

Bridging complexity theory and hierarchies, markets, networks, communities: a 'population genetics' framework for understanding institutional change from within.

Abstract

Complexity theory is highly compatible with institutionalist approaches to analysing governance. This article develops a 'population genetics' account of governance dynamics using complexity concepts. This framework joins 'hierarchy, markets, networks and communities' (HMNC) with concepts of endogenous change, genetic recombination, and fitness landscapes. Institutional environments are comprised of 'populations' that contain a range of genetic profiles. Change and stability are shaped by nesting and abrasion of alternative combinations within a governance field. This framework can help researchers understand how agents attempt to transform meso-level institutions from within, using the field of primary medical care governance in Auckland as an example.

Introduction

Institutions – the relatively hard-wired, formal and informal rules that govern public management practices – are (by definition) difficult things to change. When they do change, according to much public policy literature of the past thirty years, it is because of ‘external perturbations’ – policy equivalents of meteorites wiping out dinosaurs. This does not give much hope to policy actors operating within institutional environments that they may see as problematic and in need of change. Yet institutions do change from within, and many authors more recently have highlighted the role of endogenous processes in generating institutional change (Streeck and Thelen 2005; Mahoney and Thelen 2010). Nevertheless, there are challenges in understanding the ways in which ‘intentional agents’ attempt, instigate and/or enact institutional change. Part of the challenge here is that institutional change in public management is commonly conceptualised in terms of abstract ideal-types such as hierarchies, markets, networks and communities (HMNC). While these concepts have proven to be useful, if broad-brush, descriptive analytical categories, they have not proven particularly amenable to the development of theories of institutional change, or how actors attempt to generate change within their institutional settings.

By contrast, the emerging public management literature on complexity theory purports to theorise dynamics of endogenous change, and the role of agents in these change processes (Bovaird 2008; Rhodes et al 2011; Haynes 2015). A number of influential authors have expounded the argument that the most important contribution that can be made by complexity theory to public policy will be based on ‘theoretical partnerships’ with more established bodies of public policy and public management theory (Pollitt 2009; Room 2011; Cairney 2012). While I have argued elsewhere that the complexity-inspired approaches to public policy and governance could benefit from sustained engagement and cross-fertilisation with HMNC concepts (Tenbenschel 2015), there is also a great deal that complexity theory can offer in return.

The purpose of this article is to provide a new lease of life to the HMNC by infusing it with concepts drawn from complexity theory. More specifically, I develop a ‘population genetics’ framework for analysing institutional change in public management, and the role of agents in that change, from materials that have been provided by Colin Crouch in his discussion of the role of ‘institutional entrepreneurs’ in the process of ‘recombinant governance’ (Crouch 2005; Room 2011), and the concept of rugged institutional landscapes adapted by Graham Room (2011) from the geneticist, Stuart Kauffman (1995). By using these concepts drawn from complexity theory it is possible to infuse some dynamism and a clear actor-centred focus into what has been a predominantly static and descriptive HMNC approach.

I start by outlining the key principles of the HMNC approach and the limitations that have emerged. The second section draws on the work of Crouch, Room and Kaufmann to address these limitations and put actors in the forefront of processes of institutional change, and a third section applies the resultant approach - what I refer to as a ‘population genetics’ approach - to a New Zealand health policy case study which tracks the attempts of policy actors to transform their institutional environment. In doing so, I aim to provide a framework which draws from complexity concepts which can be useful to actors engaging in institutional change.

Hierarchy, Market, Network, Community (HMNC)

HMNC literature has been applied extensively to public management cases in two ways. The first way is to make broad generalisations about the tide of history in public management

turning from hierarchical to market governance, and subsequently (perhaps) to network governance. Such approaches are broad-brush and are problematic because they apply HMNC teleologically and/or normatively to argue that public management is progressing (or should progress) or is regressing from one ideal type to another (Osborne & Gaebler 1992; Goldsmith & Eggers 2004). This is characteristic of a great deal of New Public Management (NPM) literature, as well as much New Public Governance (NPG) literature. These approaches often neglect the significant degree of 'network-type' governance that did exist in the so-called hierarchical mid-twentieth century (cf Le Grand 2007), as well as the persistence and reinventions of hierarchical tropes and techniques over recent decades (Lynn 2011).

Others (including this author) have adopted a more agnostic approach (Davies & Spicer 2015) to applying HMNC. Here, HMNC is primarily used as a language of classification. The basic principles of this more agnostic HMNC literature can be identified:

- 1) Hierarchies, markets, networks and communities are ideal types of social co-ordination generally. As such, they are also ideal types of institutional designs that can be harnessed by governmental and non-governmental actors to govern policy problems. As ideal types, they provide a way of mapping governance types analogous to the way that compass points of north, west, south and east provide a foundation for mapping geographical space.
- 2) Most governance arrangements involve combinations of these ideal types. This idea first articulated in sociological literature by Bradach and Eccles (1989) quickly became widely accepted and adopted in public management literature since the late 1990s (Rhodes 1997; Exworthy *et al.* 1999; Considine and Lewis 2003; Keast *et al.* 2007; Lewis 2009). 'Hybridity' has become a common term for describing combined types of co-ordination and governance (Ranade and Hudson 2003; Lewis 2009; Byrkjeflot and Gulbrandsøy 2013)
- 3) Those who use HMNC in this way are agnostic about whether specific modes are normatively preferable to others. A common argument is that all have specific congenital strengths and weaknesses, and that the appropriateness of the use of any mode is largely shaped by contextual factors (Rhodes 1997; Tenbensen 2005; Bouckaert, Peters & Verhoest 2010).
- 4) There is also widespread agreement that governance combinations are not static and change over time. Again, there are many empirical studies that interpret change in terms of the evolution of new governance mixes (Lowndes and Skelcher 1998; Lance *et al.* 2009).

For the most part, this use of HMNC in public management literature is predominantly pragmatic and primarily descriptive, and not particularly ambitious theoretically. Unless it is tied to a broader historical institutionalist framework (eg Tuohy 1999; Helderma 2007; Van De Bovenkamp *et al.* 2013) the HMNC categorisation is rarely elaborated and used a theoretical framework. While it offers some potential for understanding how agents might initiate, sustain, or even resist changes in governance, there are a number of conceptual issues that require clarification if HMNC is to be useful for understanding processes of institutional change, and for generating insights about how institutional change could be catalysed by agents in the worlds of public policy and management.

Is there a fixed quantum of governance?

One assumption often built into analyses that use HMNC is that of a 'fixed quantum' of governance. This is the idea that if new modes of governance become important, they do so *at the expense of* another mode. As applied to the analysis of governance, this implicit assumption is that as one type increases in its scope, another (or others) must decrease (Byrkjeflot and Gulbrandsøy 2013). A move *towards* a new destination is always a move *away* from another. A variation of the 'fixed quantum' assumption, is that 'extra' governance entails redundancy that is inefficient. This argument is made by Entwistle et al who posit that 'it must ... be true, at least in purely theoretical terms, that the duplication or triplication of a single act of co-ordination is wasteful of resources' (Entwistle *et al.* 2007: 66).

However, this 'fixed quantum' view is challenged by a growing base of empirical work that highlights the presence of 'positive-sum' rather than 'zero-sum' relationships between governance modes. A study of frontline welfare staff across four nations found that Australian practices of welfare governance involved *higher levels* of hierarchy, *more* network and *more* market than practices in other countries (Considine and Lewis 2003). The use of control (hierarchy) and trust (network) can be seen as supplementing each other (the existence of one underpinning the existence of the other) creating a 'reinforcing cycle' (Edelenbos and Eshuis 2009; Six 2013). Similarly, it may also be possible that there may be 'not enough governance' in that co-ordination of any sort between actors is absent or minimal (Tenbensen et al 2011). This question is important because it has implications for agents intentionally seeking to change how things are governed – particularly whether or not existing institutional structures need to be intentionally dismantled.

Are all governance 'hybrids' the same?

Widespread use of the term 'hybrid' with regards to governance modes has the potential to obscure rather than enlighten. In public management literature, there have been countless studies of specific governance arrangement consists of a combination of hierarchy and network. However, to paraphrase Leo Tolstoy, each example of hybrid governance is hybrid in its own way. This issue is analogous to that raised by Skelcher and Rathgeb Smith (2015) regarding hybridity of organisational types.

In health sector examples from Israel and New Zealand (Sax 2014; Tenbensen *et al* 2011) the mixes are those in which the hierarchical control is over policy direction and network collaboration comes into play in implementation. By contrast, Moynihan (2008) provides an account of the USA's Incident Command System (ICS), in which there are networking relationships between a range of different government organisations in planning system responses, but a hierarchical chain of command in response to national emergencies and crises. Treating these examples as members of the same analytic category of hierarchy-network hybrids may not be that useful or meaningful. For agents seeking to change institutional rules and conditions, thinking in terms of hybrids is therefore problematic and vague.

Under what conditions are co-existing modes compatible or incompatible?

There are many examples in the literature in which writers attribute the coexistence of different modes to the fact that one or both is present in order to make up for the deficiencies (perceived and/or real) of the other(s). If we focus our attention on the co-existence of hierarchy and network, in addition to the examples above, a number of studies reveal examples in which hierarchical and network co-ordination co-exist in complementary ways. These examples

traverse a wide range of contexts ranging from the management of geographic data (Lance *et al.* 2009), health service delivery (Currie *et al.* 2011); pharmaceutical benefits systems (Sax 2014) and crisis response (Moynihan 2008). Many of these are examples of 'mandated networks' in which governments use authority (hierarchy) to stimulate the development of network co-ordination where it is regarded as necessary to achieve policy goals (Rodríguez *et al.* 2007; Elst and Rynck 2013).

There are also many examples in which the co-existence of different modes is regarded as a source of incoherence, tension and conflict. Jonathan Davies (2005) emphasises the inherent conflict in attempts to blend networks with hierarchy and/or markets, as do Entwistle *et al.* (2007). Conflicting modes is also a prominent theme in the work of Bode (Bode 2006; Bode and Firbank 2009). Many studies of mandated networks diagnose failure due to the inherent contradiction entailed in enforcing co-operation between organisations (Addicott *et al.* 2007). In addition, a number of studies readily identify both conflict and complementarity within the same case, or across multiple cases (Addicott 2008; Ferlie *et al.* 2011; Sax 2014). The theoretical challenge, therefore, is to develop a more general language that aims to understand/explain why (the same) combinations of governance types are conflictual in some contexts and complementary in others. The conflict/compatibility question is particularly pertinent for agents attempting some form of institutional change, as it raises the question of whether attempted changes will be resisted or accommodated by other actors. Being able to distinguish between actions and interventions that set off vicious cycles of conflict between institutional principles from those that trigger virtuous cycles of improvements in governance could constitute a 'high-level' capacity of public managers.

How can we understand the dynamics of change?

Combinations of governance modes do change over time, and can change regularly, and these changes are often driven endogenously. Thus, co-ordination and/or governance in a particular field can move from one admixture of hierarchy and network to another, different, mix of the two. Again, the metaphor of 'hybrid' governance is ill-suited for this purpose, as hybridity (for individual organisms) is static, rather than changeable.

Bringing together HMNC and complexity concepts - a 'population genetics' approach

Each of these weaknesses of the HMNC conceptual repertoire can be addressed by turning to complexity literature. Genetic metaphors and concepts have been touchstones for a range of complexity theorists, and have also been fruitfully applied to institutional analyses. The key is to shift from thinking of institutional arrangements as 'individual units' that may exhibit 'purebred' or 'hybrid' characteristics to imagining them as 'populations' of governance arrangements. The foundation of such a 'population genetics' approach to governance can be found in Colin Crouch's book, *Capitalist diversity and change: recombinant governance and institutional entrepreneurs* (2005). Graham Room (2011) has argued strongly that Crouch's approach should be at the heart of any approach incorporating complexity and institutionalism.

Crouch and the genetics of institutional change

Crouch's framework emerged from a critique of the way ideal types were applied in the 'varieties of capitalism' (VOC) literature. Specifically, he took issue with the implicit (and sometimes explicit) argument that there were 'pure' types of capitalism that were coherent packages, and that examples that did not fit these pure types were problematic/ unlikely to be

viable. For Crouch, ideal types should be seen as reference points, but many permutations of governance (institutions) are actually possible in the past, present and future. Some may be realised, others not. The primary task of analysis is to understand how and why particular empirical forms develop in particular circumstances, rather than assessing governance arrangements in terms of proximity to ideal types.

Crouch starts by introducing the concept of 'fields' of governance. Fields, according to Crouch can be 'anything from the production of innovative biopharmaceutical products to organizing a religion' (Crouch 2005: 101). He then proceeds to provide a way of mapping the particular governance arrangements that take place in particular fields. Governance for Crouch is social co-ordination generally, which includes, but is not limited to, governmental attempts to steer. Crouch specifies a list of nine governance (institutional) attributes (see Table 1) that may be relevant to any form of social co-ordination. Each attribute distinguishes between two contrasting capacities. We can think of these capacities as particular 'allele' expressions of specific genes. Crouch's nine attributes (genes) of governance are outlined in Table 1 below.

Table 1 Crouch's attributes of governance:

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| <p>1. <i>Exogeneity versus endogeneity</i>. A governance mechanism may be either external to the institution being governed or internal to it.</p> <p>2. <i>Formality versus informality</i>. The character of the rules through which governance is expressed can be either formal (that is explicit, in principle clearly specifiable) or informal (implicit, subject to nuance and variable mutual understanding).</p> <p>3. <i>Substance versus procedure</i>. In the former there is direct intervention by agents responsible for governance to give incentives to behaviour by allocating resources. In the latter a set of procedures affects the behaviour of ordinary actors within the institution.</p> <p>4. <i>Signalling versus dialogue</i>. Signalling simply indicates what constitutes compliant behaviour (as in the pure market). Dialogue provides for complex exchanges of speech acts and negotiation of terms (as in most other governance forms, particularly at the local level).</p> <p>5. <i>Verticality versus horizontality</i>. Communication also has a directional dimension. Vertical communication implies an authority centre (as in an association, or a corporate hierarchy). Horizontality presupposes a system of rules in place, enabling communication itself to be lateral and not itself embodying a command structure.</p> <p>6. <i>Strong versus weak enforcement</i>. Fundamental to governance is enforcement capacity: How effective is the governance mechanism in ensuring compliance? We can initially model this capacity simply as being either strong or weak.</p> <p>7. <i>Extensive versus limited reach</i>. There is a second aspect of enforcement: its reach. Do the enforcement mechanisms in question extend generally across the society or indeed the world, or are they limited to those directly connected to the institution?</p> <p>8. <i>Difficult versus easy exit</i>. Related to the strength and reach of enforcement capacity is the possibility of exit from the institution. This can be difficult, leaving units and individuals trapped within the enforcement scope of the governance mechanism, or easy.</p> |
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9. *Public versus private goods*. All governance provides goods for a collectivity of some kind, but the character of the collectivity so served can vary from a pure public one (in the economist's sense) to a private, defined group.

Source: (Crouch 2005: 109)

Any specific capacity (allele) may be more or less relevant in different fields. Just as webbed feet may be particularly useful in a swampy environment (but not in a desert), dialogue as communication capacity may be useful in some contexts, while 'signalling' (non-dialogical communication) might be useful in another. Crouch then suggests which specific permutations characterise particular ideal types of governance, including state hierarchy, markets, networks, communities, guilds, and associations (Crouch 2005: 100-109).

Crouch regards his list of attributes as a starting point for discussion rather than the final word. For the purposes of applying the argument to policy implementation and public management in a parsimonious way, I suggest we start with six attributes of Crouch's framework. For present purposes, I restrict the list to those public management contexts in which governance is endogenous – defined within territorial boundaries of the state (cf Crouch's first attribute), noting that exogenous constraints would need to be included where there is multi-level governance. Secondly, all public management, by definition, involves public goods (attribute 9) so all institutional forms will feature this capacity. Finally, I have omitted attribute 7 – reach of enforcement – from the discussion because in public management, strength (attribute 6) and reach of enforcement are largely synonymous. This leaves six attributes:

- (2) **Formal** versus informal governance rules
- (3) **Substance** versus procedure
- (4) **Signalling** communication v dialogue
- (5) **Vertical** v horizontal communication
- (6) **Strong** v weak enforcement of rules
- (8) **Difficult** v easy exit from relationships

Table 2 plots Crouch's genetic profiles of hierarchies, markets, networks and communities across these six attributes (2005: 110-11). The value '1' denotes the first (bold type) pole of each attribute from Table 1, the value '0' represents the second term.

Table 2: Genetic profiles of public management governance modes

	2 Formal (1) v informal (0) governance	3 Substance (1) v procedure (0)	4 Signalling (1) v Dialogue (0)	5 Vertical (1) v horizontal (0) communication	6 Strong (1) v weak (0) enforcement	8 Difficulty (1) v ease (0) of exit
Hierarchy	1	1	1	1	1	1
Market	1	0	1	0	0	0
Network	0	1	0	0	0	0
Community	0	0	0	0	1	1

In Table 3 below, note that hierarchies and networks have opposing capacities for five of the six selected public management attributes in this attenuated version of Crouch's table.

Table 3: Genetic profiles of hierarchy-network hybrids

	2 Formal (1) v informal (0) governan ce	3 Substance (1) v procedure (0)	4 Signalling (1) v Dialogue (0)	5 Vertical(1) v horizontal (0) communication	6 Strong (1) v weak (0) enforcement	8 Difficulty (1) v ease (0) of exit
Hierarchy	1	1	1	1	1	1
Network	0	1	0	0	0	0
HN Hybrid A	1	1	0	1	1	0
HN Hybrid B	0	1	1	0	0	1

This offers a way of understanding the range of possible hybrids. Table 3 identifies two hybrids of hierarchy and network (HN Hybrids A & B). Leaving aside attribute 3 in which Hierarchy and Network have the same value, Hybrid A shares three capacities with ‘pure’ hierarchy (formal rules, vertical communication, strong enforcement) and two with ‘pure’ network (dialogical communication, easy exit). Hybrid B is the opposite of Hybrid A on these five attributes.

However, the usefulness of Crouch’s framework goes well beyond this more fine-grained taxonomy of governance institutions. This ‘genetic’ approach also enables a dynamic, evolutionary understanding of governance modes. To see how Crouch does this, we revisit the issue of conflict v compatibility. Crouch’s critique of the VOC literature took issue with the assumption that ideal types of governance were necessarily more coherent than mixtures. He distinguished between logics of similarity and complementarity. The logic of complementarity entails a preference for ‘mongrel’ forms that ‘appear more balanced’, whereas the logic of similarity entails the superiority of ‘purebred’ ideal types that have ‘exaggerated characteristics’ that enable these institutions to ‘do some things particularly well’ (2005: 55).

Crouch is particularly interested in complementarity which can take a number of forms. A dominant institutional form may contain, nested within it, a complementary, ‘recessive’ institutional form. This recessive form may be present, protected, latent, and ready to emerge under different environmental conditions. The recessive, complementary form could also arise as a consequence of exogenous punctuations which suddenly render the dominant form less effective. This resonates with the concept of ‘bifurcation’ in the complexity literature in that movement away from one relatively stable state to another requires the availability of the alternative state (Rhodes et al 2011). The presence of a ready-made alternative creates institutional arrangements that are more robust in the face of major external changes. But contrasting institutional forms can also result in abrasions (see also Room 2011) in which the differing institutional principles reflect competing logics of adaptation when there is no form that is clearly optimal.

While an individual of any species carries a finite amount of genetic material, the population of that species can express a narrow or a broad range of genetic diversity. In the same way, the amount of governance (and available institutional forms) can vary enormously from a limited genetic pool to a highly diversified species. Within this genetic diversity, particular expressions may be dominant in the population at a particular time, but the population may carry within it other patterns that may come to be dominant under quite different environmental conditions.

Institutional change can involve changing just a single allele, while more far-reaching institutional change would involve the switching of multiple alleles (attributes).

The key point of Crouch's approach is that it brings agents back in to the picture of institutional change. In circumstances in which agents perceive problems and limitations in established institutional arrangements, agents can attempt to shape institutions by drawing from complementary institutional capacities which could be found 'within' the field, or could be borrowed, copied or adapted from 'adjacent' fields (see Crouch 2005, Chapters 6-7). Similarly Room (2012) emphasises the importance of 'artificial selection' (rather than Darwinian natural selection), in order to emphasise the role of human agents in deliberately attempting to craft institutional arrangements from available materials. For both Crouch and Room, 'recombination', both large scale and small scale, is the driving force of institutional change.

Fitness and Fields/Landscapes

Change and recombination are oriented to achieving better 'fitness' of the institutional arrangements in the particular field of governance. But what does fitness mean? To begin to answer this question, imagine a public management field in which a particular genetic combination of Crouch's institutional capacities is unambiguously superior to any other combination (see Kauffman 1995: p173-4). This would entail that there was one allele of each public management gene which was clearly superior to the other. Under these conditions, the optimal solution would be the combination of the six superior alleles. For example, in James Q Wilson's typology of organisational activities (Wilson 1989), 'production' activities such as the delivery of mail may be best co-ordinated under an ideal type hierarchical mode (formal rules, substantive governance, vertical relationships, signalling communication, strong enforcement, and difficulty of exit). If there was a particular example of mail delivery governance that included some '0' settings (ie network alleles), any move from '0' to '1' (the hierarchical alleles) would result in superior fitness.

However, there are no guarantees that innovations or mutations will actually achieve improved fitness. An important concept in complexity literature is that of 'fitness landscapes' which can vary from 'smooth' to 'rugged' (Kauffman 1993; 1995; McKelvey 1999; Room 2011). Here, the term landscape can be regarded as synonymous with Crouch's 'fields'. To illustrate this, first imagine a scenario in which the optimal institutional form is a specific combination of hierarchy and network alleles (0s and 1s), such that any move towards this combination would unambiguously result in better fitness. In this field/landscape there is no interdependency between the hierarchical (1s) and network (0s) components in the optimal institutional arrangement. They are entirely compatible. This describes a 'smooth' landscape.

In most public management contexts, however, there is much less clarity around optimal institutional arrangements, and no arrangement is likely to fit 'perfectly' in a given field/landscape. Where the fitness of one allele is dependent on the expression of other alleles, a mutation from one allele to its alternative will often result in reduced overall fitness. This is what Kauffman (1995) describes as a rugged landscape. The higher the level of interdependency there is between alleles, the more rugged the landscape. This means that trade-offs are required because there are multiple and potentially conflicting possibilities of 'better' governance.

Under such conditions, agents seeking to change institutional arrangements (alleles) do so in an inherently risky environment. In some landscapes, there may be strong imperatives to change,

particularly if actors experience and interpret existing institutional arrangements as sub-optimal. Yet, agents attempting institutional change do not know what the results of their innovations will be.

Summary of the population genetics Approach

By drawing on the ideas of Crouch, combined with the idea of rugged and smooth landscapes, we have developed a 'population genetics' approach that deals with the limitations of HMNC literature outlined earlier. Firstly, the framework provides a way of moving beyond a 'zero-sum' view of the quantum of governance. The population genetics framework conceptualises 'more governance' in terms of greater diversity of institutional genetics within a particular field, even though this may generate conflict between institutional forms.

Secondly, through the identification of the specific institutional genes relevant to public management, it is possible to distinguish between different institutional combinations of the same set of governance ideal-types. This can stimulate more sophisticated comparisons between governance arrangements. Hierarchies, markets, networks and communities remain as useful concepts for understanding governance forms as 'aids to navigation' or reference points analogous to north, south, east and west as points of the compass. Following Crouch, however, it is important not to treat hierarchy, market, network and community as 'purebred' ideal types that are inherently more coherent or better adapted than 'mongrels'.

Thirdly, the population genetics framework allows for a sophisticated analysis of conflict and compatibility between governance modes. By adopting Crouch's concepts of complementarity, nesting and abrasion, and Kauffman's concept of rugged landscapes based on interdependency between genes, we have developed a conceptual language that explores the dynamics of conflict and compatibility in a given field. Conflict between institutional forms is a highly likely feature of rugged landscapes.

Finally, and most importantly, the framework develops a conceptual language for understanding the dynamics of governance through processes of natural and artificial selection. It is an approach that can be applied at micro, meso and macro levels of analysis, and through the concept of nesting, allows for analytical movement between these levels.

Applying the population genetics approach: governing after-hours medical care in Auckland, New Zealand

To show the analytical possibilities of this population genetics approach, we apply these concepts to an example of institutional innovation in primary medical care in the city of Auckland, New Zealand. The specific dynamics involve attempts to change the inter-organisational arrangements (contracting, accountability and collaboration) pertaining to the availability and affordability to patients of medical care on evenings and weekends that were developed by the Auckland After-Hours Network (ARAHN). The data for this case study analysis was drawn from two evaluations of these initiatives (Tenbensen *et al.* 2013; Tenbensen *et al.* 2014b). The primary focus of the evaluations was the effectiveness of specific initiatives to improve patient access to after-hours care. However, over the two phases of evaluation, investigators conducted 28 interviews with key informants from the range of organisations involved, were non-participant observers at some network meetings, and conducted analysis of network, agendas, minutes and contracts. A substantial portion of these data sources contained information on the formation and maintenance of ARAHN, its governance and its processes of

decision-making. This data provided rich information about existing institutional arrangements, and attempts to transform them by some agents at the centre of ARAHN. Fuller summaries and interpretations of this data can be found in the evaluation reports (Tenbensen *et al* 2013: pp10-18; 24-28; 62-63; Tenbensen *et al* 2014b: p38-41; 175-183).

In order to show how actors actively attempt to reshape their institutional environment, and the ways these attempts play out, the following account draws from the above exposition of Crouch's approach. We first identify the specific institutional field (landscape) of interest, then define the public management problem that agents seek to address. The third step is to pin down the institutional 'genetic profile' that characterises this field, and the fourth is to show how particular agents attempted to alter this profile in their 'sub-field'. Finally, we trace the dynamics of nesting and abrasion between the pre-existing institutional form and the 'challenger'.

Step 1: Identify the institutional field/landscape

The institutional field in this analysis is primary medical care in Auckland. As a consequence of health system restructuring in the early 2000s, two types of organization became the central actors in New Zealand's primary care system. District Health Boards (DHBs) are public sector organizations responsible for planning and funding health services in a geographical district, and they directly provide publicly-funded hospital services, and a range of other health services. Primary Health Organisations (PHOs) are non-government organisations of primary care providers, funded by capitated budgets per enrolled patient (Cumming and Mays 2008). PHOs enter into contractual service agreements with DHBs. In New Zealand most patients also pay a co-payment when they visit a primary care practitioner. While New Zealand's health system is organised centrally, there are distinct differences in the configuration of organisations and services at the local level, which have been shaped by local, historical contingencies. An important development specific to Auckland was the proliferation of PHOs, and the fact that their boundaries were not contiguous with DHB geographic catchments (Tenbensen 2016). Even since a period of PHO consolidation in 2009-10, the Auckland region has been served by 3 DHBs and 6-7 PHOs. Another largely unique feature for Auckland is that since the 1980s, a different model of after-hours service provision, known as Accident & Medical (A&M) clinics, became established (Hider *et al.* 2007). Most of these after-hours providers are not part of PHOs, and therefore are not funded by government to provide medical services. Primary care providers (general practices) in Auckland have long regarded A&Ms as competitors.

Step 2: Identify the problem that policy actors are attempting to address

The problem at the centre of this case study is access to medical care in evenings and weekends (after-hours) in the city of Auckland. In 2010, the cost for many patients visiting a doctor after-hours was around \$90 NZD (far more than most 'within-hours' co-payments). For some policy actors, this highlighted a large problem of unmet need in primary care, particularly for patients such as young children whose conditions often manifest or worsen after-hours. For others, including the DHBs themselves, this situation contributed to a broader problem of increasing demand on hospital emergency departments for patients for whom non-hospital after-hours care was unaffordable (Tenbensen *et al* 2013).

Step 3: Specify the dominant genetic code of the field

Despite some examples of collaborative relationships across the health sector at the local level (Tenbensen *et al.* 2011), Auckland's health sector in the 2000s quickly settled into a set of

institutional arrangements in which contractual and principal-agent relationships came to be dominant. This institutional dynamic was underpinned by a legislative and regulatory framework that emphasised accountability for the use of government funds and responsiveness to government policy priorities (Hood 1991; Boston et al 1996; Tenbensen(s) 2010).

In terms of Crouch's attributes, the relationship between DHBs and PHOs was characterised by **formality** rather than **informality**, primarily in the form of the PHO Service Agreement. Governance was **substantive** in that central government policy specified what should be done. Communication more commonly took the form of **signalling** rather than dialogue, because DHBs were legislatively bound to implement central government policy, such that PHOs came to be seen as agents of implementation. PHOs in Auckland saw each other as competitors for enrolled patients. Where there was additional funding available, such processes were contestable, invoking the signalling mechanisms of the market. DHB-PHO relationships under this contractual model were predominantly **vertical**. By-and-large, it was **difficult** for DHBs and PHOs to exit relationships with each other if they occupied the same or similar geographical territory. However, there was one key attribute according to which DHB-PHO arrangements did not fit the hierarchical ideal-type. In some key areas of the PHO Service Agreement, the DHBs were often unable and/or unwilling to enforce the terms of the contract, a situation of **weak** enforcement.

This profile was particularly evident in the area of after-hours medical care. Under the PHO Service Agreement, PHOs are contracted by their local DHBs to provide "access to First Level Services on a 24 hour a day, seven day a week basis for 52 weeks a year for all service users" (After Hours Primary Health Care Working Party 2005). However, from the establishment of PHOs there was considerable ambiguity in the interpretation of the clause from the PHO Service Agreement. A Ministry of Health report noted that GPs that were not contributing to after-hours care and did not experience any imposition of penalties. PHOs and GPs claimed that service agreements were not funded sufficiently to cover after-hours care (Verstappen 2011).

In Auckland, DHBs thought that they were paying for after-hours care through the PHO Service Agreement, but this was not enforced in any meaningful way. Subsequently, in 2009 the Ministry of Health provided extra funding for DHBs, requiring them to take on the specific responsibility of reducing barriers of access to after-hours medical care in their district.

Table 5: Pre-existing governance of primary medical care in Auckland

	2 Formal (1) v informal (o) governance	3 Substance (1) v procedure (o)	4 Signalling (1) v Dialogue (o)	5 Vertical(1) v horizontal (o) communication	6 Strong (1) v weak (o) enforcement	8 Difficulty (1) v ease (o) of exit
Pre 2010	1	1	1	1	0	1

Step 4: Trace policy actors attempts to create a new institutional form

In 2010, the three DHBs in metropolitan Auckland agreed to take a regional approach to the issue. They circulated a request for proposals (RFP), and a consortium of some A&M clinics developed a proposal. However, some PHOs objected to this process and threatened to challenge it. Consequently, the original RFP process was abandoned and a 'working group' of health provider organizations (DHBs, PHOs, A&M clinics) was established and a new 'alliancing'

contracting process was initiated. In June 2011 this working group became formally constituted as the Auckland Regional After-Hours Network (ARAHN) (Tenbensen *et al.* 2013).

After an intensive three month process in mid-2011, ARAHN members agreed on specific initiatives to be funded, and the mechanisms by which the initiatives would be funded. The most prominent initiative was the subsidisation of A&M co-payments for young children, the elderly and other high-needs categories for after-hours medical services. This initiative was paid for jointly by DHBs and PHOs (Tenbensen *et al.* 2013). The development of ARAHN was one example of many attempts by government to stimulate more collaborative relationships between health sector players, and was arguably more successful in forging these relationships than other attempts in Auckland in the two years prior. ARAHN was chaired by a retired general practitioner who was also the chair of one of the smaller PHOs. An Auckland-based health sector consultancy organisation was funded by the network to provide logistical support for the development of network activities.

The emergence of ARAHN provides a clear example of an attempt to alter the genetic profile of governance in the field of after-hours care. Crouch's institutional attributes help us to chart how policy actors – in this case, the ARAHN chair, the consultant agency employee and some key representatives of A&Ms, PHOs and DHBs engaged in 'artificial selection' regarding the governance arrangements. The new arrangements developed as part of ARAHN differed across three of the six attributes of governance used in this framework. Most clearly, there were shifts from signalling to **dialogue**, and from vertical to **horizontal** relationships. There was considerable investment of time and resources in *processes* (meetings, negotiations, face-to-face consultation), which required considerable energy, leadership and consistency of key personnel, to build and maintain. The chair of ARAHN estimated that 90 meetings took place over a three month period in mid-2011 (Tenbensen *et al.* 2013). DHB representatives attended as network members, rather than as principals of an agency relationship. The development of the ARAHN initiatives required significant compromises between participants which would not have been reached without a commitment to dialogue and horizontal communication (Tenbensen *et al.* 2013). The third shift (mutation) was from weak to **strong enforcement**. Network members signed up to a set of obligations of which they were accountable to fellow members. A&Ms were required to reduce fees for targeted groups and keep specific opening hours. PHOs and DHBs were committed to contributing to the pool of funds. These contractual requirements were regularly reported on and reviewed at network meetings.

This also indicates that there was no change on the attribute of **formality**, a new agreement (the network contract) was highly formal, and the focus of sustained effort from ARAHN participants. There was also no change regarding **difficulty of exit**, and new actors (A&Ms) were drawn into the alliance contracting process.

The contrast between pre-ARAHN and ARAHN institutional arrangements is highlighted in Table 6. Here we can see that the ARAHN arrangements were not 'pure' networks as defined by Crouch's attributes. Indeed, they comply with the network ideal type (ie, values of 0, aside from dimension 3) in only two of the five attributes in which pure hierarchy and pure network types differ – namely the two attributes (dialogue and horizontal communication) that are most frequently emphasised in network literature.

Table 6: Contrast between pre-ARAHN and ARAHN governance of after-hours medical care

	2 Formal (1) v informal (0) governance	3 Substance (1) v procedure (0)	4 Signalling (1) v Dialogue (0)	5 Vertical(1) v horizontal (0) communication	6 Strong (1) v weak (0) enforcement	8 Difficulty (1) v ease (0) of exit
Pre ARAHN	1	1	1	1	0	1
ARAHN	1	1	0	0	1	1

In this example it is also clear that key participants in ARAHN acted as institutional entrepreneurs by crafting these new arrangements. This institutional array can be seen as an attempt to mitigate the effects of the dominant institutional mode (111101). PHOs in particular appreciated the move to more horizontal relationships based on dialogue and good-faith negotiation. This produced a number of negotiated solutions to various sticking points. For example, a system of variable co-payment levels for A&Ms participating in the initiative was devised in order to address concerns raised by some of the PHOs and their member practices that after-hours co-payments at A&Ms would be cheaper for patients than in-hours co-payments charged by GPs located nearby participating A&Ms. The eventual solution was to set co-payment levels for each eligibility category at the '80th percentile' of GP charges within a 5km radius of the A&M. This meant that the agreed co-payment level for A&Ms were the same or more than the fees charged by 80% of GPs within that radius (Tenbensen et al 2013).

DHB participants in the network were pleased to see the shift to an arrangement with more teeth (a sense that they might now actually get what they were paying for). For these participants, the move from weak to strong enforcement was the key motivation for supporting institutional innovation. Thus, the innovation involves a new combination of attributes drawn from both the network and hierarchical ideal types.

Step 5: Analyse the dynamics of abrasion, nesting

This new institutional arrangement (110011) was specific to after-hours medical care. The overall institutional environment of health services governance in Auckland, however, followed the overarching institutional form (111101). Thus the new after-hours institutional forms could be seen as 'nested' within the more encompassing regime of primary care governance. There are some important consequences of this nesting.

Firstly, there is abrasion between the dominant and the nested institutional arrangements. ARAHN and its approach to governing after-hours care were not universally welcomed in the Auckland primary health sector. Some key actors within DHBs defended the integrity and appropriateness of the dominant mode, and argued that the new collaborative arrangements between providers violated the principles of efficiency, contestability and value for money (Tenbensen et al 2013). For these actors, a move from principal-agent **signalling** could stimulate 'provider-capture' and the formation of provider cartels.

In another example of abrasion, when ARAHN institutional entrepreneurs attempted to expand the scope of ARAHN from after-hours care to all 'urgent care', encompassing an even broader range of services and providers beyond primary care, there was significant pushback and resistance from more senior DHB management who were instrumental in reasserting the

predominant institutional approach in response to ARAHN's attempted expansion (Tenbensen et al 2014).

Thirdly, ARAHN's continued existence was governed by the rules of the dominant institutions. As the network's activities are predominantly funded by DHBs, continued funding was subject to yearly renewal in which the ARAHN enters into a relationship defined in principal-agent contractual terms with the three DHBs (Tenbensen et al 2014b). DHB senior managers were able to act simultaneously within the pre-existing and new institutional forms. As a consequence of all these factors, the new institutional forms developed within ARAHN were fragile, and vulnerable to changes to local and national priorities.

Ultimately, the ARAHN initiative to subsidise after-hours services broke down in 2015. After all parties had agreed to a comprehensive agreement for funding after-hours services, DHB board members and senior management put the contract on ice in response to an internally (DHB) sought legal opinion that deemed the agreement to be in breach of New Zealand's Commerce Act (Taylor 2015). One example of a supposed breach was the '5km radius' agreement outlined above. At the time of writing, it appeared that the DHBs would unilaterally determine contracts for after-hours service, marking a return to the traditional 'principal-agent' institutional form (Taylor 2016). This amounts to a rejection of the **dialogue** element of ARAHN governance by the broader institutional parameters of public management in New Zealand.

Our example indicates that Auckland's health service governance is arguably a rugged institutional landscape, in which there appear to be strong interdependencies between 'genes'. Relationships between the actors in the after-hours space (DHBs, PHOs, A&M clinics) are contingent upon multiple institutional arrangements of neighbouring and overarching governance spaces. For example, the feasibility of horizontal communication was dependent on the setting of the 'signalling/dialogue' gene. If contracting for after-hours services must be commercially contestable, then horizontal communication between organisations becomes (or remains) problematic. In this environment, attempts to introduce innovations such as those developed by ARAHN trigger the cascade of consequences for primary care governance beyond the after-hours subfield, which then have the consequences for ARAHN that were outlined above.

The analysis of the Auckland primary care field provides the basis of a deeper understanding of how actors' attempts to create and strengthen alternative institutional forms fare in an institutionally dynamic setting. Actors clearly have some scope to develop alternative institutional forms, but ultimately the ruggedness of the landscape is largely beyond their control. Nevertheless, there may be scope for central government actors to 'tune' the parameters that give the landscape its shape (Room 2011). In this example, loosening or tightening the requirements around competitive contracting in the health sector are possible ways in which the parameters can be tuned. While this article has focused primarily on the meso-level of analysis, this 'macro' question of how to tune landscapes in order to reduce the complexity of interdependencies emerges as a central issue for both public management theorists and practitioners.

Conclusion

The population genetics framework based on the work Colin Crouch draws from complexity theory in order to provide a language for understanding the dynamics of institutional change.

HMNC concepts, which are widespread in institutionalist literature, provide a viable starting point for this conceptual bridge between complexity theory and institutionalist analysis. This population genetics approach points to a type of advice in which practitioners have some concrete options for influencing institutional dynamics. The first possibility is to actively scan their governance field/landscape for alternative, recessive institutional forms and seek to widen their reach. A second possibility is to 'pilot' new institutional forms within their field. These new forms need not be polar opposites of dominant forms. Instead, they may only involve switching two or three capacities (alleles) identified by Crouch. Such a targeted approach could well be useful in limiting the scope of resistance from dominant institutional forms. Ultimately, the success of local attempts to change institutions may be beyond the control of the practitioners that initiate them, as exemplified by the Auckland after-hours care case. However, it is possible that many other public management stories of successful institutional change at the local level can be easily interpreted in terms of the population genetics framework.

As a contribution to public management theory, this fusion of concepts addresses respective weaknesses in complexity theory and HMNC. On the one hand, it addresses the predominantly descriptive character and the lack of dynamism in HMNC. It does this by treating HMNC ideal types as a small subset of a much larger range of empirically possible governance forms defined in terms of dimensions of genetic variation. In doing so, we are able to avoid the conceptual dead-end of 'hybrid governance'. By seeing governance forms as genetic expressions which can be subject to mutation and selection, the range of possibilities for understanding governance evolution is significantly expanded beyond broad-brush narratives of change from hierarchy to market to network. Crouch's approach then allows us to understand the dynamics of change and attempted change in terms of competition and/or synergy between contrasting governance modes characterised by processes of nesting, abrasion and recombination.

The population genetics approach also enhances the application of complexity concepts to public management by utilising more established policy and public management concepts, in this case, hierarchies, markets, networks and communities, to underpin complexity-inspired analyses. An important benefit of this move is that it counteracts the tendency in complexity literature to regard hierarchical governance as antithetical to complexity-informed 'good practice', a stance that is distinctly unhelpful in understanding public management and policy dynamics in parliamentary democracies (Tenbenschel 2015). More broadly, it provides an example of a bridge between complexity theory and more established conceptual and theoretical repertoires. Following the recommendations of Room, Cairney and Pollitt, this is the most promising way to develop the analytical and practical utility of complexity theory.

The Auckland primary care example sketches out the analytical possibilities of a population genetics approach, but also highlights areas for further empirical and conceptual development. Firstly, a more sustained development of the approach would require a methodology for mapping the genetic profile of governance arrangements. There needs to be a reliable and plausible method for empirically distinguishing between capacities on each of Crouch's dimensions. This challenge could possibly be addressed through development of interview schedules, surveys or Delphi processes designed to unpack these dimensions. In doing so, it will be important to be cognisant of a key limitation of the metaphor in that gene alleles are 'digital', (either/or) states, whereas possible positions on Crouch's dimensions may be analogue (more of/less of). Indeed, in Crouch's application of his own framework, he allows for ambiguity and variation on specific genes within defined modes (Crouch 2005: Chapter 5). Another

metaphorical limitation is that real genes often have more than two alleles, and therefore variation might not be one dimensional. However, moving beyond Crouch's unidimensional representation of capacities would add considerably to the complexity of the framework itself and could reduce its parsimony.

Secondly, if the concept of rugged landscapes is to be useful, there needs to be a way to map the interdependencies between genes. This is a considerably more difficult challenge, because in order to demonstrate interdependencies one would need to explore and map a range of governance possibilities in a single field/landscape. The best that might be possible is to develop 'thought experiments' and scenarios to draw out these (possibly hidden) interconnections and interdependencies from participants in governance arrangements.

Even if such challenges prove difficult to address methodologically, the conceptual language of population genetics can still provide useful metaphors that can be used to construct plausible accounts of governance dynamics. In this way, it already provides a novel and potentially powerful way to understand the role of agents in attempting institutional change from within.

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