his University of California team, instigated 'first-generation' and then 'second-generation' design methods, the latter drawing critical attention to the politics of design and the political argumentation needed to tame wicked problems (Rith and Dubberly 2007). He first proposed the notion of wicked problems in a seminar in 1967 to refer to 'that class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision-makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing' (Churchman 1967, B-141). He presented these ideas to students and colleagues in courses and seminars, including a paper to the Panel on Policy Sciences at the American Association for the Advancement of Sciences in Boston in 1969, and again in Norway in 1971, before publishing a paper on planning crises, design methods and wicked problems in 1972 (Rittel 1972) and the classic paper the following year (Rittel and Webber 1973).

The 'first-generation' iteration of design methods that Rittel helped establish in the early 1960s had adopted a rigorous, rational, scientific, system- based approach, but had morphed by the late 1960s into a 'second-generation' iteration with a cybernetic emphasis upon communication and feedback (Rith and Dubberly 2007). The turbulent context in which 'Dilemmas in a general theory of planning' was published reflected the contradiction between the achievements of technological systems (where rationality, order and control allowed NASA to put a man on the moon) and the evident social complexities and policy chaos of the USA in the face of relentless social challenges (Wildavsky 1973). The

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seminar at which Rittel proposed the notion of wicked problems was organised by systems theorist West Churchman (1967, 1968), who at that time was exploring ways to transfer any lessons from managing the space programme technology into the contrasting 'world of urban problems' (Skaburskis 2008, p. 277). The ten differences between scientific and social problems that Rittel listed at the 1967 seminar were tested and refined in Rittel's teaching, and with only slight adjustments formed the complex definition of wicked problems in 'Dilemmas in a general theory of planning'. Melvin M. Webber, who was then a colleague teaching at the Institute of Urban and Regional Development, University of California, Berkeley, attended the seminar and was also of the view that rationality was a myth in the planning context. Skaburskis reports that Webber spent years trying to nudge Rittel into publishing the wicked problems paper in a US journal before they finally collaborated in writing the 1973 version (Skaburskis 2008, p. 277).

Dilemmas in a general theory of planning

Rittel and Webber's basic aim was to reject both a systems-based, rational-scientific, grand theory of planning *and* the 'classical paradigm of science and engineering' as a basis for framing 'social science' and 'modern professionalism'. Their motive for revisiting and redefining the role and capacity of planning theory and the planning profession was the social dissent, riots, upheavals, and protest movements that radically disrupted America in the 1960s and 1970s. They argued that social problems could no longer be addressed by assuming, as science does, that they are 'tame' or 'benign', or definable, separable, and solvable, and thus able to be characterised, analysed and planned for by adopting a rational systems perspective. Wicked problems, which include 'nearly all public policy issues' (1973, p. 160), are indeed the opposite. They are 'ill-defined' and 'malignant'. They cannot be 'solved', but are reliant instead upon 'elusive political judgment for resolution…over and over again' (p. 160). Whilst systems theory had utility as an analytic approach in the 1950s and 1960s, it was clear to Rittel and Webber that it needed to be broadened conceptually to account for more diverse 'systemic networks' that are 'interacting, open' and 'interconnected' (p. 156; p. 159; Churchman 1979). Furthermore, social upheaval was reflective of the politicisation of numerous 'subpublics' 'pursuing a diversity of goals' inspired by varying 'valuative bases', and a shift, therefore, away from a unitary 'American way of life' towards 'numerous ways of life that are also American' (p. 156; 167–8). 'The process of argumentation' advocated by Rittel and Webber 'is (therefore) the key and perhaps the only method of taming wicked problems' (Rith and Dubberly 2007, p. 73).

Wicked problems defined—Rittel and Webber 1973

Proposition 1 There is no definitive formulation of a wicked problem.

Proposition 2 Wicked problems have no stopping rule.

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

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

Proposition 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.

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

Proposition 7 Every wicked problem is essentially unique.

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

Proposition 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.

Proposition 10 The planner has no right to be wrong.

In summary, as Mel Webber wrote several years later: 'The classical model of rational planning is fundamentally flawed. It assumes widespread consensus on goals, causal theory sufficiently developed as to permit prediction, and effective instrumental knowledge. None of these conditions pertains' (Webber 1983). Although Rittel and Webber made challenging contributions to systems theory and to recognition of the complexity of social networks, interconnections and nodes, the subsequent heavy citation of their paper focused on their characterisation of wicked problems, a model which has resonated for decades.

A critique rapidly emerged from philosopher Archie Bahm (1975) who argued that the authors found fault in the nature of social problems rather than in professional competence, thus 'causing these problems to become more difficult to solve' (p. 103). Bahm argues that there is no inherent incapacity to define social problems, providing there is an understanding that problems are: (a) limited to some portion of a larger problem; and (b) defined in ways that recognise their context (p. 104). Furthermore, Bahm argued that lack of research funding might be the main barrier to the discovery of 'stopping rules' for social problems. According to Bahm, the 'not true-or-false, but good-or-bad' distinction makes no sense. He claims that *every* problem is unique, not just every wicked problem; and that the existence of many failed 'wicked' solutions does not mean that a problem cannot be solved (p. 105). A more generous review was provided by Catron (1981) who applauded Rittel and Webber for 'calling attention to some very fundamental deficiencies in our approach to social problems' (p. 13). He saw the key achievements of their 1973 paper as *ontological* for identifying the existence of wicked problems, *epistemological* for challenging our ability to understand them, and *ethical* for questioning our ability to act rightly in relation to them (pp. 13–14). But he was less inclined to dismiss the utility of scientific methods.

The debate about the viability of a general theory of planning continued, with Alexander (1998) advocating a contingency framework, integrating four different views of planning: 'deliberative rationality, communicative practice, coordinative planning and frame setting' (p. 667). However, he and others, including Webber (1983) himself, did not explicitly utilise the terminology of wicked problems. Many authors developed similar ideas using other adjectival forms such as 'messy' or 'intractable' or 'unstructured' or 'contested' problems. Nevertheless, the language of 'wicked' accelerated markedly, so that by 2010, for example, there were as many citations of Rittel and Webber's paper in 1 year as there had been across the entire decade of the 1990s. Frank Fischer (1993) was the first *Policy*

Sciences author in the 1990s to substantively apply the wicked problem concept, arguing that 'wicked' or 'intractable' problems 'seem only to respond to increased doses of participation' (p. 172). Fischer aligned wicked problems with 'recalcitrant', 'undisciplined', 'uncontrollable' and 'unmanageable' problems (p. 175) and suggested that collaborative citizen-expert inquiry could hold the key to solving a specific category of contemporary policy problems.

By the 2000s, the 'wicked context' of contemporary social problems was widely acknowledged. Roberts (2000) noted three common sets of coping strategies: *competitive* (where power is dispersed but contested), *collaborative* (where power is dispersed but not contested), and *authoritative* (where power is not dispersed). Constructivist interpretations became well established in the literature (e.g. Hajer 2003), paving the way for a new wave of reflective analysis that remains active today. For example, Nie (2003, p. 309) distinguished conceptually between 'wicked by nature' and 'wicked by design', with the latter generated by political processes, in the sense that apparently 'straightforward policy problems can turn wicked when they are used by political actors as a surrogate to debate larger and more controversial problems' (Nie 2003, p. 314).

'Wickedness' and environmental policy analysis

Over the last two decades, recognition of Rittel and Webber's notion of intransigent, wicked problems that require complex, networked, and communicative solutions has become mainstream. Environmental policy analysis, both conceptual and applied, has dominated the research output that has utilised the wicked problems notion, including case studies and theoretical re-interpretation, none more significant than by Levin et al. (2012) on 'super wicked' global issues. Environmental problems are seen as classical examples of wicked because they defy easy resolution (McBeth and Shanahan 2004, p. 319), each one being uniquely complex (Ludwig 2001, p. 759), and located 'at the boundaries of natural and social systems' (Van Bueren et al 2003, p. 193; Dryzek 1997). Furthermore, environmental conflict is typically 'value-based' (McBeth and Shanahan 2004, p. 322) so that in many cases not even the 'strongest possible evidence' (Nilsson 2008, p. 336) can settle differences between stakeholders (Van de Kerkhof 2006) or avoid triggering major political conflicts (McBeth and Shanahan 2004; Nilsson 2006, p. 241). Scientific knowledge matters less in these circumstances than the ability to negotiate politically, under conditions of uncertainty, and to work effectively in networks and at the boundaries between science, stakeholders, and politics (Hajer 2003). It is hard to extinguish such conflict when it is manufactured, or wicked 'by design'. In this case, wickedness is actively designed into existence, as political or media strategy for example, by actors whose interests are benefited by this approach (Nie 2003, pp. 327; 334; McBeth and Shanahan 2004, p. 322; Shanahan et al. 2008, p. 134).

Environmental policy research thus highlights both the enduring challenge of wicked problems and the enduring significance of 'wickedness' as a frame for policy analysis (e.g. Durant and Legge 2006). The majority of contemporary environmental policy research simply acknowledges wickedness as the context for specific policy analysis (Nilsson 2006; Nilsson et al. 2008). However, Van Bueren et al. (2003) go further by interrogating the nuances in wickedness in terms of the varying circumstances of *cognitive, strategic, and institutional* uncertainty. Because interdependent actors have a collective action problem, they argue, the uncertainties underlying and shaping wicked problems can only be reduced

through network-based 'cooperation', thereby 'enhancing and intensifying interactions between stakeholders' (pp. 193–4; 211). There are echoes here of the 'argumentative process' in action just as Rittel and Webber (1973, p. 160) had imagined it. Balint et al. (2011) suggest that understanding different problem types is fundamental to constructing effective strategies for improving environmental policies and natural resource management programmes. However, much of the environmental policy analysis is pessimistic, like McBeth et al.'s (2010) identification of wicked policy arenas which repeatedly cycle through various policy venues offering varying solutions but rarely solving problems. The super wickedness of climate change is all the more irrational and 'tragic' because 'time is running out; those who cause the problem also seek to provide a solution; the central authority needed to address it is weak or non-existent; and, partly as a result, policy responses discount the future' (Levin et al. 2012, p. 123).

The notion of globally significant super wicked problems was not anticipated by Rittel and Webber, but this wider level of challenge has led Varone et al. (2013) to propose integrating 'boundary spanning', 'territorial institutionalism', and 'multi-leveled governance' to create expanded spaces to deal with them. After all, climate change, and economic, security, health and immigration issues all function 'in different institutional contexts as well as levels of governance' (p. 311). By contrast, Rittel and Webber's focus is domestic pluralism and how government can respond to multiple actors operating within increasingly open systems and with conflicting views about complex problems and their solutions. The governance arrangements for handling this challenge were not elaborated by Rittel and Webber, but four decades later Varone et al. identify the emerging importance of 'functional regulatory spaces' that reflect the need for multi-dimensionality and polycentricity in State action (2013, p. 330). Rittel and Webber would likely see this as an extension of their support for open, communicative, systemic networks. They were certainly more focused on capturing the new politics of diversity (1973, p. 167), and with it the rejection of traditional expertise (p. 169), than on devising new institutional arrangements—an exploratory task which they saw as a key challenge for actors in diverse situations. However, their concern to encourage collective puzzling towards viable (rather than 'correct') policy solutions remains of great relevance today.

The wicked solutions 'industry'

Rittel and Webber's dual emphasis on the key features of wicked problems, together with their provocative view about the impossibility of 'solving' such problems, helps to explain the enduring and growing interest in their paper over several decades. They provoked the emergence of an intellectually robust wicked problems solutions 'industry', including both supporters and critics of the original framework.

Rittel and Webber were somewhat bleak about the capacity for wicked problem solving. As they saw it, citizens and policymakers are faced with unique public policy problems, with no optimal design solutions (1973, pp. 155; 158), indeed no 'solutions' at all, beyond what can be delivered through political judgment (p. 160) and that in turn would be variable owing to interests, values and ideologies (p. 163). Systemic analysis based upon the rationalist policy stages or cycle approach ('understand the problems or the mission', 'gather information', 'analyse information', 'synthesise information', 'work out solution') would not work. Neither would the drift of incrementalism, 'the policy of small steps',

because working in incremental fashion may cause new problems at the micro-level whilst failing to improve causal relations at the macro-level (p. 165). The only viable solutions would be to: (i) acknowledge the 'open systems' context, (ii) keep an open mind on solutions, and (iii) adopt 'an argumentative process in the course of which an image of the problem and of the solution emerges gradually among the participants, as a product of incessant judgment, subjected to critical argument' (p. 161).

Rittel and Webber did stress that '(t)he analyst's "world view" is the strongest determining factor in explaining a discrepancy and, therefore, in resolving a wicked problem' (p. 166), so the contemporary scholarly focus on crafting better processes for collectively developing improved outcomes would not surprise them (see for instance Koppenjan and Klijn 2004; APSC 2007; Head 2017; Xiang 2013; Head and Alford 2015). They might take issue, however, with solutions based upon either social engineering-style analysis or alternatively a non-strategic 'incrementalism' (p. 165), the former for assuming too much rationality under circumstances of contestation and ambiguity, and the latter for underestimating the scope for positive collaborative leadership. They would applaud collaborative capacity building (Weber and Khademian 2008) and constructive conflict management (Cuppen 2012) as likely solution pathways for wicked problems, but not deliberative dialogue nor shared understandings (Rasio and Vartiainen 2015) given their advocacy of argumentative collaboration. They would also baulk at the notion that the essential elements of wicked problems could be definitively revealed through quantitative data analysis, because wicked problems are 'unknowable' with 'no criteria for sufficient understanding and because there are no ends to the causal chains that link interacting open systems' (p. 162). Most significantly for evidence-based theorists (Parkhurst 2016), the wicked problems thesis rests upon the notion that the emergence of fragmented 'subpublics' (p. 167) has injected competing and contested values into policy debates, thereby undermining the evident certainties and reputational standing of professional knowledge. Indeed Rittel and Webber relegate experts to the status of 'players' rather than arbiters in political games (p. 169).

Some of Rittel and Webber's pessimism was generated by their critique of the intellectual fallacies of addressing wickedness and complexity through the lens of rationalist systems theory. They announced the need for second-generation systems thinking which was based on argumentative methods. The modern policy sciences literature has moved well beyond old-style systems theory and today pursues a broad range of argumentative, deliberative, collaborative, and network-based approaches to resolving problems and improving outcomes (Head and Crowley 2015). A conference at Berkeley to commemorate the fortieth anniversary of the 1973 article provided an opportunity for three generations of scholars to consider the legacy. This conference generated a special issue on wicked problems, in which the contributors broadly supported various versions of adaptive management and collaborative rationality, as a contemporary strategy for working with wicked problems (Head and Xiang 2016; Innes and Booher 2016). Another recent conference gave rise to a number of papers arguing that the insights of the 1973 paper should be connected up with the modern literature on governance, policy design and innovation, implementation, and the politics of crisis management. There was also strong support for a greater focus on policy learning and greater synergies between academic and practitioner forms of knowledge. The field of 'design' thinking, in its many forms, has also been heavily influenced by the notion that researchers and practitioners are always 'in design school'—learning from experience, and across disciplinary boundaries, the skills needed to facilitate bottom up, locally oriented, place-centric, collaborative solutions to wicked problems.

Conclusion—Rittel and Webber revisited

In terms of their own standing as theorists of both problems and solutions, Rittel and Webber never did write the 'constructive companion piece' (Catron 1981, p. 14) on solution-making that they reportedly had in mind to complement the problem orientation of 'Dilemmas in a general theory of planning'. Rittel's 'second-generation' design method, based on the notion that all design and planning should be seen as a process of transparent political argumentation, was not widely taught, although his design rationale became very influential with colleagues in niche fields (Rith and Dubberly 2007, pp. 73–74). Mel Webber, as a planning professor, remained an original, visionary, and controversial thinker (Bendixson 2007), who resisted central planning models in favour of 'fostering of multiplicities of potential outcomes compatible with the wants of plural publics' (Webber 1983, p. 89).

What is often forgotten is that in 'Dilemmas in a general theory of planning', Rittel and Webber emphasised 'the growing pluralism of the contemporary publics' (p. 167) as the context and setting for problem solving activities. Their paper concludes with the inherent challenges, still relevant to the policy sciences today, of theorising the nature of 'societal goodness', the means of dispelling wickedness, and the resolution of 'the problems of equity' in a pluralistic society (p. 169). There is a bright future for wicked problems research, not simply in redefining wicked problem analysis in contemporary terms, and expanding solutions-oriented empirical research, but in revisiting Rittel and Webber's fundamental engagement with rationalism, closed and open systems, politics in society, pluralism and challenges to the efficacy of professional expertise. If researchers do not appreciate this, then they do not understand wicked problems at all.

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