

An Introduction to Systems Thinking (transcript)

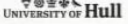
Subtitle: Integration and Implementation in the Face of Wicked Problems. A roughly accurate transcript of [Gerald Midgley](#)'s talk at the First Global conference on Research and Implementation, held in Canberra, Australia, in September 2013. [Link](#). ([Link to powerpoint](#))

0m0s [Daniel Walker](#): introduction (not transcribed): Gerald Midgley's talk provides an introduction to systems thinking for people with little prior knowledge of the field.

1m38s Gerald Midgley (GM): I am going to use the 'wicked problems' language for purely pragmatic reasons that policy makers tend to use that language. There are issues with it, but we can discuss that later. I want to look at what is systems thinking. Over the past years I have spent 20 years studying the plurality of systems ideas and how you can deal with the fact that we have had a 100 years of research and there is a little irony that systems thinking is supposed to be transdisciplinary and what it has ended up doing is fragmenting into a huge number of systems communities with hundreds of different methodologies and the big question is: how you can deal with that kind of plurality. So I want to say a little about that plurality and present four different systems approaches for different purposes, acknowledging that I have picked four well-practised ideas out of a multitude. And I'll leave you with three systemic principles for addressing wicked problems.

2m50s GM: I will say very little about wicked problems as it has been dealt with under the title of complex problems. The main issues are: many interlinked issues, cutting across silos, complexity, multiple agencies, multiple scales, multiple perspectives, conflict, power relations, uncertainty about the possible effects of action. Note that not all systems approaches can deal with wicked problems, but I am particularly interested in those that can.

3m25s GM: What is systems thinking? Complex term with two words. Thinking first: thinking uses language, language is socially shared, so actually dialogue helps us think. This is not some naïve notion of thinking that goes on in your mind. Thinking is both personal and collective. Given the enormous variety of systems ideas, how can we make sense of them? A very nice framework is from Derek Cabrera and colleagues. According to it there are four key systems thinking skills. So I changed the language a little bit and so on, that's OK. But what he was saying that we use this kind of thinking every day. But I looked at this and I thought, there is something more to it than this. Looking at different systems methodologies, you realize that each one prioritizes different systems thinking skills. So, Cabrera's framework provides a neat framework to

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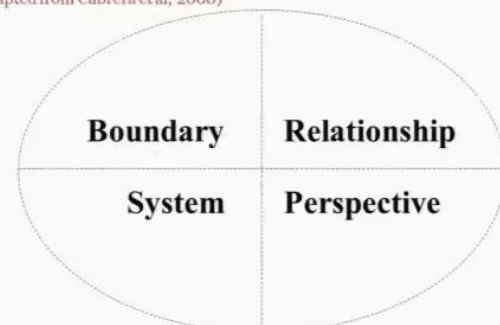
- What are 'wicked problems'?
- What is systems thinking?
- Different systems approaches for different purposes, with practical examples
- Three systemic principles for addressing wicked problems

Wicked Problems involve...

- Many interlinked issues, cutting across the usual silos (e.g., economy, health and environment), making for a high degree of complexity
- Multiple agencies (across the public, private and voluntary sectors) trying to account for multiple scales (local, regional, national and global)
- Many different views on the problem and potential solutions
- Conflict over desired outcomes or the means to achieve them, and power relations making change difficult
- Uncertainty about the possible effects of action

Four Systems Thinking Skills

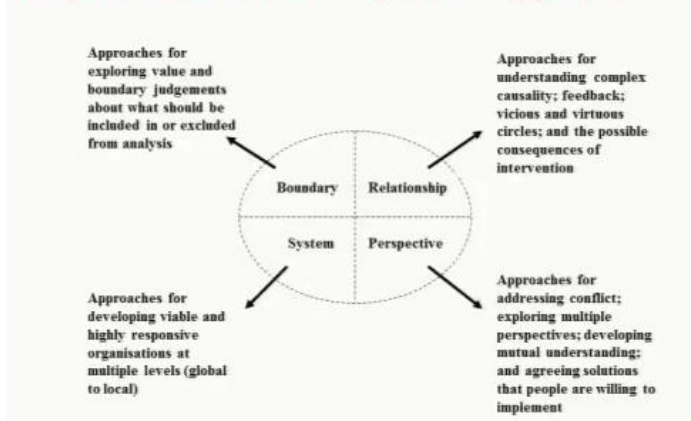
(adapted from Cabrera et al, 2008)



present some of the plurality. And I use this framework to talk to policy makers, so that I can present systems thinking not as a little bit of the big puzzle but with much more overview than would normally be the case. The framework can be used to : 1. Exploring boundaries – understanding the inclusion, exclusion and marginalisation of stakeholders and the issues that concern them. 2. Appreciating multiple perspectives – how and why stakeholders frame issues in different ways; even whether something is a system or not will depend on a person’s particular perspective. 3. Understanding relationships – networks of interconnections within and across systems. 4. Thinking in terms of systems themselves – organised wholes with emergent properties that cannot be theories, nested systems.

5m40s GM: When we begin to look at different approaches, I want to emphasize that they are about interventions through research to actually bring about change. So I am talking about systemic action research rather than simple observation. Science from a systems thinking perspective is one useful approach that you can harness in the service of systems intervention. The four skills suggest four different types of approach: (1) approaches for

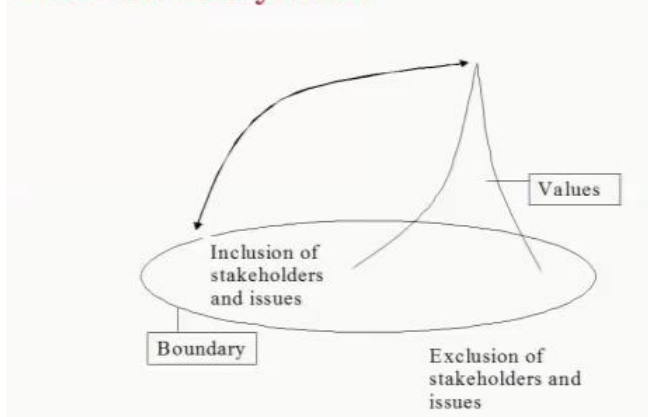
Emphases of Different Systems Approaches



exploring value and boundary judgements about what should be included in or excluded from analysis, and marginalized as well; (2) approaches for understanding complex causality, feedback, vicious and virtuous circles, and the possible consequences of intervention; (3) approaches for developing viable and highly responsive organizations at multiple levels (global to local); (4) approaches for addressing conflict, exploring multiple perspectives, developing mutual understanding, and agreeing solutions that people are willing to implement. You can see the breadth of approaches.

6m55s GM: I will give you four examples in no depth whatsoever and give brief snapshots of my own work using them just to give you a flavour of what it means in practice. For the first type, of boundary judgement, I want to go back tot the late 1960s. I start with the basic assumption of systems approaches, viz. everything in the universe is directly or indirectly connected to everything else, but human beings always have a partial view. Nobody has this God’s eye view of interconnectedness. We have a partial

The Boundary Idea



view in two senses: a. we can’t see the whole, never. And b. values are key in helping us draw boundaries. So it’s partial in the sense that it is value-driven. The ellipse in the diagram is the boundary between included and excluded stakeholders and issues. The peak represents values and there is a two-way relationship between values and boundaries. The values that you bring into an arena of action will help drawing meaningful boundaries. Values are not general principles, they are linked to our personal goals. But some boundaries are already given by institutions, and those boundaries constrain the type of values that may be expressed. Hence the two-way relationship. Through exploring the value judgments as well

as the boundary judgments and looking at different possible boundaries that you get a more comprehensive understanding of the situation. My own work adds to earlier work from the 1960s to 1980s by looking at conflict and marginalization processes. What happens when people make different boundary and value judgments, how they frame things differently, how stakeholders and issues become marginalized, how that becomes stabilized in social systems instead of resolved. I will give you an example of a project where the identification of marginalization, the boundaries of who was being marginalized, was critical. This was a project about developing services for young people under 16 in Manchester, UK. There were 2000 children living in the streets. We were tasked by some volunteer organizations to work with a wide variety of agencies, none of which had ... responsibility to deal with this and they wanted to get people engaged. We wanted to put young people at the centre of this work. Marginalization (ie. boundary judgments) took place by considering them to be less rational, less able to make informed decisions about their own lives, and living on the street they often got involved in petty crime and prostitution to keep them going. We dealt with this in several ways, first of all by seeking the young people's views themselves before contacting the professionals so as to avoid domination and pre-framing of the boundaries. We communicated their words and not just ours to professionals. We drew big diagrams with their words over it. And the emotional impact of that secured commitment to change, which is very important to intervention. A critical thing we disagreed about as a research team was about using design methods. Some people wanted to use different methods with young people as with adults. In the end we decided not to do that, because young people were much better able to deal with things than the professionals who felt disempowered by their own agencies. So it was effective to use the same design method, you can get comparability between what young people were saying and what the agencies were saying, thus valuing young people's voices equally.

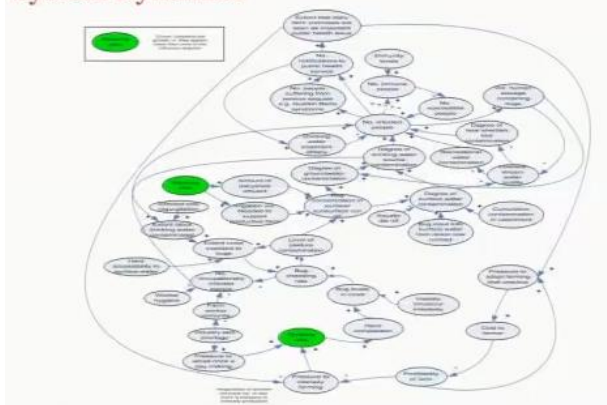
Developing Services for Young People (under 16) Living on the Streets

Young people on the streets are marginalised in two ways:

- As young people under 16, they are regarded as less rational and less able to make informed decisions about their own lives than adults
- Living on the streets, they can easily be regarded as 'troubled teenagers' on the fringes of society, and are often vilified for their involvement in petty crime, prostitution, etc.

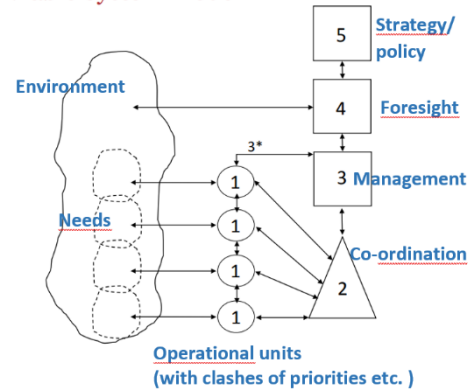
12m05s GM: Moving on to approaches dealing with complex causality. System dynamics would be a good example. But it will be dealt with by somebody else, so I am not going to dwell on this. The adjacent horrible pile of spaghetti is from a project I worked on in New Zealand, which has one of the highest rates of Campylobacter food poisoning in the developed world. How do they get transmitted from animals to humans. And it's a highly conflictual problem, because of the enormous importance of farming to the economy. So you have stakeholders that blame each other. So when we came in people were not willing to talk with each other. By causal mapping of the different perspectives and then bringing them together to look for the connections the groups realized that they had to talk with one another. Their perspectives were interdependent.

System Dynamics



13m30s GM: The third one is about developing a responsive, viable organization. The example is about the viable system model (VSM) of Stafford Beer (1950s, but continues to be developed). See video (of this transcript) or a [post](#) in CSL4D. You can use the model to diagnose problems in your organization or to design a new organization. I used it in New Zealand when I worked for a research institute in a multi-disciplinary group. The question was how to define operational units in ways that reflect the policy environment. I have done exercises of defining research priorities and research groups over and over again and usually people define things and then go off and do their own thing and they no longer pay much attention to it and those labels just collapse. These ones actually lasted and did so for years, because they were really defined with the policy environment in mind. And we looked at things such as foresight, strategy and so on built into the groups.

The Viable System Model



16m02s GM: The last one is an approach for exploring conflict and multiple perspectives. This is really my personal favourite area and there are so many methodologies and I picked one. I picked soft systems methodology (SSM), because it is one of the most widely used. First I will take you briefly through the process. SSM starts by exploring the mess. You are not dealing with a system necessarily, you are dealing with a messy problem. Nobody can see the whole picture. One way for doing that is putting up a huge sheet of paper across the wall and get everybody collectively drawing a picture of what is happening. The adjacent picture is of a feasibility study in New Zealand for developing a new dam. You (the audience) don't have to know what it means, but the people who drew it know what it means, so they began to see the larger picture unfolding. After that you start to explore different transformations that different people want to see and what they mean to different people. The trick here is not to force agreement on one transformation in that early stage of inquiry. It's a mistake that you often see that people have an insight of something they can do and everybody piles into that that ('yes, let's do that') and you don't explore the variety of perspectives. So you keep that variety of perspectives open. And Pete Checkland who developed SSM offers a mnemonic (see next page), which I have adapted a bit (Midgley 2001) to help people staying on the same page of what they mean when they are talking about transformation. So, transformation (3rd bullet) is where you are now and what you want to move to. And underpinning that is some kind of world view or perspective, assumptions. There are beneficiaries that you can name, there are actors, people that can actually bring that

Soft Systems Methodology

- Map the mess!
- Identify possible transformations that different people want
- Explore what these mean to different people to ensure that people are not talking past one another
- Map the activities that would be needed to make the transformations a reality
- Compare back to the earlier picture of the mess
- Look for accommodations between different perspectives and agree desirable and feasible changes
- Move to action

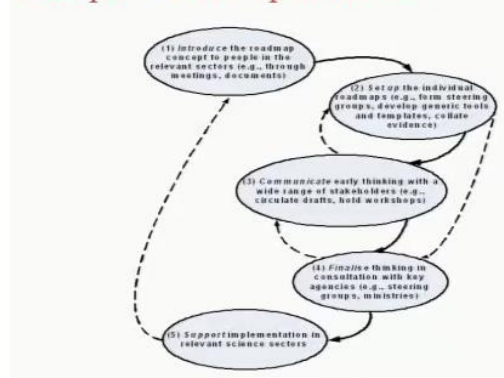
Example of a Rich Picture of Water Management Issues



transformation about, there are owners, not in the sense of financial owners, but people that can stop the transformation from happening, there could be victims that you might need to identify and decide if they are acceptable, and there are environmental constraints that we can debate, what you have to take as given, and what in the policy environment that you have to take as given, or what can you actually, realistically change. By exploring that kind of questions, people stop talking past one another, because one of the big dangers is that everybody agrees on a transformation and then it all unravels down the line when they realize they are using language to mean different things. And then there is mapping the activities that are needed to make the transformation a reality (see list ‘soft systems methodology’ on the previous page). So here is

- BATWOVE**
- Beneficiaries
 - Actors
 - Transformation
 - Worldview
 - Owners
 - Victims
 - Environmental Constraints

Example of a Conceptual Model



an example from a project that I did with the Ministry for Research, Science and Technology in New Zealand (it’s got another name now). This ministry had developed 4 roadmaps for long-term investments, 30-years investment, biotech, nanotech, energy and environment research. They wanted us to evaluate the process (not the content) they had used for developing those roadmaps. We worked with a whole bunch of stakeholders and ministry staff. This model is where they started from. Just as an example: point 2 is to set up individual roadmaps and point 3 is to communicate early thinking with stakeholders. They only made one change: they reversed those two steps. They realized through the engagement with stakeholders that they had preframed those roadmaps too much, so that when they took out those roadmaps to stakeholders there was stakeholder resistance against them. Instead of listening to the stakeholders first and allowing the framing to emerge. So you know, when you talk with the CEO of that ministry, she said this was a really neat codification. She hadn’t realized what kind of process they were using until she saw it on paper like this. And the changes made a big difference. When they took out the next roadmap there was a very different stakeholder reaction to it.

21m05s GM: SSM basically ends by looking for accommodations between different perspectives. Accommodation is different from compromise. It’s different from a consensus. So, an accommodation doesn’t assume everybody agrees. It just assumes that people can identify a reasonable way forward that they can all live with. You don’t have to have ultimate agreement. Neither is it a compromise, i.e. everybody gives up something. You hopefully will find some emergent possibilities that people can work with. One brief example of that. I worked with a disaster response team, 19 different agencies in Hull, all of them wanted to develop a counselling system for activation in the event of a disaster. They had done 18 months of conventional planning and got nowhere because of their different perspectives. And they came to us saying: can you help us do this. And we had 6 days to help them. And one of the interesting pieces of learning from that is that a lot of people complain that participatory and systemic approaches are time-consuming, but we managed to do in 6 days what they couldn’t do in 18 months. So I think that’s efficient as well as effective.

22m30s GM: So, let us leave with 3 systemic principles. I have talked about the 4 systems thinking skills, I have illustrated that with some approaches and methods. So the first principle is explore boundaries, stakeholders, issues, values, processes of marginalization upfront in the work. And revisit the boundaries of your work when new aspects of a problem

present themselves. That's really critically important. Because I've seen too many consultants actually talk with management or policy makers, just take their view of the issue as given, work with that and it ends up creating more problems than it solved. You must have that exploration upfront, because the whole point of a wicked problem is that it is not possible for one stakeholder to actually understand the whole (emphatic nod). The second principle is drawing upon mixing

methods from across these systems approaches and across the biophysical and social sciences. So, welcome that whole plurality. The old adage is: if the only tool you have is a hammer, everything looks like a nail. And the third one is that if you have got no previous experience or limited experience, start from where you are and work out from there. Find the next thing in systems thinking that might work and take that on. Big, big bugbear that I've got is that when you become a doctor or an engineer you spend 4 or 7 years at university. When you start systems thinking you are supposed to pick it up in a weekend course. It's not acceptable, but we have to live with it. This explains the third principle, because most policy makers won't get more than a weekend course. Applause (24m24s). Questions?

24m43s Question 1 by Dr. Alan Lucas about stakeholders and the role of stakeholder management. GM: I want to address that obliquely, because I want to define stakeholders slightly differently. Most people think of stakeholder as being there some kind of issue and they are the people being somehow impacted by that issue. They are involved in it, affected by it. I tend to think about it more broadly than that. You need to think about who ought to be involved as well as who is involved. So it is broader for a start. And stakeholder management, well yeah, it's an important principle. In terms of a wicked problem though, generally speaking you're not talking about one agency. So when people talk about stakeholder management most of the management literature is talking about what an organization does to manage its stakeholders in a rather instrumental way. That's not what I am talking about. I am talking about participatory engagement and it invariably goes beyond the boundaries of one organization regarding its stakeholders.

26m07s Question 2 by ... of the University of Sydney about the problem of educating ministers and members of the professional class. GM: With ministers? Mostly I have worked with civil servants. Certainly in New Zealand I tended to be working with the people behind the scenes, rather than the ministers. It is absolutely a big challenge. When I have involved politicians in workshops I found that absolutely fascinating. They have to have the experience of it. And it's not just politicians, but managers in general. I have often been in situations where people have welcomed me in, but then in the end of the process they said: "well, I thought we did things systemically already, and now I realize there's a whole lot more to it than I realized. So they need that experience of doing it. It's not something you can learn in the classroom. One of the challenges I found was reading all this work, being a PhD in .. research and actually going out and doing it. And it's whole different ball game.

27m32s Question 3 by ... of the University of Western Sydney who just wanted to pick up on the point made about the youth project, where you got the youth in, find their points of view, and also the other project about where you're not supposed to presuppose the questions before you can ... the stakeholders. It seems that a lot of people know that it's a good process. I just wonder what observations you may have made, unofficially or otherwise, about why politicians and policy-makers consistently forget this? GM: Well, I've got multiple answers to that. One principle that is really important to bear in mind, and its

Three Systemic Principles for Managing Wicked Problems

1. Explore boundaries (stakeholders and issues), values and processes of marginalisation up-front, and revisit the boundaries of your work when new aspects of a wicked problem present themselves.
2. Draw upon and mix methods from across the systems approaches (and the biophysical and social sciences) to be as responsive as possible to the multiple dimensions of wicked problems.
3. If you have no previous (or limited) experience, start from where you are. Try new methods when the need arises, and build capacity for the longer term.

important for interdisciplinarity as well as for that stakeholder engagement, is that boundaries enable us as well as constrain us. So people cling on to their boundaries because actually it is useful for them in some way. So when you are asking them to challenge those, you are really threatening the possibility that they might lose the ability to control what they've got. So that's at a principle level what's going on. It's also about how you do it. I've seen some very naïve approaches to doing that. And let me give you an example from that children's project. We went out on the street at night to work with young people and we were accompanied by a youth worker from [The Children's Society](#), which is a charity in the UK. So they were introducing us to young people, we were talking with them. And they were really shocked, because these young people wanted to talk with us and wanted to contribute their stories. And they said their whole youth work policy was about waiting for young people to come to them, so they would be out there with food kitchens and they would wait sometimes three months for a young person to come to speak to them. And they realized they didn't have to do this. So the very first change that happened through that project was a change in their whole youth work approach right across the country in the end by that organization. So that was just custom and practice, how they thought about it, they never had never done anything to challenge their assumptions that young people wouldn't want to be approached, that they should wait to be approached. End of question session and talk.

Abstract (from Youtube): Different thinking skills. Selected examples are described and illustrated with brief case studies from action research projects undertaken in the UK and New Zealand. The four selected examples are: the theory of Boundary Critique for exploring boundaries; Soft Systems Methodology for appreciating multiple perspectives; System Dynamics modelling for understanding relationships; and the Viable System Model for thinking about governance and organisation in whole system terms. The case studies from practice demonstrate that systems approaches provide valuable ways forward for dealing with intransigent problems characterised by: * Complex and uncertain interactions, with consequences that cannot easily be predicted; * Multiple goals (e.g., economic, social and environmental) in tension with one another; * Multiple scales (e.g., local, regional, national and global); * Multiple agencies, organisations, groups and communities involved or affected; * Multiple perspectives on defining both the problem and potential solutions; * Conflict, power relations and vested interests making change difficult; and/or * Scepticism due to unintended consequences from previous attempted solutions. Nevertheless, no one methodology or method can respond equally well to all of these complexities, and there is considerable room for the further development of systems theory, concepts, methodologies, methods and practical applications. Please note: in the section of the video where the Viable System Model is discussed the last slide in the progression of slides about this model has not been reproduced. You can see this slide in this presentation on <http://i2s.anu.edu.au/...>

Biography: Gerald Midgley is Professor of Systems Thinking at the University of Hull, UK. He also holds Adjunct Professorships at the University of Queensland, Australia; the University of Canterbury, New Zealand; Mälardalen University, Sweden; and Victoria University of Wellington, New Zealand. From 2003-2010, he was a Senior Science Leader in the Social Systems Group at the Institute of Environmental Science and Research (New Zealand). He has had over 300 papers on systems thinking and stakeholder engagement published in international journals, edited books and practitioner magazines, and has been involved in a wide variety of public sector, community development, technology foresight and resource management research projects. He is the 2013/14 President of the International Society for the Systems Sciences, and has written or edited 11 books including, *Systemic Intervention: Philosophy, Methodology, and Practice* (Kluwer, 2000); *Operational Research*

and Environmental Management: A New Agenda (Operational Research Society, 2001); Systems Thinking, Volumes I-IV (Sage, 2003); Community Operational Research: OR and Systems Thinking for Community Development (Kluwer, 2004); and Forensic DNA Evidence on Trial: Science and Uncertainty in the Courtroom (Emergent, 2011). Introduced by Daniel Walker. The First Global Conference on Research Integration and Implementation was held in Canberra in Australia, online and at three co-conferences (Lueneburg in Germany, The Hague in the Netherlands and Montevideo in Uruguay), 8-11 September 2013.