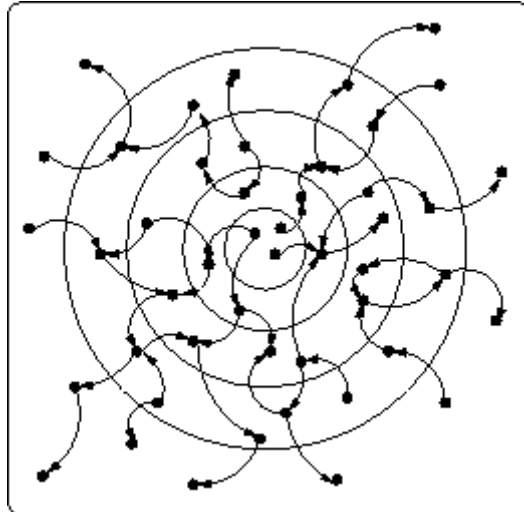


Governance in Complexity: An multi-level policy-framework based on complex systems thinking

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1. Introduction

Society has become increasingly complex on three levels: the level of society itself, of the problems facing our society and of dealing with these problems (governance). Trends such as internationalization, informatisation, integration and individualization have led to the emergence of the network-society (Castells, 1996) and an increasing societal complexity. This development has led to the emergence of a new type of problems at the societal level that cannot be solved with simple, short-term solutions. These problems are defined as persistent problems: they are unstructured (Hisschemöller, 1993, Hisschemöller and Hoppe, 1996) and highly complex because they are rooted in different of societal domains, occur on different levels and involve different actors with different perspectives, norms and values. Solutions to such problems are not given and purely analytical approaches will not suffice.

Policy-making itself has become highly complex in the context of these persistent problems, dealing with different actors and perspectives, with an absence of clear solutions and a lack of mechanisms to assess progress and success. Dealing with persistent societal problems will require approaches that give special attention to learning, interaction, integration and experimentation, since every implemented solution will reflexively lead to changes in the societal structures, in turn transforming the problem itself. The reality of policy-making has become that of governance; structuring and coordinating seemingly autonomous interactions between different actors at different levels that produce and reshape societal structures. The traditional policy-making paradigm of developing plans, strategies and implementing these in a rather straightforward manner has to be replaced by a more holistic, refined and more integrated perspective on policy-making.

The apparent need for an integrative approach, which takes the complex nature of the networked society as starting point, is currently not addressed in policy sciences. Existing models and theories on the policy process are predominantly analytical and assess coordination and organization failures of existing governance systems and postulate ideas for improving these but they do not offer a new model for governance of societal change (sustainable development). The concept of transition management (Rotmans et al, 2000), which combines the insights from complexity science with insights from policy- and governance studies, is being put forward as such an integrative form of governance.

2. Transitions and the complex systemic dynamics of change

The behaviour of complex systems has become a focus of study in many scientific disciplines (Midgley, 2000). Complex systems' thinking is strongly associated with ecological and evolutionary studies (e.g. Gunderson and Holling, 2002) since similar dynamics are observed in both fields of study: emergence, co-evolution, feedbacks, variation and selection etc. The Darwinian paradigm of continuous gradual evolution

however is not supported by studies of complex ecological systems (Gould, 2002; Gunderson and Holling, 2002). Such studies, along with similar studies into complex-systems dynamics in other fields, suggest the model of punctuated equilibrium; short periods of revolutionary change that interrupt longer periods of gradual incremental change. Combining the punctuated equilibrium model with the notion of complex social systems leads to the idea of transition as structural changes at the level of a particular system that occur in a relatively short period of time.

Although transitions are thus characterised by non-linear behaviour, the process itself is a gradual one, typically spanning one or two generations (25-50 years).² Historic analysis of societal transitions³ (Verbong, 2000, Geels, 2002, Loorbach et al. 2004) suggests that transitions go through different stages (Rotmans et al. 2001). The nature and speed of change differ in each of the transition stages:

In the *predevelopment* phase there is very little visible change on the societal level but there is a lot of experimentation

In the *take-off* phase the process of change gets under way and the state of the system begins to shift.

In the *acceleration* phase structural changes take place in a visible way through an accumulation of socio-cultural, economic, ecological and institutional changes that react to each other; during this phase, there are collective learning processes, diffusion and embedding processes.

In the *stabilisation* phase the speed of societal change decreases and a new dynamic equilibrium is reached.

In transitions there also is multiple change at different levels. In analysing social systems three (functional) levels that are influencing each other are distinguished: niches, regimes and landscape. The multilevel model originates from innovation studies (Rip and Kemp, 1998 and Geels, 2000, 2002). The central level is the meso level of *regimes*. It is the level of a specific socio-technical domain that is at the heart of the analysis, like the energy domain, the passenger mobility domain, the food production and consumption domain, etc. The regime refers to institutions: dominant practices, formal and informal rules and technologies (and ensuing logic of appropriateness) that pertain in the domain, giving it stability and guiding decision-making. The second level is that of *niches*; places in which novelties are created and tested. Such novelties include new technologies, new rules and legislation, new organisations, new ideas and such. The third level is the *landscape*, the overall societal setting in which processes of change occur. The landscape consists of the social values, political cultures, built environment (factories, physical infrastructures, etc.) and economic development and trends. The landscape level typically develops

² The time span is not a defining characteristic but a result.

³ The transition concept has always been used to distinguish different phases: for example the demographic transition is visualised by a double s-curve; one indicating birth- and one indicating death rates (Davis, 1945).

autonomously but influences directly the regime level as well as the niches by defining the room and direction for change.

Complex social systems are adaptive, which implies that the system as a whole adapts to its environment. Complex social systems are co-evolutionary by nature as well; interactions within the system lead to incremental, evolutionary changes. In addition, there is emergence: dynamics at a particular system-level are resulting from interaction between developments at lower systems'-levels. Complex adaptive systems, social or other, thus change because of internal (often small-scale) changes out of which patterns emerge or because of external changes in the environment (landscape). This co-evolutionary, adaptive characteristic gives the system the property to self-organize (Rotmans 2004). Self-organization in the most pure sense of the word means the emergence of order without external control (Nicolis, 1989). Self-organization in a societal system refers to the whole of activities influencing the systems dynamics. In complex adaptive social systems there is no external control over the system. Moreover, it can be argued that every directed action of any kind by any agent can be considered as 'managing' some (sub) part of the system. Management is than inherently part of the system and can even be regarded as a complex system itself (Kickert, 1990, Kemp and Loorbach, 2003).

3. Transition governance: order and chaos

Governing societal change in a desired direction has been the focus of political scientists as well as management scholars for decades. There seems to be an increasing consensus amongst scholars about the impossibilities of bringing about such change either individually, through authoritarian approaches or through liberalized market-approaches. These impossibilities are explained both from the perspective of failing government and the need for new governance arrangements (by authors such as Scharpf, Hooghe, Teisman), as well as from the increased (societal) complexity and the unstructured and complex nature of the policy process (e.g. Hisschemöller, Sabatier, Lindblom).

The concept of transition management can be linked to fields as multi-level governance and adaptive management (Kemp and Loorbach, 2003). Transition management aims at the development of a portfolio of management strategies to influence different types of developments. At the micro-level it aims at influencing the variation and selection process through creating room for self-organization, experimentation, learning and knowledge co-production. At the macro-level, transition management aims at redefining leading visions, ambitions and goals within the context of a constantly changing society. At the meso-level, transition management targets existing institutions, regimes and structures in order to 'open them up' or tries to develop new, competing ones. As such, transition management can be considered as a form of multi-level governance (Scharpf, 1999; Hooghe and Marks, 2001) whereby state- and non state-actors are brought together to co-produce and co-ordinate policies in an iterative and evolutionary manner on different policy levels.

This evolutionary, iterative perspective builds upon the ideas of advocacy coalitions (Sabatier, 1999) and partisan mutual adjustment (Lindblom, 1993) as drivers for social change. Different groups with different belief systems, stakes and ambitions try to put their issues on the (political) agenda and thus protect or further their interests. Through these processes of negotiation, adaptation, co-production and sometimes dispute, actors change or adapt their views, redefine their own place and role in the system and are able to rephrase the problems perceived. These processes take place at each level, creating competition (processes of variation and selection) between visions, agenda's and actions and between, institutions, networks, companies and individuals.

4. The Multi-Level Governance perspective

The multi-level framework for transition management distinguishes between three levels at which governance activities occur:

- Strategic level:** processes of vision development, strategic discussions, long term goal formulation
- Tactical level:** processes of agenda-building, negotiating, networking, coalition building
- Operational level:** processes of experimenting, project-building, implementation

At each level, specific types of actors participate, specific (policy) instruments are used and different competencies are needed. Taking an actors' perspective, transitions are the outcome of the interactions between actors on one level and interactions between levels. Actor strategies inform short-term activities, and competing companies for example will follow similar trajectories. Innovation within this context is multi-level innovation ranging from product-innovation to organizational and system innovation. Transitions as societal innovation only comes about when the innovation processes at different levels interact and reinforce each other.

A good example of how such societal innovation takes place is the transition in Dutch waste-management (Loorbach, 2003b). Long term planning (through national environmental plans) and envisioning or the formulation of ambitions⁴ triggered activities at the lower system levels; the development of new technologies and practices, new rules and regulations for these technologies and practices. In turn, the new way of dealing with waste (recycling and waste-separation, new treatment possibilities) influenced the long-term images and ambitions. In other words, in transitions new systemic patterns emerge out of the seemingly chaotic and spontaneous processes and different system-levels.

Transition management is by definition multi-actor process as the degree of complexity of transitions is too high to be managed in terms of command and control by one actor (Loorbach & Rotmans, 2004). Transitions are the result of many causes,

⁴ the best example was the so-called Ladder of Lansink', an hierarchy of waste treatment possibilities ranging from landfilling and incineration to recycling, re-use and prevention

not a singular cause, so there is no single actor that has the managing capabilities to fully control the process. Moreover, since many actors are involved as stakeholders there are different viewpoints, agendas and stakes relevant. In this perspective every actor is ‘managing’ or influencing at least some part of the system. Of course there are differences in power, instruments, roles and practices between actor-groups⁵, but in practice each actor-group has particular contributions to make in each phase of transition. In other words, while transitions defy traditional planning, they are (and thus can be) influenced and adjusted in terms of the direction and pace of transitions (Loorbach & Rotmans, 2004). Analysis from this point of view is investigating what types of actors are important and what are suitable strategies that influence a transition.

By linking the transitions concepts (multi-level, multi-phase), notions from complex systems (emergence, co-evolution, self-organization) with different building blocks from governance studies (the incremental approach, the advocacy coalition framework, the multi-level governance concept) we have developed a rough framework for structuring transition management activities (see Table 1). At the **strategic** (systems’) level most important is giving direction to developments by developing leadership capacity, long-term orientation and integrated strategies. This is by definition not a democratic process (Lindblom and Woodhouse, 1993), and should therefore be carried out by strategic actors in the transition-arena, which is explicitly linked up to societal strategic networks. At the **tactical** level, the transition agenda is the main instrument, allowing for negotiation processes and broader stakeholder involvement through network governance. On a thematic or subsystems level, different strategies can be developed in coalitions, networks, firms etc. At the **operational** level, implementation and execution of transition experiments is the main focus, stimulating innovator and entrepreneurs to come up with innovations and alternatives. At this level, even top-down regulation of directives could suffice.

⁵ We distinguish between governmental organisations, companies, knowledge institutes, NGO’s and intermediary organisations

Level	Goals	Activities	Instruments	Competencies
Strategic	Integration	System/problem structuring	Integrated systems analysis	Systems thinking
	Direction	Envisioning	Transition Arena, networks	Creativity, guts
	Attuning	Exchange of perspectives, co-ordination, interaction	Transition Arena, transition coalitions	Communication skills, network competencies
Tactical	Agenda-building	Exchange of goals, negotiations	Transition agenda	Thinking in terms of co-production, negotiation skills
	Networking	Coalition building	Transition paths Innovation networks	Communication and consensus building
Operational	Innovation	Experimenting	Transition experiments, testing grounds	Learning and communication
	Development	Implementation	Projectportfolios	Project management

Table 1. The multi-level transition framework

In practice, transition management has to result in the organization of sustainable innovation and the constant transfer of knowledge. In the Netherlands, the model of the transition-arena (Loorbach, 2002, Dirven et al. 2002, Loorbach and Rotmans, 2004) is being developed as a steering model to organize transition management activities. The transition-arena is best viewed as a virtual arena or network, which provides room for long-term reflection and prolonged experimentation. Such a transition arena has to be supported by political or regime-powers, but not dictated by it, for example through the support of a minister, director etc.

5. Conclusions

The complexity of our society has increased. The organization of social systems has become maladapted to the changing outside conditions leading to persistent problems. Social systems as a whole, including the organization of public management, are not able to change their own systems structure consciously. In order to change the unsustainable structures of the system we need management principles based on the dynamics and behaviour of complex systems. The multi-level, multi-phase transition concept provides a framework, which enables analysing social complexity in a structured way (Van der Brugge and De Haan, 2005).

The presented framework for transition management has been derived from the complex systems approach and governance theories. The framework is both

descriptive and prescriptive in the sense that it can be used to analyse as well as to structure transitions and transition management. Only recently the integrated strategies based on transition management are being developed, and an assessment of the effectivity of the approach is difficult. However, the approach at least theoretically addresses some of the major problems in current policy making, especially with regard to long-term sustainable development. Besides, it seems to sit very well with the latest debates on governance, policy making and complexity.

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