What are the implications of complex systems thinking for policymaking?

Can a concept derived from the natural sciences be applied to the political and social sciences? ***Sarah Quarmby*** *consider whether complex systems thinking, currently enjoying a moment of popularity in the policy research and practice worlds despite having no single accepted definition, can add to our understanding of policy. And is it really a new approach?*

Complex systems thinking is experiencing a moment of popularity within the worlds of policy research and practice. It's an intuitively exciting approach that seems to capture some fundamental truth about our experience of policy: it suggests that policymaking takes place in a system that operates somewhere on the spectrum between "complicated" and "chaos", making the results of policy interventions difficult to predict. Those who have attempted to study or shape policy might attest to this understanding. But social scientists have a duty to probe their intuitions to see if there are practical and theoretical implications of the approach.

What are complex systems?

The theory has its roots in the natural sciences, and there is no single accepted definition for complex systems as they apply to policy. Instead, they are generally understood in terms of some key characteristics. The most important feature is that complex systems behave in a way that is greater than the sum of their individual parts. This means that you can't understand the system just by looking at its individual elements, but rather it has to be studied as a whole.

Similarly, complex systems involve feedback mechanisms, so that the results of actions (the outputs) are not commensurate to the original actions (the inputs). A small action can have widespread effects across the system, which is also referred to as non-linearity. Add in the capacity for self-organisation, and emergent behaviour that is not the result of central control, and you have a complex *adaptive* system. Beehives and the human brain are commonly given as examples of complex adaptive systems – understanding how a bee works will only go so far as to understanding how a bee colony operates.

How do complex systems fit in with policy?

Proponents of complex systems approaches claim that since policymaking is complex, attempts to understand and influence policy need to take this complexity into account. Such approaches are being applied to policy research and practice in a wide variety of ways and much of the discussion from the academic world has focused on their theoretical implications. Some are looking at ways to model complex systems; others are incorporating complexity into study designs. At a recent conference on "Systems Perspectives on Policy Development and Evaluation", those on the practice side of policy seemed less concerned with the theory and more interested in what changes complexity thinking might imply for the way they go about their day-to-day craft. This may go some way to assuage concerns voiced by academics about how to prevent policymakers feeling nihilistic when faced with knowledge that the world is complex, and the results of actions difficult to predict.

Perhaps due to the variety of definitions of complex systems, there is a lot of variation amongst the claims made for their application to policy. At one end of the spectrum, this approach is being offered as a "new scientific paradigm" for studying the social world. Others see it more as a "complementary analytical tool" to be used in conjunction with established policy concepts such as game theory. Links are also being made to wicked problems, and there is the suggestion that complex systems thinking might be the most appropriate way to approach these issues that seem to frustrate traditional policy methods.

On the other hand, some experts are questioning whether a concept derived from the natural sciences is applicable to the political and social sciences, and whether there is much to be gained from comparing policy systems to ones arising in nature. There are some important differences between a beehive and a policy system, for example, not least that humans may be aware that they are operating within the context of a complex system and alter their behaviour accordingly.

Date originally posted: 2018-10-12

Permalink: http://blogs.lse.ac.uk/impactofsocialsciences/2018/10/12/what-are-the-implications-of-complex-systems-thinking-for-policymaking/

Blog homepage: http://blogs.lse.ac.uk/impactofsocialsciences/

Is it really a new approach?

Klijn suggests that some elements of this approach, specifically non-linearity and behaviour that is not dependent on central control, can be found in existing policy theories. For example, the garbage can model (from 1972) conceives of organisations as organised anarchies where decisions are made by chaotically mixing problems and solutions together like rubbish in a bin, rather than being the result of a single rational decision-maker. Similarly, Kingdon's multiple stream analysis (1984) suggests that decisions are made only when three "streams" – policy problems, solutions, and political events – happen to coincide, and when there is a "policy entrepreneur" on hand to take advantage of this. Lindblom's advice from the late 1950s and early 1960s that, given the uncertainty of the policy environment (or non-linearity), changes are, and should always be, incremental, also seems to be a pragmatic response to some concerns raised by complexity theory.

Frequent mention is made in the academic literature to the need to clarify the way that this approach can be put into practice empirically, or as Holmes and Noel put it, move from "systems thinking-talking to systems thinking-action". The variety in definitions of complex systems within the social and political sciences, however, makes this process less straightforward and risks undermining the empirical evidence produced. Given the divergent definitions, evidence found to support one person's understanding of complex systems approaches often cannot be extrapolated more widely to make claims about complex systems approaches in general. In this way, Leykum et al's paper, which finds that diabetes interventions that take complexity into account tend to be more effective than those that do not, is an important contribution to the complex systems literature, but perhaps cannot speak for complex systems approaches as a whole.

Where next?

Complex adaptive systems thinking is an exciting approach, and the popularity of the theory in the policy literature is testimony to this. But a number of issues are yet to be resolved. There needs to be clearer indication of the practical changes that it implies (if any) for policy research and practice. What are we saying that is different from "we need to take the wider context into account", and "it's hard to predict all possible consequences of any given action"? A widely accepted definition of complexity in the context of policy would add weight to evidence found to support the theory. We also need to clarify whether there is good cause to apply a natural science theory to political science. Most importantly, we should be wary of accepting the approach first and then looking for evidence to support it, rather than following the normal social science method of evaluating whether there is evidence in favour or against a given hypothesis.

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