Designing Solutions to Wicked Problems:

A Manifesto for Transdisciplinary Research and Design

Edited by Terry Cutler

Proceedings from the Designing Solutions to Wicked Problems symposium held on the 9th and 10th November 2009 at the Melbourne Town Hall with a compendium of provocations and commentaries.
'Designing solutions to wicked problems' is a clear, simple title that summarises the nature of the problem nicely. Nevertheless, this compact title leaves a host of questions to be unpacked.

The core issue of the problem involves understanding a class of problems known as ‘wicked problems’. Horst Rittel identified this class of problems in the 1960s with profound impact in the planning professions and social sciences. The wicked problem was ‘that class of social system problems which are ill-formulated, where 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. The adjective “wicked” is supposed to describe the mischievous and even evil quality of these problems, where proposed “solutions” often turn out to be worse than the symptoms.’

Rittel and Melvin Webber elaborate on the concept of the wicked problem in two famous papers, providing ten criteria defining the nature of wicked problems, as already outlined by Terry Cutler (see pages 111–12).

Shum Buckingham emphasises the nature of wicked problems embedded in professional tasks, writing that wicked problems ‘cannot be easily defined so that all stakeholders agree on the problem to solve; require complex judgments about the level of abstraction at which to define the problem; have no clear stopping rules; have better or worse solutions, not right and wrong ones; have no objective measure of success; require iteration – every trial counts; have no given alternative solutions – these must be discovered; often have strong moral, political or professional dimensions.’

Why do wicked problems matter? The answer is that the vast majority of world systems are now subject to class-two evolution – including the ecological and physical systems that govern life on the planet. Buckminster Fuller describes design as the difference between class-one evolution and class-two evolution. Class-two evolution involves ‘all those events that seem to be resultant upon human initiative-taking or political reforms that adjust to the change wrought by the progressive introduction of environment-altering artifacts’.

Today, we design artefacts, processes and systems in a world increasingly influenced by the planned and unplanned consequences of our work. We plan and create wicked problems as a natural consequence of projects undertaken by the vast army of designers, planners, engineers, architects, technologists and similar professionals now working to execute the myriad decisions of politicians, legislators, voters and managers that determine the goals that different organisations will pursue. One argument for the importance of design – and the danger of wicked problems – is the increasing number of areas that are now subject to human initiative. The vast range of technologies that surround us mediate most of the human world and influence our daily lives. These include the artefacts of information technology, mass media, telecommunication, chemistry, pharmacology, chemical engineering and mechanical engineering, along with the designed processes of nearly every service industry and public good now available other than public access to nature. Within the next few years these areas will come to include the artefacts of biotechnology, nanotechnology and other advanced hybrid technologies.

As I have written elsewhere, ‘The artificial world increasingly affects the natural world in class-two evolution, and the world can grow worse as well as better. Design now plays a role in the general evolution of the environment, and the design process takes on new meaning. As designers take on increasingly important tasks, design has greater effects and wider scope than ever before. While the success of evolutionary artifacts and craft traditions suggests that many human beings are able to do a competent job of design, design failures are nevertheless common. The most common reasons include lack of method and absence of systematic and comprehensive understanding.'
These involve gaps in knowledge and preparation. It is here that research and theory play a role.\(^{25}\) Many of the problems we face today are linked in regressive chains of problems in which the interaction of political, economic and scientific factors make solutions nearly impossible. These are situations where apparently sound economic solutions have disastrous long-term consequences or situations where scientific solutions are politically unacceptable to key decision-makers. In addition there are many cases where our effort to solve old problems simply shapes new problems. The massive Encyclopedia of World Problems and Human Potential (Union of International Associations, 1994–95) identifies over 12,000 world problems organised in 320 linked hierarchies and more than 120,000 relationships of seven types.\(^{26}\) It also identifies 836 loops of problems as ‘vicious problems’, a class of problems comparable to wicked problems. The encyclopaedia is available online at no cost, presenting excellent examples of the nature of this class of problems and a sense of what is at stake.

Wicked problems matter because many threaten our wellbeing and development as a species – and some threaten our existence – while the worst wicked problems threaten the ecosystems and life systems on which we depend.

Catastrophic climate change represents the most visible current example of a massive wicked problem. Opinions differ on the nature of the threat of catastrophic climate change. Despite this, the earth will survive as a physical system of some kind. The contested question is whether humanity can survive the new configuration of the planetary ecosphere that may result. We are already experiencing serious problems through the extinction of many species of animals and plants that have enabled our evolution and development; although such problems involve factors such as over-fishing, changing forest to farmland and taking agricultural land out of food production to grow biofuels. This is not the place to address these problems; I give them as examples of wicked problems that show why they matter very much indeed.

Understanding the nature of wicked problems – and finding ways to solve them – takes on a major dimension in situations such as this.

**The nature of wicked problems**

We can model the class of wicked problems in a trivial example. Imagine that three people want to eat dinner together at a restaurant. Each of them has a different preferred restaurant. If each insists on eating at a restaurant different from the other two, and none wishes to change his or her preference, they face a wicked problem. Trivial as this example is, this kind of clash of values, opinions, preferences and decisions lies at the core of many larger and far more serious problems.

While trivial wicked problems may be unsolvable, problems with wicked dimensions can sometimes be rendered tame. In the 1950s and early 60s sending a manned spacecraft to the moon with live passengers and bringing them back to earth in good health may have been a wicked problem. If it wasn’t wicked it came close, and it involved many wicked dimensions – scientific, political and economic. Following the brief age of successful lunar exploration the space agency that sent humans to the moon lost a great deal of its capacity. For political and economic reasons, and possibly for technical reasons, resuming lunar exploration may once again be a wicked problem.

One challenge in our effort to understand wicked problems is the possibility that some problems may be partly wicked and partly tractable. Understanding these reasons and moving to resolve them are crucial steps forward in dealing with wicked problems. The history of science provides examples of problems that may or may not have been wicked at different times. It was the success of
the scientific method in solving apparently intractable problems that gave so many people such hope for science and technology. In some cases, problems have been so puzzling that experts have occasionally been uncertain as to whether there really was a problem to be solved – one of the key criteria of a wicked problem. The story of how Sir Andrew Wiles solved Fermat’s Last Theorem offers a good example of how a researcher solved a possibly wicked – and certainly intractable – problem. Classic works on problem solving such as How to Solve It or The Mathematician’s Mind demonstrate the heuristics and development of human invention. Nevertheless, as the three diners demonstrate in my trivial example, wicked problems often remain intractable for reasons that defy science.

Wicked problems and design

From time to time one hears it said that design problems are inherently wicked. This is often true in the sense that selecting design solutions involves reaching a decision on goals and the nature of the problems that must be solved to reach those goals. In that sense the large frame of design is well suited to solving wicked problems. But it is often false in equal measure. First, one rarely knows whether one has solved a wicked problem. Designers move on quickly following the implementation of as much of a solution as a client will pay for, so the problem they may believe has been solved may simply be passed on to someone else for another iteration. Second, it often happens that a failed design solution wins prizes – and design prizes can be misleading, in that they indicate taste preferences rather than solutions that have been tested and scrutinised by experts. Third, designers, many trained in the artisan crafts guild tradition, simply assert, as guild masters do, that they have solved a problem – even when others can easily see that the problem has not been solved.

My favourite example of this was a case where a design company created a brand for dairy products in a market still protected by monopoly legislation during the run-up to the end of monopoly status. Dairy products commanded enormous shelf-space in all food stores in the nation concerned. At the time of the branding exercise one company controlled the entire national market with a product range that most consumers used in nearly every meal and many snacks. A design company created a brand for this product range, a brand programme that seemed acceptable but hardly outstanding. Six months after launching the brand the design company and the still-protected monopoly undertook a study to learn that the new brand had 98 per cent brand recognition. The monopoly claimed that this demonstrated the popularity of their brand, while the design firm touted the success of their work as a brand-building company. At the time of the study, there were no competing brands – and any brand or design programme used to identify a successful monopoly product used several times daily by over 90 per cent of the population would achieve massive band recognition.

While brand building and corporate identity are classic examples of wicked problems, one reason that designers seem to believe they are well suited to solving wicked problems is ignorance. They believe they have solved problems when they have merely made choices, and they believe their choices have been successful when the reasons for success are entirely extraneous to their work.

Nevertheless, because choices can appear to solve problems that have defeated science and technology, designers often feel that they are especially suited to solving wicked problems. In a mean-spirited mood I’d point to the quack medical cures of times past, which a cynic might compare with television preachers and faith healers. If we look beyond hyperbole and mistaken claims that the design process may well point the way to techniques that allow us to address wicked problems. This requires interdisciplinary design research.
One crucial issue of design research involves finding ways to render tractable selected aspects of wicked problems. This can allow us to solve parts of the problem aspect by aspect, peeling back layers of the problem to reach the wicked political and economic core.

At the wicked core, negotiated solutions enter the picture. Negotiated solutions do not solve core issues in a scientific sense. Nevertheless, negotiation may allow us to resolve problems and move on. We can sometimes resolve by agreement what we cannot solve. In a world that requires us to address current problems and move on to the next problem, this may do much good.

**Beyond the disciplines**

It seems that there remains some dispute about the meaning of the labels we apply to the different kinds of work that we attempt outside or beyond the boundaries of classic disciplines.

According to *Merriam-Webster’s Collegiate Dictionary* interdisciplinary means ‘involving two or more academic, scientific, or artistic disciplines’. Since terms such as multidisciplinary, cross-disciplinary, pluri-disciplinary and transdisciplinary all point back at that one definition, it doesn’t seem fruitful to debate the nuances or differences. A large and growing literature exists to examine the nature of the different kinds of extra-disciplinarity. After several earlier attempts to understand and engage in interdisciplinary research in – or moving out from – several fields, Julie Thompson Klein and Lisa Lattuca summarised the literature to date. The field of enquiry has exploded afresh in the decade since. Nevertheless, as Andrew Brennan says, ‘there has been no progress and [there are] some signs of regress’.

For us, a key question is whether extra-disciplinary activities working across the borders of disciplines constitute a different kind of activity or simply a difference in degree and scale. Both may be true. Scale change leads to state change, and the ways in which we work lead to different kinds of work. Even in the frame of the traditional disciplines the way we think and write our work has begun a process in which we revise the perspectives and understandings of what we do. David Damrosch attributes the changing nature of disciplines and academic culture to many causes. The post-modern condition is one way to summarise the problems that Damrosch and his colleagues examine. State changes and second-order evolution are both symptoms and causes of the post-modern world – a situation described 50 years ago in *Landmarks of Tomorrow*, a book that introduced the term post-modern to our vocabulary – in a sociological and analytical sense, rather than the literary sense it later took on.

Today, we face many important questions on the operational nature of transdisciplinary research collaboration. But operational issues are far less important than strategic issues.

New problems require new approaches, and the scale of wicked problems clearly creates unfrequented challenges.

**Several ways forward**

There are several ways to move forward. While it does not seem likely that all design problems are wicked problems, it is likely that many design problems are wicked – and it seems that design thinking may help in solving wicked problems.

Design is inherently interdisciplinary, but the interdisciplinary challenges that face the world today mean that design is not enough.


33 For example, J. Monroe, Writing and Revising the Disciplines, Cornell University Press, Ithaca, 2002.
