Socially Sustainable Work Organizations
A Chaordic Systems Approach *)

Mari Kira & Frans M. van Eijnatten
Helsinki University of Technology, Department of Industrial Engineering and Management, Helsinki, Finland, Voice: +358 50 384 15 67; Fax: +358 9 451 36 65; E-mail: mari.kira@hut.fi
Eindhoven University of Technology, Department of Technology Management, Eindhoven, The Netherlands, Voice: +31 40 247 24 69; Fax: +31 40 243 71 61; E-mail: F.M.v.Eijnatten@tue.nl

Abstract

This paper outlines both theoretical and practical approaches to socially sustainable work organizations. Socially sustainable work organizations have a dynamic ability to function both by repeating accustomed and by devising innovative solutions, and they maintain this operational viability by promoting the functioning capabilities of their stakeholders. The organizational and stakeholder functioning capabilities are founded on complexity stemming from the simultaneous uniqueness and integration of resources. It is argued that traditional Socio-Technical Systems approaches do not offer optimal foundations for achieving sustainability. Instead, the adaptation of Chaordic Systems Thinking is proposed. It is concluded that to promote social sustainability, a work organization has to be understood as a holarchically structured entity in which development can only take place when also its members develop in their interior and exterior complexity. Complexity development is outlined as an emergent process; the importance of ‘un-learning’ or dissipation is also explored.

Keywords: Socio-technical systems, sustainable development, work design, open systems thinking, chaordic systems thinking

*) This paper has been submitted to the ISI Journal: Systems Research and Behavioral Science. Please Don’t Quote.
Introduction

A work organization can be defined as a socio-technical system that is purposefully designed and controlled to generate services or products (e.g. Huczyski and Buchanan, 1991). While fulfilling this productive function and generating economic outcomes, a work organization contributes to social changes and also influences the natural world. The attention of work organizations to economic outcomes has tended to shadow alertness to these other outcomes. The generation of shareholder/owner wealth has often been considered as the sole responsibility of a work organization.

In recent years, this wealth-generation premise has increasingly been questioned. Various interest groups have demanded that work organizations should contribute positively to society and the natural environment rather than just utilize them to reach the economic goals. Moreover, many people – including numerous executives and shareholders – have realized that organizational success depends on the well-being of various resources engaged in the operations. Depleting natural, human, and social resources will eventually delimit the operation alternatives of the organization itself. Many work organizations try to find ways to fulfill their economic goals such that the human, social, and ecological resources involved also have a chance to grow and develop.

The solutions to this challenge are searched under the umbrella concept of sustainability. The worldview of sustainability demands the development of a working life in which human, social, economic, and ecological resources are all allowed to prosper (Docherty et al., 2002) and in which the productive operations of today do not set limitations to those of tomorrow (cf. Brundtland et al., 1987). The sustainability worldview promotes human activities aimed at achieving a goal without, at the same time, creating negative unintended consequences in any related areas. However, such a worldview seems to be difficult to translate into concrete work-organizational design and operating practices.
This paper focuses on social sustainability in contemporary work organizations and outlines both theoretical and practical approaches that can help in securing social sustainability. We therefore characterize work organizations that are able to maintain their operational and/or business viability by promoting the development of social and human resources. Even though the main focus is on the intertwined social and economic areas of sustainability, we will outline some generic theoretical approaches that may help in addressing ecological sustainability in the context of work organizations as well. The approach we take is systemic: we study work organizations as socio-technical systems in which the goal of sustainability can be reached. However, we will argue that traditional Socio-Technical Systems approaches do not offer optimal foundations for achieving work-organizational sustainability. Instead, we will recommend the adaptation of an emerging systems approach called Chaordic Systems Thinking (e.g. Van Eijnatten, 2004), which is able to make visible several work-organizational features and processes that are closely linked with sustainability.

**A definition of a sustainable work organization**

At the core of ecological sustainability definitions, there usually are two intertwined ideas: adaptation capability and diversity (e.g. Holling and Gunderson, 2002). A sustainable ecosystem is able to adapt to external pressures, and builds its adaptation capability on the diversity of its resources. In order to address work-organizational sustainability, this definition needs to be adjusted to accommodate for the special characteristics of humans and social systems.

Firstly, we define organizational, social, and human sustainability as functioning rather than adaptation capability. For people and social organizations, mere adaptation to the environment does not secure sustainability. Being critical about and pro-actively co-creating the environment are also required. Social sustainability differs from ecological sustainability because people are capable of purposefully co-creating their environment. At the work-organizational level, sustainability means an ability to find ways to deal with challenges and capability to create new opportunities for productive existence. To this end, a sustainable work organization transforms both in its exterior characteristics (such as its structure) and in its interior characteristics (such as the mental models shared by its members). Sustainability is – in this sense – a dynamic state (Newman, 2005). Through dynamic functioning capability, a sustainable work organization is able to keep on reaching its economic goals. However, one further factor is needed to turn what otherwise would simply be longevity into true sustainability. While striving to achieve its economic goals, a sustainable work organization promotes the functioning capabilities of its employees, its business partners and societal stakeholders, and the natural resources affected. The organizational functioning capability is achieved and retained precisely through the sustained functioning capabilities of the organization’s stakeholders. Even though a sustainable work organization may change internally and externally over time, this quality to promote the functioning capabilities of all stakeholders remains and distinguishes sustainable work organizations from simply enduring ones. Also at the individual
level, sustainability can be defined as the dynamic, sustained capability for ‘internal’ (cognitive and affective) and ‘external’ (psychophysical) functioning in various life situations. Just like a sustainable work organization as a whole, also its human and social parts are able to rely on a repertoire of alternative actions: when one action fails or becomes impossible, another action can be devised or mobilized.

The second difference between our work-organizational sustainability definition and ecological sustainability relates to the foundations of sustainability. Where ecological sustainability grows from diversity enabling adaptation, organizational sustainability grows from social and human complexity allowing the dynamic functioning. Complexity stands for the degree of simultaneous uniqueness and integration of system elements (e.g. Heylighen, 1999). At the individual level, a greater degree of complexity means, for instance, the integration of various personality characteristics, knowledge, skills, and experiences into a coherent Self (Csikszentmihalyi, 1990) or competence (e.g. Illeris, 2004). At the organizational level, complexity grows from competent employees integrated into well-functioning groups. Complexity means divers resources that are optimally integrated to form a well-functioning whole: in human and social systems, diversity has to be accompanied by integration to allow for coordinated, sustainable functioning (see also Holling and Gunderson, 2002). A sustainable work organization is able to function because its operations have enabled its employees to individually and collectively develop and become more complex.

Systems thinking and sustainability

Theoretical work-organizational constructs making accessible the various aspects of and preconditions to sustainability are necessary for its promotion. For instance, theoretical constructs able to address the interconnectedness of various resources and the processes of complexity development are needed. Below, the paper aims to provide such theoretical work-organizational constructs and approaches building on the Socio-Technical Systems (STS) approach, but also going beyond it. We will first describe the historical development of STS to recognize its main elements. Subsequently, we will discuss why STS may fail to promote sustainability in contemporary working life. As a remedy, we will introduce a new systems approach called Chaordic Systems Thinking (CST). Four principles for promoting social sustainability are distinguished, and it is demonstrated how CST contains constructs to address all these principles.

A socio-technical system is composed of technical and social parts (Emery, 1959). The former follows the laws of the natural sciences and the latter those of the human sciences; they nevertheless are mutually dependent, since they need each other in order to fulfill the production function. STS aims to jointly optimize the social and technical aspects of a work organization, or to create an organization design “in which each decision is reached for both technical and social reasons” (Cherns, 1987). The premise is that both quality of work and economic competitiveness can be reached this way. STS can therefore be understood as a work-organizational approach aiming at both social and economic sustainability. As an applied systems-thinking approach, STS
approaches work-organizational analysis and design by means of action research.

The life cycle of the STS approach has spanned already over half a century. During this time, self-managed groups – as a way to optimize the social and technical subsystems – have become the hallmark of STS and have been established in various industries. The initial discovery of semi-autonomous workgroups in a British coalmine in the 1940s paved the way for the famous industrial democracy experiments in Norway in the 1960s (Emery and Thorsrud, 1969). In the 1970s and ‘80s, the classical STS dispersed into several regional systems-methodologies that all build on the classical approach, but also have their distinctive characteristics (Van Eijnatten, 1993).

Open Systems Thinking (OST) served as the original foundation for the classical STS, as researchers, inspired by developments in biology and cybernetics, applied its concepts to work organizations (Trist et al., 1963). In line with the OST concepts, the classical STS perceives organizations primarily bound in a steady stable state and able to reach that state regardless of their initial conditions or the paths they take (equifinality: Von Bertalanffy, 1950). The underlying assumption is that one can ‘figure out’ and purposefully create an optimal work organization that reaches the socio-technical goals. In this sense, OST-based STS also uses the classical approach to causality. Equal causes are seen to have equal effects (Heylighen, 1989), and cause-effect relationships are predictable and often reversible.

The geographical varieties of STS originated in North-America, Australia, Scandinavia, and the Netherlands. They consolidated the classical STS approach and broadened the scope of the paradigm to include both system dynamics and organizational cybernetics, as well as critical theory (Gustavsen, 1992). At the practical level, North-American STS uses a ‘nine step’, expert-led method to arrive at an appropriate joint optimization of the social and technical sub-systems. In Australian STS, for instance, the ‘Search Conference’ was added as a planning or learning environment for establishing a do-it-yourself STS change. In Scandinavian STS, the Democratic-Dialogue cycle serves as a focal change process to improve collaboration between several organizations in a network (Gustavsen and Engelstad, 1986). Dutch STS advocates ‘Self-Design by Knowledge Transfer’ (De Sitter, 1993) or a change strategy in which organization members both learn to understand and apply the STS principles for redesigning their own work, in a participative way. (For a more detailed description and comparison of these regional STS approaches, see Van Eijnatten, 1993). All mentioned STS varieties therefore specify how to change into a group-based organization, using a systematic stepwise change method. They also share a common worldview of Participative Democracy, which states that employees should be able to participate in making decisions that shape their work (Emery and Emery, 1989).

STS methodologies have been very successful in developing the quality of work in different parts of the world (Emery and Emery, 1989; Van Eijnatten, 1993; Taylor and Felten, 1993). However, towards the turn of the century increasingly important questions concerning ‘work-life balance’ (Brett and Stroh, 2003; Sturges and Guest, 2004) and intensification of work (Barisi, 2000; Paoli and Merlié, 2001) began to arise. It started to seem that self-managed group work does not automatically guarantee the quality of work in the turbulent situation in...
which many jobs cannot be pre-designed or confined from changing external
demands (e.g. Kira, 2003).

Based on such realizations and also on earlier research (e.g. Kira and
Frieling, 2007), we are convinced that, for several reasons, OST-founded STS is
falling short in promoting the kind of work-organizational sustainability we have
defined above. First, STS focuses on shaping work and organization towards a
predefined goal through predefined paths and, consequently, pays relatively little
attention to the ways in which a work organization spontaneously develops itself
through interactions of its various stakeholders (cf. Schwaninger, 2006).

Connectedly, there is an inconsistency in STS relating to the ways in which
human agency is addressed. This inconsistency is characterized as a ‘Kantian
split’ between rationalist and formative teleological frameworks (Stacey et al.,
2000). An organization and its members are understood in terms of the rationalist
framework or as empirical objects to be controlled. However, managers or
designers are located within a formative framework: they are intentional
individuals making choices to develop an organization. Consequently, STS
perceives organizational development as a manager- or designer-controlled
activity towards pre-chosen goals. Participative Democracy only exists within
these intellectual boundaries. Thirdly, the aim of STS is to hold an organization in
a steady equilibrium state by means of feedback control. However, in order to
promote sustainability, we need a dynamic approach in which organizations can
dynamically transform and exist not only in one, but in multiple equilibrium states.
Additionally, sustainability is not only about reaching some pre-defined goals, but
also about how those goals are to be reached.

In order to allow for work-organizational sustainability, we will consider
organizations as chaordic open systems (Van Eijnatten, 2004). In Table 1 we
have listed some key differences between OST, insofar as it was applied in
conventional Socio-Technical Systems models, and Chaordic Systems Thinking
(CST). We will focus on both systems dimensions and systems dynamics as we
draw some distinctions between these two systems views, and demonstrate how
CST can promote sustainability better than OST.

Table 1. Open Systems Thinking versus Chaordic Systems Thinking in
Organizational Development and Change

<table>
<thead>
<tr>
<th>Open Systems Thinking</th>
<th>Chaordic Systems Thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>For development...</td>
<td>For development...</td>
</tr>
<tr>
<td>Feedback control...</td>
<td>Chaordic behavior...</td>
</tr>
</tbody>
</table>

With respect to system dynamics, we contrast OST and CST, as used in
organizational development and change, on four characteristics. In OST, the goal
of a system is to remain in a homeostatic state by predictable exchanges with the
environment. The CST view, on the other hand, emphasizes that systems
change: following a disturbance, a new kind of equilibrium may be reached.
Sometimes a chaordic system follows linear paths (represented by a single point
attractor), at other times the system behavior changes in a nonlinear way
(represented by a strange attractor). The concept ‘chaord’ actually stands for
these characteristics: a social system is understood to function both ‘chaotically’
and in an orderly manner (e.g. Fitzgerald, 1996; Hock, 1999).
In terms of system environments, OST can cope with the two most advanced types of the original Emery and Trist (1965) typology – i.e., Disturbed Reactive and Turbulent Field environments – by maintaining a steady state under those conditions. By being able to change and exist in several equilibrium states, a chaordic system can, instead, handle (Hyper-) Turbulent Fields and Baburoğlu’s (1988) Vortical Environments. CST makes visible how both system and environment change in turbulent ways by hosting the biological concept of a fitness landscape (Manderick et al. 1991; Holland, 1992), as a metaphor.

As described above, OST uses the classical approach to causality. CST adds another view to it by emphasizing that distinct states may lead to the same result, and the same state leads to distinct outcomes (Heylighen, 1995). Moreover, sometimes the causes and effects of work-organizational phenomena are altogether difficult to distinguish. Instead of simple causalities, chaordic systems exhibit surprising emergent and also dissipating phenomena (Fitzgerald, 1996). New systems features are dynamically created and discarded in interactions between system elements.

In OST, feedback and feedforward are used as separate mechanisms to control the system dynamics. In CST, feedback and feedforward are connected in combined loops, resulting in a possibility to describe complex patterns of behavior.

With respect to system dimensions, we contrast OST and CST, as used in organizational development and change, on seven characteristics. OST uses a functionalist social theory approach (Jackson, 2000): organizations are seen as objective systems. OST inquiries tend to focus only on the exterior aspects of a system or on the empirical, observable domain. CST focuses on both exterior and interior aspects including also interpretive domains. And where OST takes a holistic perspective with the emphasis on the integration and interaction of parts, CST takes a ‘holonic’ perspective (see below), where each organizational entity is perceived both as a whole in itself and as a part of a greater whole. The focus is on mutual interaction between the parts influencing their whole and the whole influencing the parts. Therefore, CST perceives all actors engaged in the interactive development of their work systems: the rationalist and formative teleologies of OST (see above) are replaced by a transformative teleology in CST. All these features together mean that CST perceives the members of an organization operating both in horizontal (e.g. cross-departmental) and vertical (e.g. cross-hierarchical) aggregates in which more complex structures and mental models may develop. OST instead studies an organization as a simple, hierarchical structure and pays little attention to the ‘internal’ cognitive complexity development. OST is distinguishing one single state of optimal structural complexity and operational coherence, while CST is identifying multiple possible states.

This compact comparison explains some major differences between OST and CST, but also indicates that CST adds to OST rather than replaces it. Many basic OST systems concepts are inherent to the chaordic-systems view; some additional constructs have been integrated. OST can be seen as a special case of CST. We therefore perceive CST as a further development in the systems-thinking tradition. Its main contribution lies in its richness, i.e. the combination of functionalist and interpretive social theories, the integration of exterior and interior domains, the fusion of holistic and holonic perspectives, and the hybrid of
horizontal and vertical systems aggregates, see Table 1. Since the birth of OST, the world and our understanding on it have changed. CST offers conceptual tools to address the new realities. Whereas striving towards homeostasis was appropriate in the ‘70s, the need for continuous change in work organizations is more obvious now.

The structure and dynamics of sustainable work organizations

In this section, we will identify four principles of sustainability stemming from the sustainability definition given in the beginning of the paper. Each principle illuminates some aspect of organizing that can promote socio-economic sustainability. We also will point out how the chaordic system properties may help in addressing these principles and analyzing a work organization and designing it towards sustainability.

The connectivity principle of sustainability: Comprehending a work organization as a holarchy

By our definition, the functioning capability of a sustainable work organization builds on the functioning capacity of its stakeholders. For instance, a work organization is sustainable only when also the human and natural resources it utilizes are able to grow more complex and sustainable. Therefore, to secure sustainability, the relationships between an organization and its constituent members cannot be addressed in a holistic way, i.e. by perceiving members only in terms of their contribution to the whole organization. These relationships should not be addressed in a reductionistic way either, i.e. by dismembering the organization into its parts (see Jackson, 2006). Instead, organizational entities should be studied by paying attention to their mutual interaction. This can be called the connectivity principle of sustainability (cf. Fitzgerald, 2002).

CST offers conceptual tools for addressing the connectivity principle. Within CST, social entities are conceptualized as holons and social systems as networks of holons or holarchies (Koestler, 1967; Wilber, 1996). The holonic nature of an entity means that it is an independent whole and a dependent, yet influencing, part of a greater whole, all at the same time. Employees are whole-beings who – for the virtue of this wholeness – are able to influence their work organization. At the very same time, employees are also influenced by the work-organizational setting in which they function. Through the CST lens, one therefore can see an organization consisting of social holons with varying degrees of aggregation: individuals, groups, etc. CST acknowledges the connectivity of these organizational holons and makes visible their interrelated destinies as they influence one another and form a holarchy of networking, interdependent entities.

Such understanding of a work organization’s structure paves way for practical means to promote social sustainability. Firstly, with the holonic view, the need to develop individuals and organizations simultaneously such that development in one builds on the development in the other becomes obvious. For instance, when it is acknowledged that employees shape their organization (rather than are only subjugated parts of it), it becomes clear that work-organizational development
without individual development is not possible. Secondly, realizing that also individuals shape their groups and that groups shape organizations means that the power to shape events is acknowledged to exist in a complex manner in an organization (e.g. Mathews, 1995). The possibilities to generate novel ways to function are recognized to grow from the actions and interactions of managers and employees equally. Therefore, when designing a work organization with a chaordic approach, each relation between organizational actors is addressed as a mutual relation instead of an ‘osmotic’ relation that allows the flow of ideas, information, and influence only in one direction. Both managers and employees are addressed as equal stakeholders having influence on unpredictable organizational development; a transformative causality framework emphasizing the emergent nature of social development is adopted (see Stacey et al., 2000).

The connectivity principle has also implications to conceptualizing the external boundary of a work organization. In OST, a work organization is seen to be confined within a permeable, but definite boundary (e.g., Emery, 2000). In CST, various holons are seen to establish and maintain their connectivity to reach a shared purpose and to relinquish the shared purpose and connectivity when needed. From this it follows that the boundary of a work organization conceived as a holarchical structure is in a constant flux. In systemic terms, judgments can be made on what is inside and what is outside an organization, but these judgments need to be revised constantly. The environment of a holarchic organization also differs from that of an open system. According to Wilber (1996), each holon reacts to a worldspace having some meaning to it. Therefore, a work holarchy exists in contexts of meanings and may have different environments, each conveying a different set of meanings that are sometimes rather contradictory to each other. To promote the sustainable functioning capability of various work-organizational stakeholders, the analysis of an organization’s internal and external boundaries therefore has to focus on their continuous transformation and on the diversity of meanings being transmitted over these multiple boundaries.

The consciousness principle of sustainability: Paying attention to the internal and external development

A sustainable work organization supports both the internal and external development in itself and in its stakeholders. Achieving a higher degree of complexity in one domain only – be it either exterior or interior – is not a sustainable solution, because the domain lacking complexity development also tends to nullify the complexity development in the other domain. Old thinking (interior) nullifies new doing (exterior), or old doing prevents the realization of new thinking. Therefore, the aim should be to increase complexity in work organizations both in interior and exterior domains. This is the consciousness principle of sustainability.

Also CST pays direct attention to the fact that each system has both internal and external domains (Fitzgerald, 2002). In terms of ‘exterior’ characteristics, employees use their skills and competencies. Work teams and organizations follow established structures and procedures. The ‘interior’ aspects relate to awareness or to what the individual employees think and experience, and what the shared cultural norms and values are. The environments of a work
organization may equally be understood in terms of both the exterior and interior aspects. The exterior aspects refer to the physically observable, technical and material conditions, the ‘interior’ aspects point to the cultural and moral assumptions.

The consciousness principle of sustainability has clear implications for the analysis and design of work organizations. Firstly, it is not enough to study only an organization’s surfaces – its visible structures and artifacts. Another, equally important system dimension is formed by the shared mental models underlying the visible and the concrete. Similarly, the co-evolution of a work organization and its environment(s) should be studied by paying attention not only to the visible material flows, but also to the flows of ideas, values, and norms (e.g., Dijksterhuis et al., 1999).

There already exist several conceptual approaches for comprehending and developing an organization’s internal dimension. For instance, White (2006) has contemplated the aesthetic aspects of organizational development: “The focus on aesthetics is to induce a kind of reflection […] which would help us to take account of the emotional and symbolic aspects of organizing…” (White, 2006; p. 781). Bohm (1996) has proposed dialogue-based approaches in moving beyond individual assumptions towards shared solutions. We therefore propose applying such conceptual models as aesthetics for reaching the internal dimensions in a work-organizational analysis, and applying collaborative, dialogical processes for promoting the shared and individual mental models grow more complex (i.e. more differentiated and integrated). Sustainable organizational development cannot only be about structural change but must be about mental changes as well.

**The emergence principle: Towards a higher degree of complexity**

In the sustainability definition given above, complexity is perceived as a resource rather than a problem to be managed (cf. Csikszentmihalyi, 1990). Complexity, when defined as the simultaneous uniqueness and integration of system elements, is the foundation for solutions to emerge when facing a new challenge. When facing a challenge or loss, complex individuals (with various, integrated skills and mental models) can find some solution to the question of how to go on. At the level of organizations, the diversity of members is respected and their dynamic integration to collaborative wholes is encouraged. In such complex organizations, solutions can emerge from social interaction. New ways to function therefore emerge from complexity. We call this the emergence principle of sustainability. The CST system property of emergence emphasizes exactly this opportunity (see e.g. Fitzgerald, 2002).

Connected to the consciousness principle above, the emergence of complexity can take place both in the exterior and interior domains of individuals and collectives. As individuals and collectives develop in their exterior complexity, each of their actions becomes more distinct and differentiated, but also integration among the various actions grows. In the interior domain, individuals’ and collectives’ awareness may become more complex. At both levels, more complex awareness means more profound understanding of any single issue (differentiation) and more many-sided considerations among contradictory signals (integration of different views).
Designing and developing a sustainable work organization means therefore maximizing the odds for complexity to emerge. Perhaps the most important way for a work organization to promote its employees’ individual and collective complexity development and functioning capabilities is to encourage workplace learning, or learning and development that take place during the daily work activities (e.g. Emery and Thorsrud, 1969). Through individual workplace learning, employees can develop their professional and personal resources (e.g. Illeris, 2004). Through collective workplace learning processes, an organization as a whole can develop new work practices, processes, and shared mental models (e.g. Crossan et al., 1999). Power structures and culture promoting employees’ participation in various work activities and in social interaction are prerequisites for the emergence of individual and collective complexity (see Kira and Frieling, 2007).

The dissipation principle: Making room for change

Emerged complexity may become very successful, but can eventually turn to rigidity (Holling and Gunderson, 2002) where the organizational system of unique resources and established integration patterns is not altered even at the face of an environmental change or opportunity. The work organization becomes unresponsive to the environment and loses its creativity. It is only through dissipative processes that an organization can regain its viability and makes room for sustainable change. We call this the dissipation principle of sustainability. The CST system property of dissipation directly relates to this (see e.g. Fitzgerald, 2002).

The dissipation principle of sustainability also means that a sustainable work organization is not an ‘eternal’ structure. During its life, it strives to maintain its functioning capability by reaching a higher level of complexity. But it may also dissipate and – partly or wholly – cease to exist. The natural processes of being born, developing, transforming, and even ceasing to exist are acknowledged and respected when a work organization is regarded from the sustainability perspective. However, during its life, a sustainable work organization creates potential for the further functioning of its stakeholders.

Emergence and dissipation of complexity

The model of ‘adaptive cycles’ developed by Holling and Gunderson (2002) provides ideas to better understand the dual process of emergence and dissipation. The model, which describes dynamics in ecosystems, has two elements (see also Holling, 2004). Firstly, it describes how ecosystems travel through different phases, during which the connections between their parts emerge and dissipate. The model also addresses reasons for such ‘natural’ dynamics by recognizing different forces that promote or hinder these transformations. We apply the adaptive-cycle model to work organizations and discuss how a work organization may change to remain sustainable. We maintain the perspective that sustainability means dealing with inevitable changes in a productive manner, by turning them into development.

During the life cycle of a work organization, its complexity and connectedness change continuously (see Holling and Gunderson, 2002). ‘Complexity’ refers to
both the abilities and resources of individual holons (uniqueness) and the degree to which the organization is integrated and, by consequence, able to generate unified responses to the challenges it is facing. ‘Connectedness’ describes the quality of that integration in terms of flexibility or rigidity. In this sense, connectedness provides a new perspective to complexity. So far, we have addressed complexity as a resource, but it also can turn into a problem when the integration of the unique system parts becomes too tight. Rigidly integrated work organizations lose their functioning capabilities, since they have no room to be creative.

A work organization progresses from its formation, when it is characterized by a loose connectedness of its parts and low complexity, to gradually increasing connectedness and complexity. In this growth stage, new work practices are formed through collaboration and individual work experiences. Gradually, routine solutions become established, and organizational culture grows strong and stable. Complexity increases in the work organization and its members. Holling (2004) calls this incremental phase of growth and accumulation ‘the forward-loop’ of development (see also The Resilience Alliance, 2006). However, the forward-loop cannot go on forever. The more connected an organization becomes, the more rigid it will be. Eventually, it loses its capability to respond to new challenges that demand answers which go beyond its usual repertoire.

In order to maintain sustainability, both smaller and more profound ‘back-loops’ are needed (Holling and Gunderson, 2002). The existing connectedness, resulting in the usual patterns of operation, needs to be severed as these patterns no longer provide effective solutions. In CST terms, the work organization is now at a bifurcation point (e.g., Van Eijnatten, 2004) where the striving for consolidation is competing with the striving for change. The old structural (exterior) and mental (interior) connections – resulting in dominant shared behavior patterns, values, and norms – become increasingly questioned. Weak, novel ideas appear at the same time and grow stronger the moment they prove promising. A sustainable work organization reacts by listening to the novel ideas and allowing the old solutions – the ‘old’ complexity – to dissipate and make room for new types of complexity to emerge. The back-loop is a rapid phase of change leading to reorganization and renewal (The Resilience Alliance, 2006).

According to Holling (2004), each adaptive cycle can be seen ‘sandwiched’ between two types of change forces: small-and-fast changes and large-and-slow changes. The small-and-fast changes create forces of revolt and push an organization towards a ‘back-loop’ as it becomes consolidated to the level of established complexity. As employees become aware of the looming stagnation, they want to innovate and create new kinds of work activities. Such small-and-fast changes may create a pressure for the usual organizational practices and structures to transform. The large-and-slow changes, in their turn, can be understood as ‘memories’ (Holling, 2004), providing the framework for options when striving towards change. Therefore, work organizations are continuously promoted towards change by small-and-fast processes at the work-activity level (change attractors) and, at the same time, slowed down by the large-and-slow institutionalized values, norms, and practices (stability attractors). A sustainable work organization is able to deal with and benefit from both types of forces in the manner discussed below.
Sustainable work-organizational development

We now have established four principles for sustainability in work organizations, which state that, in order to promote social sustainability, a work organization has to be understood as a holarchically structured entity in which complexity development can only take place when also its members develop in their interior and exterior complexity. Furthermore, we have discussed how complexity development is an emergent process; individuals may develop in their complexity through daily workplace learning processes, and collective complexity development necessitates dialogical collective workplace learning processes to take place. We have also established the importance of ‘un-learning’ or dissipation. Building on this sustainability definition and on Holling and Gunderson (2002), we derive four factors dynamically promoting sustainability in a work organization through its life. Above all, these factors relate to the realization that in order to be sustainable, a work organization has to allow its complexity to fluctuate rather than maintain a homeostatic state.

Firstly, a sustainable work organization is aware of different forces changing and stabilizing it. Employees’ innovations in the daily work activities – the small-and-fast changes – are treasured as valuable seeds for a new level of complexity. The institutionalized aspects (‘memories’) are approached with criticism; they are questioned when they turn out to be inappropriate. Preparing for changes in exterior-structural and in interior-cultural levels becomes the usual activity. Secondly, having reached a highly complex state, a sustainable work organization becomes alert to the possibility of rigidity. If the organization does not have adequate responses to a sudden change in the environment, it is time to question the prevailing complexity and engage in a ‘back-loop’ of dissipation. In this situation, the previously created shared resources and individual learning are liberated and used to initiate reorganization. Managing a work organization in a sustainable manner means mastering two types of situations wisely: by carefully engaging dissipation and reorganization which leads to novel actions and awareness.

Thirdly, an organization can only be considered sustainable when the connectivity and consciousness principles of sustainability are respected in every situation. In the forward-loop, complexity has to be nurtured at all holarchical levels, and in both interior and exterior domains. In this way, complexity is fostered in the work organization as a whole and in the parts. When the organizational complexity eventually turns into rigidity and there is a need for dissipation, individuals’ complexity remains to carry them, and maybe even the whole organization, through. In the dissipative back-loop, the existing operations patterns and shared ways of thinking have to be addressed to make sure that the change leads to balanced exterior and interior developments in the work organization and its members. Fourthly, a work organization may travel through different levels of complexity but still retain its learning. In this sense, the back-loop development breaking up ‘old’ complexity does not take a work organization back to square one. Even if organizational practices are being discarded or the whole organization ceases to exist, the complexity and consequent functioning capacities of individual employees and groups will remain. The next adaptive cycle of the collective may start at a higher level of complexity. In this way, a
sustainable work organization allows itself or its constituent holons to gradually climb towards higher levels of complexity.

**Discussion: creating sustainable work organizations**

We have recognized the belief in controllable work-organizational design and in the creation of a predefined optimal state as the main problems in STS. Approaching a work organization with the aim to control its surface aspects is not enough to access all elements of sustainability. Instead, the interconnectedness of various stakeholders needs to be taken into account along with the social phenomena that directly derive from this interconnectedness: for instance, the power relations, emergent development, and dissipative change. Especially, conceptualizing the ways in which both employees and managers can influence the change and development in a work organization is important. Therefore, we have discussed how complexity can emerge and should, at times, dissipate in a work organization to secure sustainability.

Our approach raises the obvious practical question: who should do what to secure sustainability? The practical question leads to a theoretical question: is it possible to design sustainability? And if it is, are we falling back into the rationalist and formative teleologies where a manager is positioned ‘outside’ a work organization to make intelligent interventions to change it (Stacey et al., 2000)?

To start with the practical question, the connectivity principle of sustainability points out the holonic nature of a work organization. A manager and an employee are parts of it, but are also independent whole-beings. Therefore, because of their wholeness, they both can engage in the individual and collective learning processes that lead to the emergence of complexity. Also because of their wholeness, they both are able to be aware of the work organization and to take conscious actions to push the emergence of collective complexity to a direction they find meaningful. And, as parts of the organizational system, they both can be subjects of institutionally or individually generated change pressures (cf. Zhu, undated). Therefore, we perceive all organizational actors suspended in the force fields of agency and system dependence. In practice, managers often have more opportunities to influence the organization. But the kind of sustainability we have outlined is not possible without equal impact and participation from employees. We therefore perceive employees and managers through transformative teleology in which they both influence the unpredictable organizational and individual development.

Striving towards sustainability necessitates both shared understanding on sustainability among employees and managers, and their equal opportunities to influence the sustainability-promoting complexity development. The worldview of sustainability needs to be generally understood and accepted; only when all the actors in a work organization work towards internal-external complexity development in all stakeholders, can this be achieved. Therefore, the most fundamental aspect of a sustainable work organization is not some particular structure or particular action taken, but instead a very special shared comprehension of the purpose of the organization and the way it operates. In a sustainable work organization, all members base their work-related decisions on
sustainability considerations or, in other words, on how the decision can promote the functioning capabilities of those affected. Where the STS worldview of Participative Democracy provides the key principle for work-organizational design, the worldview of sustainability gives guidance for each organizational member on what to do with their participation opportunities.

The actual analysis of work and organizational events as well as the design and development of work organization towards sustainability have to aim at promoting all principles of sustainability. Therefore, when analyzing a work organization, attention needs to be paid to the holonic structures. The interconnected two-way interfaces between organizational actors and stakeholders and between entities at various aggregation levels need to be recognized to promote mutual complexity development. Work and work-organizational design should be aimed at creating a workplace that can be influenced by all its members in order to secure the natural processes of complexity emergence and dissipation. Equally, work and work-organizational design should seek to sponsor learning opportunities: both individual and collective learning should be promoted by, for instance, providing opportunities for new experiences of action and influence and for dialogical interaction. The interior and exterior aspects both need to be included in the analysis that strives to understand how the organization functions, and work-organizational design needs to address both the emergence of interior and exterior aspects. The daily development of work at the workplace should focus on the promotion of workplace learning, simultaneous employee autonomy and power equality, and comprehensive understanding of sustainability.
References


Table 1: Open Systems Thinking versus Chaordic Systems Thinking in Organizational Development and Change

<table>
<thead>
<tr>
<th>Subject of Comparison</th>
<th>Two System-Thinking Models in Organizational Development and Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspect / Characteristic</td>
<td>Open Systems Thinking (OST)</td>
</tr>
<tr>
<td>Dynamics of the System</td>
<td></td>
</tr>
<tr>
<td>Potential Types of Internal Environments</td>
<td>Single, Simple Equilibrium: Steady State or Homeostasis</td>
</tr>
<tr>
<td>Potential Types of External Environments</td>
<td>Disturbed Reactive Turbulent Field (Hyper-)turbulent field</td>
</tr>
<tr>
<td>Potential Types of Causality</td>
<td>Distinction conservation: Predictable/ Reversible Equifinality</td>
</tr>
<tr>
<td>Potential Types of System Dynamics</td>
<td>Isolated feedback or Feedforward</td>
</tr>
<tr>
<td>System Dimensions</td>
<td></td>
</tr>
<tr>
<td>Type of Social Theory</td>
<td>Functionalist</td>
</tr>
<tr>
<td>Causality Framework</td>
<td>Rationalist / Formative</td>
</tr>
<tr>
<td>System Domains</td>
<td>Exterior / empirical</td>
</tr>
<tr>
<td>Relationship Whole / Parts</td>
<td>Holistic Part and part interaction Integration</td>
</tr>
<tr>
<td>System's Complexity Levels</td>
<td>One single level</td>
</tr>
</tbody>
</table>

End of Document