Making (Dis)Connections: Complexity and the Policy Process?

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This article explores the methodological problems of using models from 'complexity science' for understanding policy process. The article argues that the problem of complexity is not just a problems for modelling, but needs to be understand as a problem in the world of social policy itself. Highlighting the possibility of describing policy process with complexity science, the article then situates the issues through three scenarios from an ethnographic study of collaboration in social welfare. The article asks, 'how do we make connections between these scenarios as part of a policy process?' and suggests there is value in understanding policy process as constituted in communications. Doing so suggests recognising the inherent role of 'ignorance' as part of policy process.

This article arises out of a critical engagement with the problem of how we make connections between the complexity sciences and social policy. This critical engagement is one which highlights the methodological problems of 'modelling' social policy but my concern is not with modelling itself, but rather, with how to develop a sensitivity to 'complexity' as a problem *in the world of social policy itself*. Such sensitivity to complexity, I will argue, leads to a consideration of 'ignorance' as a constitutive component of the policy processes itself, rather than something demonstrative of 'deficit' in policy processes. Examining ignorance as an important and essential aspect of any policy process suggests a turn to ask, what forms of ignorance does policy constitute, and what forms of ignorance can we afford?

My argument begins with a brief comment on what the policy process might look like if it were to be imagined in terms of the types of dynamics suggested by 'the complexity sciences'. There is a problem however: can social policy process be characterised in this way? Of course, at one level, complexity science may simply offer a useful metaphor, a useful language through which to understand policy processes. However, to go further than this, to explore the validity and ethics of that language, we need to ask what assumptions about policy process would arise from such models?

To situate my concerns I present three 'episodes' from an ethnographic case study of collaboration in social welfare (Medd 2000). The episodes do not represent real examples but are derived from particular scenarios in the study. The purpose is illustrative in order to situate what may otherwise be a rather abstract discussion. The three episodes present us with a problem. On the one hand, they have something in common: they all refer to the project I have called *Interface* in a locality I call *Webton* [1]. This is the connection. On the other hand, they are all different: they happen at different times, in different places, with different motivations, different people and with different implications and outcomes. Episodes like these are distributed throughout the world of social policy. Decisions like those made in these episodes are everywhere. These are dis-connections. My question then is this: how does complexity science suggest we account for these episodes as a part of a policy process? What connections does complexity science suggest we look for?

Making Connections with Complexity Science

There has been a long history of research on 'the policy process' which is 'closely connected to efforts to examine the nature of power in society and to specify the necessary conditions for democratic government' (Hill 1997: 1; see also Colbatch 1998; Hill 1993; Parsons 1995). In a context where claims made upon complexity science are hard to exaggerate in terms of what authors

propose the implications are for changing the way we think and act (see Brockman 1995, Capra 1996, Prigogine and Stengers 1984) what does this new 'world view' (Dent 1999) propose for our understanding – or indeed vision – of the policy process? A note of caution. There is a risk here of positing and reifying complexity science as coherent body of research; one characterised by consensus, clarity and unified purpose. However, such an attempt will ultimately overlook differences, contestations, and politics, it would deny the complexity of complexity science itself (Medd 2001) as well as its mutability across different networks (Thrift 1999). Here I do not want to give a list of the key features of complexity science but rather, give something of a taste of what policy processes might look like if we were to describe them in the language of complexity science. To do this I want to draw on work by Paul Cilliers who details an account of the dynamics of complex systems (Cilliers 2000; for a more detailed account see Cilliers 1998).

Following Cilliers (2000) description there are seven characteristics which our complex system of social policy would have. Our policy process would:

- 'consist of a large number of elements which in themselves can be simple' but which 'interact dynamically by exchanging energy or information'. The 'effects of these interactions are propogated throughout the system'.
- have 'many direct and indirect feedback loops'.
- be characterised in terms of 'open systems – they exchange energy or information with their environment – and operate at conditions far from equilibrium'.
- have 'memory, not located at a specific place, but distributed throughout the system' and 'thus has a history'.
- have emergent properties, that is, 'behaviour of the systems is determined by the nature of the interactions, not by what is contained within the components. Since the interactions are rich, dynamic, fed back, and above all, non-linear, the behaviour of the system as a whole cannot be predicted from an inspection of its components'.

The system is adaptive in so far as it 'can (re)organize [its] internal structure without the intervention of an external agent'.

There are a number of implications that follow in terms of how we understand and act upon such a system of social policy. For example, in considering the implications for understanding organisations, Cilliers (2000) argues: relationships are vital to the system; organisations cannot be understood in isolation from context; organisations cannot be understood in isolation from history; the organisation is unpredictable and novel characteristics may emerge which can be beneficial; in the organisation small causes may have large effects (the consequence of non-linearity); the organisation may self-organise at points of criticality, that is, will be critically sensitive to adapting for its own survival; the organisation cannot survive when there is too much control, such that control should be distributed throughout the system; and finally such organisations have shallow 'structures' in terms of the relationship between interactions.

And so we could think of these points as characteristic of our policy process, our self-organised non-linear policy process. Indeed, the reader may have noticed, there is strong resonance - and indeed explicit reference in many cases - between such a description and analysis of new forms of 'network governance' which emphasises the 'self-organisation' of policy networks used to describe (though often confusingly prescribe) contemporary forms of policy (see for example Amin and Hausner 1997; Kooiman 1993, Rhodes, 1997).

We could continue this line of imagining. We could develop a more precise theoretical model based on complexity science to describe the dynamics of the policy process. We could describe this system through a variety of concepts, for example 'the edge of chaos', 'self-organised criticality', 'co-evolution', 'fitness landscapes' etc. (Battrom 1997, Elliot and Kiel 1997, Haynes 1999, Kiel 1997). We may be satisfied with this. We may be content to use this language of complexity science to think about the dynamics we observe and which – if we are in the policy world – we effect. There is a question, however, which I want to explore. If we use this language for analysis and that analysis informs our practice, then what assumptions are we making about how policy process works? What claims are we making about the underlying dynamics of policy processes when we describe them it

as emergent self-organised non-linear systems? What happens in this process to complexity? What, I think we should ask, ignorance do we assume?

Making (Dis)Connections: what does (not) count for Complexity Science?

In the last section I suggested we could use the language of complexity science to describe policy processes, but that we need to examine more closely the assumptions that have underpinned the models through which this language has developed. I want to explore in this section the assumptions underlying the models of complexity science, and I want to do this by thinking about the connections such models would make between three episodes taken from an ethnographic study of collaboration in social welfare (Medd 2000). In exploring these connections, I want to argue we need to stand back, dis-connect, from complexity science, and, which I will develop in the final section, explore how social policy itself makes connections and how these connections are at the route of understanding the complex dynamics of social policy.

Episode 1

May 1994 … *Imagine*, Joan and Paul. They are friends. They are also decision-makers in the policy world. Joan makes decisions in a Health Promotion department of a local Community Services Trust. Her decisions are about the health promotion of young people. Paul is making decisions for Youth and Community Development, a department in the Local Authority. His decisions are about young people in a particular locality I'll call Webton. Joan and Paul realised that they were concerned with a similar population in Webton and they decided to do some work together, informally. Access to young people was a big problem and they decided to undertake some 'outreach' or 'detached' work. They literally 'hung around' areas where young people spent time, for example in arcades and street corners. They enjoyed it but felt, for these young people, services were just providing 'sticking plasters' and no preventative work was happening. They developed a project with the aim of providing a physical base in Webton through which services could be provided and development work could take place. Developing the project involved a complex array of negotiations between different policy decision-makers from different agencies. The outcome was *Interface*, a voluntary project with statutory and voluntary sector funding, providing services for all people in the locality of Webton.

Episode 2

March 1997 … *Imagine* 'Webton' had, in 1994, been successful in securing regeneration funding for a Single Regeneration Budget (SRB), the main mechanism of funding from the Regeneration Group of Regional Government which aimed to 'enhance regional economic competitiveness'. A key objective of Webton's bid was to 'tackle the short/medium term needs of the population of the bid of the bid area, in relation to employment, training and education, health, community development and crime prevention'. The SRB was co-ordinated by Ken, a local authority officer. A project, *Interface* is looking for funding from March 1997, and the SRB could provide up to 25% of this. Ken suggests to the manager of Interface that she should put in for 'growth funding' to extend the work of the project into the community. Yet, when presenting the application to the executive, Ken recommends, 'the project should consolidate its role as a one-stop-shop … and curtail some of its community development'. In March 1997 the SRB committee agree to fund the project according to particular objectives: jobs in Interface itself; local access to employment; young peoples social and personal development; crime prevention; women's self defence; support for older people; support for voluntary organisations and volunteers.

Episode 3

June 1997 … *Imagine* Jim, a volunteer in a project called *Interface*. The project is funded by the local authority, health authority and single regeneration budget. A young man comes into the project. He explained to Jim that he had recently come out of prison and had been staying in a hostel which he had to leave to allow for young people of high priority. He has been staying in a bed and breakfast and has starting drinking heavily. The landlord has threatened to throw him out if he comes back drunk once more. After talking with the young man for over 2 hours, Jim persuades him to contact the alcohol support group and to come along to the mens' support group run in the project. The man leaves. Jim fills in the report form, that is then processed by Marie who is the information officer in the project.

These episodes are interesting here because of the (dis)connections between them and the question they present as to how we understand them as part of policy processes. On the one hand, these three episodes are connected by their common referent: they all refer to a project I have called Interface in a locality I call Webton. This is one connection (note, I am not suggesting the only connection). On the other hand, they are different, there are dis-connections: they happen at different times, in different places, with different people, with different implications, outcomes, motivations. Episodes moments - like these are throughout our everyday world and the world of social policy. Decisions like those made in episodes are everywhere in social policy. To talk, write, or think about policy as a complex system we need to think about how our assumptions make connections between these events such that they are a part or not of that system. To highlight once again what is at stake here, how we make those connections has implications for what we count in and out of policy, what we ignore, and, for example, who or what is responsible for different outcomes, in this case, the outcomes of Interface and its users.

There are two problems facing our models from complexity science. The first problem, is what is it about the episodes that I have identified above that we are interested in as part of our policy processes? If we think back to the list provided by Cilliers, just what is it in these episodes that are the agents and interactions of the system? The second, related to this, is what is it that is 'emergent' from or between them? Raising these questions points to a paradox for our methodology because, if the emergence of novelty is central to complex systems, then how, without knowing what the emergent novel phenomena is, can we know what the connections between these events that lead to that phenomena are? Faced with these episodes it seems we have to assume what the system is to see the connections rather than explore the system that emerges. I note this problem because it leads us to the question of what *a priori* assumptions we may carry with us if we use the models from complexity science to understand the policy dynamics.

This problem becomes more evident if we consider what 'building' a model of the policy process would involve. There are may ways to build models (Gilbert and Doran 1994; Gilbert and Conte 1995; Gilbert and Troitzsch 1999) and of particular interest to complexity science has been agent-based modelling in which 'agents' are given various rules for interaction and we then explore the emergent patterns over time and space (see e.g. Holland 1998; Kaufmann 1993). We can go further of course, we can train the agents to learn thus making the system not only complex, but also adaptable (see e.g. Cilliers 1998). For our policy process then, we would identify a series of interacting agents and with, to use Turner's (1997: xxvi) words 'successive tweakings of the variables and the connections among them' we can fit the model to 'resemble that of reality'. The important theme to this approach is that emergent systems are the consequence of - and can therefore by modelled through - the interactions of the parts through which relational properties emerge. And so, in our endeavour to understand 'policy processes' we would search for individual agents. Perhaps we would use 'agents' as representing the decision-makers in our episodes - Jean, Paul, Ken or Jim and see how they are clustered together to form the larger scale phenomena 'policy process'.

As modellers of the policy dynamics, we would have to make various assumptions. First, to build such a model we would have to assume the rules according to which our agents would interact. We would have to assume what rules Jean, Paul, Jen or Jim were following. We would need these assumptions even if we built a model where our agents can 'learn' and be 'trained' (Cilliers 1998), because the way in which learning or training takes place is predetermined by the modeller (Cillier 2001). Further, we would need to locate parameters within which the interactions take place. An important aspect of complex adaptive systems is their local and contingent nature, and yet, for us to build a model in a way to capture the dynamics of the system, our model would have to include all the

interactions of the system. If we wanted our model to represent the real system and tell us about the dynamics of that system, we would have to '*repeat* the system' (Cilliers 1998: 10), the model would have to be as complex as the system itself (Cilliers 1998: 58). This of course is not possible, and even if it were, we would be faced with the same problem we already a face now a system too complex to comprehend (Cilliers 2000).

My point is this. In order to build a model we have to make decisions, decisions about the agents, their forms of interaction, and the parameters they are affected by. However, in making such decisions, the question is, how do we deal with emergence? If the pattern of policy, for example, is an emergent one, how can we assume what rules our various actors - Jean, Paul, Ken or Jim are operating by? Are the rules not also emergent and negotiated? Can we assume there are stable rules? What if these rules are themselves emergent properties? Even with advanced 'connectionist' models (e.g. neurol nets), while they allow for the possibility of self-organisation (Cilliers 1998 p.19), we would have to train the agents in learning, and we would have to assume that in our system, 'at the level of the individual neuron no complex behaviour is discernible, but the *system* of neurons is capable of performing specific, complex tasks' (Cilliers 1998 p.18). We would have to assume at the level of Jean, Paul, Ken or Jim, as our individual neurons in the network, there is no complex behaviour. In other words, the implication of this approach would seem to be that while we might understand the policy process as complex, as able to perform complex tasks, the individual neurons (the actors in our episodes) would demonstrate no such complex behaviour.

The problem we have is the reductionist and deterministic assumptions in models from complexity science (Medd 2001). First, the models of complexity science are deterministic because the rules (or meta 'training' rules) through which the agents act are determined by the modeller and in turn determine the parameters of behaviours of the various agents within the model. Even in the connectionist models, the transfer function of each node, and the possible connections between nodes, are 'set up' by the designer and do not change in time (and if they could this would depend again on their 'set-up' by the designer) (Cilliers 1998: 16-18). While connectionist models can learn and can be trained, the conditions under which this is possible is *determined* by the designer [2]. Second, the models of complexity science have a hint of reductionism in so far as the properties and dynamics of the system are characterised as emergent *from* lower level dynamics. Explanation of the 'emergent' relations and the emergent system comes from interactions below operating according to particular rules, relationships or variables. This form of reductionism in the extreme opens the way for approaches drawing upon complexity science which advocate a biological basis for explaining social processes (see e.g. Smith 1997). Such explanations are inadequate, as research on health inequalities demonstrating the limits of biomedical models for explaining patterns of social differentiation of health, for example, has consistently demonstrated (Graham 2000).

Reductionism means that the limitations of determinism in the models of complexity science become particularly acute. First, if it is the case that interacting individual agents constitute social systems, for example the economy (e.g. Cilliers 1998: 7), then the modelling process of complex systems needs to incorporate the ways in which those individuals interact. The problem of the modelling process is that it has to assume *a priori* the conditions structuring those interactions which refers human agency to rule based dynamics (Hatch and Tsoukas 1997). Second, part of determining those dynamics refers to determining the way in which the properties of the whole feedback, and influence, those dynamics. Human actors, as the process of making sense of 'complex systems' makes clear, do reflect on the dynamics of the system as a whole, however inaccurate their representations may be, and this can inform their actions. There can be a relationship between the system and the agent, but how this occurs we cannot assume *a priori*, and nor can we assume it is static.

The problem we have is that the connections that a model from complexity science would make between the episodes presented are connections which involve reductionist and deterministic assumptions. They are connections assumed *a priori*. There is a need then, I want to argue, to make dis-connections between those models and our understanding of policy processes, for we risk missing important characteristics that complexity presents to *the formation and constitution* of policy process.

(Dis)connections in the policy process

I want to take a step back at this point and think more closely about the episodes I have presented, or to be more precise, to think about this process of representing episodes. There is a danger that the episodes are read as discrete moments, bounded in time with a clear end and beginning. But to think of them in this way would be to confuse my (re)presentation of 'episodes' with the processes from which they were selected. In each scenario there is no clear distinctive end, nor beginning, separate from the process of observing such ends and beginnings. How, when, why and where we bound processes into such episodes and what we ignore in the process - will depend on what we are interested in and what claims we want to make. For example, in none of the episodes have I tried to capture the feelings, motivations or any other psychological characteristics of those deemed actors in the episodes. And yet, if I were to do so, we might see, for example, that the episodes extend beyond the temporalities I have assumed and, indeed, extend beyond the actors I have identified. In other words, how I have chosen to represent these episodes, and these representations could have been shown differently. My point here is not to delve into epistemological debates about claims to 'truth'. Rather, my point is to suggest we need to look more closely at this problem of observation and its relationship to complexity.

It is interesting that the literature on complexity science gives little detail to understanding 'complexity'. Complexity is a problem. This is indicated in the difficulty of giving definitions and measurements of complexity (see e.g. Foley 1996), and the resistance in the literature to offer clarification at the cost of simplification (Cilliers 1998: 2; Elliot and Kiel 1997: 65-6). And yet, as Chia (1998) has made clear, complexity science itself is forced to represent complexity and complex dynamics symbolically which ultimately involves classifications of complexity, a reduction of complexity to what he calls 'taxonomic complexity'. But there is another way to think of complexity that often gets lost. There is what Chia (1998: 350) calls 'dynamic complexity', 'the sense of fluent indeterminacy and temporality intrinsic to life'. If we begin with dynamic complexity, or in Luhmanns terms 'unstructured complexity', we begin our observations in a world in which everything is connected to everything else (Luhmann 1995: 27). However, Luhmann (1995: 24-18) argues, we live in a world in which it is not possible to connect the totality of anything. To make an observation, for example, we cannot have the information to observe everything at once; time ensures this - we must make selections of what we observe. I am forced in my representations of the 'episodes' to select what is important to my story, to select particular relationships from the complexity with which I was faced. To represent any system, any phenomena, we are forced to make selections, to reduce the complexity of the phenomena in our representation. We are forced to therefore ignore both what we cannot accommodate and what we do not know about.

This problem of complexity that we face in trying to make sense of the episodes, namely that other observations and descriptions are possible, is *a problem in policy process itself*. The policy world must also deal with the problem of complexity and to understand the complex dynamics of policy processes, we need to examine the observations that come to constitute that world. This needs clarification and elaboration. What I have not established yet is just what that world is. What is the world of policy that does this observation? What makes the world of policy a world distinct, differentiated from other worlds? How does that world make (dis)connections that constitute it as a form of structured complexity in relation to unstructured complexity? This, it seems to be, is a problem at the heart of debates about 'the policy process' (see Colebatch 1998; Hill 1997; 1993; Parsons 1995); namely though the problem of defining policy often remains unresolved, debates nonetheless ensue involving various distinctions, for example, between 'policy making' and 'policy implementation' or between 'top down' versus 'bottom up' approaches to explain the policy process. Rather than juxtapose the debate in terms of, for example, policy being emergent from the processes at the 'street level' or being determined and fixed in objectives in legislation, I want to begin with the problem of complexity through which dynamic policy processes emerge as a form of differentiation.

So what is emerging? If we borrow from Luhmann the idea of systems being constituted as differences (structured complexity), then there is a shift to understand the unity of the system, not as a holistic emergent phenomena that incorporates all the parts, but rather, as the unity of those differences, the unity of system/environment differences (Luhmann 1982; 1989; 1995). To make this point clear, the argument is to propose that the emergent policy system is not something that

incorporates all the interacting parts of the system as might be characterised in formulations using complexity science, for how would this be possible? Just what would be included? What, from the episodes, would matter for that policy system? For example, in episode 3, what is it about Jim that would be part of the policy process? When is Jim inside or outside the policy process? When Jim is inside, is everything Jim does part of that system? The point is this: if we assume policy forms structured complexity then we need to examine what differences between policy and its environment are constituted in the system of policy. Borrowing from Luhmann again, I want to argue that these differences are constituted in communications, that is, that policy processes are systems of communications.

Why think of the policy process in terms of communications? There is a complex argument here about the role of communications as constitutive of the social world (see Luhmann 1995, 1993, 1990). For my purposes here we can see the significance in terms of asking the question, what is it about the actions of the various people in my episodes that make them part of a policy process? It seems nonsensical to assume everything those people do, or did, are part of policy processes; be it scratching their heads, telephoning home, going to the toilet etc.. If everything becomes included, then we have no means to differentiate which leaves us with the world of dynamic complexity, and thus no means to explain even material constraints. But materialities do pose constraints, they can be used in different ways, they have different conditions of possibility, different 'affordances' (Hutchby 2001). To become part of the system of policy process - and not just an affordance, a condition of possibility for the system - actions must constitute acts of communication, they must lead to effects, that is to differences, in the policy process. How this happens, however, cannot be understood by the intentionality of those actions alone which becomes clear when we look at how those actions becomes constituted as acts of communication.

The key here is that effects in the policy process cannot be *determined* by the actor (even though the actor may well steer them) because an actor cannot know for certain how an action will be received, observed, interpreted, understood. Communication is more complex than one person making an action and providing information that is communicated, because the communication only becomes constituted, complete, once it is received by another system [3] . To make this clear, consider episode three. Jim is a volunteer in Interface which has funding through various policy mechanisms. We could argue there are a number of systems here and I want to focus on three. First, there is Jim and the man he is working with, an interaction system based on 'personal presence' (see Luhmann 1995 414). Second, there is Interface where this interaction is taking place, an organisation based on differentiation of 'members and nonmembers' (see Luhmann 1993: 188). Third there are various policy systems which fund Interface, these we might argue form functionally differentiated systems each with specific concerns (see Luhmann 1982). The episode with Jim is complex, it could be described in many ways. How do we make sense of the relationship between this and, to take one as an example, the health policy process in 1997? At each level of system – interaction, organisation and functional – there is complexity, indeed, each system arises out of complexity while also forming new complexity. Complexity is self-conditioning (Luhmann 1995: 24). Temporality is important here. Indeed, it is the key, for if there were all the time in the world, then, for example, the health minister could gather infinite information about the health policy process. The minister could know about, for example, the detail of Jim's interactions, of Interface's organisation, of the policy communications. However, time is a reality and the minister, and the systems, must find ways to deal with time. As Luhmann puts it, systems 'cannot afford to rely exclusively on one-to-one relations between external and internal events …', complex systems 'need time to process information and come up with apt responses' (Luhmann 1982: 230). And so, systems develop ways of dealing with perpetual change in their environment without corresponding temporal changes within the system itself. Jim himself, nor his interactions with the client, need not – and indeed cannot - know about all the complexity of policy nor Interface at that moment in time, just as those systems need not – cannot – know about all the complexities of that Interaction.

Thinking in terms of temporal differentiation of complex systems and noting that communication takes place in so far as an observation is constituted, we can start to look at our policy process in a different light. Consider how Jim's interaction becomes part of the health policy process. Jim, in his role as volunteer, has no direct contact with the National Health Service. He will not be phoning the minister to let the minister know how he got on. What Jim will do is record the interaction. He may verbally report to his 'manager' and discuss how it went. But his manager also will not be phoning

the minister. Rather, Jim's interaction will be recorded in the monitoring forms that are part of Interface. Who was the client, what was the problem, what happened next, how long did it take, had they used the service before. These sorts of things will be recorded. These also will not be sent to the minister. They will be collated in the future – monthly, quarterly, yearly figures. The complexity of Jims interaction will be reduced into various categories according to predefined criteria. So what then becomes the connection to the health policy process? Well – and I am of course reducing the complexity of these process to be illustrative of the scenarios – Interface will send its figures to a representative of the health authority. These figures will be collated and again, their complexity reduced into various categories (codes) according to particular policy criteria, and so on and so forth through different interactions and organisations of health policy. It is the observations which constitute communications that are our object 'policy process'. Jim's interactions are not the part of the policy process, but rather, the policy process makes observations of those interactions in various forms. These observations reduce – indeed ignore - the complexity of the interactions.

Conclusion

I have suggested that to understand the policy process we need to examine the observations that constitute the policy communications making differentiations between what is and is not part of the policy process. Further examination would need to examine more closely the specific codes and programmes of specific policy programmes and the mechanisms through which these communications take place. This is beyond the scope of this article for here I have been more concerned to illustrate how we might think about complexity and the policy process, and I want to draw my argument to an end by suggesting some (and there will of course be more) of the implications of such an approach.

I want to emphasise ignorance. Identifying complexity as a problem for policy means identifying the relationship of policy and ignorance. This relationship, my suggestion is, is not one of ignorance being something that must be avoided as previous commentators have implied (Booth 1988; Minogue 1993; Nocon 1989;). Ignorance is entirely necessary to policy for policy cannot have a one to one temporal correspondence with its environment. Though the argument I developed may have appeared abstract, particularly in relation to understanding ignorance as constitutive of policy, it is important not to lose sight of the significance that a recognition of 'the ecology of ignorance' (Luhmann 1998) can have. Here I want to note just a few important themes. First, asking what ignorance is assumed in policy means acknowledging the limits of 'inclusion' in decision making for complexity necessitates the need to exclude in decision-making processes. Discourses of 'inclusion' or 'exclusion' should, it would seem, be recognised in terms of their co-relationship and specificity. Claims to more inclusive policy making, for example, should be accompanied by not only 'inclusion of what, who, to what', but also the corollary 'with the exclusion of what, who, from what?'. All of this requires recognition of the limits of temporalities for there would appear to be an ethics as to what temporalities are drawn in these processes of inclusion-exclusion. Second, asking what ignorance is assumed in policy means drawing attention to the knowledge claims of evidence both in terms of generating an evidence base (what closures of observations were made?) as well as evidence in practice (what evidence was chosen? what does such evidence not observe?). Finally, asking what ignorance is assumed in policy refers also to the question of what policy itself is. Different claims about the dynamics of policy processes attribute different assumptions about where choices are made, which in turn has assumptions about who is responsible, what the possibilities are, as well as what the implications might be. The 'ecology of ignorance' is one in which we need to recognise that our solutions will cause problems and different ignorance leads to different possibilities.

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Notes

[1] All the names taken from the study are pseudonyms in order to ensure anonymity to the people in my study.

[2] The problem of determinism is highlighted in the scenario of introducing our model of 'complexity science' into the dynamics of complexity science (Medd 2001). It is an essential problem of modelling social dynamics (see Denning 1990, Renfrew 1987). There is a claim that social systems differ from physical systems because in social systems, perturbations may come from within the system itself (Reed and Harvey 1992 p.370; Byrne 1998 p.50). However, the problem with modelling and simulation is that the models of complex systems remain closed systems as far as the internal operations are concerned, and therefore the perturbation is represented as a variable. The models have no way of changing the operations within themselves unless programmed to do so (thus referring the closure to a second-order level). These models cannot account for change within the relationships themselves, only their outcomes, and in this sense remain deterministic. See discussion by Sayer (1992, chapter 6) who explores the relationship of closed and open structures in the context of quantitative methods in the social sciences.

[3] Communication is thus a synthesis of utterance, information, and observation. Here observation refers to (mis)understanding, it refers to the observing system making a distinction between the utterance and the information. For the detailed argument of this conceptualisation of communication see Luhmann 1995 chapter 4.