Guest editors' introduction

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The advent of the new sciences of complexity has produced a subtle but important change in policy analysis illustrated by the papers in this volume. In brief, policy analysis is no longer strictly concerned with simplifying a complex environment by reducing alternatives for problem solving and resource allocation to a few optimal scenarios that fit a rational decision-making model. Instead, the new mantra for policy analysis may be that 'more is better'. No longer merely a problem to solve or an irrational quagmire to avoid, the complex dynamics of public life have become a resource for generating a wider range of solutions to 'wicked' social problems and prompts the engagement of more players in the decision-making process. Indeed, complexity may be the new code word for politics - the dynamic, emergent system of relationships that characterizes both the public and private sectors. Yet, whether the new sciences have transcended the limitations of past practice - perhaps even contributing to the evolution of democracy - or whether it merely further illustrates the continuing limitations of human reason depends on how they are interpreted.

The dichotomy dissolves

The use of complexity 'logic' in policy analysis, with its themes of complex adaptive systems, emergence, and co-evolution seems to, once and for all, dissolve the myth of the politics/administration dichotomy which posits that the two realms can and do operate independently of each other. Steve Bankes's paper, for example, describes the decision-making environment as an 'open system'.

The dichotomy is often thought to be the brainchild of Woodrow Wilson at the turn of the 20th century - an expedient solution to the Modernist problem of separating the 'chaos' of politics from the routine and mechanical tasks of implementing public policy (1898). By mid-century, however, the dichotomy was severely criticized by Dwight Waldo in *The Administrative State* (and others) who felt it denied the reality of administrative life in a dynamic and value-oriented society (1948, 1984). The dichotomy, however, was kept alive by management theorists and economists - Herbert Simon, in particular, who in *Administrative Behavior* (1947), further reduced the process of administrative decision-making to a hyper-rational function, one so detached from the more human sphere of politics that it made value orientations and ethics seem both irrelevant and dangerous.

Simon, however, is still revered as an icon for the evolution of policy analysis. Over the decades his influential and often brilliant understanding and evocation of mental and computational models for decision-making have reflected the paradox of modeling - that descriptions of human behavior may indeed be accurate at the point of social evolution that they are made, but such explanations do not always translate into effective action in an emergent and dynamic environment.

As Cletus Moobela's article illustrates, for example, the rational actor model has failed to meet its expectations - among them the realization of sustainable cities. By contrast, the engagement of complexity in the urban environment seems to produce vibrancy in civic relationships and problem-solving innovation. Complexity is used in Moobela's case study not merely to explain the urban scene, but rather as the conceptual foreground for effective interventions in urban regeneration. The key appears to be the recognition by planners that no one organization "has a monopoly of knowledge or resources to deal with complex urban problems."

In the dynamic 'real world' in which patterns of behavior often organize across boundaries - especially those that exist only in the mythology of administrative or political intent - planning based on the linear allocation of resources perhaps has always been doomed to fail. The U.S. Forest Service, for example, was eventually forced to abandon its mechanical approach to forest management. In the 1950s and 1960s, the Forest Service was a quasi-military organization that depended on volumes of written procedures for resolving conflict in the use of forest resources. Initially, it seemed the 'stakeholders' in forest management were relatively few - recreationists, mining interests and lumber companies. With the introduction of the Environmental Protection Act in the States in 1970s, however, the simplistic practice of 'multiple use' - dividing up the forests among stakeholders - ran afoul of new perceptions of forests as eco-systems and the Forest Service soon found itself in a much broader policy system, interacting with multiple agencies and interests groups concerned with the relationship among various elements of the environment. The 'procedural reason' of the Forest Service gave way to the need for improved skills in negotiation and communication as old agency boundaries became more opaque (Ruhl, *et al.*, 2006).

Even with the advent of ecological thinking in environmental resource management, however, policy analysis remained rooted in positivism - although the positivism was coming under increasing scrutiny in the humanities and social science. By the mid-1970s, political science programmes in universities had stepped back from political theory and philosophy and were devoting themselves to the new 'science' of policy analysis that, in theory, freed analysts from the uncertainties of politics and rationalized the process of resource allocation. This movement was fed by the marriage of policy analysis with the idea of distributive justice - an idea usually credited to John Rawls' seminal book *A Theory of Justice* (1971) that sought to 'solve' social inequality by the equitable distribution of resources based on comprehensive rational planning and decision-making.

Policy analysis seemed to free decision-makers from the complex and value-laden circumstances that surround poverty. The dominant belief in the later half of the 20th century was that poverty could be eliminated by trusting the self-interest of rational actors and then applying rational principles to the distribution of social goods in a consistent and therefore fair manner. The new 'science' of policy analysis, given a power boost by the success of Rawl's theory in academic and administrative circles, became the primary weapon in the war on poverty; one ironically designed from linear scientific assumptions that were already dated by the 1970s.

Postmodernism: A transition between the sciences

Yet, neither the politics/administration dichotomy nor the idea of distributive justice have ever denied the reality of complexity, although the dynamics involved in a complex adaptive system have not been understood until the advent of complexity science, nor perhaps well-considered in academic circles until postmodernist theories began to shake the tree of assumptions that supported positivism. What postmodernism did was to help along a change in the attitude toward social complexity - perhaps facilitating and co-evolving with the new sciences. Yet while postmodernism brought to mind the possibility of 'multiplicity,' of multiple points of origin, and forthrightly questioned the premises of the rational actor model or the need for a single vision of the ideal, it did not fully calm the anxiety of planners and practitioners. The political realities did not change much during the postmodernist debate as political practice became more deeply rooted in rationalism. Complexity, now an accepted reality, still seemed to impede the ability of practitioners to respond in a timely manner to their political bosses.

Although postmodernist arguments echo in the papers in this volume, it is not surprising, however, that what actually seems to evoke the innovative ideas described in them is the failure of modernist science to solve social problems, create sustainable cities, or achieve social justice. This failure trumps the conceptual paradigm shift of either complexity science or postmodernism in terms of its influence on the emerging field of policy analysis. A number of the papers reflect the key importance of the new diagnostic and dialogical tools of complexity as the means to cut a larger cross-section of reality in hopes of finding answers that eluded slower computers and less elegant mathematics. While accepting the importance of these new tools, the papers also suggest that the purposes for which they are employed could be broader than what is expressed in much of the current literature on policy analysis.

For example, the concern of the politics/administration dichotomy was to separate the rational acts of the 'business' of government, from the emotional and 'irrational' nature of politics. If the dichotomy is dissolved by means of the insight that it is a falsity - an impossibility in an inter-related system - does that necessarily also resolve the real-time tension between 'rational and irrational' elements? One answer to this question, in a view similar to that of David Kernick, would be that accepting social reality as a complex adaptive system, perhaps even respecting it for its complexity, produces the need for different skills than the cognitive ability to analyze the difference among policy alternatives. The capacity for participating in complex conversations - those which embody the layers of meaning, values and experience of the individuals involved - puts the policy analyst in the position of participating in social evolution as it emerges, rather than merely attempting to direct it from the sidelines. It is a different framework entirely from one in which the social environment is 'flattened' to a calculation among individual interests that suits a model of resource allocation. Rather, Kernick's approach suggests that social reality can indeed be engaged as it is and, further, that it can be learned from.

Multiplicity of method

In a similar view, William Trochim and Derek Cabrera, represent a growing trend among policy analysts for using multiple and innovative approaches to gathering information and creating shared meaning and new solutions to old problems in the interaction of people. In this view, decisions co-evolve with the maturation of both individuals and groups as they tackle the complex issues of human existence. This prompts one to wonder if sooner or later, political science will find its way back to philosophy as the need emerges again for individuals to grapple with the ambiguous

'big questions' of human intent and purpose. If politics - and by extension public life - is a complex adaptive system, for example, is a predictive computer tool an adequate attractor for the emergence of society? Yet, the possibility also seems to exist that by using policy analysis as a dialogical tool, with the intent of engaging complexity rather than merely studying it, then the conditions of a new public philosophy - perhaps one that finally transcends the limitations of modernist science, may yet emerge.

In Steven Bankes's piece, for example, the emphasis is on moving past the idea of 'optimizing' an ideal outcome and instead enabling interactions that produce a 'robust' decision-making environment as the condition for innovation. It is a shift from containing complexity to both engaging and creating it. Yet, the improved decisions or the increase of possible alternatives may not be the only outcomes of such a practice. In the old policy science, it seemed possible to contain the interactions among causal agents to an intended outcome and to ignore the relationships among actors that seemed only coincidental. From a complexity perspective, a robust environment is one in which learning and creative adaptation is exponential across the political landscape. Therefore, a self-aware policy analysis would seem to hold the potential for creating both the conditions and the emerging capacities for democracy.

Initial conditions

Cathal Brugha and Dermot Casey describe the uncomfortable reality of policy analysis struggling to evolve in the regulating space between the new sciences and older social constructions that frame conventional decision-making practices. This is perhaps most evident in politics itself, which despite the robust debate around globalization, sustainability, and the acceptance of individual diversity, remains true to its 17th century roots. Yet, rationalized politics and political culture are no longer merely philosophic ideas, but rather the regulating framework of social perception and social action.

Brugha and Casey suggest that what is needed most at this juncture is a commitment to "shared and genuine interest in understanding new phenomena, mastering new techniques - sharing… knowledge." This will not occur on its own, they say, but calls for institutions whose shape and sense of purpose enlivens this commitment as an organizing structure in culture.

Where in the system this quickening of the will to knowledge occurs may be different, however, than through the implementation of the ideal conditions for science through regulatory accretion. As both Kernick and Moobela point out, for example, knowledge for policy analysis may emerge from the environment itself - the loci where most resource decisions are made. This 'knowing in practice' involves not only the complexity of the environment - but also the complexity of the individual who activates intuition and reflection. Brugha and Casey's concern for educating for science, for example, might also include developing the capacity among citizens and planners to recognize the 'big' choices that can be made in small circumstances - those in which the conditions of a just and moral society gain a foothold in social evolution, in a way that rational planning and resource allocation cannot. As Brugha and Casey suggest, a new science applied through the old lens of modernism - assuming complexity to be the negotiations of rational actors, just more of them, for example - will likely not produce any significant realization of the aspirations of an evolving policy analysis. The conscious engagement of why complexity science is different than reductionist science may be important to enhancing the potential of this time to truly transcend the limitations of the past, rather than merely adapt to them. But then we are only human!

Yet, as politics are embraced, uncertainty is accepted, and the rational actor model is exposed for its limitations, there remains some old doubt about the capacity of human beings to deal effectively with complexity and uncertainty. An underlying implication in one or two of the papers is that however much humans may come to value their diversity, because their rationality is 'bounded' they simply do not have the evolutionary ability to deal with reality as it is. In this regard, high-speed computers and complexity math are seen to do what humans cannot - that is to reason on par with complexity of information available to them. This would seem to suggest that new mathematics have put computers ahead of humans in the evolutionary race - in a kind of exponential leap from their humble beginnings. The implication is that although there are no rational actors, their existence is still an ideal among some analysts.

The limitation of this bias is that it begs the question of how rationality remains 'bounded' in humans while complexity science (and Simon) suggest that everything else, including computers, are subject to learning and evolution. In the use of policy analysis by practitioners there is sometimes a tendency to see 'bounded rationality' as a fixed state of limitations rather than as an emergent state in which they might participate. The potential exists, for example, for computer models to assist in the evolution of humanity if used with an enlightened understanding of their potential, not only for problem solving, but for pushing the boundaries of human capacity - for reasoning, but

also for accepting difference, for sustaining civic relationships, and for co-creating different futures. Policy analysis in this regard can perhaps be an interactive dialogue is which solutions are sought to recurrent problems, but by which the human capacity for engaging the circumstances of social complexity also is enhanced.

Emergence: An evolution or an iteration?

The simple abundance of ideas, the crosscurrents between disciplines, the underlying hope of new methodologies, and a new freedom to experiment combine to create a strong sense that we are in the middle of a sea change in policy analysis. As with all changes, the outcome is uncertain and perhaps there is reason for caution in attributing too much to the new tools. What seems to be shaping up, however, is a co-evolution in which policy analysis, rooted in the pragmatic questions of daily citizen and administrative life, will shape the purposes and potential of the new sciences as much as complexity mathematics influences it.

This is good news in the sense that an emergent field of policy analysis is becoming less the bounded, regulating abstraction of the political environment and more an evolutionary actor with others in the system. This co-evolution is bound to produce something even if it is a break from the mechanical regulation of entrenched social problems and an opening of a more democratic and diverse dialogue about what to do and what can be sustained.

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