7. The policymaker's complexity toolkit

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> Evolution is cleverer than you are.
> Orgel's Second Rule

INTRODUCTION

As discussed in the introductory chapter, one of complexity theory's most useful contributions to policymaking and implementation may be the provision of a unifying language between different disciplines and professions, between 'theorists' and 'practitioners'. Whilst not quite yet the 'Esperanto' of scientific and social enquiry (Lissack, 1999), the framing of concepts with similar phraseology, models and conceptual metaphors might help both policymakers and practitioners communicate more effectively and begin to promote a common understanding of approaches to enquiry and policy implementation across disciplinary and cultural boundaries (Klein, 2004; Cooper et al., 2004; Price, 2005). Indeed contributors to this chapter come from different disciplines within one academic institution and have all found 'complexity' to be a commonly understood framework (if not completely uniformly interpreted), through which productive conversations regarding policy and practice can occur. We introduce the Brighton Complex Systems Toolkit (CSTK, 2012) to represent an example of successful collaborative practice, and frame a modified version as a suggested 'Complex Practice Toolkit', advocating a complexity approach, informed by an 'evolutionary' discourse, for both policymakers and those implementing policy (practitioners).

This chapter first discusses our interpretation of what might be called 'hard and soft' complexity, provides a concrete example of using complexity in practice to develop a cross-sector 'toolkit' for practitioners, and then goes on to suggest and explore seven tools for a 'Complex Practice Toolkit' for policymakers, based on our experiences and informed by theoretical perspectives.

Our intention is to help the policymaker and practitioner appreciate rule and value-based interactions between different agents (with different strategies) in their defined systems, to enable communication, information capture and recall, leading to pattern recognition, sense making and the evaluation of outcomes. The ultimate goal is to select and amplify successful work-streams and damp down of those less successful in an adaptive or evolutionary sense. We acknowledge that evolution and adaptation will occur in most complex systems (that is those involving humans), but in the area of policy-making, we hope to guide those in positions of influence to facilitate what has been termed an 'ecology of innovation' (Goldstein et al., 2010), and hope that the 'Complex Practice Toolkit' might act as a catalyst for action and change.

HARD AND SOFT COMPLEXITY

The Toolkit assumes that 'natural complexity' (that is, that complexity all around us in the natural world) and its scientific study have generated an inter-disciplinary 'complex systems science' where fundamental theory has been both generated and tested. Described by some as 'hard' complexity, or perhaps more usefully by Morin (2007) as 'restricted' complexity (in so far that there is a tendency to look for essential characteristics of different but related systems in a neo-reductionist manner), this area remains important to the policymaker since it embraces empiricism and data collection. 'Big data' relating to any defined system, can now be mined, and trends showing successful 'adaptations' to the changing environments identified. More difficult to apply and explore in recent years has been 'soft', 'metaphorical' or 'general' complexity (Morin, 2007), and we discuss the influence these concepts might have on culture and communication within a given system.

THE BRIGHTON KNOWLEDGE EXCHANGE PROJECT

The Brighton Knowledge Exchange project (http://www.brighton.ac.uk/sass/complex-systems/) brought academic and scientific expertise together with policymakers and practitioners in order to develop an approach which we consider to be significantly different from current advice, and which incorporates a language which is meaningful to both sides.

The Brighton project developed as a dialogue between public and voluntary service organizations which took place over the course of 12 months in 2010–11 as part of an ESRC funded knowledge exchange grant. The principal aim of the dialogue was to explore how complexity models and metaphors could be used to develop applied methods to support the organization, management and professional delivery of public services. Participant organizations ranged from small community organizations to statutory service providers working with the local authority. The scope of public service activities represented was equally diverse, including substance misuse, adult learning and social care commissioning. Time pressures and resource constraints faced all 12 project partners, and facilitated a sense of common purpose and a sharp focus on the practical application of ideas.

A combination of methods were used to support partner dialogue at both practical and conceptual levels, but in particular an online environment was created through which partners could contribute discussion points, videos, podcasts, references and documents. This environment helped to generate a set of resources which were drawn upon and further developed via face-to-face workshop sessions. These sessions included system mapping workshops and 'critical reading' groups in which ideas concerning a specific article were shared and examined.

Whilst methods of engagement varied to suit a range of partner needs, the 'back and forth', iterative examination of ideas and practice remained central to the project. In this way, partners began to use complexity concepts to articulate patterns of activity that were fundamental yet that had been frequently unacknowledged. For example, one partner from a community adult learning centre found complexity concepts offered a

counterpoint to conventional funder and commissioning conceptualizations of their work (each individual learning programme they offered had previously been treated as a separate entity). Complexity models allowed them to re-ground their strategic planning activities around a holistic view of their service provision, creating a space for them to articulate the means by which they adapted their curriculum in response to feedback from the community.

Since the end of the project, community partners have continued to work with academic partners, forming a 'Community Research and Evaluation Gateway'. This forum has been successful in supporting community organizations in their articulation of *core values* (cf. 'rules') and their need to orientate organizational, management and professional practices around these values. The holistic, complex and frequently radical thinking that underlies the interventions these organizations design is frequently at odds with the policy and funding environment. Empowering community organizations to stay close to their values through engaging them in academic research partnerships has created the possibility for triggering 'upstream' policy change. Their attentiveness to community feedback, professionalism with respect to data and information use and radical thinking in the face of complex community issues have now offered a capacity to effect change within local policy systems. Not having previously had the time and resource to articulate these elements of their professional practice has been recognized as the principal factor which left them in a disempowered 'response' mode of policy engagement. The Community and Research Evaluation Gateway now aims to address and mitigate this by lending voice to community organizations and enabling system change.

The experience of the Brighton Project led to the development of an initial toolkit (CSTK, 2012). Implementation has led to some modifications and it has been developed into what we term the 'Complex Practice Toolkit', comprising seven 'tools' for policy-makers aligned with an evolutionary or bottom-up approach to management. Although similar to approaches recommended by other management strategists (Beinhocker, 2007; Grisogono 2006; Axelrod and Cohen 2000), our new and radical 'Complex Practice Toolkit' is based on the pragmatic outcomes of a grounded knowledge exchange project, involving both 'theorists' and 'practitioners' engaged in policymaking and its implementation. The proposed toolkit can be summarized in Table 7.1.

Table 7.1   Complex Practice Toolkit: seven tools for policymakers

1.	Define your policy system
2.	Lead through facilitation, distribution, direction and rules
3.	Give up the illusion of prediction and control – encourage self-organization
4.	Take a realistic view of human behaviour (heuristics and rules of thumb)
5.	Use information scanning and resource management to enable economic evolution
6.	Evolve a portfolio of 'policy experiments'
7.	Empiricism, data and evaluation: do more of what works and less of what doesn't

SEVEN 'TOOLS' FOR POLICYMAKERS

1. Define your Policy System

Regarding policy-making in practice, one important thing to do initially is to define the complex adaptive system(s) in which policy is both formulated and implemented. Defining a system implies that it might be 'identifiable', that is, possess an identity, and that identity should necessarily be 'different' from that of another. In complex systems, this identity is a function of the dynamic nature of differences between agents and groups of agents (the important philosophical and ethical consequences of the relationship between difference, identity and complexity are well explicated elsewhere (Cilliers and Preiser, 2010)). Lichtenstein et al. (2006: 6) define the 'system' as being comprised of 'agents, individuals as well as groups of individuals, who "resonate" through sharing common interests, knowledge and/or goals due to their history of interaction and sharing of worldviews'. Considering public agencies and communities of individuals as systems such as this offers the prospect of planned and facilitated interactions in what Conn (2010) terms 'spaces of possibilities' which can be recognized and exploited, offering a way to acknowledge the asymmetry which often exists between the top-down and bottom-up in terms of relationships and organizational dynamics. Individuals in the community have strong horizontal peer relationships at a tangent to the vertical hierarchy of the external public agencies, thus requiring adequate support in this 'space of possibilities' which exists between communities and other structures. It is suggested that practitioners and other intermediaries need to work together in this space for mutual benefit.

Defining the system may be aligned with the, often temporary, 'space of possibility' in an organizational interaction, with support and facilitation of the 'space', together with planning for the measurement and evaluation of outcomes becoming an important task for the policymaker / leader (Sanderson, 2006). An example might be the implementation of a series of stakeholders' or policy teams' workshops, using methods such as 'Open Space' or 'World Café' (Malby and Fischer, 2006; Olson and Eoyang, 2001), in which the attendees first 'define the complex system' from their own perspectives, connect and share information and plans for potential outcomes, and begin to develop a system culture based on shared values and norms. This was indeed the process undertaken in the development of the initial Brighton Toolkit, and the 'Community Research and Evaluation Gateway' may be seen as the reality of a 'space of possibility'.

Determining whether the system has changed or evolved to a new state, such that it becomes necessary to redefine it, can be checked with participants intermittently, yet might also be informed by 'horizon scanning' by the facilitators of the planned interactive activities.

Intervening in the system
In the Brighton project, we used Meadows' short paper (1997) as the focus for a workshop on how to intervene in a system. Participants became interested in how Meadows had identified a range of possible interventions and how this highlighted the limited range of practices endorsed by current policy and public service management models. For example, Meadows' model positioned practices concerning resources and information use as low impact compared to those associated with empowerment, purpose and

paradigm change. Community organization partners in particular felt that dominant, funder-driven organization and management practices frequently so stifled articulation of the more radical elements of their strategic vision that they felt unable to properly empower the client groups and communities with whom they worked. A number of intervention points were identified and incorporated into the toolkit for use by practitioners.

The original Brighton Toolkit developed Meadows' framework with prompt questions for use in workshops or educational sessions, and important elements of the framework have been developed in the CPT presented here. Readers might wish to try out the Brighton Toolkit in its own right instead of or as an adjunct to the CPT (http://www.brighton.ac.uk/sass/complex-systems/ToolkitFramework.pdf). The authors would welcome feedback on success or otherwise with the use of either.

2.   Lead through Facilitation, Distribution, Direction and Rules

Policymakers wishing to facilitate change or a review of strategy within their system may see themselves as educators or facilitators, but the overlap with *leadership* may be larger than imagined. Leadership in a complex environment presents a challenge, both conceptually and practically. Accepting that groups of humans interacting as a system make the system complex and adaptive, how should one best see 'leadership'?

In the last decade it has been recognized that 'decentralization' is a driving force for many organizations (Castellani and Hafferty, 2009; Lichtenstein et al., 2006; Osborn et al., 2002), a good example in the UK being the NHS (Department of Health, 1997; 2000). As organizations cope with these decentralizing forces, there is a growing recognition that traditional 'top-down' theories of leadership may not be helpful, and may be, at best, overly simplistic (Osborn et al., 2002). Social processes are seen as too complex and 'messy' (Klein, 2004) to be attributed to one individual or a planned series of events (Finkelstein, 2003; Marion and Uhl Bien, 2001). This leads to increasing doubt about the notion of leadership resting within the character or characteristics of the leader (Seers, 2004), and whether the leader can indeed 'act on' an organization exogenously (Meyer et al., 2005).

A novel way to approach leadership from a complexity perspective is to see leadership as an emergent event, what Lichtenstein et al. (2006) see as 'the outcome of relational interaction among agents' in the system. These authors have expounded the notion of 'complexity leadership theory', seeing leadership as transcending the individual and being a phenomenon associated with the 'system' (Hazy, 2006; Marion and Uhl-Bien, 2001). Viewing the organization as a 'complex adaptive system' defines leadership by relationships and interactions rather than by hierarchical structures. Leadership may then be seen as a 'distributed' process (Brown and Gioia, 2002; Gronn, 2002), and may provide an integrated theoretical framework for explaining interactive dynamics that have in recent years been acknowledged by a variety of emergent leadership theories, for example shared leadership (Pearce and Conger, 2003), collective leadership (Weick and Roberts, 1993) distributed leadership (Gronn, 2002), relational leadership (Drath, 2001) adaptive leadership (Linsky and Heifetz, 2002), and leadership as an emergent organizational meta-capability (Hazy, 2006). This concept of 'distributed leadership' has major implications for how leadership is constructed, retaining the notion of a 'system', not dissimilar from Senge's (1990) 'learning organization', that is, reifying the 'system' in which the agents interact. However, at the other extreme lies another perspective which

goes further and touches on the importance of 'self' in the relational interactions that occur in the policymaker's 'system'.

Drawing on the work of Mead (1934) and Elias (1939), Stacey has developed the notion of the 'complex responsive process' of human relating, referring to the '*actions of human bodies* as they interact with each other, so constituting the *social*, and as each interacts, *at the same time*, with himself or herself, so constituting *mind/self*' (Stacey and Griffin, 2006: 14; italics in the original). Griffin (2002) built on Stacey's work on complex responsive processes in proposing a model of leadership which moves beyond the systematic approach to complex leadership. His ideas involve the patterning of one-to-one, group-to-individual and group-to-group interactions described by Mead and Elias, as a model for both developing leadership and explaining ethics in any system. The notion of 'participative self-organization' is seen as a way in which these issues are played out, and theories of ethics are seen as theories of leadership, both being action into the future and therefore about the identity of persons who are both changeable and stable. The role of leader emerges in the interaction in a group, and those participating are continuously creating and recreating the meaning of leadership themes in the local interaction with which they are involved (ibid.: 203). Groups then 'tend to recognise the leadership role in those who have acquired a greater spontaneity, a greater ability to deal with the unknown as it emerges from the known context' (ibid: 204).

So what does this mean for 'leadership' in the policymaking world? The 'leader' may perhaps be best seen though this lens as 'facilitator', bringing agents together, establishing interactive frameworks and catalysing interactions in the 'space of possibilities'. The leader can offer the 'distributed leadership' model to agents within the system, allowing dynamic shifts in leadership concepts and roles as the system evolves. The leader can help agents define their system from within, both temporally and spatially. S/he can also influence the direction of evolution of the system, not through being 'directive' but through offering a temporal framework and expectations (that is, likely lifetime of the 'system') and creating a vision of one or several possible futures (that is, end-states of the system). Expectations of ways of behaving (ethics and values) will also need explication, through the exploration and agreement of 'simple rules' (explicit and implicit), at a high enough level to avoid over-specification (Zimmerman et al., 1998; Plsek and Wilson, 2001; Lichtenstein et al., 2006; Goldstein et al., 2010). In summary, complexity theory informs the 'policymaker leader' as shown in Table 7.2.

Table 7.2   Complexity and policymaker leadership

Leader as facilitator	Convene and catalyse interactions of agents in the system
	Offer 'distributed leadership' as a model for system dynamics
Define the system	Offer temporal and spatial visions of the system
	Allow agents to define the system from within
Direction but not directive	Outline temporal and pragmatic outcomes
	Explore expectations and create a vision of future states as a range of possibilities
Explore and explicate 'rules'	Explicate ethics and values using exploration and agreement of implicit and explicit rules

3.   Give up the Illusion of Prediction and Control – Encourage Self-organization

Most recent complexity theorists in the management world realize that 'traditional' ways of managing and leading are severely limited in the domain of the 'complex adaptive system' (for example Wheatley, 1992; Zimmerman et al., 1998; Stacey et al., 2000; Stacey, 2005). The hierarchical managerial system lies at the opposite end of a managerial spectrum to that which is evolutionary and ecological in its perspective, and diffusion of ideas and innovation occurs in markedly different ways between these two extremes (Greenhalgh et al., 2005). Relaxing one's grip on the need for control and prediction is difficult for the traditional hierarchical manager and is also difficult for the political policymaker who may be required to have an overall strategy defined by ideological priorities. A government minister or local mayor needs to translate this with the help of policy managers and administrators to core values and then priority tasks and related output objectives. But political leadership is mistaken if it attempts too much intervention at the micro management level. The need for using the power of 'self-organization' soon becomes apparent, and the role of the manager or leader changes to facilitating the self-organization process to occur (Olson and Eoyang, 2001). So what exactly do we mean by 'self-organization' and how can we promote it?

Self-organization refers to the emergence of new orders brought about by the interaction of social actors within the system without the intervention of a single central or external controller. There are resonances with the 'bottom-up' rather than the 'top-down' approach to policy implementation recorded in the public administration literature (Hill, 2012). Bottom-up policy making acknowledges the realism of professional discretion, as highly trained public professionals like doctors, teachers and social workers craft the detail of policy in their working lives, and exercise their own judgements and priorities into the policy frameworks they are given. Better therefore that they really are able to feel they can participate in and share the value base of their government if real long-term progress is to be made. The alternative is mistrust, organizational conflict and various manifestations of local resistance to change. New orders emerging from self-organization can include the creation of new rules and social practices as well as working groups or management bodies within the system, but these can be defensive and protective, or creative and innovative (Ricaurte-Quijano, 2013). Self organization does not have a built-in public benefit.

For Boons et al. (2009: 235–6), self-organization has four key characteristics:

1. Self-organization is a driving force that emerges from the interactions and actions of individuals in the system, often amidst unstable and constraining conditions.
2. Self-organization causes processes to follow unexpected trajectories since there is no unique agent controlling actions.
3. Self-organization is closely related to values, perceptions and interests of actors within the system. These understandings are changing constantly since actors feed back to each other through communication.
4. Self-organization is driven by the individual need to survive (self-interest, competition, or conservative self-organization), but also by the ambition to contribute to changing the state of things and having an impact on the system (public interest, cooperation, or dissipative self-organization).

The policymaker needs to be aware of the unpredictability of outcome, but also that outcome more likely to be positive and within certain parameters is more likely to occur if the values, perceptions and interests of the actors are: (a) respected and (b) in line with those of the 'system' itself, that is, the organizational culture. The wise policymaker will embrace the notion of self-organization, and put energy into creating the conditions for it to occur within the defined system, as much in line with a positive vision of the future as possible. The following practical tips may help:

1. Identify processes in the system that could be dealt with through interaction, such as the identification of perturbations or conflicts, discussion of alternatives, decision-making, implementation and the monitoring of action.
2. Set up mechanisms and encourage practices of communication and information sharing. Communication should allow individuals to identify interdependences in roles, shared and conflicting points of view, interests and values. Communication and dialogue should also allow the identification of what actors within the system would like to maintain and what they would like to change.
3. Encourage the emergence of agreed bottom-up rules and practices, which should facilitate rather than constrain voluntary action, leadership, negotiated decision-making, cooperative action, transparency and accountability.
4. Allow horizontal communication based on dialogue and negotiations between actors. Decisions should be distributed, that is, they should not be identifiable as the choice of a single actor, but the result of dialogue and multiple perspectives.
5. Encourage implementation mechanisms that rely on the alignment of individual interests and perceptions, as well as their roles and competences, that is, that rely on interdependencies, cooperative action and mutual benefit.

4.   Take a Realistic View of Human Behaviour (Heuristics and Rules of Thumb)

In recent years much light has been shed on reasons behind the fallacy that humans are rational beings who make logical decisions based on cognitive processing of all the available facts (Tversky and Kahneman, 1974; Kahneman and Tversky, 1984; Kahneman, 2011; Thaler and Sunstein, 2008). The importance of subjective heuristics and biases, environmental influences and context / history are much more important than we would perhaps like to believe. Even if the normal rules of engagement and institutional values and culture might be expected to cause an individual or group of individuals to act in a certain way, other factors, often hidden, but related to other aspects of system dynamics (such as those listed by Meadows, 1997), might cause quite unexpected actions to occur, sometimes quite contrary to the expected values of the system.

The public sector is full of operational examples where difficult decisions have to be made in the midst of complex environments, and sometimes the stakes are very high, with decisions resulting in life or death. A key aim for policymakers becomes the creation of a policy environment that supports difficult decision making, rather than undermining it. The limited rationality of even one experienced practitioner is a given, but they need a supportive and open environment where they can check their own assessment with that of others. The culture should be for shared responsibility, rather than scapegoating. The

tragedy of child deaths, due to abuse, when the case is known to public services, such as the UK case of Victoria Climbié, provides an example.

The cultural features of the organization responsible for Climbié's care might be analysed through the lens of complexity using the notion of the 'strange attractor'.[1] Like isobarometric troughs on a weather map, these cultural features (*inter alia*, leadership, funding, values, anxiety) may be seen to self-organize, endure, deepen, become shallow, engulf and be engulfed over time. Thus an organization delivering a vital area of public policy can move from a stable attractor pattern to a non-linear chaotic attractor pattern, and then 'flip' to another stable, yet very different 'attractor state'. This change may relate to external and/or local political pressures, requiring managers and practitioners with experience, confidence and system sensitivity to recognize high-risk priorities and contain fragmentation. The practice dynamic between the organization's attractor thrust towards scientific managerialism (based on the premise of some certainty linked to performance targets and risk management checklists) and the adaptive 'edge of chaos'[2] activity that recognizes inherent instability and high levels of risk must be negotiated (Czerwinski, 1998). The latter acknowledges the need for highly developed expert and qualitative practices, with supportive shared, collective working and decision-making. Classical managerial shortcuts will be unable to refine a positive culture of decision-making based on practice experience and an open sharing of multidisciplinary perspectives. Supporting this view, Houchin and MacLean's important study (2005) of the building of an organization on complexity lines identified the lack of management of workers' anxiety (effectively an all-powerful attractor) as a critical factor in the eventual undermining of the project, and complements Menzies Lyth's psychodynamic account of organizational anxiety in a health context in an earlier decade (Menzies Lyth, 1989).

In the case of Climbié, where there was, *inter alia*, a breakdown of the formal child protection system (local authority, health, police in particular), Lord Laming's subsequent report highlighted the responsibility of senior management and recommended the introduction of new structures and protocols (Laming, 2003). This rigid and reductionist response notwithstanding, there has been a turnaround in the effectiveness and processes of Hackney Children Services since the event. Perhaps of more relevance to the change is the adoption of a systemic approach to the organization, recognizing the embeddedness of denial, fear and anxiety as key 'attractor' features of the child protection system (Ferguson, 2005; Smith, 2005), and also the introduction of a 'Meadows approach' to staffing that allows for building 'stocks' and 'buffers'. Knowledgeable and experienced staff have been appointed, and a managerial style has evolved which has recognized the dynamic attractor processes between systems, coupled with the maturity to manage the uncertainty implicit in such work (Goodman and Trowler, 2011).

In this case study, we have identified and highlighted anxiety in particular as a powerful, dominant attractor in the complex systems of child protection and child placement. The public management facilitation of good local decision-making requires policy to be implemented in a manner that optimizes the use of collective professional experience and participation.

5. Use Information Scanning and Resource Management to Enable Economic Evolution

The use of information is one key instrument available to managers and policymakers identified in Meadows' (2008) system model and in the recent Brighton toolkit development. Policymakers in a complex system need to be aware of the importance of wide information scanning and its management to facilitate policy evolution 'pilots'. Narrow and erroneous information processing is cited as one of the causes of the 2008 Financial Crisis (Haynes, 2012).

Information comes in different forms. A distinction recognized by social scientists is *quantitative* and *qualitative*. The former puts the emphasis on data, or bits of information that are stored as numerical counts, or at least attempts to numerically code bits of information into mutually exclusive categories. While the benefits of such types of information are their potential to be precise about definition and to make comparisons of quantity, there will be issues of reliability of measurement over time and its validity (validity is whether the measure is useful in the context of its application). For example, in the managerial practice of performance management, there has been much debate about the use of quantitative performance indicators (PIs) (Haynes, 2003). Do PIs measure what they are supposed to measure (does the school mathematics test really measure mathematics skills?), and are these skills useful in an external context (will those mathematical skills taught successfully, really be the ones future industry requires of its graduates?)?

Qualitative information moves the managerial focus away from individual data items and categories represented by numbers and digits towards a synthesis of items that might depend much more on situational context. For example, a personal or household address in a database is several bits of information that nevertheless come together to provide a specific piece of geographical information: a house number, a road, and a neighbourhood, a town, combines to give the information of a business or private address. Most policy-related managerial decisions and judgements are essentially qualitative, even though they may be composed of different quantitative bits of information. They involve a synthesis of information. Complex policy systems require a synthesis of judgement.

Policymakers should begin by assessing what quantitative information they already have available at their disposal and what it tells them about the operation of their policy system. Most modern public sector institutions and agencies have a very large amount of information collected within their routine processes and operations and this is useful in describing and understanding system dynamics and behaviour. Policymaking requires managers to understand the interface of their own system with other systems. Other influencing systems will be overlapping or in close proximity to their own.

A first task for the policy manager and their support staff is to assess what information is available and what is of an acceptable quality to be used. Existing information can be repackaged and redefined to make it fit for answering questions of analysis. A simple example is that two variables like height and weight can be combined together to become the Body Mass Indicator (BMI) and this can begin to provide understanding about the prevalence of obesity in the population.

Is there still additional information that needs to be collected for better decisions to be made? If this is possible and can be prioritized, such new data collection costs will need to weighted against the likely advantage of having yet more information available and

its ability to cover existing gaps of knowledge. Another important activity is the periodic review of the collection of routine data and information, and asking whether there are currently any key changes in the core statistical information required. Given the nature of change in dynamic systems and their interaction with the environment, data quickly becomes irrelevant, and new questions need to be answered.

Having made a judgement about the range, diversity and quality of information available and what to do about it, it is futile to wait for the perfection of information collection and data sources (as this will never be achieved in a complex evolving system) but instead one should continue with the analysis and synthesis of the information that is available. Quantitative indicators can certainly give insights into the health of an overall system and how it is evolving, but this requires a dynamic qualitative judgement and active decisions rather than automated static modelling and decision tools.

Regular trend analysis is clearly important in this regard. Meadows (2008: 20) argues that system thinkers need to understand change over time rather than just examining one-off events. This allows a judgement about whether a system is approaching a major limit, or if it is about to attain a key goal. History seems to be full of examples where policymakers and managers became fixated with some particular indicators and chose to ignore or deny the importance of others. The build-up to the recent Financial Crisis was an example of this. Economists were obsessed with consumer inflation targeting and the corresponding setting of central bank interest rates, but ignored asset price inflation, in particular property price inflation fed by cheap debt and global financial flows. Similarly, policymakers thought that balance of trade figures were no longer important to scrutinize as imbalances in exports and imports would be self-corrected by inward and outward investment. This ignored the different social and financial impacts that flows of money in and out of countries have when compared to flows of goods, and the fact that balance of payments trends were related to – if not determining – particular labour market trends and consumer patterns. Before the Financial Crisis broke there were early data signs of the trouble brewing, but few spotted them in advance.

At the more micro level policy managers can use information to try and change organizational behaviour. The timing and placement of information and its analysis into organizations can certainly contribute to changes in interaction and behaviour as information influences debate and decisions. Public health information, such as the use of hospital infection rates, has contributed to major changes in UK hospital practices, with some success in controlling and reducing dangerous infections.

A growth area in the application of information in recent years has been risk management and planning. Here information is sought to assess risk in advance of an organization undertaking a particular activity. While this can provide a useful exercise in scenario planning where hard information is combined with managerial qualitative judgements, risk analysis can become dysfunctional if it tries to rely too much on historical statistical models, as complexity theory demonstrates that historical analysis is not consistently reliable as a good guide for future events. Sudden and unexpected growth in a policy system's instability makes historical data analysis patterns particularly unreliable as an aid to future decision making.

Signs of a policy system moving into chaos (high instability) require rapid and precise interventions and resource targeting. An example of this was the failure of the Japanese Government and central Bank of Japan to prevent an escalation of its own financial

crisis in the 1990s when its banking system had imploded with bad debt and loss of confidence. It failed to act quickly with low interest rates, banking reform and restructuring, something that had become an urgent priority, and also did not provide enough policy clarity to drive an economic stimulus on the back of low interest rates (Turner, 2008). Contradictory messages and actions were communicated by policymakers, including a since much criticized upwards consumer tax adjustment. Instability needs strong leadership and judgement with focused and targeted use of resources to deal with system behaviours and interactions that are no longer responding to the normal policy and management processes.

There is much debate about whether information systems can be used to identify edge of chaos movements in data that are likely to move into tipping points and increased instability, transformational changes or major crisis events. Several authors have argued that this was possible in the build-up to the global financial crisis, with house prices and household debt levels rising faster than wages, and credit bubbles exceeding real growth. Such trends could be observed in routine data that was available. Discerning such qualitative system change in quantitative data is a matter of judgement and cannot easily be programmed automatically into an information system. This is why writers like Taleb (2005; 2007) and Mandelbrot and Hudson (2008) have warned against automated 'quant' models that make decisions to spend money. Instead qualitative assessments of quantitative data are essential to any management of risk. Qualitative judgement of patterns is likely to be more successful than deterministic modelling of fixed algorithms. As one commentator put it, 'looking in the rear view mirror is not always the best guide to the road ahead' (Ellsworth, 2002: 164).

Seddon (2008) has put a stress on entry into a policy service system, and avoiding what he calls 'demand failures'. He observes that dysfunctional processing of work, as demands enter a public policy system, are often the source of much inefficiency and waste, with inappropriate outputs then provided and disappointing outcomes resulting. Examples would be bureaucratic and standardized forms of assessing need that do not allow flexibility and adaption to individual differences and circumstances. Where services and products are complex this leads to a reductionist approach rather than a holistic understanding of the service process and end output. For example, components might be ordered in advance for a housing repair, on the basis of a tenant phone call report and address location, but these components ordered from different specialist sources are not found to fit together to meet the needs of a specific property repair. Better for a crafts person to assess the job at the local scene and then to assess the relevant parts directly, thus allowing individual circumstances to be taken into account early on in the process (Seddon, 2008). Delays and waste are reduced. With complex medical cases, circumstances can change while the patient is awaiting specialist referral and so an over-rigid referral from a first general assessment to a later secondary hospital appointment may be inappropriate by the time the person gets to see the relevant surgeon and they then join a queue for a different specialist. The alternative is a much more adaptive and evolving primary care system that interconnects more easily with secondary resources and allows for changing circumstances.

The growing focus on strategic, outward-looking management in the public sector in recent decades has meant policymakers and policy managers have become better at seeing how public agencies can adapt to external economic and social change. An

important example is the need for the personal tax system to adapt to the increased numbers of women working and of single households and cohabitations and the growth in part-time employment. One might also point to the need for public health and health care systems to move from managing chronic infectious diseases to lifestyle-related conditions such as cardiorespiratory disease, cancer, mental ill-health and obesity. Such social changes require public policy and public services to constantly evolve and adapt and to appreciate when current static services become dysfunctional. The creative and dynamic use of information to make decisions about the deployment of resources is at the core of the successful management of a complex public policy system.

6.   Evolve a Portfolio of 'Policy Experiments'

The generation of novelty in an 'ecology of innovation' (Goldstein et al., 2010) is a crucial aspect of a 'selection' take on policy development. Often the novel aspects might be quite noticeable, positive in their outcome, and fit into the bracket of 'positive deviance' (Dorsey, 2000); however, many innovations might be much smaller 'fluctuations', and easily overlooked. Policymakers need mechanisms to both detect these fluctuations and to reinforce and amplify them if they have the potential to be more broadly beneficial. Using information, especially regarding inputs and outputs, in order to obtain a more holistic view of the system (Hübler, 2005), as well as identifying patterns and trends and distinguishing meaningful 'signals' from background 'noise', becomes an important part of the policymaker's role.

In order to set up these policy experiments to search for novelty, there must be a degree of heterogeneity, and it has been shown that the right combination of difference (in backgrounds, perspectives, heuristics and mental models) is much more important in homogeneous teams for improving performance than the possession of high-level skills (Page, 2007). In fact, the degree of difference among members of the social system has been shown to be proportional to the degree of novelty that the system will generate (ibid.). This essentially underlines the importance of avoiding so-called 'groupthink', when new information is discounted in favour of a single, prevailing mental map (Janis, 1972). Axelrod and Cohen (2000) remind us of the important tension within a Complex Adaptive System (CAS) between 'exploration' (creating new, untested agents or strategies) and 'exploitation' (copying tested types that have proved to be the best to date), an important trade-off for the policymaker to recognize. At one extreme 'eternal boiling' might occur, when the level of novelty, temperature or noise is so high that the system remains permanently disordered, and any potentially valuable structures are destroyed before they can be usefully employed (one might argue that the recent changes in the UK National Health Service (NHS) organizational structure have pushed the system towards this extreme). At the other end of the scale 'premature convergence' occurs when variability is lost too quickly, and speedy imitation of initially successful models prevents future system improvements (ibid.: 44). The wise policymaker will remain alert to the potential pitfalls of this trade-off at either end of the spectrum. Managerial judgements about this dynamic have become critical in the development and practice of multidisciplinary teams to solve so-called 'wicked' policy problems: examples being substance misuse, long-term unemployment, and how best

to provide integrated long-term health and social care. Increasingly governments look to non-government organization (NGO) providers and perhaps private bodies for cost-effective solutions.

There is also the need to know that with every project there is the possibility of failure. In fact the reality is that the project is very likely to fail, because, as Ormerod points out to us candidly: 'most things fail' (2005). Indeed recent thinking in the field of safety systems offers a view of failure as an emergent property of a system, with an attempt to move beyond the Newtonian analysis of failure in complex systems (Dekker et al., 2011). The policymaker's real dilemma is to design programmes of work that allow for failure, and do not assume, for instance, that regional pilot schemes should always proceed to national 'roll out' and wider adoption in due course, whatever the outcome (Gov.uk, 2012). Success in such challenging policy circumstances depends on good communication and negotiation skills in a world that adapts best via relational collaborations rather than adversarial contacting. Many of the failures of privatization seem to be linked to an early and uncompromising split between purchaser and provider where purchasers have imperfect information, but are tied quickly to long-term and expensive solutions. The provider inevitably makes bold promises to win the contract that in time they find are impossible to deliver. Examples in the NHS are poor innovation in hospital design and poorer quality buildings on completion (House of Commons Treasury Select Committee, 2011). Such a contract can quickly become adversarial where the energies go into the payment of lawyers and arguments that are not in the public interest and waste precious resources. Relational contracting allows for more constructive communication about what is working and what is failing, and how resourcing needs to change to reflect new circumstances. Given a world that has become more innovative with public policy, with ever more experimental partnerships with NGOs and private bodies, good and open systems of evaluation are an imperative. A strengthening of the relationship between research and policymaking is needed to increase the learning in an evolutionary and adapting complex policy system.

7. Empiricism, Data and Evaluation: do More of What Works and Less of What doesn't

The policymaker's experiments in novelty and innovation will generate data, and this will need evaluation. As some have cogently argued, this 'evaluation' should be closely aligned to the notions of complexity and emergence, and the modernist privileging of objective, value-free knowledge, derived through quantitative social science methodologies, should be tempered with a more hermeneutic and qualitative approach to the nature of information used in evaluation (Sanderson, 2000; 2006). In the past, policy evaluation has been seen as rational and 'goal-orientated' following a 'goal-driven' interpretation of policy itself. But this instrumental, Newtonian 'social physics' view of policy evaluation (Marion, 1999) is now more widely challenged, and since the late 1990s, the *critical realist* stance, more in tune with complexity principles, has become more central to policy evaluation (Pawson and Tilley, 1997; Byrne, 1998; Haynes, 2003). Indeed the notion of critical realism can be further aligned with the notion of dissipative social systems by adopting Bhaskar's (1998) idea of 'social naturalism', which presents a 'transformational model of social action'. Similar to Conn's 'space of possibilities' model (Conn, 2010) described above, this model posits three levels of social reality:

1. society as a 'structural entity';
2. the individual, subject to socialization in particular social contexts but nevertheless with significant powers of agency;
3. an intermediary level comprising a 'position-practice system' of 'rules, roles and relations' that regulate the interactions between the individual and social levels.

This intermediary level equates to Conn's 'space of possibilities' and links our proposed model to the early thinking of complex systems related to social policy. Sanderson (2000) also points out the importance of seeing evaluation as 'craft' or 'practice', and the development of 'communicative competence', at institutional and individual level, key in the success of an evaluation strategy.

Seeing evaluation as equivalent to 'selection' in evolutionary reams, Axelrod and Cohen (2000) suggest that social activity is used to support the growth and spread of valued criteria. An example of this might be prize competitions, for example the Nobel Prize, whereby the processes of refining prize criteria, selecting judges, including nominees in publicising winners will serve to disseminate the underlying goals that motivated the creation of the prize. Such activity increases the use of the criteria imported in the prize, which may be far more effective than direct advocacy of those criteria (ibid.: 158).

Another factor important to bear in mind is that of time. Looking for shorter-term, more granular measures of success as a proxy for longer-term broader goals may be the only practicable solution. Sabatier (1986) identified the problem of 'premature assessment' of the effects of policies and programmes, a problem which besets evaluation in many policy fields. It has been argued that a timeframe of 10–15 years is needed in order to identify how policies and programmes are working as a basis for learning. In particular, such a timeframe is needed to be able to distinguish, on the one hand, the effects of the implementation structure and, on the other hand, the validity of the relevant policy theory, the latter being crucially dependent in complex systems upon longer-term impacts. In reality, one may need to make an evaluative decision in the much shorter term, and proxy measures are often essential. An example in a game of chess might be the number of pieces taken, or the dominance of the central board area, or for the military or emergency services, conducting simulation exercises in a context as near to reality as possible without genuine war disaster will also provide valuable, quick experience. Although the nature of complex systems means that any outcome or evaluation of lower-level factors involved might be at risk of misattribution, since no complex system can ever be truly modelled (Cilliers, 1998; 2001), the evaluation of shorter-term simulations can be valuable for selection, even with acknowledged reduction in validity (Axelrod and Cohen, 2000).

Complexity theory therefore has important implications for evaluation in the context of policy initiatives to address key economic and social problems, in that it requires us to challenge some basic assumptions that underpin traditional approaches; for instance how we can gain access to and analyse social processes, how policies to change such processes are formulated and implemented, and how such policies 'work' in promoting change. It requires us to recognize that evaluation is necessarily itself a highly complex endeavour, a craft or 'practice' (Sanderson, 2000), which, in common with other crafts and expert practices, may require tools to facilitate the process, and to become expert in the craft is likely to require extensive, repetitive and deliberate practice (Ericsson et al., 1993; Simon and Chase, 1973).

CONCLUSION

We have presented seven 'tools' in a 'Complex Practice Toolkit' for policymakers, based on principles collated from other experts in the complexity and policy field over many years. We present this model in a contextual basis, with grounded examples from practice, acknowledging the diverse disciplinary backgrounds which complexity enjoys. The insights and principles emerging from fundamental theory are presented as recommendations for application to practice.

Our seven tools approach indicates that one should: (1) define the system one is working in (as nearly as possible) to make things manageable; (2) lead in one's sphere of influence through facilitation, distribution, direction and by using some 'simple rules' based on values; (3) openly acknowledge the limitations and 'illusion' of prediction and control and encourage self-organization in an appropriate way; (4) take a realistic view of one's colleagues' behaviours and seek to understand the heuristics and 'simple rules' which set the culture in the context in which they operate; (5) use information and resource scanning to maximize the intelligence one has to hand to make economically sensible decisions; (6) try things out via a portfolio of policy experiments or pilots (which are always evaluated); and (7) using the evaluation of these experiments, do more of what works and stop that which does not (acknowledging that these outcomes may well be context-specific, and generalization may be risky).

In this chapter have also shown how Meadows' (1997) ideas for intervening in a complex system, which influenced the development of the Brighton Complex Systems Toolkit (CSTK, 2012), have also shaped the development of the 'Complex Practice Toolkit', described here. We hope that for both models, further iterations and 'improvements' will occur, using the knowledge co-created to date to construct a 'fitter' model for future use. We encourage the reader to try these models in practice and would welcome feedback on the 'Complex Practice Toolkit', to improve its applicability and utility. We will of course respond in the spirit of collaborative creativity.

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NOTES

1. In using this term we adapt the physics definition minimally to mean 'a state toward which a system tends to evolve'.
2. In using the term 'edge of chaos' here, we mean a critical phase of evolution of a system when rapid evolution occurs, and the system could either become chaotic (and potentially cease to exist), or revert to a more stable pattern (attractor), which may or may not resemble the previous stable state or 'attractor'. It is therefore the state of maximal creativity, yet also maximal anxiety.

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