Use of complex adaptive systems metaphor to achieve professional and organizational change

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Aim. This paper uses the experiences of a programme designed to bring about change in performance of public health nurses (health visitors and school nurses) in an inner city primary care trust, to explore the issues of professional and organizational change in health care organizations.

Background. The United Kingdom government has given increasing emphasis to programmes of modernization within the National Health Service. A central facet of this policy shift has been an expectation of behaviour and practice change by health care professionals.

Methods. Change was brought about through use of a Complex Adaptive Systems approach. This enabled change to be seen as an inclusive, evolving and unpredictable process rather one which is linear and mechanistic. The paper examines in detail how the use of concepts and metaphors associated with Complex Adaptive Systems influenced the development of the programme, its implementation and outcomes.

Findings. The programme resulted in extensive change in professional behaviour, service delivery and transformational change in the organizational structures and processes of the employing organization. This gave greater opportunities for experimentation and innovation, leading to new developments in service delivery, but also meant higher levels of uncertainty, responsibility, decision-making and risk management for practitioners.

Conclusion. Using a Complex Adaptive Systems approach was helpful for developing alternative views of change and for understanding why and how some aspects of change were more successful than others. Its use encouraged the confrontation of some long-standing assumptions about change and service delivery patterns in the National Health Service, and the process exposed challenging tensions within the Service. The consequent destabilising of organizational and professional norms resulted in considerable emotional impacts for practitioners, an area which was found to be underplayed within the Complex Adaptive Systems literature. A Complex Adaptive Systems approach can support change, in particular a recognition and understanding of the emergence of unexpected structures, patterns and processes. The approach can support nurses to change their behaviour and innovate, but requires high levels of accountability, individual and professional creativity.
Introduction

The agenda for change and improvement in the delivery of care in the United Kingdom (UK) National Health Service (NHS) has been clearly laid down in government policy for England through a number of documents (Department of Health 1998, 2000a, 2000b). In the field of public health and nursing, two professional groups, health visitors and school nurses, have been the focus of considerable attention (Department of Health 1999a, 1999b, 2001, 2002). These groups have a specific public health remit, with an emphasis on assessment of the health needs of individuals, families and the community. The primary purpose of each is to promote health and tackle inequality. To this end school nurses work in schools to provide health-promoting learning programmes, screening and individualized care as necessary. Health visitors work mostly in a primary care context, often focusing predominantly on families with preschool aged children. The desire to ‘modernize’ the roles of these disciplines came from an explicit attempt to: ‘enable them to respond effectively to the challenge of the Government’s new policies’ (Department of Health 1999a, p.132), particularly in relation to public health practice.

In order to explore and implement new roles for these professional groups the Department of Health (DoH) established and funded four primary care trust (PCT) pilot site change programmes to identify:

- models for the new public health roles of health visitors and school nurses;
- factors associated with sustainable role change in these professional groups;
- the necessary structural and organizational changes to support practitioners in their new roles.

This paper uses our reflections and material from the independent evaluation of the longest running of these pilots as a case study for an exploration of the usefulness of the Complex Adaptive Systems (CAS) model of organizational change within a health care setting. The change programme was hosted in a PCT; these are responsible for assessing health need, procuring and in part providing primary health care for local populations, and commissioning secondary care appropriate to the needs of a geographically defined population (Department of Health 2000a).

The change programme used key concepts from the explanatory framework of CAS and provides a vehicle for a discussion of the strengths and weaknesses of this developing approach to organizational change (Olsen & Eoyang 2001). The programme was funded as a comprehensive change programme, to deliver changes in behaviour and service among its public health nurses. Independent evaluation of the programme was secured at the outset and a ‘utilization-focused’ approach (Patton 1997) was chosen as the best method of providing both formative feedback on the implementation process as well as a summative report on overall programme effectiveness. All the data generated to inform the evaluation were rendered anonymous and shared with the participants themselves, who approved publication. Quotations and examples given within this paper were generated in this way.

Background

Changing professional behaviour

Changing the focus and nature of professional behaviour, particularly within health care settings, where traditions of professional autonomy are strong, has been recognized as complex and difficult (NHS Centre for Reviews and Dissemination 1999, Nutley et al. 2003). The promise of a robust evidence base as a stimulus to change is now felt to have been overplayed, as attempts to implement research evidence in practice have proved more challenging than many anticipated (Oxman et al. 1995, NHS Centre for Reviews and Dissemination 1999, Fitzgerald et al. 2003).

At the outset of this programme of change there was no rigorous supporting evidence base for the government desire for nurse-led community public health programmes. In addition, the range of frequently opposing opinions expressed in the professional literature (Goodwin 1991, Twinn 1991, Twinn & Cowley 1992, Caraher & McNab 1996, Craig & Smith 1998, Cowley & Billings 1999, Carr et al. 2003) was mirrored in the practitioner population of the pilot site. As a consequence, the need for and the direction of change for the service was disputed from the outset, with some wanting to provide a universally delivered family health support service, while others felt that a targeted community-based health-promoting service would address health inequalities better.

Organizational change

Although the programme was concerned with changes in the behaviour and performance of health visitors (who are widely seen as having a good deal of autonomy over their priorities and practice), an initial organizational analysis confirmed...
that the organizational structures and processes in place played a large part in determining the actions of these practitioners; for example, line managers and general practitioners (GPs) had particular expectations of them and their day-to-day activities. Running child health clinics and undertaking home visits to families were generally perceived as ‘what health visitors did’, and local policies were developed that emphasized such normative expectations. In addition, the distribution of practitioners across the PCT was based on historical allocation rather than population need, and this played a major role in how health visitors organized themselves and the types of activities they could undertake.

The PCT managers recognized that a more flexible and responsive service that could react appropriately to local population needs was required. They were also concerned with service equity and needed to be satisfied that services were of equally high standards across the city. As a result of the level of uncertainty about the direction for change and the best way to achieve it, an exploratory and reflective change process was required that had a ‘good enough’ vision rather than a preordained strategic plan. For these reasons a CAS model of change was used to frame the programme and plan activities within it. This approach contrasts with the mechanistic framework commonly used to view organizations and methods for facilitating change within health care systems.

Organizations as machines

Recently, a number of commentators in the UK have asserted that the health care system is suffering from the application of an outdated and inappropriate organizational model (Plsek 2001, Fillingham 2002). They argue that many health care organizations continue to be designed in line with the principles of Taylor’s scientific management theory (Morgan 1986), with the assumption that a good organization is like a well-oiled machine. This machine will have a designer, usually the Chief Executive, who specifies the parts, what they will do and how they interact (Morgan 1986, Pratt et al. 1999). Hierarchical in nature, with high levels of bureaucracy, this organization will have a senior management team who create detailed instructions for those below them to carry out. Middle managers in such organizations act as engineers, monitoring and maintaining the machine, identifying breakdowns and fixing them.

The use of a traditional industrial machine-like model of organizations leads one to approach change as a predictable and linear process, initiated and controlled by those in senior positions. Plans can be made and, if followed, the expected change will result. Any problems will be the result either of a lack of clarity regarding expectations or an inability or refusal to undertake the actions prescribed. Such problems can be remedied with improved communication and staff performance management.

Such machine-like organizational structures appear inappropriate for 21st century health care, where changes in populations, disease patterns and technologies require constant adaptation in the work of professionals for the delivery of new and evolving services. Nevertheless it has been the tacit model for health care delivery in the UK, and one that, until recently, has been largely unchallenged (Plsek 2001, Fillingham 2002).

Organizations as complex living/adaptive systems

An alternative metaphor has recently been used to describe organizations, that of the living or complex adaptive system (Kernick 2002). Within this framework, organizations are characterized as living entities or organisms existing within a complex ecosystem. In any ecosystem, individual organisms are independent and have their own identity, yet coexist and are dependent on each other for the maintenance of the whole system and therefore their survival. The living entities interact with the environment and are affected by it, creating a balance of interdependent elements (Levin 1998). The complex set of relationships existing between these various elements of an ecosystem is often described as a web. These living systems are not fixed but rather change, grow, repair, adapt, reproduce and slowly evolve (Zimmerman et al. 1998, Pascale et al. 2000, Kernick 2002).

Insights from complexity science have been used to view organizations differently (Lewis 1994). Van Eijnatten et al. (2003, p. 361) asserted that an organization can be seen as a ‘complex, dynamical, non-linear, co-creative, far-from-equilibrium system...an intelligent entity in which chaos and order always and forever co-exist’. Interactions within a complex system produce largely unpredictable outcomes, or ‘emergent behaviours’ (Burton 2002, Harkema 2003). Stacey (2003) highlighted the importance of simple rules within these systems, ‘[CASs]... have a large number of agents, each of which behaves according to some set of rules. These rules require the agents to adjust their behaviour to that of other agents’ (Stacey 2003, p. 287). As a result of responses to these rules, orderly patterns of behaviour emerge in a process of self-organization. The behaviour of flocking birds, colony-building termites and computer viruses have all been cited as examples of such systems (Plsek 2001, Burton 2002, Englhardt & Simmons 2002a).

This analogy throws a different light on health care, enabling it to be seen as an adaptive system, gradually evolving in response to a range of internal and external stimuli.
Organizations or groups of organizations within a larger health and social care system are smaller systems, each with their own identity, yet dependent on each other. Kernick (2002, p. 115) concluded that, when applied to an NHS context, CAS can help to explain how organizations ‘...are sustained, how they self organize and how outcomes emerge’.

Using insights from CAS to bring about change in an organization means an expectation of relative unpredictability and unforeseen emergence. Change would be provoked, not by detailed plans and instructions, but by attempts to increase the possibilities for natural adaptation. This is encouraged by use of appropriate stimuli to increase creativity at all levels of the organization and the creation of more flexible organizational arrangements (Iles & Sutherland 2001). At its best this will push an organization to the ‘edge of chaos’. Burton (2002, p. 17) described this location as: ‘...the area where the emergence of order and self organization takes place...the interface between the slow changing stable states and the rapidly changing uncontrollable areas of chaos’. This is a condition of experimentation where the next steps to be taken are not immediately apparent (Pascale et al. 2000, Psek & Greenhalgh 2001).

Unpredictability and a lack of detailed expected outcomes do not mean that change should not be encouraged or directed. Some commentators (Psek & Wilson 2001, Kernick 2002) have identified a need to recognize and work with the ‘natural attractors’ in a system (i.e. the values, behaviours and so on that people or organizations are drawn towards) rather than attempt to ‘battle resistance to change using formal structures and sanctions’ (Psek 2001). They also highlight the importance of ‘generative relationships’ (relationships that generate new ideas and solutions) for increased creativity. The use of minimum specifications (simple rules) or ‘principles for action’ is also seen as a mechanism through which change in a specified direction can be encouraged (Psek 2001). The key elements of CAS as it relates to organizational change are outlined in Table 1.

The remainder of this paper will explore some of these key concepts and comment on their usefulness in the organizational change programme case study.

The programme

The PHAAR (making a Public Health Approach a Reality) programme of change was initiated and developed by the authors in collaboration with the PCT. The details of the programme and outcomes have been reported elsewhere (PHAAR Development Team 2003).

The proposal to achieve change using the CAS model posed real challenges for all those involved in the programme because decisions about the direction and process of change needed to be iterative, with no predetermined outcome other than improving the ‘fit’ between health visiting practice and public health policy. Nevertheless, the chief executive and his team accepted from the outset that change could be necessary at any point or level of the organization and that clinicians and managers would be involved in determining the pace and direction of change.

Planning for unpredictability

For leaders of change, one of the initial challenges of using a complex systems metaphor is coming to terms with the contradiction in planning for uncertainty and unpredictability. Within this programme the expected outcomes were not mapped out in advance, rather it was planned that a future, which met the expectations and needs of external stakeholders, practitioners and local people, would emerge through a continual process of learning, envisioning, clarifying and experimenting. We did not wish to ‘engineer’ change but rather create the conditions within which it would emerge. These conditions developed through multiple actions, including reflection, debate and challenge, encouraging development of multiple new relationships, an education programme tailored to needs following skills analysis and recognizing and validating newly emerging organizational and professional structures and processes.

<table>
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<tr>
<th>Table 1 Key features of complex adaptive systems</th>
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<td>• Complex adaptive systems will be self-organizing and new elements will emerge at various points. These changes may be incremental or dramatic as they adapt to reactions between subsystems and with other systems.</td>
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<td>• Uncertainty is inevitable in an evolving system, rendering top-down control impossible. The views and experiences of those at a variety of points in an organization are necessary to gain an understanding of it.</td>
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<td>• Spontaneous change occurs more readily where there are a range of different behaviour patterns (microdiversity).</td>
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<td>• Agents within an organization act according to their own internal rules or mental models. Attractor patterns within the system will ‘frame’ and limit change.</td>
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<td>• Simple rules or guiding principles can lead to innovative emergent changes.</td>
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<td>• Change can be stimulated by the encouragement of new generative relationships. These can produce new insights and solutions into complex problems.</td>
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<td>• There will be simultaneous stability and instability at the edge of chaos, this being a requirement for the emergence of novelty.</td>
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The programme began with events designed to raise expectations of change and encourage the start of a learning, reflective and creative process. Professionals and managers were brought together to envision the future and consider the ways in which they would like change to happen. During these workshops the new Government policies, expected professional roles and key elements of public health practice were reviewed. Practitioners were asked to consider potential challenges to their professional practice, evaluate their effectiveness and identify the strengths and weaknesses of current work patterns. A general vision for the future was debated and key elements agreed on. These were broad, allowing plenty of scope for diversity within the system (Table 2).

Further workshops and audits generated a common understanding of the range of current behaviours and future expectations and this ‘diagnostic analysis’ was used as the basis for the development of a flexible action plan. This plan was used as a focus for a wide range of activity and was kept as inclusive and fluid as possible to allow for unexpected outcomes as they arose.

Although the open process was largely productive, the levels of uncertainty during the process caused anxiety, sometimes expressed as hostility or distress as the following quote extracted from the independent evaluation illustrates:

It feels very uncomfortable; you know I mean I keep being asked if I feel comfortable with this. I mean how can I feel comfortable with something if I don’t actually know how it’s going to be when we’re actually doing this? (Health visitor)

Balancing the need for openness and time for debate and reflection with the need for some stability and order (in the context of practitioners’ heavy workloads) was a major challenge. To function ‘on the edge’ rather than become immersed in chaos, it was necessary to recognize elements of self-organization as they emerged and identify these as firm decisions at various points in the programme. An example of this was decisions regarding minimum health visitor service delivery for all families and team structures. These decisions were shared and agreed with the PCT board so that all were clear that reorganization could be expected around these changes. These decisions provided simple and agreed rules for determining future practice.

### Mental models and attractor patterns

Within a CAS it is held that the ‘internalized rules’ of agents will determine actions within any given environment (Plsek & Greenhalgh 2001). This was in agreement with Benner’s (1984, p. 6) postulation that ‘accounts of practical situations presented in narrative form with the context intact are laden with assumptions, expectations and ‘sets’ that may not be a part of formally recognized knowledge’. It is possible that divergent approaches and communication about the same clinical situation may point to different sets and therefore, different actions. These internal or mental models are the ‘often unstated models or rules that guide our actions and help us anticipate and predict; they are our internal representations of how things work…’ (Miller et al. 1998).

Facilitating practitioners to gain insight into their mental models and enabling challenge to these models and their divergence was crucial to the change process. As Senge (1994, p. 236) stated, ‘…because mental models are usually *tacit*, existing below the level of awareness, they are often untested and unexamined’. Exposing practitioners’ ‘in use’ internal rules and understandings, rather than the commonly ‘espoused theories’ (Argyris & Schon 1974) and opening them up to contest and review through action learning was a major component of the programme.

It was evident that practitioners within the same nursing disciplines had varied understandings of their professional roles and working practices, both current and anticipated for the future. This led to lively debates and exploration of paradox and tension as philosophical approaches and working practices were explored and challenged. One example was the different beliefs practitioners held about universal versus targeted services. Some felt that the same service should be offered uniformly, while others felt that this ignored the principle of equity. The programme leaders facilitated many discussions within the programme but debates also went on day-to-day within teams and offices across the organization. While unsettling and challenging to practitioners, the debates raised differences of opinion that continued to produce productive insights and contributed to increasing awareness of the tensions followed by some modification in ‘mental models’, as seen from, often innovative, changes in approaches and working practices.

The extent of critical reflection required was unsettling for some, as indicated in the following quote from the project’s internal facilitator towards the end of the programme:

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**Table 2** The vision for health visiting and school nursing services

- Increased population – rather than individually-focused work
- Increased emphasis on addressing inequality, with a concurrent decrease in the amount of routine, universal service provision
- Flexibility to work from and with the agenda of local communities, responding creatively to areas of need
- Increased inter-agency working
- Contributing to organizational public health (i.e. health improvement) plans

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I don’t think I envisaged the amount of problems there would be...I was naive as to just how difficult understanding this approach is, and moving from traditional skills to asking people to develop different skills or to go back to skills they once had has been hard for some people.

A range of different attractors (values or behaviours people are drawn towards) also motivated practitioners, which has been noted in another primary care context (Miller et al. 1998); for example, some health visitors within the programme were pulled by the attractors of casework with individual clients, while for others work with whole communities was a powerful attractor. The programme was funded to enable change towards a general goal of increased work with whole populations, hence attention was paid to identifying with staff the ways in which this could become a meaningful and fulfilling pattern of behaviour for them. Practitioners eventually decided to develop multi-skilled teams, which enabled some staff to work with individuals, while allowing others to pursue a broader, community development approach thus accommodating diversity and pursuing policy goals.

Generative relationships

During the course of the programme staff were encouraged to make new links with personnel in other agencies and sectors, to discuss their work with them and look for possibilities for joint work. A number of new relationships were introduced in a number of areas (see Table 3).

Table 3 The range of new relationships developed by public health practitioners

- Peer relationships between practitioners working in newly established teams, sharing workloads and accountability for outputs. The majority of practitioners had previously been working in almost complete isolation, taking personal responsibility for a defined ‘caseload’
- Practitioners and Public Health specialists within the primary care trust. Prior to this programme these groups were largely unaware of the other’s work
- Clinicians and Managers, who are continuing to work on the balance of decision-making between frontline teams and the managerial level
- Health visitors and other disciplines, including nursery nurses, midwives and clerical assistant staff who are now part of the teams
- Health staff and local people, through a range of participatory techniques such as rapid appraisal of community health needs, resulting in a wide range of new and innovative services
- Practitioners and workers from other agencies, through discussion and jointly established new initiatives

These relationships appeared to produce new ‘emergent behaviours’ and work patterns. The productive sharing of ideas, work problems and responsibility for decisions taken, particularly in relation to complex public health issues and ethical dilemmas, has been one of the outcomes of this programme. Practitioners involved expressed surprise at the extent to which others wished to work with them and the creativity and new approaches to service delivery that emerged from sharing with others. A number of new projects have been initiated by this activity and new energy and commitment to working differently can be seen. Two examples were the setting up of a health clinic within a local refuge for asylum-seekers and an exercise class for a group of Asian women.

Involvement and self-organization

Moving away from a machine metaphor, where senior managers determine actions of others, towards one of collaboration and emergence meant that large numbers of staff needed to be involved in the process of determining the extent and nature of change. Great efforts were made to keep the whole process as inclusive as possible and enable field staff to direct the change. Large numbers of participatory ‘events’ were arranged, from structured large-scale workshops to small informal discussion groups. Managers, internal and external stakeholders were all invited to comment and reflect on plans with practitioners as they progressed and health visitors consulted with local people, if only to a limited extent.

These high levels of involvement resulted in high expectations of change. The solutions generated by practitioners were not always comfortable for others within the health care ‘system’, particularly those unaccustomed to a public health focus. The practitioners challenged conventions and changes proposed were highly contested. The proposals made, developed by practitioners themselves in response to local needs and circumstances, were examples of self-organization; for example, practitioners made the decision to move away from the previous service model of ‘attachment’ to the general practice population (i.e. where health visitors have specific responsibility for the registered population of a GP practice) towards teams located in geographic neighbourhoods within the city. This decision provoked more debate, particularly among GPs and the PCT senior management team, than any other single issue. Nevertheless, with the support of the PCT a decision was taken to go ahead with this change, something most health visitors felt was critical to working in the ways required of them by public health policy. The support of the Chief Executive and his team was important to practitioners, as it provided them with the necessary confidence to move
into new teams in spite of the inevitable challenges this major change provoked.

**Simple rules and guiding principles**

Plsek (2001) asserted: ‘Complex behaviours can emerge from a few, flexible, simple rules, or so-called minimum specifications’ (Plsek 2001, p. 6). At the outset of the programme the practitioners involved had large numbers of standards and guidelines, written in an attempt to regulate their behaviour. Many health visitors cited these as a major obstacle to innovation and change and consequently it was decided to replace them with a small number of principles agreed between staff. Designed to encourage innovation and experimentation within some agreed parameters, these principles emerged from many discussions within the organization regarding clinical and organizational decision-making. These simple rules and discussion of them were an important component in the process of influencing emergent behaviours (Kernick 2002) and enabled practitioners to create their own local solutions to the challenges of practice they faced. However, the adoption of these rules brought into focus issues of risk and personal responsibility for decisions for managers and professionals alike. The clinicians involved perceived a high degree of autonomy as necessary to enable them to respond to the specific circumstances of individual patients. Managers, on the other hand, were used to standards and protocols acting as a mechanism to ensure quality of service delivery and minimize risk. The CAS framework supports the view that simple rules, rather than prescriptions for action, are more likely to bring about innovation and flexibility.

**Tension and paradox**

The creative tension emerging from the exposure of mental models, attractor patterns and existing behaviours was a strong and inevitable feature of the programme. This was in part because a series of ‘wicked’ (Zimmerman et al. 1998) questions were put to the practitioners and managers by the programme facilitators. These are questions that have no obvious answers, but expose assumptions. Tension was also created by the need for external energy to challenge the status quo, bringing to the fore issues of leadership and pushing the whole organization beyond its ‘comfort zone’:

There’s a real chance that we wouldn’t have been as brave – having said all that about the tension, the fact that that tension was there was ultimately a constructive thing about pushing the programme into an arena that it could have walked back from and said ‘this is bloody difficult’ and just allowed it to drift…we couldn’t have done it without some form of external facilitation. (PCT Chief Executive)

**Discussion**

Use of the CAS metaphor to replace that of the machine has been recommended as a new and productive way of approaching organizational change (Brodbeck 2002, Harkema 2003). In particular, its use has been suggested as a way to develop organizational flexibility and adaptability for an increasingly fast-changing world (Englehardt & Simmons 2002b). By modelling an organization’s structure and processes on a CAS and supporting learning and experimentation at all points within an organization, it is asserted that it will adapt to external stimuli through self-organization, and in so doing achieve improved performance. However, this claim is contested (Tetenbaum 1998, Englehardt & Simmons 2002a, 2002b) and, although there is a growing body of literature in this area, there have been few studies to test the effectiveness or otherwise of this approach. In common with many management texts, much of the literature is at the level of ideas, assertions and theory development (Plsek & Greenhalgh 2001, Plsek 2001, Burton 2002, Englehardt & Simmons 2002b, Kernick 2002, Stacey 2003) sometimes supported by a range of real life anecdotes and case studies (Olsen & Eoyang 2001, Fillingham 2002, Harkema 2003, Smith 2003, Van Eijnatten et al. 2003). Complex Adaptive Systems provide a ‘model’ or ‘framework’ to aid analysis or construction of an approach, rather than a fully formed theory that can be tested (Englehardt & Simmons 2002a), as such it has been criticized as merely a substitute for ‘pragmatism and judgement’ (Lafferty 2002).

Despite these shortfalls, CAS remains an interesting alternative framework through which to instigate and understand change. Through the assertion that involvement, good relationships and multiple understandings of any given situation are the key to achieving organizational success, CAS offers an alternative paradigm to that of strong and effective leaders ‘managing’ a passive or resistant workforce through change. Using the approach in the case study presented here produced multiple and profound change both at the level of organizational structure and process and at the level of professional behaviour. As such it was successful as a method to bring about and make sense of change within this environment. However, one issue, which is not a key component of the literature on the use of CAS within organizations, but which was a significant element of the case study experience, is the emotional impact of high levels of
uncertainty during organizational change. Such high levels of uncertainty have been shown to increase work-related psychological strain (Bordia et al. 2004), especially where the staff concerned feel a lack of control. In this case study, the practitioners themselves were largely in control of the change process as a group, determining the direction of the programme through discussion. Inevitably some practitioner’s views were subjugated in this process and for these practitioners this must have increased their perceived lack of control. More widespread use of a CAS approach would mean that uncertainty and experimentation become the expected form of organizational behaviour and, as was found in this case study, although some may experienced this as an exciting opportunity, others may find it threatening and difficult to manage. The lack of attention to this issue within the CAS literature may be a result of the scientific (as opposed to humanistic) origins of complexity science and the computer simulations that have sometimes been used to describe and explain them (Stacey 2003). Focusing on the process of interaction between individuals rather than on the structure or process of the system is helpful in this respect (Pratt et al. 1999, Lindberg 2002, Stacey 2003). This encourages attention to the dialogue between individuals in organizations and, as Stacey (2003) points out, it is in such dialogue that evidence of distress (and change) is most apparent.

The belief that new developments will emerge in a process of self-organization is a key element of a CAS approach (Beinhocker 1999, Beeson & Davis 2000, Fitzgerald 2002). However, this process is not an automatic response to changing external conditions, indeed many successful organizations have been seen to be resistant to change in such circumstances, preferring to copy tried and tested methods and patterns of behaviour (Englehardt & Simmons 2002b). Emergence requires the application of energy and a certain set of conditions. Stacey (2003) viewed this as one of internal diversity and fluctuations in the external environment. One key feature of the professional group under focus in this case study was their diversity, in motivations, views and practice. The diversity was strengthened during the change process as each emerging team was given the authority to organize itself according to the needs of the local client group and the attractors of the practitioners.

There has been considerable debate within the complexity literature about how to best use the attractors within a system to shift behaviour towards new and potentially better-adapted operating patterns (Plsek & Greenhalgh 2001, Kernick 2002, Lindberg 2002). The key attractors identified in this programme were practitioners’ mental models, certain rules, policies and procedures and the organizational structures, which were all found to encourage certain ways of working and discourage others. We found in accordance with other commentators, that existing attractors were very powerful and bound up with the professional and organizational identity of each individual. Our experience within this programme was that the combination of changing the external organizational attractors and facilitating exposure and debate of existing mental models enabled practitioners and managers to appreciate and work towards future externally imposed models of health care through the lens of their own fundamental attractor patterns. Sustaining the ability to practice in a diverse way was key to this.

The image or metaphor of CAS can enable us to see organizations and change in a new light. The growing interest in the concept within private sector organizations and the consequent restructuring of these organizations to enable increased experimentation and adaptability (Harkema 2003, Smith 2003, Van Eijnatten et al. 2003) has only recently begun to be replicated within health care systems. There is no doubt that the UK NHS, like other Western health care systems, needs to adapt to new consumer demands, disease patterns, and technologies, all within the context of limited resources. In the language of the current UK Government, the NHS needs to ‘modernize’. Nevertheless, it is acknowledged that this level of change cannot be prescribed in detail by a government department, rather it needs to be generated in many places at once, and be adapted to local circumstances and needs, in line with agreed priorities (Department of Health 2000a).

Conclusion

This programme challenged everyone actively involved with it. There has been widespread liberation, of energy and creativity that had previously been stifled by bureaucratic structures and expectations of conformity. This liberation has led to a range of new self-organizing patterns of behaviour right across the health care system, and new services, more responsive to local needs, are now emerging.

Moving away from a linear model of change to one that expects unpredictable and challenging outcomes was a useful process. The experience, however, also revealed the high levels of attention and energy required to prevent the system falling back into pre-established patterns. Using a largely untested model in health care to bring about the type of changes required from practitioners to deliver on public health policy at times felt very uncomfortable for all involved. While it is evident that research into the practical use of the CAS model is required in order to assess more
What is already known about this topic

- Policymakers are placing great pressure on health care organizations to change the nature of the services they provide.
- Changing professional behaviour to achieve this is recognized as complex and difficult.
- Insights from complexity science have recently been highlighted as potential aids to understanding organizations and change, but there are few examples of their use in health care services.

What this paper adds

- Moving from a linear model of change to one that expects unpredictable and challenging outcomes was useful, but it also revealed the high levels of attention and energy required to prevent the system falling back into previous patterns.
- Innovation and new styles of behaviour occurred when simple rules replaced multiple regulations, where microdiversity was encouraged, attractor patterns were exposed and debated, and new generative relationships developed.
- Tension and apparently irreconcilable differences (the ‘edge of chaos’) can be very productive in the development of new emerging patterns of behaviour.

fully its usefulness, this framework may offer some assistance to those struggling to implement change in a large organizational structure, or those wondering why their detailed plans for redesign are not having the impact they expected.

If the CAS framework continues to gain managerial approval and is used by a growing number of organizational leaders to inform the development of future health care systems, what effect could be anticipated for nurses? As this case study highlights, nurses could expect to see a transformation from being at the receiving end of a command and control hierarchy to being a member of a self-directing team. While this may appear attractive because it gives greater opportunities to experiment and innovate on behalf of their users, and sits comfortably with notions of professional autonomy and control, it will also mean higher levels of uncertainty, responsibility, decision-making and risk management. Accepting these as central elements of a nurse’s working life and educating future nurses accordingly may be the key to successfully working in the health care organizations of the 21st century.

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Author contributions

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