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Leadership and Complexity: Can Individuals Make Differences in Complex Systems?

Sibout Nooteboom & Geert Teisman

Peter Senge (1990) claimed: ‘Give me a lever long enough and I can move the world’. Is leadership about a lever and do such levers exist? Perhaps. This chapter focusses on who and what is leading societal complex adaptive systems (SCAS). In these systems, any (self-proclaimed) leader can push the system in some direction. At the same time, ‘the system pushes back’ (Senge 1999). Often, it is unclear what or who is pushing back. Such systems seem to have a will of their own. At the same time, they evolve by human hands. The emergence of SCAS is a chicken-and-egg problem: the leader is not first, and neither is the system s/he is acting in. Complexity leadership theory (CLT) focusses on how ‘leaders’ and ‘systems’ coevolve. In search for understanding how leaders matter, we will conclude that (1) to create ‘a lever long enough’, leaders have to participate in heterogeneous informal networks focussing on knowledge development, separated from existing power relations, and (2) to make informal networks effective, a dynamic balance between power and knowledge is needed. Informal networks help to create ‘local’ trust between leaders to elaborate options of change. Here they can build narratives needed for system adaptation, like socio-technical transitions. Because they are playing power games in formal organisations at the same time, they are also able to implement elements of change. By doing so the narrative can spread through the system, giving legitimacy to adaptive action.

This chapter elaborates four central themes in the literature on CLT: (1) the combination of, and links between, formal administrative organisations and informal adaptive network interactions, (2) the question whether leadership in complex systems is about persons or much more about the self-organized spreading of complexity leadership in SCAS, (3) resonance as manifestation of complexity leadership and (4) the methods needed to observe network interactions and self-organized spreading. The authors are scientists, substantiating their assertions by referring to peer reviewed sources, but they are also reflexive practitioners of process facilitation in complex situations. These experiences provided useful opportunities to observe volatile interactions.

1. Introduction

Power and leadership in societal complex adaptive systems

Societal complex adaptive systems (SCAS) are ‘large ecosystems of complex interactions between large groups of citizens-consumers-producers and their governance systems’ (Teisman & Klijn, 2008). SCAS embed smaller subsystems on which they may critically depend, like organizations, natural resources, value chains and, finally, ‘governance networks’, the vehicles of SCAS leadership dynamics. Subsystems can be distinguished on the basis of a higher intensity of their internal versus their external interactions. However, the boundaries between

them are often not very clear. At the same time, many people and leaders in that ‘messy’ system aim to create order by defining boundaries. Organizations are the often-used demarcations of subsystems, and those in charge of an organisation are often assumed to control its development. These people formulate goals and mission statements, divide and allocate tasks and create mechanisms to control their organisation. SCAS are assumed to be controlled by regimes, as concentrations of leaders of organisations that are relatively powerful, a power which is given to them by the rules and resources they have at their disposal. This concentration of powerful people – the regime - is clearly visible in the policy debates and processes of policy formation and execution. Ministers are proposing certain policies, parliament is voting about it, and civil servants are executing the approved policies. This is the visible and well-known part of leadership.

However, if we place the intensity and impacts of interactions in SCAS at the centre of our analysis, organizations and regimes may not always be the most influential subsystems. Well-known alternatives are value chains, spanning beyond organizational boundaries and beyond national boundaries. Value chains are often governed by several public-private-civic regimes working together. As the chain as a whole depends on all its links, the joint issue is the organizing principle. Leadership is shifting from organisation to chain and is becoming less clear to identify: who is leading a chain, or is the chain leading itself?

One step further, and even less institutionalized than value chains, are countervailing subsystems emerging in so called ‘niches’ (Fischer-Kowalski & Rotmans, 2009). Numerous collaborations and competitions within and between these subsystems, often under the radar for many, generate new adaptations and innovations. These may develop into strong links of future value chains, either adding to the complexity of the economy or replacing existing value chains. The question is, what is the role of leadership in the emergence of niches?

Boundary judgements in space and time

Complexity Leadership Theory (CLT) emphasises that leadership can exist in both regimes and niches alike. However, the development of a SCAS is not only determined by its own leadership. A SCAS interacts with natural systems in which it is embedded, and with neighbouring SCAS. This is captured in the literature about social-ecological systems, socio-technical systems and their interactions. These interactions often have an unstable character and emerge in fluid systems (‘on the edge of chaos and order’). Any boundary drawn around a subsystem in a SCAS (‘this is my object of research’ and ‘this is the system I am leading’) is superficial, temporary, permeable, and arbitrary. Natural resources on which the social subsystems depend are relevant, and both co-evolve, but this interaction is obviously of a different nature than the interaction between human actors.

In other words, SCAS are partly overlapping systems in partly overlapping systems in partly overlapping systems. This characteristic creates permeable and ever-changing boundaries. Practitioners and researchers reflecting on how ‘their’ SCAS works may focus on what they assume to be the most crucial subsystem, looking for direct feedback on the issue they want to deal with and study. Feedback from remote subsystems in space and time is neglected. By drawing boundaries around ‘my’ system, the interdependencies with the context will not disappear however. SCAS can be - and indeed are - influenced by events outside the boundaries of ‘my’ system.

A well-known example is the bankruptcy of American bank Lehman Brothers in 2008. Several leaders in countries in Europe expected this to be an American problem. Shortly after, they were confronted with the numerous ‘unknown’ interdependencies between the American and European bank systems. Since then, analysts and leaders of banking systems are trying to consider this complexity under the banner of ‘financial systemic risk’ (see Centeno and colleagues in this volume). The same goes for the relation with natural systems. Leaders may define natural resources (say, water) on which they depend within the boundaries of their SCAS. But negative external effects may also be neglected because they are out of sight and outside ‘their own’ system (say, a water catchment). The effects then will only be identified at a late stage. The climate debate typifies this process. Many national leaders confronted with scientific evidence about climate change were able to start a process of joint narratives and actions, clearly manifested in the 2015 Paris agreement. Still, some new leaders deny the relation between SCAS and climate. Therefore, for scientists interested in complexity leadership, the most important lesson here is that boundary judgement is a critical element of system thinking (Flood 1999).

Sustainable development as resilience

Drawing an arbitrary boundary then, researchers and leaders may be interested in the sustainable development of the SCAS they belong to, as they depend on it. We define sustainable development as resilience: the capacity of a system to adapt to changing circumstances of its physical or social environment, with a view to its survival: the maintenance of its internal complexity in an evolving form – co-evolving with its physical and social environment. In case of looming external shocks, SCAS resilience may depend on proactive adaptations as drastic as transformation of its internal regime. Leaders may also want to protect the interests of others, like human rights. I.e., a SCAS may have to reinvent itself to survive, by self-destructing niches and regimes to enable the emergence of new niches and regimes that add to the resilience of the whole (creative destruction). Only leadership can overcome SCAS inertia, and only if it can deal with complexity.

Three sub-dynamics of leadership

If critical limits are in sight in an environment, like planetary boundaries, the timely adaptation to these limits is part of societal leadership. If the environment of any arbitrary bounded SCAS changes unexpectedly in some unique way, agents in this SCAS may experience a dependency of the resilience of ‘their’ system on innovative responses. Innovative responses however are difficult to achieve in existing formal power ‘games’ (e.g., [Scharpf, 1994](#); [Lewis et al. 2017](#); [OECD, 2017](#)). This is why CLT pays special attention to the leadership of adaptation: how do SCAS adapt to changing circumstances? Who can do this, while at the same time help their own organization survive? In search of new answers, CLT has identified three sub-dynamics of leadership (Uhl-Bien et al 2007; Uhl-Bien & Arena, 2017; Murphy et al 2016):

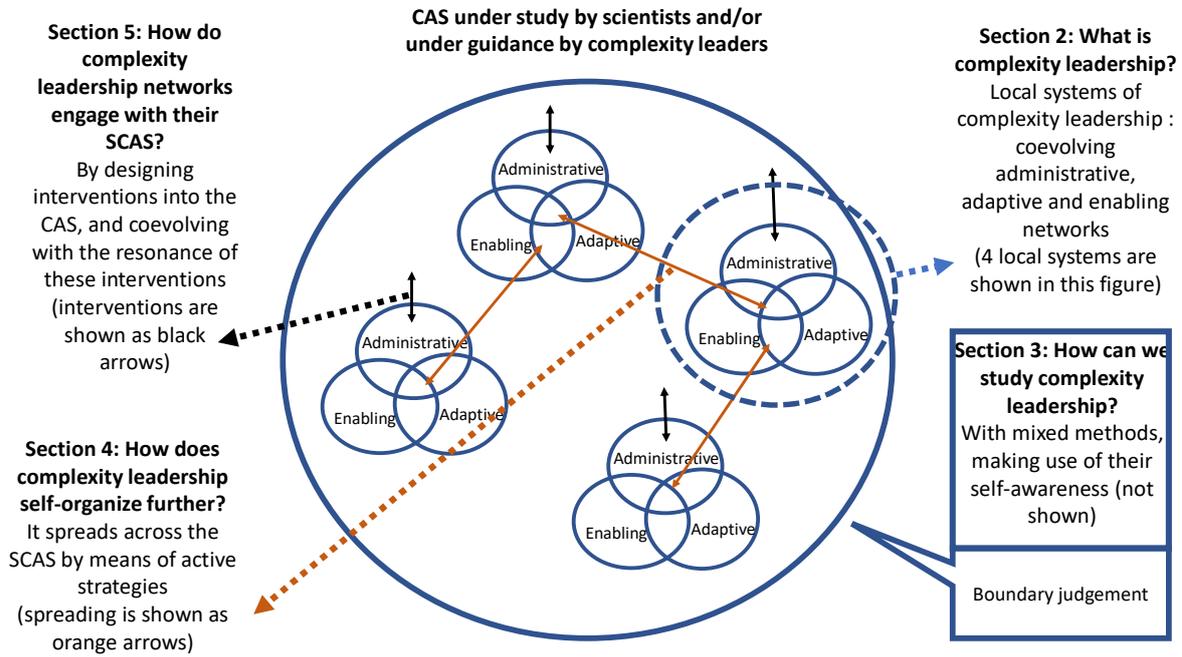
- (1) Administrative leadership; specialized in bureaucratic competences creating hierarchy, alignment and control (comparable to the regime leadership described above);
- (2) Adaptive leadership; the ability to change the existing bureaucracy and alignments in order to fit changing conditions (comparable to the niche leadership above);
- (3) Enabling leadership; the ability to structure and enable favourable conditions for adaptation and learning, and embed these changes in the existing administration (networks of regime members who enable the emergence of niches).

Structure of this chapter

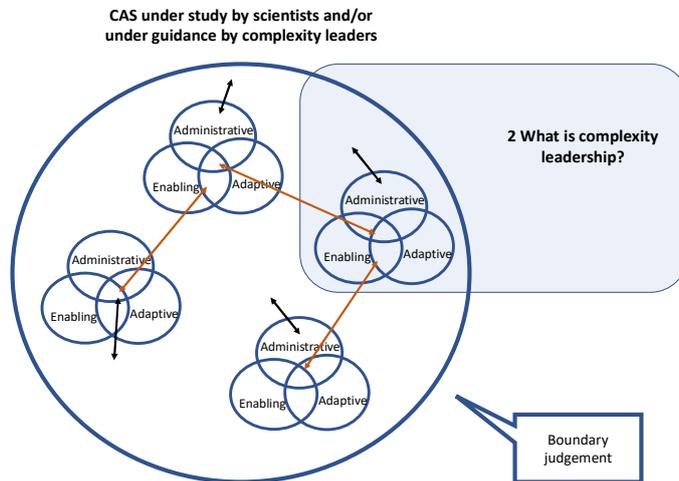
Figure 1 illustrates the different challenges linked to CLT that we elaborate in this chapter. The diagram has solid arrows, which represent types of interactions in the SCAS itself, and dashed lines and arrows that connect these types of interactions in the SCAS with the four remaining sections of this chapter:

- The dashed blue arrow () indicates the topic of **section 2**: individuals who self-organize with others, whom they know and trust, into local complexity leadership networks. Only the administrative leadership component interacts with the larger SCAS in a widely visible way (vertical solid black arrows ).
- A solid blue callout () connects **section 3** with a whole SCAS, as defined by a boundary judgement. In this section, we describe how people can mentally disassociate themselves from their self-defined SCAS, enabling them to reflect on it as if they were independent researchers on the outside looking in.
- An orange dashed arrow () indicates that **section 4** describes how complexity leadership can spread in the SCAS to other localities (a process represented by solid orange arrows ). Adaptive and enabling leadership, in contrast to administrative leadership, are only visible to informal networks, but still may inspire others - elsewhere in the SCAS but still connected to these informal networks - to develop their own complexity leadership.
- **Section 5** (dashed black arrow ) brings us back to the solid black arrows (): the interaction between administrative leadership in many localities and the larger SCAS. Effective complexity leadership will have influenced the way in which administrative leaders visibly communicate with their supporter groups, moving the SCAS in adaptive directions. Informal networks, bridging gaps in the SCAS, will have synchronized administrative leadership to some extent.

Figure 1. Structure of this chapter



2. What is complexity leadership?



Leadership theory and complexity

Many SCAS adapt to changing circumstances. We assume that adaptation is the difficult-to-control result of collective behaviour. For instance, whether climate change will be limited to 2 degrees Celsius will depend on numerous actions by numerous actors. Some will have more impact than others will, but none of them will ‘make the difference’ on their own, as nobody

is ‘in charge’ (Crosby & Bryson 1992). The amount of management literature providing advice to leaders in complex situations is limitless (e.g., Machiavelli, 1515; Mintzberg, 1983). However, there is no unified and testable leadership theory that considers SCAS dynamics (Dihn et al 2014).

Complexity theories and leadership

Social complexity theories started to focus on the behaviour of all individuals who make up a social system. Agent-based modelling could explain the emergence of cooperation ‘in the shadow of hierarchy’ (e.g. [Scharpf, 1994](#); [Axelrod et al 1999](#)). The reverse – models of interacting individuals that spawn powerful individuals and increase SCAS adaptive capacity - has yet to be empirically tested ([Allen & McKelvey 2011](#); [Sendiña-Nadal et al 2016](#), Heylighen 2016b). Empirical research into the capacity of large supporter groups to assess their own situation, which enables them to support their leader’s strategic choices, is difficult and limited (e.g. Kahneman, 2012; [Laan et al, 2017](#)). In social complexity theories, interpretative methods suggest that formal leaders have power to intervene and shape development at local levels, but these leaders are at the same time subject to their unpredictable context (they operate ‘at the edge of chaos’; e.g., Teisman et al., 2012). Complexity leadership seems to be about actors shaping the context, as well as actors being shaped by it, i.e. learning, at the same time.

Complexity Leadership Theory

Building on decades of work, Uhl-Bien et al (2007: 299) claim that ‘the old model of leadership was formed to deal with a set of assumptions not valid for the contemporary situation and therefore of questionable relevance’. They propose to look for leadership in networks rather than as a quality of individuals. ‘Complexity Leadership Theory (CLT) focuses on identifying and exploring the strategies and behaviours that foster organizational and subunit creativity, learning, and adaptability when appropriate SCAS dynamics are enabled within contexts of hierarchical coordination (i.e., bureaucracy)’ (Uhl-Bien et al 2007: 299).

CLT defines ideal-typical network dynamics, through which researchers may know what to look for in empirical SCAS. In CLT, *the top-down view* of individual behaviour of formal leaders in official networks with formal, bureaucratic powers merges with *the bottom-up view* of self-organising collective behaviours. These evolving networks connect subsystems in a SCAS. *Administrative leadership* is skilled at acquiring power and may be willing to invest some of that power in long-term outcomes. CLT defines *adaptive leadership* as creative, experimental, generative, and relatively powerless. Administrative and adaptive leadership have different ways of looking and acting and differ in appreciations. To become mutually successful, both administrative and adaptive leaders depend on *enabling leadership* to protect the resources they need, like safe time and space to work. Complexity leadership then is about an ecosystem of self-organizing and volatile networks of administrative, enabling and adaptive leaders. Together, in interaction, they can create volatile hierarchies in the shape of scale-free networks (e.g. [Barabási and Bonabeau, 2003](#); Allen & McKelvey, 2011; Bodin, 2017, see Kim in this volume). Scale-free networks can enable ideas and behaviour to resonate and spread quickly through a SCAS by connecting the local to the global - a point to which we return later.

Complexity leadership manifests itself by intentionally creating adaptive tensions in a SCAS (McKelvey, 2000; Uhl-Bien et al, 2007), for example an ‘Eco-tax’ to encourage the use of

sustainable energy. If the tension is indeed constructive, it stimulates the combining of sources of knowledge, the synchronizing of interventions of leaders in different subsystems to ensure that the SCAS adapts, and it stimulates conflict with other leaders to combat inertia. As SCAS often comprise simultaneously mutually dependent and mutually competitive organizations, CLT may focus on the rules of interaction rather than directly on the interactions themselves (Goldstein et al, 2010). A variety of SCAS adaptations may be developed and tested in niches. In successful cases, the new options will become mainstream through the power positions of enabling leaders involved in the testing of adaptations: they can either take direct decisions or - as member of the SCAS regime - they can create expectations by widely spreading new ideas (i.e. a manifestation of the scale-free property of the enabling leader network). Such expectations are also adaptive tensions. Other than eco taxes, expectations are not ripples in the economic system, but ripples in the policy system; but indirectly the other is also affected, as the economic system and the policy system co-evolve closely. Mainstreaming means that ripples becomes waves, which often is also a rather fluid and chaotic spreading process.

The role of trust: complexity leadership versus conspiracy

Effective networks can topple hierarchies, according to Sean Cornelius (2018). However, one cannot know in advance how likely it is that ideas emerging in an informal network will generate a change for the whole SCAS. There will be countervailing powers when they go out in the open. The raw dynamics often seen in social media is a clear manifestation of that. Michel Foucault (2011) assumes that everything ‘in public’ is by default interpreted by external observers as intended to acquire support without care for the truth, unless peers have some reason to believe that it is in their own interest not to politicize – i.e. to care for the truth. Therefore, courage to share the truth, according to Foucault, necessarily emerges only in hidden interactions behind the scenes. For example, peace talks may commence behind the scenes. At first, even talking to the enemy can be considered treason. Yet, without a first contact, reconciliation seems impossible. It is all in the interpretation of intentions (‘is it treason or reconciliation?’). A personal relationship would enable to interpret intentions; Truth and Reconciliation Commissions (TRCs) are popular tools to speed-up this process, with mixed successes as the ‘truth telling’ they organize can only heal conflict if trust co-evolves on both sides first. TRC’s –expressions of administrative leadership - can try to make it easier, but cannot ‘create’ trust and courage. In Rwanda, for example, a TRC even worsened the situation (Brounéus, 2008). This is a chicken-and-egg problem that only can be solved by co-evolution of mutual perceptions enabled behind the scenes, i.e. by enabling leaders on both sides. This is why informal networks are so crucial in CLT and why enabling leadership, looking for the truth about a SCAS, and looking for trust to enable regime-challenging adaptive leadership, are necessarily hidden and implicit at first. This creates room for manoeuvre. But, like Foucault (2011) wrote: what is hidden, is also suspect and distrusted in the eyes of cynical distant observers.

This also goes for researchers. They must dig into these networks in order to understand them, participating in hidden interactions and asking for explicit reflections on what they believe to observe. As Checkland (1981) already argued, action research is needed – and the boundary between adaptive leadership and scientific action research becomes blurred (see also the next section on method).

Outsiders may suspect that adaptive and enabling leaders and action researchers, working together behind the scenes, are manipulating the truth out of self-interest or biased in some other way. Adaptive leaders may then more easily fail to convince others to support their niche, and scientists may fail to get their interpretations published. As regards the question who is right, the insiders or the outsiders, the jury may remain out forever. Foucault suggests that an ironic approach could be a way to overcome the epistemological paradox of being part of a system and yet being its more or less objective viewer. Jessop (1993:7) writes: ‘self-reflexive irony [means] that participants must recognize the likelihood of failure but proceed as if success were possible’, assuming that without ‘requisite irony’ in the SCAS there will also be no ‘requisite variety’ (Ashby 1956) of niches for SCAS resilience.

Complexity leadership as symbiotic networks on the edge of chaos and order

Having defined the three sub-dynamics of complexity leadership and having discussed the motives of their practitioners, the questions still remain: What do these leadership sub-dynamics look like in practice? And how is that different from other leadership theories? The literature gives a twofold answer:

- A shift from the quality of *action of a single leader-in-action* to the quality of *interactions between multiple-leaders-in-interaction*
- A shift from *decisions* to *change events* as crucial moments of collective leadership.

The **first shift** is that the study of leadership in complex systems focusses less on ‘the leader’, his characteristics and impact, and more on the interaction between actors, as leadership is seen as a system phenomenon. The three sub-dynamics CLT postulates do not mix in their archetypical forms, but depend on each other for their own survival (symbiosis).

The administrative sub-dynamic fits with many existing studies on leadership, focusing on demarcated units, often organisations, and on single leaders appointed to be in charge and looking for the achievements to create clear goals, procedures and control. This sub-dynamic of complexity leadership especially explains how organisations evolve. Core competencies in administrative leadership are well-known, like boundary-maintenance and goal-achievement. Administrative network interactions focus on creating immediate and visible results for each one’s existing organization and supporter group. CLT, however, adds two other sub-dynamics: administrative leadership needs help to combine order with change.

The sub-dynamic of adaptive leadership adds qualities needed to fit in with changing conditions, like boundary-crossing and goal-seeking. Where administrative leadership deals with maintaining order, adaptive leadership often implies criticizing the existing order and creating some chaos as paths into a new and better-fitting order. In SCAS, innovations are complex and niches can only survive if they combine knowledge and interests from several of the existing organisations, which is why adaptive leadership evolves in boundary-crossing networks.

As adaptive leadership depends on resources that are controlled by administrative leadership, like time, complexity leadership theory postulates enabling leadership, i.e. enabling co-existence and mutual adaptation between administrative and adaptive leadership (symbiotic co-evolution). High-quality interactions between enabling leaders, part of the regime, can build

temporary and partial trust between them, leading to more courage to share the truth (Foucault, 2011). Then, an enabling network can emerge between them, fostering conditions for the emergence of an adaptive network that gives them back new niches adding up to complex innovations that henceforward can mainstream in the administrative sub-dynamic. These innovations may threaten the current regime to enable sustainable development of the SCAS. Some regime-players may, as a person, believe they will be able to adapt and find a place in the new regime; others may not believe that and may tend to obstruct. Personal perception of opportunity and risk will influence their behaviour: constructive or defensive, i.e. enabling or not; and this perception also emerges in interaction with their social network: are they connected to enabling leadership or not?

The **second shift** proposed by CLT is its focus on events rather than decisions. A multiplicity of actions and interactions is always available in the system of administrative, adaptive and enabling dynamics. Events are moments where these come together in such a way that a systemic leap is achieved (at least in the governance system of a SCAS – i.e. a regime change). These moments can emerge as a surprise, like catastrophe theory describes (Poston and Stewart 1998). A system may already be under adaptive tension for a long period, but it may still manage to sustain an existing path. But then, after only a relatively small triggering event, its regime may collapse and it changes course. Examples are the collapse of the Soviet Union, the GDR and the fall of Bearn Stearns, contributing to a long period of financial problems in the USA and Europe. This last event has enormously expanded the interest in CLT in the financial sector. It can help to define adaptive tensions that build up criticality. The focus changed to the resilience of the whole system and how a network of interaction has to be established to keep the system as a whole healthy and strong.

Regime collapse does not necessarily mean SCAS collapse: a new regime may emerge. This may have been some rebellious networks' intention, wanting to make the SCAS more resilient. The other side of the event orientation is therefore that of positive change events, or tipping points, as Gladwell (2000) mentions in his famous work – what complexity thinkers often refer to as 'phase transitions'. Change events are meetings of many actors from which a new joint direction emerges matching the adaptive tension created by complexity leaders (see Nooteboom, 2006). We will refer to the 2015 Paris Climate Summit example later. Essential is that complex adaptations to threats often need such complex events where collective leadership can become visible, absorbed by administrative leadership, and resonate to larger groups.

As soon as the importance of such proactive change events is recognized, the organization of paths towards potential change events becomes a crucial element of complexity leadership. The leadership needed to build up adaptive tension leading to change events will usually be unrecognized by media, citizens and even scientists. Still, CLT argues that such leadership is crucial for SCAS resilience.

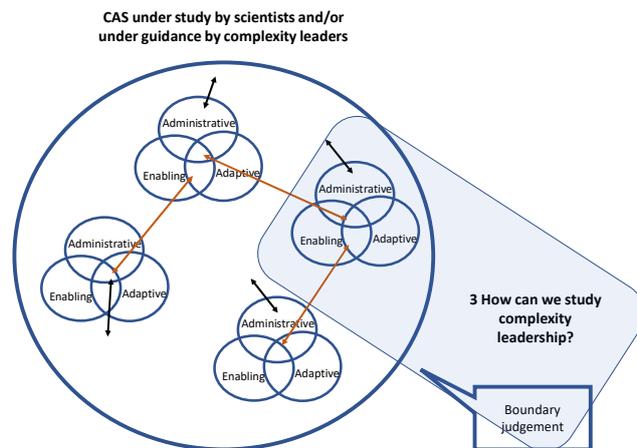
High quality interactions emerge locally before they can spread

Change events with an impact on large SCAS depend on sufficiently shared complexity leadership throughout that SCAS. However, first, breakthroughs at smaller scale are necessary. Complexity leadership first has to emerge locally, i.e. where individuals know each other personally: they should observe with their own eyes that the other two sub-dynamics actually emerge as well, so that they personally can make the required connections between the three

leadership sub-dynamics. Without such personal connections, the three sub-dynamics are oblivious to each other, disabling their symbiotic co-evolution. Again, administrative leaders need adaptive leaders to survive, but in its archetypical form, administrative leadership is unaware of adaptive leadership; therefore adaptive leaders are not rewarded by archetypical administrative leaders. Adaptive leaders can only become effective once a high-quality administrative leadership domain exists, driven by an enabling leadership sub-dynamic behind the scenes. Nooteboom (2006) describes a series of breakthroughs cascading at different scales that resulted in a European scale change event in sustainable mobility governance. He observed one specific scale-free enabling network that played a key role in this upscaling of events, enabling a resonance that manifested as ever bigger waves in the policy system. This enabling leader network consisted of administrative leader who had long been opponents in negotiations about government policy, where they had started to appreciate each other, laying the basis of their trust across social gaps.

Trust across social boundaries, in the form of complexity leadership, can simultaneously emerge at more boundary localities in the SCAS. Each locus of complexity leadership can have knock-on effects on other localities, spreading complexity leadership throughout the SCAS (we later return to this phenomenon called ‘stigmergy’).

3. How can we study complexity leadership?



The next question is: how to study this compounded and unbounded concept of leadership? We cannot limit ourselves to studying the official leaders in charge. Nor can we stick to stable system characteristics. The assumption of symbiotic co-evolution, in fact, forces researchers to identify dynamics of interdependence –relationships, interactions and patterns of change. It is already true that the sub-dynamics of administrative, enabling or adaptive leadership are difficult to observe, let alone the observation of the interaction between the three sub-dynamics. What is an effective combination of methods? What is the relation between researcher and object of research in identifying patterns of co-evolution? In addition, what is the result of complexity leadership research, knowing that it focusses on change, and not on stable cause and effect relations, as can be done in simpler systems?

Hazy & Uhl-Bien (2015: 100) put their hopes on an ambitious blend of methods, including ‘multilevel modelling, agent-based modelling, dynamical systems modelling, dynamic network analysis, and improved data analysis techniques could be combined with traditional methods to inform process-related leadership research. Together, these theories and methods will ignite a new era of complexity-informed research that has the potential to acknowledge the contextual nature of leadership as practiced in today’s increasingly complex organizations.’ This may be true, but does no justice to the difference between positivist method and interpretative method, and to the epistemological paradox mentioned before. Many scientists still stick to the positivist idea that they are studying a complicated and stable system. Once this system is understood ‘today’, they for simplicity assume, it will also be understood ‘tomorrow’ and ‘elsewhere’. But this is not true for SCAS, as ‘tomorrow’ and ‘elsewhere’ exist only in different systems.

The difficult to grab reality of complexity leadership

Complexity theory therefore has to seek more sophisticated methods. Correlations and significant quantitative differences will not tell much about the future evolution of a system. We are not dealing with a stable system, where some leaders only perform actions with administrative qualities, and others with only adaptive or enabling qualities. In a complex dynamic system, one observable action can reflect all of these qualities at the same time, and a leader can shift between administrative and adaptive rationalities, and combine them to become an enabling rationality.

A project manager, for example, responsible for realizing a project within scope, time and budget, may perform within the mandated boundaries of administrative leadership. The project (his formal responsibility) is clearly demarcated from what is not the project (the formal responsibility of others). The project team is clearly distanced from the outside world, and the process is planned in detail to achieve a well-specified output for which the mandate was given in advance. The project manager will not have to be truly innovative to create these results, otherwise he would not have accepted such a project. Nor is he rewarded for innovative efforts, unless he has the courage to accept an assignment with a high probability of failure. In the absence of complexity leadership, he may not have that courage.

However, things need not necessarily be like that. Each appointed project manager may also have self-organizing capacities, and room for manoeuvre within his/her mandate, to apply administrative duties in an adaptive way and to develop actions that simultaneously contribute to adaptation and aligning change in the existing administration. For instance, if s/he intends to make his project a vehicle for developing propositions that challenge the status quo, enabling leadership is crucial. Looking for synergy with surrounding projects aiming to make a system leap, and seeking collaboration with managers outside the project jurisdiction are acts of adaptive leadership. In our research, we identified several examples and saw that these sub-dynamics often emerge in informal networks (e.g., Nooteboom, 2006). Such sub-dynamics and networks are difficult, but necessary, to study.

In our participant observations, we were struck that in formal evaluations and control reports, project leaders emphasise motives and actions fitting the requirements of administrative leadership. Accountability is about scope, budget and time, so the formal narrative uses these terms. Adaptation is left out in formal reports. On the other hand, in training and telling about

their day-to-day process management, project leaders often present adaptation as their core business. There seem to be two parallel universes, the administrative one of mechanical and orderly systems and the adaptive one of chaotic systems where much is done by professionals without a clear assignment. Behind that is the enabling sub-dynamic that is even more difficult to observe, and which may not even be well understood by the insiders, following their gut feelings.

Sophisticated research methods are needed to observe these ‘parallel, co-evolving universes’. Researcher and researched object are no longer divided, but have become intertwined. Communications of project leaders, for instance, often tend to deal with the need to adjust to the internal administrative routines and the external demands of the environment in which the project will have to be realized. Only by close interaction between research and action can the three sub-dynamics of complexity leadership be identified and elaborated. A first step is focusing on sense-making: how leaders explain what they observe and what they do.

Discourse analysis: looking for CLT narratives

A scholar of CLT, assuming that the survival of SCAS depends on interaction between leaders, will want to know whether networks among these leaders are consciously shaping safe, scale-free and networked interaction platforms. For example, do they separate and intertwine administrative and adaptive dynamics? Do they separate and/or connect short-term and long-term motives? Can they explain how they define and analyse their SCAS, the sustainability of its development, the range of possible changes, and the way(s) in which they try to generate adaptive tensions? Such ‘discourse analysis’ is not new to social sciences (Fischer & Forester, 1993). What is new, however, is the focus on the discourses about the administrative and adaptive domain and how they are intertwined by enabling leadership. The discourses in the administrative domains will be easy to observe as they are formalised and more visible to media, citizens and scientists. Interpretative research already gives a lot of attention to these discourses. Discourses in the adaptive domain are not formally documented. Formal databases, like organization’s websites or even confidential memos in internal hierarchical processes, are of no use. Scientists must engage with prospective networks of adaptive and enabling leadership and win their trust to observe them in action, either in real time, or by having regular updates. Then they may try to understand what the insiders themselves consider to be adaptive and enabling, and why.

Individual respondents can be invited to explain how they see complexity leadership emerging at their local level – i.e. in their personal networks. They can also reflect on how they see complexity leadership emerging at other localities in the SCAS, and how they think it spreads (see Figure 1). In order to find relevant and valid empirical data about adaptive leadership, researchers will have to participate and create trustful relations with the ‘research objects and respondents in one’. The researcher is no longer the outsider looking into the system, like if it were a fishbowl, studying the fish and their behaviour as an independent observer. He becomes part of ‘the fishbowl’, taking an independent position right in between the fish.

This approach will create tensions with academic peers, particularly those steeped in positivist traditions, who assume that scientists should ‘stay out of the fishbowl’ to remain objective. Complexity leadership theorists are looking for a third way to this dilemma, such as directly

involving peer-scientists to review each-other's observations and, thereby, maintain research rigour (e.g., Murphy et al, 2017).

Triangulating narratives

An additional option for informative science development in CLT is the option of comparing the variety of narratives (discourses) in complex systems. Different narratives and perceptions about administration and adaptation may, and often will, exist in one SCAS context. These will not necessarily match. Sometimes they contradict each other, despite all being aimed at resilience of the same SCAS. Scientists can check by triangulation: asking leaders from different parts of a SCAS to reflect on the degree of fit among the different narratives. Leaders may be able to reflect on personal investments of peers and the levels of risk they believe peers are taking ('courage of the truth'; Foucault 2011). Complexity leadership dynamics and impact can only be reconstructed through observations of participants (reconstructed by interviews, surveys and participative observing by scientist). Degree of fit may be measurable quantitatively (e.g. 'bridging social capital' [Geys & Murdoch 2010](#)), but it is not clear how this will help us to determine scientifically supported 'sustainable' interventions if we do not record the emerging overlapping narratives themselves.

Discourse analysis therefore is an explorative method, always open for next-level analysis. Next-level can include quantitatively testing simple patterns of causality derived from discourse analyses, but also qualitative case studies, opening the opportunity to show how feedback mechanisms will work. If variable A will influence variable B at a certain moment $t=0$ and place $p=0$, it often will be the case that variable B will influence A later ($t=1$, $p=1$). With such circular causalities, quantitative research is less appropriate to identify the pattern of emergence. In such situations however, scientists can improve their knowledge when they feed back the triangulated narratives into the interviewed networks. When they see that this is helping them to become more self-aware of their own, and their co-existing, subsystems, their willingness to inform the researcher is also likely to increase. Mutual interest can create a new form of informed science. To paraphrase Kahane (2017), it is possible to connect, even with your objects of research.

Practical wisdom: complementary to positivist science

By triangulating narratives, and looking for both commonalities and discrepancies, scientists can make sense of local processes where leadership strategies co-evolve with their narratives. Aristotle called this philosophy of science 'phronesis' (practical wisdom) (e.g. Foucault, 2011; [Flyvbjerg, 2011](#); [Hassan, 2014](#)). Participative social scientists can become the instant mirror of complexity leaders, and help them to perceive flaws in collective reasoning.

Traditional scientific methods and review processes may warrant scientific acceptance in mainstream situations, but is as we see it of limited use to those actively engaging with SCAS governance. Methods for studying complexity leadership, in particular if research is financed with the aim of improving governance, are therefore difficult to reconcile with a positivist scientific method.

Phronetic researchers may accept the fact-value dichotomy (see Gerrits 2012: 169), but observations meaningful for action may consist of inter-subjective interpretations, which are of lit-

tle use outside the local and temporal research context. For example, a certain interaction between administrative, enabling and adaptive leadership may be symbiotic in one context, but fail in other contexts. This is already acknowledged in CLT, albeit practitioners, for lack of better ideas, often still cherish the idea of identifying best or good practices that can be repeated at other times and places. Table 1 identifies limits of existing strategies for policy research, showing how, under complex conditions, novel and emergent practices will have to be identified in action, through exploration of the ‘adjacent possible’ (Kauffman, 2003). This is difficult and unattractive to scientists. As an example, in cases where the contexts evolve, a whole set of leaders may adapt to these changing circumstances, but in different ways. Hence, it may be difficult to reconstruct the contribution made by a specific actor and/or groups in networks involved in complexity leadership. For example, administrative leaders - owners of budgets and having formal decision-making power - often seem to make the breakthrough steps, visible for the media and the public. CLT asserts that they could only have done this thanks to symbiotic coevolution in a complexity leadership network.

On the other hand, rather than solely reflect on leadership dynamics, positivist scientists can themselves become complexity leaders. They can contribute to adaptive networks (which in the case of science means sharing knowledge) and to enabling networks (which in the case of science means promoting research that is yet to be mainstreamed and sanctioned). Nooteboom (2006), for example, described how scientists of transport systems and environmental systems interacted in networks with practitioners from the public and private sector. They were doing that at their own cost and risk, with unclear rewards. Other than the satisfaction of helping the SCAS, their benefits may have been limited to better identification of research questions with societal relevance – something the academic system did not necessarily reward them for. Neither did the interactions create positivist empirical data for them either, as they effectively would have been studying themselves. Nooteboom (2016), however, entered into this process, not aiming to influence the agenda, but just to describe the leader interactions, potentially contributing substantially to sustainability. He was not an expert of transport, but studied complexity leadership. He was discussing his observations with an academic peer, who was not involved in the interactions and peers in the network. This could become a new accepted method of triangulation in which the joint review of results is central, and is an approach with utility in situations where ‘nobody is in charge’. On the other hand, scientific peers are often not experienced enough with the SCAS-under-study to give a high-quality review. Table 1 visualizes the challenges of research on complexity leadership in terms of benefit for practice and acceptance by scientific peers.

Table 1. Types of leadership research issues

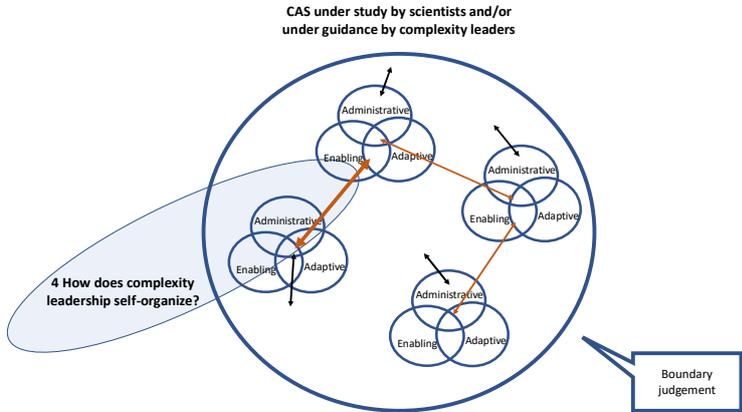
	The object of leadership and science		
	Simple issues	Complicated issues	Complex issues
Characteristics	A stable situation with a significant correlation between the explained variable b and explanatory variable a	A stable situation where variable b is influenced by a set of other variables. Solving the problem b is more complicated	A dynamic compounded situation where different changes take place in mutual interaction and no clear causality can be found. New patterns emerge and small initial changes can create large changes in result.

Contribution of science	Once science identifies this correlation and the causal relation it can identify the best practice	If all these variables are considered a good result can be achieved	Science identifies the emerging patterns in and between systems and how it is stable (path dependent) and adaptive (path creating) at the same time
Societal practice	The best practices can be copied and will result in the same improvements.	Good practices to copy, but less sure about the interplay of explanatory variables. (lower correlations).	Science cannot predict, nor prescribe best practices, but can identify temporary stability and dynamics to inform leaders to apply administrative and adaptive approaches
Limits	Risk of unintended side effects and circular causality may backfire.	Same risk as with simple systems, but more vigilance to correct side effects.	Less risk, more opportunity, but dependent on still emerging methods: administrative leadership has difficulty to reward research efforts, and results are equally difficult to publish in scientific journals.

Emerging manifestations of complexity leadership

Several attempts have been made to identify patterns within and between the three sub-dynamics of complexity leadership. Murphy et al (2016) observed leadership in urban regeneration cases and analysed the entanglement between the three sub-dynamics, noting the ‘rich opportunity to examine complexity leadership in differentiated public sector settings. As such, the study contributes rare empirical examples to the field of complexity leadership.’ (Murphy et al (2016):701). [Nooteboom & Termeer \(2013\)](#) and [Termeer & Nooteboom \(2014\)](#) (and supporting sources) describe Dutch networks of enabling leadership having shared characteristics: professionals dealing with complex issues generally believed that a high quality development of SCAS depends on some kind of synergy between official action in the interdependent public, private and civic arenas. In some instances, there was explicit use of terms from leadership and complexity theories to underpin initiatives (Nooteboom, 2006). The next section explains how these complexity leadership skills spread through the SCAS.

4. The self-organizing manifestation of complexity leadership



In the previous section, we focused on the interaction between people who know each other personally, which enables risk sharing and the development of adaptive shared narratives. Such narratives however, and particularly the behaviour of complexity leadership itself, have to occur sufficiently throughout the SCAS to enable sufficient components of the SCAS to develop adaptive capabilities. After all, a regime change needs a critical mass. Margaret Mead reportedly said: ‘Never doubt that a small group of thoughtful, committed people can change the world. Indeed, it is the only thing that ever has.’ Such a small group may do that by becoming an exemplar, inspiring other small groups to think for themselves as well, applying similar strategies to make their own network self-reflective, i.e. developing mutually reinforcing narratives about complexity leadership throughout the SCAS. This idea of spreading has been compared with how viruses spread and create an epidemic situation. Continuing the virus metaphor, change requires that the administrative leadership system where decisions about rules and budgets are taken is slowly ‘contaminated’ with the new narrative in such a way that the administrative ‘immune system’ (i.e. ‘standard procedures’) does not kill the new narrative.

Strategies of complexity leadership that can diffuse throughout the SCAS

If complexity leadership starts locally, how do leaders promote the self-organization of these sub-dynamics in ways that would allow complexity leadership skills to spread across the SCAS? Which leadership strategies can travel through the SCAS, and how can this process of contamination be accelerated? Heylighen ([2016a](#), [2016b](#)) proposes ‘stigmergy’ as a mechanism of indirect coordination and diffusion. It involves complex, coordinated activity without any need for planning, control, communication, simultaneous presence, or even mutual awareness. Originating from biology (e.g. bird swarming), the concept is now applied to ‘other self-organizing activities including robotics, web communities and human society’. Several theories implicitly postulate mechanisms of such stigmergic self-organization of complexity leadership in human society. It concerns discourses about leadership practices or about how to spread leadership skills that are easily understood to resonate well, and that help complexity leadership disperse in the SCAS. Some are popular, even if their empirical grounding or universality is not always clear. We name a few examples:

- [Axelrod & Cohen \(1999\)](#), departing from general complexity theory, assert that leaders may **create variation, interaction and selection** (they identify eight concrete intervention strategies). Here, variation creation is similar to a strategy that enables a wealth of adaptive networks, made possible by as much enabling networks. Selection is similar to formal policy making in all administrative networks that is informed by the adaptive narrative (see also Westley et al, 2011). Axelrod & Cohen (1999) refer to sub-dynamics throughout a whole SCAS.
- At a smaller scale, [Scharmer’s \(2009\)](#) ‘**presencing**’ approach creates events that help to separate the knowledge dynamic from the power dynamic in a collective mental exercise; i.e. to separate administrative leadership dynamics (i.e. power games) from adaptive dynamics (i.e. learning without politicizing).
- [Nooteboom & Termeer \(2013\)](#) observed a **number of strategies** practitioners used to help complexity leadership dynamics emerge (Table 2). If ‘contagious’ and ‘inspiring’, these might lead to stigmergy. Murphy et al (2017) identified a comparable set of strategies. Strategies that work in one local context will not necessarily work in other local contexts, but still can inspire leaders in that other context.

- Change events can serve as platforms for **exemplars** of complexity leadership. As described above, the prime goals of events are to enable policy discourses to compete, to merge and to resonate. To participants, breakthrough at events may be a surprise, but they actually seal one or more preceding rounds of deliberate development by target-oriented insiders (Teisman, 2000). These same insiders also perhaps might design events to become vehicles for diffusion of complexity leadership skills, becoming role models of complexity leadership.

Table 2. Adaptive and enabling leadership strategies influencing administrative leadership (Nooteboom & Termeer 2013)

<i>Strategies of adaptive leadership</i>	<i>Strategies of enabling leadership</i>
Organizing minimal structures. Complex innovations depend on structures that enable people from different backgrounds to spend time together in a search-oriented way. Collaborative structures can serve as vehicles, if the scope is sufficiently open.	Reflecting on cross-organizational relationships. Enabling leaders may reflect on their relationships with enabling leaders in other organizations, so that they can look for ways of creating room for adaptive leadership to emerge across their organizations.
Connecting. Organizing novel linkages among people, domains, organization levels, and businesses. Attending conferences, inviting interesting speakers, organizing debates or temporarily exchanging employees are well-known forms of fostering connection.	Investing in personal relationships and joint views. Identifying cross-organizational goals and opportunities by investing in personal relationships with counterparts. Developing trust by observing one another's public behaviour - does it violate the joint goal or not?
Improvising. Looking for opportunities and taking initiative. Following innovation's course by stepping into it, acting, reflecting upon the outcomes, and experimenting again.	Sharing and providing resources. Providing time, room for manoeuvre, and a voice toward a wider audience to adaptive leaders.
Keying. Avoiding becoming bogged down in existing policies and procedures. Search for opportunities within existing frameworks. Slightly rearranging existing routines and procedures as adaptation to new problems.	Creating transparency. Organizing a process to let the new narrative travel into the domain of administrative leaders.
Sense making. Inspire enabling leaders to spread innovative ideas and create support for associated interventions. Recognizing and naming new meanings in experiments and local adaptations, but also framing and reframing them.	Integrating. Paying attention to the translation, repetition, and upscaling of innovations. Connecting new stories about innovation to customary stories and identity of existing organizations to assure that the innovations become embedded in the organizations.

The example of Z and his peers

An example (based on Nooteboom, 2006) is the reflexive behaviour of informal leader Z in a process to promote a transition toward sustainable mobility. Z had no formal powers. Several administrative leaders however identified her as a driving force of informal interactions to influence the transition. Z was not 'hired'. She developed, with support from a civil servant, close relations with a deputy Director General of the National Department of Transport (i.e. enabling leadership at work). The deputy DG enabled his civil servants to facilitate informal network meetings, and participated personally. Around Z and the deputy DG, an informal network with dozens of active participants developed, which convened on a regular basis. Other players in the informal network generated trust in the transition from her informal engagement. Z invited administrative leaders who were knowledgeable and influential in the transport and energy systems, and at the same time willing to act in informal networks on

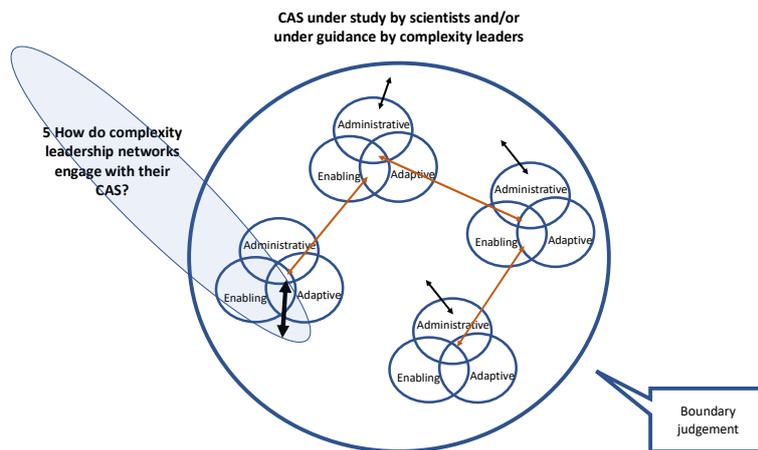
their personal behalf. Z explained to others how she acted and how they might act in order to separate power-aimed actions from truth-sharing in the informal network. Z also explained how the exchange could help those involved to find a common sense of direction. Some participants were competitors in daily life (e.g. employees of oil companies and environmental activists). They found a narrative that covered shared interests and uncovered contrasting interests, without sharing sensitive information. They reasoned from the future to the present, drawing a limit where immediate market competition and political struggle were involved. In meetings, no decisions were made, only narratives. The emphasis was on exchanging views, not changing one another's minds. Z used an open view: 'perhaps they are looking for wind in their sails'; and 'perhaps we are developing a language about sustainable development which people can also use in their own organizations'. Participants shared explicit reflexions on the SCAS, its potential futures, ongoing innovations, administrative actions, and the internal dynamics of their own organizations. Potential synergies became visible, and outside of the network, new cooperative projects emerged. One such project was to organize a large-scale change event: a high-level conference at the EU level with 75 national Directors-Generals on transport, energy and environment, and several CEOs from the car industry and from the oil industry, generating a breakthrough moment. Participants jointly understood that making diesel fuel sustainable was challenging (this was before the 'dieseltgate' affair in 2015). This event extended and intensified the informal network. The complexity leadership approach, which meant staying away from an official project with resources and objectives, was unfamiliar to many of the participants. Z was able to articulate the nature of the process in a way that made it attractive despite no formal business being done: it was only about sharing knowledge. Participants identified Z's interventions in the meetings and network as inspiring. Z argued: 'Although I could conceptually explain my behaviour, I usually let my behaviour speak for itself, so that others can copy it. It is like offering someone chocolate is a better way of making people advocate the eating of chocolate than explaining how it tastes'. Z explicitly stimulated co-evolution between subsystems by confronting them with realities. She played with local system boundaries, by creating trust in backrooms between two competing CEOs, and organized events where they shared their joint analysis more widely. All this was done informally, without formal assignment. Z's stories were recognized and confirmed by her peers, when they were asked open questions.

2nd order self-organization: stigmergic enhancement of complexity leadership skills

If we can identify common factors driving self-organization, leaders may intentionally reinforce these factors to speed-up the process, as proposed in the theory of stigmergy. However, there is no unified theory, and the impact of factors are highly context-specific. Complexity leaders may initiate a reflective space (variously called a transition arena, protected space, agora, communicative space, arena for dialogue, participatory space; see Wittmayer and Schöpke 2014). Where systems thinking was previously the domain of universities, new self-analysing approaches are now emerging to help the networks self-organize and improve by reflecting on the practice (learning-by-doing). These approaches may use practical wisdom offered by 'exemplars' (experienced role models) that inspire across contexts, without trying to copy 'best practices' from one context to the other. Practical methods go by such names as 'Communities of practice', 'U-labs', 'Social labs', 'Coaching ourselves' or 'Mastercircle'. Practitioners of process management and mediation often try to incorporate practical wisdom into political processes, aiming to separate power-processes from trust-building, to enable reason to emerge behind the scenes, which thereafter can 'contaminate' the political process

(e.g., De Bruijn et al, 2010; Kahane, 2017). In CLT, speeding-up self-organization into symbiotic sub-dynamics is labelled as enabling leadership. It would be interesting for further research to assess the extent to which elements of CLT appear in these conversations, and the extent to which such groups are able to analyse their SCAS and how they co-evolve with it.

5. How do complexity leaders engage with their SCAS?



In CLT, the assumption is that once self-organizing skills have spread throughout the SCAS, its learning capacity may become strong enough to cause system transformations. Joint interventions can create such a leap, as was intended with the Climate Agreement in Paris, 2015. To paraphrase Foucault (2011): without trust, any visible proposition for such intervention will be widely interpreted as an attempt to seize power rather than to make the SCAS more resilient in the long-term.

Even if there is trust in a SCAS's governance system, administrative leaders cannot enable a breakthrough on their own. In workshops we conducted, leaders indicated how they analysed networks, possible futures and the interventions that are needed to make their SCAS more resilient. They argued that initially, this should be done jointly and incrementally, building up adaptive tension in the SCAS as a lever for breakthroughs into one or more potentially desirable directions, and away from undesirable development (see also e.g. [Mc Kelvey, 2000](#)). This enables CLT dynamics to co-evolve with the observed effects of their interventions in the SCAS. For example, if they see that subsidies do not do the trick, they might shift to encouraging wide discussion about Eco taxes. If successful, they create a dynamic in the SCAS that does not depend on their interventions anymore. In other words, SCAS changes take the shape of an S-curve (e.g., Fischer-Kowalski & Rotmans, 2009).

Intervening in the SCAS structure, and intervening in the SCAS agenda

Complexity leaders distinguish between two levels of formal interventions: intervening directly in institutional structures (type 1), and interventions in the agenda for developing the first type of interventions (type 2). Type 1 interventions are well-known, and summarized in Table 3. Type 2 is about using power to enable a SCAS' governance system to deal with urgent issues that challenge the resilience of the system. Type 2 interventions may for example be determined as follows:

- Leaders may focus on points on their official agenda where their own support group enables them to speed-up the development of type 1 interventions. If the SCAS is not yet ready to move to type 1 interventions, they propose a broader agenda to enable a search for type 1 interventions.
- In accordance with their agenda’s content, they may narrow or broaden the selection of public, private and civic organizations they invite to participate early in these processes, where their knowledge and support is needed.
- They may apply available legal procedures of planning and decision-making in such a way that they support their proposed agenda, and create democratic legitimacy for the outcomes.

Table 3. ‘Type 1’ strategies of intervening directly in the institutional structure of a SCAS (e.g. Ostrom, 2005; Senge, 1990; [Meadows \(undated\)](#))

<p>Sharing or concentrating powers. A key principle of liberal democracy is checks-and-balances. Interdependencies between subsystems can stimulate competition for the short-term (away from monopoly, like anti-trust) and collaboration for the long term. For example, long-term interdependencies can be brought early to the attention of policy makers by means of environmental impact assessment. However, when rules become too detailed, a general resentment of rules may emerge, or competition may require investing all resources into short-term survival, with nothing remaining to invest in collaboration for the long term.</p>
<p>Command & control. The traditional way of limiting pressures on ecosystems and on human health is general regulations and permit systems for human activities. This can help to reduce adverse impacts of socio-technical systems, particularly in sensitive places like residential areas and natural areas. However, at a certain point of regulation the enforcement cost become too high, because either the rules are endorsed insufficiently, or non-compliance is difficult to prove.</p>
<p>Financial incentives. The financial context in which market actors operate influences their behaviour (e.g. tax systems, trade tariffs, levies, subsidies, financial products). Climate change mitigation can be supported by higher prices of greenhouse gas emission, for example. This however goes against powerful vested interests. Compensation of losses is usually complex; there may be risks for the income of the state.</p>
<p>Infrastructure development. A way to influence SCAS development is to develop infrastructure. Available infrastructure will create a response in the market, the effects of which can to some degree be foreseen, and often have significant implications for sustainable development.</p>

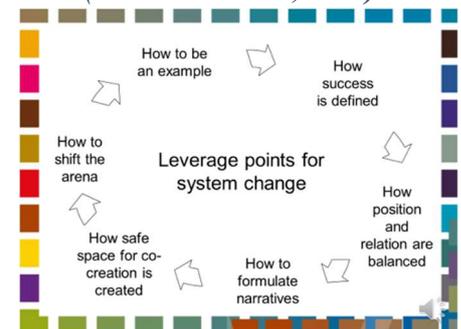
Resonance: in dialogue with the SCAS

Type 2 interventions are about setting an influential agenda. A joint agenda is the first step towards innovative interventions accepted by vested interests. This is challenging: interventions may be built up in small steps, harmless in the eyes of networks protecting vested interests, or made to look like harmless Trojan horses. But they are often controversial. Many spectators may not see the logic behind interventions, or they may not trust the proponents. Leaders must be careful not to move too fast, as they might lose their mandate if proposed interventions are widely rejected (paraphrasing Machiavelli (2015)). Even before taking a small step, a social learning process may be needed in the SCAS, starting with an even smaller step. To that end, complexity leaders may enter into a ‘dialogue with the SCAS’, enabling widely shared narratives to co-evolve with their own narratives and interventions, which can again legitimize the next interventions, one step further. Methods for large groups dialogue are evolving, like the wiki-surveys described by Salganik & Levy (2015). By influencing the audience’s perceptions, perhaps by presenting known facts and asking inescapable questions at first, leaders can provoke reflection and influence people’s willingness to support direct interventions into the SCAS, which they otherwise would oppose. They can communicate their own views of the

current and the desirable state of a SCAS, creating a sense of urgency for structural interventions. If highly visible people, often those with much power, are directly connected to enabling networks, these networks can get scale-free properties: local networks can enter into a dialogue with the whole SCAS. There may be competitors in the administrative networks who want to convince the SCAS members of alternative ideas, as they do not share views about their common future or the urgency and desirable direction of change. This all becomes part of the same dialogue. Question is, whose ideas resonate best?

So, we are looking for ways in which leaders can resonate a variety of ideas, enabling the SCAS to select the ‘best’ ideas for further exploration. All leaders in this competition can make use of any of the communication channels available to them. In a liberal democracy, existing channels include media performance, referenda, member consultations of political parties, party election programmes, polls, focus groups and consumer panels. The management literature on intentional resonance and dissonance in SCAS is too vast to summarize here (e.g. Coleman et al, 2014). (Note, ideas can be intentionally resonated in social systems to cause cognitive dissonance as a constructive tension; cf. ‘an inconvenient truth’.)

Figure 2. Leverage points mentioned in an adaptive leader network (Nooteboom et al, 2011)



Clearly, leaders consciously use resonance. Practitioners we interviewed reflected on that. They often asserted that for sufficient resonance also some more rigid structures need to co-‘vibrate’ in order to pass on messages. [Nooteboom et al \(2011\)](#) show how innovative ideas successfully resonated through several leverage points that complexity leaders used. For example by defining the measures of success: if these are framed to reflect the ideas of complexity leaders, they may attract constructive behaviour in the system. Idiosyncratic examples suggest that leverage occurs when interventions in the leverage points of the SCAS make the whole SCAS ‘vibrate to a new state’. Paradoxically, the existing structure of a SCAS is therefore needed as soundboard to enable it resonate to a new structure state. Administrative leaders are also part of that structure; the more power they have, the more visible they are, and the easier it gets for them to resonate ideas widely.

SCAS as imperfect soundboards

Adaptive leaders cannot ‘order’ a change. They can try to resonate ideas by circulating them in enabling networks. What determines which ideas will resonate with enough individuals in a SCAS to change the system? What determines whether ideas that resonate actually will contribute to resilience? What determines whether the ‘wisdom of crowds’ (Surowiecki, 1995) are capable of selecting ‘best’ ideas? These are still insufficiently researched questions. It is too simple to assume that ‘the idea that resonates best’ also contributes most to a sustainable development. There are problems at the level of agents, and the level of systems:

- Kahneman (2012: 202/3) shows that audiences are often wrong when evaluating their leaders. Audiences have ‘hindsight and outcome bias’. Leaders, on the contrary, are often overconfident. ‘An unbiased appreciation of uncertainty is a cornerstone of rationality—but it is not what people and organizations want.’ (Kahneman, 2012: 263).

- Existing powers create rigid structures. Each structure has preferred ideas, like a string only resonates a few tones. The distribution of power influences the ideas circulating in a SCAS, who we meet, with whom we have a dialogue, who we see on television, and who is punished for breaking established norms. Ideas convenient for dominant powers will resonate best. A digital world (infosphere), where powerful investors may control infrastructure, also may develop a structure that favours the resonance of ideas that reinforce existing power structures; the internet may increase scale-free connectivity and our collective intelligence perhaps, but not necessarily without bias (e.g., Floridi 2014).

Many complexity leaders and authors are aware of the impact of soundboards on what will resonate, and look for subtle structure changes to enable others to resonate in the interest of resilient SCAS developments. For example, they may try to correct biases of the media and the social media, which they assume are created by their powerful owners. Such subtle structure changes can, e.g., relate to democracy (Al Gore, quoted in Maslin (2017), the balance between public, private and civil powers (Mintzberg 2014), globalization (Rodrik 2018), impact assessment (Flyvbjerg 2000: 6), rules for transparency, internet governance (Floridi 2014), ‘value alignment’ in artificial intelligence (Green, 2018) and application of human rights (Mudde 2017). At the end of the day, this all seems to be about preventing power from determining the ideas that are widely shared, giving all truths an equal chance.

6. Conclusion

Complexity Leadership Theory (CLT) identifies the (quality of) leadership in societies by looking at interactions. Societies are studied as Societal Complex Adaptive Systems (SCAS). Their opportunities and resilience depend on the effectiveness of interactions in, and the co-evolution between networks of leaders. Some of them are specialized in administration aiming for stability, others in adaptation aiming for change and some in enabling, aiming to balance stability and change. From this starting point the authors have elaborated four themes.

First, the **interactions between administrative leadership and informal adaptive sub-dynamics** propel all levels of governance in a SCAS. Ideal-typically, administrative leadership is about powerful regimes where knowledge is used to serve power. Ideal-typically, adaptive leadership looks for developing narratives in niches about the need to change along with options of change. Developing and combining knowledge are central assets guiding the ability to change. Trust-building serves as enabler to develop and share knowledge for the common good. The co-evolution between adaptive and administrative leadership is enhanced by a third ideal-typical sub-dynamic, enabling leadership. Adaptive and enabling leadership can emerge from the desire to contribute to the sustainability of the SCAS they belong to, in combination with their complexity skills. A balanced combination of administrative, adaptive and enabling leadership are assumed to help a SCAS to become more resilient and sustainable. Administrative leadership is about creating stability. They however can easily be trapped, creating a status quo. Adaptive leaders threaten the status quo of administrative leaders, using change events to enable new paths to emerge, accepting a lack of control and a risk of not being rewarded. In informal networks, they find room for innovations, which they cannot develop in the administrative formal parts of a SCAS. In fast-changing worlds, with enormous challenges, this adaptive capacity is crucial for creating a resilient SCAS. Enabling leadership is

the art of balancing these two crucial, but also easily conflicting manifestations of leadership. We are still at the start of understanding these dynamic interactions.

Second, we searched for a **fitting mixed scientific method** that is curiosity-driven, aiming to observe complexity leadership interactions, and also to contribute to the resilience of SCAS. Data about adaptive and enabling leadership interactions will not be found in existing databases. Complexity leadership scientists need to enter the complexity leadership networks in order to collect the crucial knowledge. By doing so they become a part of the interactions. Interactions are fluid and the scientific observation in networks are tacit and difficult to validate. Nevertheless they are crucial for understanding leadership in SCAS.

Third is the phenomenon of **self-organized spreading of complexity leadership** behaviour and skills throughout the SCAS. Leadership is not the exclusive ‘right’ of those ‘in charge’. In the complexity leadership approach, change will result from a balance between administrative, adaptive and enabling leaders and many of the adaptive and enabling leaders can be found all over the governance system. Formal leaders who look for a lever to change a SCAS, as we asked ourselves at the beginning of this chapter, will have to leave room or, even better, create room for adaptive and enabling leadership capacities and connect the three spaces of administrative, adaptive and enabling leadership. Their leading-by-example helps others to learn about their strategies of leadership. Research shows that some leaders applying the model of complexity leadership explicitly are aiming to spread complexity leadership in ‘their’ SCAS.

Fourth, **resonance** is presented as a visible manifestation of complexity leadership. Adaptive leaders create ripples. If ripples resonate they can become waves of innovation and adaptation in the SCAS. Resonance brings adaptation to the front-stage, where it can make the time ripe for course changing decisions by administrative leaders. With knowledge acquired in adaptive networks and trust achieved by enabling activities, administrative leaders can find just safe-enough room for manoeuvre using ideas that resonate or mute in the SCAS. Administrative leaders then start to change their behaviour, thanks to the need to change that is ‘in the air’. Adaptive leader networks try to identify what resonates, in search for a next intervention that bridges their narrative with narratives in the administration. In this way, complexity leadership emerges in incremental moments of interaction, aiming to create influential change events; ripples become waves. We still have to identify where and why leadership networks are parasitic (i.e. their prime goal is not SCAS resilience) and where administrative, enabling, adaptive and leadership dynamics are symbiotic, and breakthrough events occur (Bil & Teisman, 2017).

When breakthroughs occur, the regime temporarily slacks, and leaves room for new interventions, for example by introducing a tax on CO₂ emission. The SCAS then resonates with facts that are new to many. Learning capacity of SCAS depends on a balance. Networks where no-one has domination over others seem more likely to split off the enabling and adaptive sub-dynamics that are needed to form complexity leadership. Individual short-term survival, crucial for administrative leaders, will be more balanced with the long-term resilience of their SCAS. New knowledge is developed and shared in the shadow of power, shielded from dominant powers by trust. Balance is about doing what is decided by those in power, and at the same time developing interventions to adapt to change.

We close with two thoughts to put complexity leadership in perspective:

First, complexity leadership becomes more critical in a **globalized world**, with wider and more open SCAS boundaries, and with individuals experiencing to have less influence. People may become cynical and turn to leaders who oversimplify reality, ignoring interdependencies that are in the future. If CLT is valid, adaptive and enabling leadership networks could share knowledge to build trust and countervailing interactions.

Second, paradoxically, whereas adaptive leadership emerges behind the scenes it may create **more transparency** of administrative leadership. It creates generative social interactions, open to outsiders, as well as closed interactions. Both are constantly interacting and co-evolving. Each ‘frontstage’ of administrative leadership can be the home of a ‘backstage’ of enabling leadership, separating knowledge sharing off from power dominance, thereby enabling these to co-evolve with each other. Enabling leadership then creates more and better transparent projects with more adaptive potential. If this leads to more open interactions of administrative leadership, overall transparency increases. The leadership system itself develops a ‘requisite variety’ (Ashby 1956). The wisdom of crowds (Surowiecki, 1995) can be mobilized - not as interaction between one leader and a huge audience, but between multiple networked leaders and audiences. Openness enables the SCAS to select ideas, emerging narratives in rounds of shared idea development.

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