

# Non-linear change in organizations: organization change management informed by complexity theory

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## Abstract

Organizational change processes are often modeled on a linear understanding of change in which the process is composed of individual succeeding steps. In this paper, an organization change process in a Swedish telecommunication company, TelCo., is studied from the perspective of non-linearity. Complexity theory is used in the paper as a loosely coupled framework of theories and perspectives that do not assume that social or natural systems operate in accordance with linearity. By integrating complexity theory perspectives on organization change, disruptive, fluid processes of change may be better understood. Notions such as non-linearity and complexity may thus be fruitfully integrated into the analysis of organizational change processes.

## Introduction

Complexity theory serves as a label for a number of theories, ideas, and research programs that are derived from scientific disciplines such as biology, mathematics, chemistry, and physics (Rescher, 1996; Cillier, 1998; Marion, 1999). The emergence of an organization theory based on complexity theory has enabled new views of examining and theorizing organizational activities (Black and Edwards, 2000; Maguire and McKelvey, 1999; Tsoukas, 1998). A few applications of complexity theory include studies of organizational transformation (Macintosh and Maclean, 1999), corporate strategy (Brown and Eisenhardt, 1998; Stacey, 1995), organization culture (Frank and Fahrback, 1999), and organization design (Levinthal and Warglien, 1999). One of the key contributions of the emerging complexity theory paradigm is the departure from linear models (Anderson, 1999; Morel, and Ramanujam, 1999). Tsoukas (1998, p. 229) writes:

chaos theory highlights the impossibility to long-term prediction for non-linear systems, since the task of prediction would require knowledge of initial conditions of impossibly high accuracy.

The acknowledgement of non-linearity of complex social and natural systems enables for new views on social organizational processes. For instance, while organization change theories have often been modeled on the "unfreeze-change-refreeze" scheme suggested by Kurt Lewin (Collins, 1998), a complexity theory framework for analysis of organization change enables for an analysis of the discontinuous, disruptive and emerging patterns of change in organizations (Dooley and Van de Ven, 1999; Black, 2000). This paper presents a case study of an

organization change activity in a major Swedish telecom company, TelCo. TelCo. wanted to develop new regimes of workplace management and invested in new ways of organizing work in one of its factories, Alpha. While the organization change activities at Alpha were based on an integrated vision and idea of how the new factory should be managed, the implementation phases did not follow a linear pattern in accordance with the Lewinian three step model. Throughout the first two years of the factory's operations, there were numerous unanticipated and unpredictable changes in the market and in the socio-economic environment of Alpha that significantly affected the internal practices of Alpha. As a consequence, the linear three step model assuming a stepwise implementation of new organizational activities is based on an ideal typical model of social systems, postulating a semi-stable organizational environment. On the contrary to this model, theories suggesting non-linearity as being an underlying structure to social and natural systems recognize that all changes are disruptive, discontinuous, fluid and fluxing. Organization change then becomes not as much a stepwise implementation as it is a continuous and vision-governed adaptation to external changes and emerging conditions.

This paper is structured as follows. First, the notion of non-linearity is examined. Next, organization change is discussed as being a theoretical perspective and a practice in the case of Alpha. Third, the implications from the study are examined, and finally some conclusions are made.

## The concept of non-linearity

Theories departing from a Cartesian-Newtonian model of physical systems

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(von Heisenberg, 1958; Whitehead, 1978) are becoming increasingly popular. Concepts such as emergence (Holland, 1998; Bergmann Lichtenstein, 2000), dissipative structures (Prigogine and Stengers, 1984; Prigogine, 1997) and autopoiesis (Maturana and Varela, 1980; Luhmann, 1990) have been become popular when theorizing social and natural systems as differing from the mechanical models suggested in Newtonian physics. While Newton thought of astral bodies as being determined by mechanical laws and linear causalities, the emerging paradigm of complexity theory does not assume causality as being based on mechanical operations. For instance, the notion of emergence is based on the idea that all evolving systems are (to borrow a concept of Freud's, later used by Althusser) "overdetermined", that they are based on a multiplicity of causes rather than one single cause. As a consequence, social and natural systems are always emerging from a number of sources, thereby making it more complicated to estimate the next phase in the development of an emergent system. Dissipative structures conceptualized by Nobel Prize winner and physicist Ilya Prigogine operate in accordance with a non-linear logic. To Prigogine, a dissipative structure is a semi-stable configuration that does not correspond to external pressures and manipulations in a linear manner. The dissipative structure can, for instance, absorb significant external pressure in certain positions, while it can be radically altered by only minor influences in other positions. When a dissipative structure is close to what Prigogine calls a bifurcation point, the dissipative structure is seemingly stable but vulnerable to external influences. When being influenced on the verge of a bifurcation point, a dissipative structure may entirely alter its structure because of a rather minor influence. Third, an autopoietic system is not based on linearity. Autopoietic systems produce the basis for their own reproduction: they are self-regulating, enclosed structures whose mechanisms are interconnected and mutually dependent. Taken together, neither emerging structures nor dissipative structures, nor autopoietic models are based on a Cartesian-Newtonian mechanical framework wherein all causes are linear and are derived from one single source. Complex systems theories enable an analysis of social systems, in this case organizations, as being multiplicities whose causes and effects are always dependent on a variety of influences. Making use of concepts such as emergence, dissipative structures and bifurcation points, and autopoiesis enables an alternative image of social

organizational systems departing from mechanical explanations and ontologies. In this case the notion of organization change is seen as being a complex, integrated, socially embedded and socially dependent process affected by a variety of causes and concerns.

### **Organization change: theory and the practices at Alpha**

Organization change is one of perennial issues in organization and management theory (Collins, 1998; Huff and Huff, 2000). The most pervasive idea in the organization change literature is that organizations' internal activities and operations are dependent or even determined by the external environment. Contingency theory (Lawrence and Lorsch, 1967; Katz and Kahn, 1966; Thompson, 1967), resource-dependency theory (Pfeffer and Salancik, 1978), evolutionary theory (Nelson and Winter, 1982; Aldrich, 1999) and institutional theory (DiMaggio and Powell, 1991; Scott, 1995) are at least four theoretical perspectives on organizations that posit a correspondence between the internal practices and mechanisms of organizations and their outside world. To Katz and Kahn (1966, p. 17), "social organizations are flagrantly open systems in that the input of energies and the conversion of output into further energetic input consists of transactions between the organization and its environment" (Katz and Kahn, 1966, p. 17). Organizations as open systems are dependent on their environment and thus organization change practices are to some extent determined by the outside world. The organization change literature include a great number of perspectives and theories on change and it is outside of the scope of this paper to do justice to this field (see March (1996), Collins (1998) and Kilduff and Dougherty (2000), for a review of some of the literature). Nevertheless, organization change has been examined from the perspective of human resource management (Abrahamson, 2000), organizational communication (Morrison and Milliken, 2000), cognition (Greve and Taylor, 2000), and from a critical view on the notion of "change" (Leana and Barry, 2000; Chia, 1999; De Cock, 1998). Even though there are a few studies acknowledging the problems of fully controlling and anticipating an organization change process (see e.g. Christensen and Overdorf, 2000; McKinley and Scherer, 2000), the literature remains rationalistic. Organization change is possible to plan, control and manage like any other organizational process (Beer and Eisenstat,

2000; Beer and Nohria, 2000). According to the well-known model of Kurt Lewin, an organization psychologist who championed the emerging methodology of action research aiming at making academic research contribute to organizational change processes, all organization change activities can be examined from a three step model including unfreezing, change and refreezing. Although Lewin's model is rich in terms of metaphorical content (Morgan, 1980) – it is powerful to conceive of an organization as a solid entity that can be liquified into some malleable fluid element and then again turned into a solid entity – it does not wholly support empirical evidence. The Lewinian model does, for instance, not recognize that the organization's external environment at the time of "refreezing" is not of necessity the same as at the time of its "unfreezing". Thus the model assumes a static context in which the organization operates. Second, the model assumes a linear conception of organization change wherein the first stage of the process is succeeded by another, and so forth. In organizational change processes it may be that unfreezing, change and refreezing appear at the same time or that the refreezing activities are never implemented prior to any unfreezing (see e.g. March and Olsen, 1976). Taken together, Lewin's model of organization change is widely recognized and it serves as a powerful metaphor for organization change, but because of its simplistic assumptions on the organization's environment it is a weak model for understanding how organization change is proceeding in real life activities. Next, an organization change programme at a major multinational Swedish telecommunication company will be examined on the basis of a non-linear model of change.

### Methodology

The methodology of this study is a combination of action research (McNiff, 2000; Eden and Huxham, 1996; Chein *et al.*, 1948; Foster, 1973; Reason, 1994) and ethnography (Atkinson and Hammersly, 1994; Putnam *et al.*, 1993; Olesen, 1994). Action research is based on the idea that academic research in social science disciplines can never be fully separated from its object of study. Rather than pursuing a detached position where the researcher does not aim at contributing to the operations and activities of the researched object, the action researcher takes an active role in his or her research. In action research, the researcher tries to make use of his or her research findings in order to make a contribution to the organization and to produce practical changes in its

operations. Action research is therefore both a methodology (based on case studies, observations, interviews, document analysis, and so forth) and an outcome, an effect on the organization.

Ethnography as an organizational research method has its intellectual roots within anthropology and other "observational" disciplines such as interpretative sociology (see e.g. Garfinkel, 1967). In organization studies, ethnography has been used in the study of manufacturing work (Burawoy, 1979; Graham, 1995; Collinson, 1992), knowledge-intensive work (Kunda, 1992; Orr, 1996), and service work (Leidner, 1993; Van Maanen, 1988; Hochschild, 1983). In addition, ethnographies have been used to study entire communities (Whyte, 1993) or managerial work (Dalton, 1959). Today, ethnography is widely seen as a general model for organizational analysis (Czarniawska-Joerges, 1992; Linstead, 1997). The primary objective of ethnography is to provide what Geertz (1973), in a well cited book called – with a concept borrowed from Oxford philosopher Gilbert Ryle – *Thick Descriptions* of events, rituals or occurrences taking place in organizations. The thick descriptions should provide numerous interpretations of the event and try to base this interpretation on a situational or contextual knowledge of the social setting in which the event occurs (see Sahlins, 2000). The longitudinal study at Alpha lasted for 18 months (Leonard-Barton, 1990; Pettigrew, 1990). One single company (see Eisenhardt, 1989; Yin, 1994) was investigated but two independent production units at TelCo. were subject to analysis. The single longitudinal case enabled for a more in-depth understanding of the particular organization.

### Organization change at Alpha

Top management at Alpha wanted to implement new "empowering" work practices on the shop floor. Alpha was a newly started manufacturing production unit located at one of the numerous sites of TelCo. By tradition, TelCo. was not seen as being a state of the art company in terms of management practices, and many of the employees in older production units were disgruntled because of the blue-collar workers' lack of influence on everyday work. As a consequence, Alpha top management wanted to see if it was possible to establish a more empowering management regime at Alpha. There were two purposes for this organization change programme. First, top management wanted to examine whether more empowered workers would be able to be more productive as an effect of the broader

and deeper work assignments. Second, top management wanted to enable the more successful recruitment of highly attractive individuals, especially younger engineers and technicians, on the basis of a good reputation among the local university educated or technically trained strata in the region.

The first step toward the new workplace practices was to make heavy investment in a new factory work environment. The investment had two objectives: first, it should offer an attractive work environment that would attract new co-workers from both other parts of the company but also from other companies and industries. Second, the work environment was supposed to reinforce the egalitarian company culture that top management wanted to promote. For instance, all the co-workers at Alpha ate their lunch and had their coffee breaks in the same company cafeteria and top management decided to pay for free fruit for all the employees in order to create an open-minded and sharing work environment. As the physical environment was improved, all the co-workers were given a course in co-workership and leadership. An external consultant who had previously been hired by TelCo. was appointed to provide a course that he should develop on the basis of his prior experiences at TelCo. The course was conceived of by the Alpha employees as being interesting and as being the shared activity that was breaking the ice for a more open-minded discussion within the company on the objectives of the organization change programme. To many cynical co-workers at Alpha, with a long experience of various TelCo. projects, boldly introduced as being the "next big thing" in the corporation, and later being dumped at the scrap heap of unsuccessful managerial programmes as a failure, this particular programme was initially seen as yet another attempt that promised more than it could deliver. However, these critics were later affirming Alpha's top management team for being persistent in its emphasis on the continuation of the programme. Even though the internal organization change practices were undertaken in a rational manner and was successful in terms of making the co-workers at Alpha rethink their entire work life situation and their relationship to the employer and peer workers, Alpha's environment caused new concerns that had an immediate effect on the organization change activities. There were two major problems that possibly could not have been anticipated at the point of time when the organization change project was started.

First, TelCo. had considerable problems in determining finally the technical specifications of the new product that should be manufactured at Alpha. The customers and the chief engineers at TelCo. were continuously changing the specifications of the new product, and software used for testing the product was continuously altered. Second, the market for the third generation mobile telecommunication (in short referred to as "3G") was delayed because of a recession in the world market as an effect of political instability triggered by the September 11, 2001 terrorist attack on the World Trade Center in New York City, in addition to rather disappointing interest from customers.

Taken together, these two setbacks for Alpha, the corporate problems of finalizing the new product development phase and the insecurities in the world market and the telecommunication business, affected the organization change processes. During the first six months of the organization change programme, the top management group planned for a significant expansion of the workforce at Alpha. It planned for at least a doubling of the workforce in the second six month period. At the end of the six month period, the first newly hired co-workers arrived at Alpha. These new co-workers were either consultants employed by Manpower and similar personnel companies or co-workers hired from other TelCo. production units. After only a few months, TelCo.'s board and CEO announced that the corporation had severe financial problems and that this implied that all consultants had to leave the company as soon as their contracts were terminated. The second setback was that after another six months, the CEO of TelCo. announced for a second time that there was a need to reduce the workforce by 2,000 employees at various TelCo. sites. The CEO's decision was shared with the rest of the company when the newly hired co-workers at Alpha had been working for a five month period. At Alpha these two major decisions of the CEO had immediate consequences for the organization change programme. First, all the co-workers at Alpha had been given the course in co-workership that lasted for four full workdays. The course was therefore a significant investment for Alpha. Second, the co-workers at Alpha had been socialized into the egalitarian culture promoted at Alpha and had begun to recognize the organization change programme as being successful in terms of promoting a co-workership as its foundation. As soon as the head office at TelCo. showed in practice that co-workership

was not worth more than the transaction costs of firing the co-workers that were not needed at the moment, the co-workers at Alpha had a problem with maintaining their faith in the organization change programme. For top management at Alpha, the exogenously given implications for the organization change programme were neither possible to anticipate, nor mediate, as the world market and the internal new product development activities were outside of the full control of Alpha top management. As a consequence, the organization change processes at Alpha were undergoing a series of disruptive changes rather than a linear set of sequential activities. First, the world market was expecting Alpha to deliver its first products as soon as possible, causing great stress for the Alpha co-workers to start manufacturing activities as soon as possible. Second, there was a period of setbacks where the market was still there but the new product development processes were not finalized. Third, neither the new product nor the market was ready for full scale production. Along with the changes in the new product and the market demand, TelCo.'s head office decided that first the consultants and later some of the "superfluous" co-workers had to leave the company. As a consequence, the internal organization change processes at Alpha were immediately affected by turbulent periods of expansion followed by times of decline. Initial enacted scenarios were later proved to be wrong or misconceived. The recruitment process of new co-workers that in the first stage was given top priority was later abandoned in order to take care of the laying off activities. The Alpha top management group was therefore operating within a set of transient periods of time that all had their own logic and objectives. Organization change is therefore to operate with a moving target whose durability is highly elusive: what is of great relevance for an organization change activity at one point of time may later be deemed as being obsolete.

The organization change process at Alpha was designed in accordance with a rationalistic model wherein each step of the model succeeds the prior step. This espoused model of organization change was, however, complemented by a theory in use model wherein the various activities were affected by unanticipated events and occurrences. While the stepwise model for organization change was designed on the basis of a state of stability, the real life situation facing Alpha was characterized by disruptive changes, negative feedback, transient states of semi-stability, and fluid evolving states of

insecurity. Throughout the entire organization change activities, periods of rapid growth were followed by periods of decline; first, new co-workers were hired and the project was given the highest priority, next, the consultants and later on some of the blue-collar workers were laid off in order to cut costs. The entire organization change process was characterized by quick expansive periods and periods of stability or decline. The process was by no means linear or unidirectional but was discontinuous, dispersed, and multidimensional rather than continuous, univocal and one-dimensional. The organization change process was thus best understood as a fluid, emergent series of events whose various components and occurrences were derived from a multiplicity of sources.

## Discussion

In De Landa's (1997) *A Thousand Years of Nonlinear History*, human societies are examined as being outcomes from various fluid, nonlinear processes. De Landa examines the movement of capital, the development of biomass and the human genome, linguistic exchanges, and processes of urbanization as being fluxing and fluid processes, flows of information, capital, genes, and even "flows of lavas and magmas", i.e. the construction of fortified towns, cities and villages. In De Landa's view, human history is best examined as being a continuous flow that solidifies into various formations and later liquifies into new movements and flows. To De Landa, there is no such thing as stable entities; history is a matter of fluid exchanges and movements across the terrains of the earth. De Landa's most original historical writings are influenced by the process philosophy of Deleuze and Guattari (1988), which De Landa makes reference to a number of times in his book. Deleuze and Guattari, fundamentally influenced by philosophers of immanence such as Leibniz and Spinoza, and more "contemporary" process philosophers such as Bergson and Whitehead, emphasize a nonlinear and processual ontology at the expense of a Platonist metaphysics assuming a distinction between reality and appearance, knowledge and opinion, original and copy. To Deleuze and Guattari (1988) as well as De Landa (1997), history and society evolve in a single plane of immanence. There is no teleology and no finality in social formations, only the restless production of connections and associations and the flow of energy and information within society. What is implicit

in both De Landa's historical writing and Deleuze and Guattari's social theory or philosophy is the firm rejection of the idea of progress, of succeeding transient steps towards a final stage of social fulfillment. While complexity theory is derived from a number of disciplines within natural science, De Landa (1997) and Deleuze and Guattari (1988) are rather seen as being social theorists. What these two perspectives have in common is the rejection of a mechanical ontological model assuming linear causality between events and effects. One of the key objectives of complexity theory in organization theory and in social theory in general is to make the highly complicated, mathematical models of complex systems applicable to analysis of social systems such as organizations. Complexity theory can be illustrated as being a continuum where the one side of the scale represents full blown mathematical models representing underlying investigated realities, and on the other side of the scale there are researchers making use of concepts developed within a complexity theory discourse as being metaphors for states and events in organizations. To say that an organization is close to a state of bifurcation based on econometric evidence is very different from the same statement as being a colourful metaphor for an organization undergoing turmoil and change. This paper presents a study of an organization change process that is closer to the Deleuze and Guattari (1988) and De Landa (1997) theories than to a more "hardcore" complexity theory based on natural science research findings. The major learning from De Landa (1997) and Deleuze and Guattari (1988) is that social systems are always fluid, fluxing, disruptive systems that undergo periods of increased variety and heterogeneity as well as periods of homogenization and standardization. No matter what events and activities appear within a social system, the flow of information and energy that characterizes the continuous movement of social systems are always multi-directed and overdetermined in terms of being caused by a multiplicity of sources.

In the case of the organization change activities at Alpha, the practices of organization change were continuously affected by external influences. Even though the organization change activities were planned in a linear manner, the outcome was affected by negative feedback, disruptive changes in the environment, ambiguities and regressive forces. The top management team at Alpha thought of these external changes as being complicated to deal with, especially in

terms of being able to maintain a clear line of argument *vis-à-vis* the co-workers at Alpha. The organization change programme at Alpha was aimed at establishing a more empowering organization culture where the co-workers should be given a greater deal of responsibility. Organization change aimed at corporate culture emphasizes certain values that require a long-term commitment. In Dierickx and Cool's (1989) words, there is a time compression diseconomics inherent to organization culture changes which in brief postulates that "you can't hurry change" because of increasing costs per unit as time is compressed. As TelCo. had a bad record for failing to sustain its organization change activities, the top management team at Alpha needed to be very cautious about the possible disappointment of the co-workers. Despite the argument provided by the top management team and especially the CEO at Alpha, the organization change activities were vulnerable to the new product development processes and market demand as well as the financial situation of TelCo. Taken together, the organization change activities could never follow a linear organization model of change because of the fluxes and ruptures in the external environment of Alpha. Complexity theory offers good analytical tools and models for an examination of such disruptive and fluid organizational experiences. Rather than assuming that reality is well-ordered, structured and predictable as in the Cartesian-Newtonian conception, it may be seen as consisting of flows of energy and information. Making analysis of organization change activities from complementary perspectives may offer new and meaningful images of organizations.

## Conclusion

This paper suggests that organization change activities can be fruitfully examined from a complexity theory framework. Organization change is a broad and multidimensional area of research in organization theory. In many cases, organization change literature offers linear models of change wherein one step of activities is succeeded by another into a series of changes (i.e. the "n-step model" discussed by Collins (1998)). Contrary to this mechanistic view, complexity theory puts into question the linearity and single direction of such organization change models. Complexity theory suggests that changes are produced on the basis of a multiplicity of interconnected causes and effects whose relationships are complicated

to conceive of from within an analytical framework assuming linearity (see Holland, 1998; Prigogine and Stengers, 1984; Maturana and Varela, 1980). As a consequence, an analysis of organization change activities based on a complexity theory framework recognizes the ruptures and breaks, points of bifurcation, flows of energy and information, and so forth, that constitute, enable, or inhibit organization change. In this view, organization change is never solely a one-dimensional series of succeeding activities, but is always taking place amidst the turmoil of transient states and interconnected flows of activities. In the case of Alpha, a production unit at TelCo., the organization change project was continuously affected by external, unanticipated influences. Both the inability to once and for all come to closure in the new product specifications, and the poor market interest for third generation mobile telecommunication strongly affected the organization change project at Alpha. Thus, the plan of the project had to be revised at different points in time and therefore the entire organization change project became more fluid and evolving than initially intended. This particular case could serve as an illustration for a wider area of application of complexity theory and other dynamic theories departing from an analytical framework assuming linearity. Taken together, complexity theory makes an important contribution to the organization change literature in terms of opening up for an analysis of organization change in non-mechanistic systems.

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