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Title:

Unlocking Organizations through Autonomous Cooperation

Applied and Evaluated Principles of Self-Organization in Business Structures

Sub-Theme 35: Applied Complexity Science

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Unlocking Organizations through Autonomous Cooperation

Applied and Evaluated Principles of Self-Organization in Business Structures

Abstract

Flexibility is a basic requirement to cope with complexity and dynamics. The aim of this paper is to analyze to which extent autonomous cooperation can provide a tool to unlock organizations. For this purpose, the approach of the competence-based-perspective is used to apply the concept of autonomous cooperation to business science and to identify its contributions to a flexibilization of the company.

Keywords

Autonomous cooperation, self-organization, complexity science, competence-management, flexibility

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1. Complexity and dynamics of social systems – the problem of unlocking

1.1. Complexity and dynamics as a driver for locking

Due to the fast technological development, as for example in the field of information and communication, the last decade has been marked by a drastic shift from the industrial to the information age (Ottens, 2003). In particular the using of the internet and telecommunication services and the new possibilities for companies and consumers involved has had positive impacts on economic growth in the European Union, not at least based on its role as a capital service delivering inputs to the production process or rather as an intermediate input to capital goods production (Colecchia and Schreyer, 2002: 154). These changes in market structures include phenomena like hyper-linking, hyper-competition and hyper-turbulence (Tapscott, 1999; Siegele, 2002) which lead to higher complexity and dynamics in companies and their environment (Hülsmann and Berry, 2004).

According to Dörner (2001: 60), a complex system can be understood as „the existence of many interdependent characteristics in a section of reality [...]“. The amount of available information based on the innovations in information and communication technologies could be understood as a rising amount of elements in this section of reality. Not the quantity of elements is decisive, however, but the existence of multiple interrelations between the elements of the system as well as between the system and its environment (Dörner, 2001: 60; Malik, 2000: 186). For example, the immense pool of information of new products and technologies offered through the internet leads to new global sales market opportunities for firms (Freiling, 2002: 1). Thus, between the offered information of the internet and the companies there is a multiplicity of possible relations.

The term "dynamics" describes the accelerated variation of the system status (e.g. the internet) over time. Applied to the mentioned example, dynamics could be understood as the

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permanently altering and available information on the internet. In this case, the elements (pieces of information) themselves change and thus the relations between them and other systems (e.g. companies) alter.

This leads to a higher complexity of the firm's environment. As a result, firms have to cope with this complex information to maintain their capacity of reacting to timely demands. To handle complexity and dynamics, there is a need for a flexible adaptation of the system which is realized through processes of system opening and system closure.

Processes of system openings (Luhmann, 1973: 173) enable the system to communicate with the environment through mutual inter-relations. Thereby it sustains the existential exchange process of resources (Staehle, 1999: 417; Böse and Schiepek, 1989: 121). During these system openings, the system absorbs a part of the environmental complexity (e.g. information) to incorporate necessary resources. To avoid the risk of an information overload, system openings have to go along with system closures. This means that the system does not absorb the entire complexity of the environment, but only the portion which in terms of the ability of solving specific problems corresponds to the system's identity (Luhmann, 1994: 261) and ability to handle it. System closure ensures that the system does not absorb more information than needed or than manageable by the system's capacity.

The management, therefore, has to face the basic challenge of balancing between the optimum degree of system openings and system closure. On the one hand, decisions of the management are concerned with system openings to gain sufficient information for a rational decision-making. On the other hand, the management has to cut the flow of information in proportion to its ability of processing information and to reach a timely decision. As a result of increasing complexity and dynamics, this act of balancing implies a dilemmatic decision-making situation for the management. Along with a rising degree of complexity in the

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environment, the degree of necessary information to solve specific problems also rises. Consequently, the decision maker has to absorb more complexity (information) through system openings, while still possessing the same ability of handling this information. At the same time, the management has to take into account the dynamics of information and the risk of an information overload caused by system closure (e.g. Hülsmann, 2005: 412; Gebert and Boerner, 1995: 11; Gharajedaghi, 1982: 251). The processes of system closure could be incorporated in a problem of decision making for the management regarding the selection of information in terms of quality and quantity.

These contradictory objectives which the management has to follow, can lead to a limited ability of decision-making (Hülsmann and Berry, 2004). The organization lacks of adaptiveness towards the permanent challenging demands of the environment, because it is caught in its own complexity and thus no longer able to make rational decisions. In this case, we speak of a *locked organization*. The notion of a "locked organization" describes a dysfunctional and suboptimal situation with a limited choice of possible decisions (Schreyögg, Sydow and Koch 2003: 259). The adjective "dysfunctional" in this context describes the limited ability of a rational decision-making. The immanent lack of information of a decision (the problem of bounded rationality (Simon, 1972: a manager cannot have the complete information about his problem of decision) is connotated with the adjective "suboptimal".

The event of a locking could have negative effects on the continuity of the organization. It describes a circumstance in which the environmental complexity outgrows the organization's capability of handling it. Thus, the system is unable to continue its exchange of vital resources with the environment because it can neither identify all necessary resources (e.g. information about new products, new trends or innovations) from the offered

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mass in the environment nor evaluate or integrate these. As a consequence, the organization cannot respond to the requested resources of the environment (e.g. products of the company which are needed by the environment) in time, quality, quantity, or place. Therefore, the lack of flexibility could result in a disequilibrium which in turn could lead to negative environmental responses in terms of the required resources (e.g. through a lower volume of sales the company could loose its market shares). In the worst case, a locked system may result in a risk of collapse for the organization.

1.2. Flexibility as a driver for unlocking

Thus, for the management there is a vital need to cope with the expanding complexity of its highly dynamic environment. In order to cope with this task, however, a flexibilization of the system is essential to adequately respond to the changing and diverse environmental conditions such as technological progress (Sanchez, 1993). In this context, flexibility describes the ability of a system to open its boundaries for required resources (e.g. information) and thereupon to change its system structures according to the demands of its relevant environment if needed. Through the process of system opening the borders to its environment become increasingly indistinct. Therefore, it is all the more important to compensate the degree of flexibility through processes of stabilization (system closure) to maintain the separate identity in the permanent processes of adaptation. Consequently, organizational flexibility is needed to cope with internal and external dynamics and complexity and to avoid the risk of locked organizations.

This leads to the question of how durable flexibility can be generated and integrated in the organizational structure. One possible tool which relates to the flexibilization of companies is the idea of competence-management. From a competence-based-perspective,

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flexibility could on the one hand be understood as a competence itself. In this case flexibility could be described as a basic requirement of the system structure enabling the system to build and leverage competences and to verify their arrangement if needed. On the other hand, flexibility as a competence itself is required to endow the system with the necessary adaptiveness which will secure a sustainable survival of the system in a dynamic, complex and highly competitive environment (Hülsmann and Wycisk, 2005). Based on this the competence-based-perspective may offer a tool to integrate flexibility into the organizational structure. But in order to do so, organizational flexibility itself has to be generated. One solution for this problem may possibly be found in the concept of autonomous cooperation. This concept belongs to complexity science which is concerned with the problem of complex and dynamic systems in natural science and analyzes how these systems generate system adaptiveness, robustness and emergent order creation (e.g. Haken, 1983; Prigogine, 1996; von Foerster, 1960; Maturana and Varela, 1980). The aim of this paper is to analyze to which extent autonomous cooperation can provide a tool to unlock organizations. For this purpose, the approach of the competence-based-perspective is used to apply the concept of autonomous cooperation to business science and to identify its contributions to a flexibilization of the company.

In the following, the concept of autonomous cooperation will be analyzed from a competence-based perspective. Section 2 describes autonomous cooperation in its history of development (2.1), its core statements (2.2) and its understanding in business science (2.3) to establish common background knowledge as well as an analytical basis. Section 3 analyzes the role of flexibility from a competence-based-perspective to point out its relevancy in this context. For this purpose, the approach of the competence-based-perspective is presented in a short introduction of its main statements (3.1) and the role of flexibility from a competence-

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based-perspective is analyzed (3.2). In a next step the attributes of the concept of autonomous cooperation are combined to their contributions to a flexibilization of the company structure (3.3). A conclusion of the results of the paper can be found in section 4.

2. The Concept of autonomous Cooperation

2.1. Origins of autonomous cooperation

The concept of autonomous cooperation belongs to the field of complexity science in the broadest sense which deals with emergent order creation and computational modelling. More precisely its basic idea derives from the concept of self-organization which has its historical roots in multiple academic fields (e.g. physics, biology and chemistry) and reaches back to philosophical sciences in 500 BC. The intention of this young science is to study, explain and identify general principles on how complex systems autonomously create ordered structures. The concept was originated in the 70s by separate scientists of different disciplines, e.g. von Foerster (1960) (cybernetics), Prigogine (1971) (chemistry), Haken (1973) (physics), Maturana and Varela (1980) (biology). After recognizing a common background of the notions complexity and order at the end of the 70s, a basis for a comprehensive interdisciplinary theory was established. Until now this young science is still at a stage of forming and developing. Initial results of different approaches of self-organization already diffused into other fields of science. The approach of autopoiesis of Maturana and Varela (1980), for instance, appears in different scientific fields, such as sociology with reference to Luhmann's systems theory (Luhmann, 1994), as well as in psychology in the area of family therapy (e.g. Hoffmann, 1984). In order to generate a theory of complexity in not only formal science but also within social systems, the merging of ideas of separate concerned approaches, such as synergetics, autopoiesis, dissipative structures etc. is essential.

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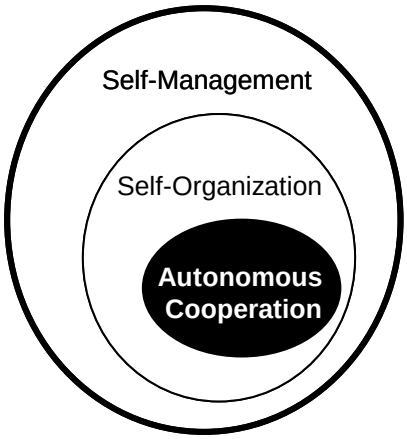
2.2. Classification of autonomous cooperation

Before the general main statements of the concept of autonomous cooperation are presented, a short classification of the concept according to belonging science and distinction to similar terms will follow. A clearly defined usage of the notions ‘self-management’, ‘self-organization’ and ‘autonomous cooperation’ has not been established yet. The specifications of the terms could be categorized in the following way.

Fig 1: Classification of the terms ‘self-management’, ‘self-organization’ and ‘autonomous cooperation’



The term of ‘self-management’ comprises the most widespread concept of the mentioned terms. It describes the ability of a system to organize itself autonomously. This means, the system determines its own goals, autonomously chooses its strategies and organizational structure and also raises the necessary resources itself (Manz and Sims, 1980). Therefore, a self-managed system is able to design and to vary its own management system whereas ‘self-organization’ as a part of management describes the way of autonomously creating an emergent order. It focuses on the autonomous formation of structures and processes (Bea and Göbel, 1999; Probst, 1987). The term ‘autonomous cooperation’ as the most narrow perspective of the mentioned terms, describes processes of decentralized

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decision-making in heterarchical structures. It presumes interacting elements in non-deterministic systems which possess the capability and possibility to render decisions independently (Hülsmann and Windt, 2005).

2.3. Main statements of autonomous cooperation

The objective of autonomous cooperation is the achievement of increased robustness and positive emergence of the total system due to a distributed and flexible coping with dynamics and complexity (Hülsmann and Windt, 2005). These desired effects derive from the perceptions of the concept of self-organization, the origin of autonomous cooperation. The concept of self-organization does not present an "over aging paradigm" but there is a general overlapping of attributes such as *autonomy, interaction and non-determinism* which can be found in several approaches (Von Foerster, 1960; Prigogine, 1971; Haken, 1973; Maturana and Varela, 1980) and which also represent the main attributes of autonomous cooperated systems.

Autonomy

We speak of a system's or an individual's autonomy if they form, guide and develop themselves, meaning that their decisions, relations and interactions are not dependent on external instances and therefore operationally closed (Probst, 1987: 82). In doing so, a complete independence of the system from other systems cannot be assumed however (Varela, 1979; Malik, 2000: 103). Each system only represents a part of a wide-ranging total system which it is in some way dependent on and influenced by. Therefore we have to speak of a relative autonomy of the individual or the system in relation to certain criteria (Varela, 1979; Probst, 1987: 82). In the company these criteria are defined by the given scope of action and decision making of the autonomy subject. For this reason autonomy manifests

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itself in the company as a result of the processes of decentralization and delegation. (Kappler, 1992: 273).

Interaction

The core statement of the concept of self-organization is that open *dynamic complex* systems (natural or social systems) develop a self-organized order within a system (von Foerster, 1960; Prigogine, 1971; Maturana and Varela, 1980) which is the result of various *interactions* of the individual system elements (Haken, 1987: 132). From this process of interaction new qualitative characteristics of a system arise, namely *emergences* (Haken, 1993: 16) that are not related to individual system components, but result from the synergistic effects of the interacting elements. It is not clarified yet how these synergetics effects arise from the interacting elements and how they may be analyzed and explained. According to Haken (1987), the system reaches a new increased level of quality through these emergences which enable the system to distinguish itself by an improved ability to cope with environmental demands.

Non-determinism

Another feature is the characteristic of *non-determinism* which is found in all self-organizing systems. As in autonomous cooperated systems general rules of decision making are predetermined (Hülsmann and Windt, 2005) and the desired final state of the system may be predicted, but not the way of how to achieve this. Based on the ability of autonomous decision making of the system elements, the system behaviour is not casually predetermined and thus not predictable (Haken, 1983; Prigogine, 1996).

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3. Flexibility out of a competence-based-view

3.1. Main statements of the competence-based-view

The main problem of the strategic management is to find answers to the question "How can a company achieve sustainable competitive advantage?" The competence-based tries to answer this question by focusing companies on their competencies to gain competitive advantage. The literature of the strategic management argues that there are two essential sources of competitive advantage – that from market position (market-based view) and that from competencies (competence-based view).

The competence-based view is a theory that belongs to the strategic management. This view started with articles and books by Prahalad and Hamel beginning in the late 1980s (Hamel and Prahalad, 1989; Prahalad and Hamel, 1990 1993; Hamel and Heene, 1994; Sanchez, Heene, and Thomas, 1996). The main statement of the theory of competence-based view is that companies focus on their competencies to achieve competitive advantage. According to Sanchez et al. (Sanchez and Heene, 1996: 8 and Sanchez, 2004: 521) competences can be understood as „[…] the ability to sustain the coordinated deployment of assets in ways that help a firm achieve its goals." In the theory of competence-based view a firm is seen as a learning organization that builds and deploys assets, capabilities and skills to achieve strategic goals (Hamel and Heene, 1994).

3.2. The role of flexibility

On this basis, five "modes" of competences have been defined by Sanchez (2004: 523): 1) cognitive flexibility to imagine alternative strategic logics; 2) cognitive flexibility to imagine alternative management processes; 3) coordination flexibility to identify, configure and deploy resources; 4) resource flexibility to be used in alternative operations and 5) operating flexibility in applying skills and capabilities to available resources. Each of these

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five modes stands for a different kind of flexibility and they all respond to changing environmental conditions such as changing markets or new technologies. Flexibility therefore plays a highly important role in the competence-based management. As competence-building and competence-leveraging represent particular forms of activeness and processes within the organization they go hand in hand with a certain degree of alteration and consequently require organizational flexibility.

A *dualistic role of organizational flexibility* can therefore be determined (Hülsmann and Wycisk, 2005). Flexibility as a competence itself or as a part of the competence-arrangement is needed to endow the system with the necessary adaptiveness which will ensure its survival in a dynamic, complex and highly competitive environment in the long-run. But precisely these constituents of flexibility are also needed to provide the system with a basic flexibility within its predisposition which is imperative to enable the system of building and leveraging competences in a continuous process of development. Consequently, the strategic competence management is confronted with two basic challenges caused by the permanently changing conditions of the environment in terms of hyper-linking, hyper-competition and hyper-turbulence: the basic requirement of flexibility and the need for balance between flexibility and stability (Hülsmann and Wycisk, 2005).

4. The contribution of autonomous cooperation to a flexibilization of social systems from a competence-based perspective

Autonomous decision-making as a tool to cope with dynamics & complexity

In the context of business science the attribute of autonomy is characterized by processes of delegation and decentralization (Kappler, 1992: 273) and can consequently be understood as the degree of autonomous decision-making processes among the company's employees. The processes of delegation and decentralization will therefore be analyzed in

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their effects on flexibility and stability as well as in relation to qualitative, quantitative, temporal and spatial aspects from a competence-based perspective.

Delegation empowers the elements (members) or sub-units of the system to make autonomous decisions which are spatially closer to the operational level of work (Mullins, 2005: 608) and thus enables the system to partially react towards changing environmental demands. The ability of autonomous decision-making allows the affected system elements to immediately induce the required actions while the rest of the organizational structure remains unaffected. Moreover, there is a link between the spatial closeness of decision-making and the temporal effect of flexibility in autonomous cooperated structures. Ways of decision-making become shorter and easier as information on the level of the sub-units flows faster. Short-term or changing environmental demands, as for example, improved personal customer services, can therefore be rapidly and systematically responded to. As a consequence, the total system's ability of problem solving - quantitatively as well as qualitatively - increases with the spatial and temporal closeness of the decision-making process.

Processes of delegation provide the necessary freedom for the sub-units to develop various patterns of competences along with the constantly changing conditions. With these the system gains the required flexibility to let evolutionary processes of retention, mutation and selection of competences freely take place. The competence arrangement of the individual sub-units can instantly integrate the outcome. As a result of this constant natural autonomous adaptation of the competence arrangement to the environmental conditions, the individual sub-units autonomously decide on the ideal degree of integration of the sub-system in regard to resources and necessary information to solve problems. Only the sub-units that operate at the direct source of action, dispose of the relevant information and thus know which competences are needed at which time. For this reason the in this autonomous way formed competences are clearly higher in quality since the affected sub-units are able to adapt

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them precisely to the current environmental conditions.

Through processes of decentralization, the entire complexity of a company (consisting of the system's as well as the environmental complexity) can be distributed among its diverse sub-units and elements and a reduction of the quantitative level of complexity for the management can therefore be achieved. These processes may be coupled with an increase of system flexibility. Instead of controlling and focusing on all the required competences of each individual element and its system interrelations, the organization now merely has to consider the sub-units in its processes of planning, designing and developing competences.

However, processes of delegation and decentralization always imply the risks of intransparency and moral hazard as well as autogenous self-organization (Göbel, 1998: 184) and intergrouping conflicts (Staehle, 1999: 301) which the management needs to consider. Furthermore, it has not been ascertained yet which degree of the empowerment proves to be effective and provides the most valuable contribution to a flexibilization. All in all autonomous decision-making contributes to a generally more effective coping with dynamics and complexity.

Interaction as a tool to obtain redundancy and emergences

The relevant information which is passed on from the management in a centralized system or in a predetermined way, is exchanged by the employees in an autonomously cooperated system. This suggests that the processes of delegation and decentralization require a higher degree of interaction between the affected elements in central organized systems (Laux and Liermann, 1993: 212). In this way the employees can make decisions autonomously and at the same time their decisions will match the present demands of the system and the actual system status. Thus, the existing pool of competences has to be transparent to enable the employees to solve problems with either problem-specific

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competences or with a possible new combination of them. In addition, lacking competences will easily be discovered. An effective information- or knowledge-system for this purpose can help to avoid costs of interaction-time.

A further aspect that is linked to the attribute of interaction in an autonomous cooperated system is the effect of redundancy. According to the concept of autonomous cooperation, each element or subsystem of the complete system is equipped with the same assets and abilities by nature as shown for example by the individual light waves of Haken's laser light (1983) or the atoms of the dissipative structures of Prigogine (1996). Applied to social systems, it could be assumed that with a high degree of interaction and exchanged information the elements learn about each others capabilities and know-how through organizational structures, such as job rotation or job enlargement for example (e.g. Schreyögg, 1998: 245; Mullins, 2005: 714). With a high degree of autonomous cooperation, each member could undertake every function of the system. This redundancy, which could be understood as a competence of the system itself, feeds the system with flexibility because its employees are able to react flexible wherever needed and even if some members turn out. However, a disadvantage of redundancy could be a lack of expertise within the system. Due to the learning of different functions, the knowledge of the employees is characterized by diversity and eventually detail which may cause higher costs in case expertise is needed.

Another main objective of autonomous cooperation is the effect of emergences which result from the interaction of the various system elements. These emergences are defined – according to Haken (1993: 16) – as new qualities of the system, which cannot be related to individual system components, but result from the synergy effects of the interacting elements. From a competence-based perspective, a new system quality would stand for a competence arrangement of a company which distinguishes itself by an improved ability of the system to

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cope with complexity and dynamics and therewith by a better fit of system structure and environmental demands. Through interaction of the system elements, for example, a bundling of company-specific resources as core competences could evolve (Hamel, 1994) which sustain competitive advantages.

Non-determinism as a tool to promote creativity

Based on the ability of autonomous decision-making, the members of an organization initially do not act in a predetermined way. The objective of this granted space of decision-making and acting is to preserve a wide range of alternatives of action for the members. It is assumed that the flexibility of action and thus reaction to sudden environmental demands increases with the number of alternative ways of action available to the members. Furthermore, the non-determined space of action stimulates the creativity of the system elements which are authorized to use innovative strategies of problem solving in trial and error processes and could eventually generate more effective ways of organizational acting. On the one hand this evolutionary process provides a basis for retention (Wolf, 2003: 293), in this case the maintenance and stabilization of profitable competences which are approved helpful in achieving the company goals will firmly be anchored in the system. On the other hand their utilization may invariably amount to context-conditional changes in the competence structure, which from an evolution-theoretic perspective would be conceptualized under the term of variation (Macharzina, 2003: 73). Moreover, the formation of variation patterns bears the opportunity of selection (Wolf, 2003: 292) i.e. the opportunity of sorting ineffectual action alternatives for achieving the company goals.

However, the organization's way of acting is not completely indetermined. A first reason for this is that social systems are open systems which means that they are in a permanent process of exchange (e.g. information and material) with their surroundings. Thus,

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social systems are permanently affected by environmental influences. A second reason is found in the system's history. According to the theory of path dependencies, a grown system is always predetermined by its former decisions made. Thus, an unlimited amount of acting alternatives cannot exist (Schreyögg; Sydow and Koch, 2003: 266).

Overall, the attribute of non-determinism in connection with the possibility of evolutionary problem-solving could contribute to a certain degree of flexibilization within the organization structure.

5. Conclusion

In the previous specifications we described the situation of a locked organization as a dysfunctional and suboptimal situation with a limited choice of possible decisions (Schreyögg, Sydow and Koch 2003: 259), meaning that the organization is caught in its own complexity and thus not longer able to make rational decisions. To unlock this dilemmatic situation of decision-making (Hülsmann, 2005: 412) the basic requirement of organizational flexibility was identified. To obtain organizational flexibility – which may be understood as a competence itself or as a basic requirement of the whole company structure (Hülsmann and Wycisk, 2005) – the concept of autonomous cooperation was analyzed to determine the extent of its contribution to a flexibilization of the company from a competence-based perspective. In doing so, several links and starting points for a flexibilization through autonomous cooperation were found.

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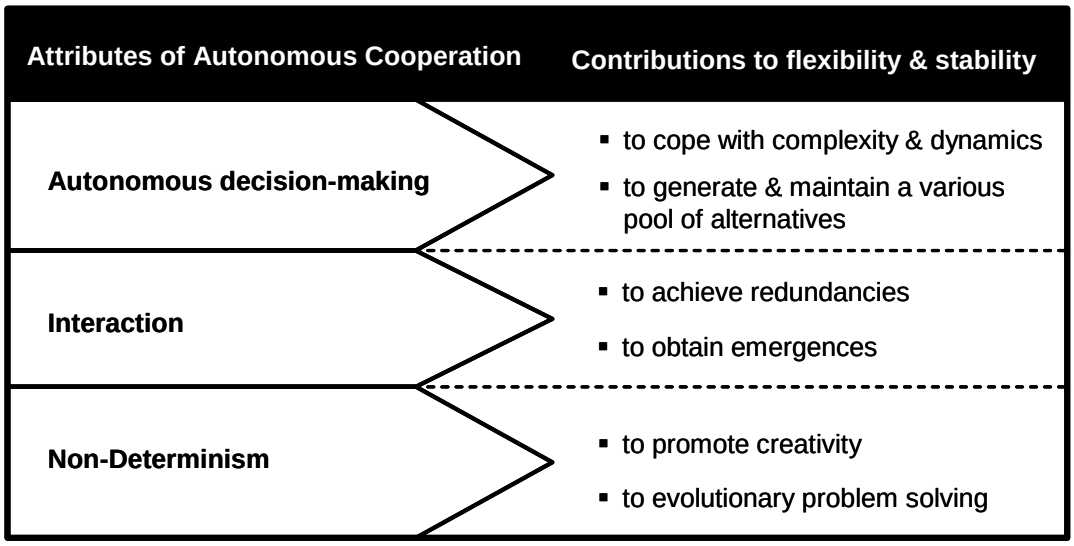
Fig 2 about here: 'Contributions of the concept of autonomous cooperation to generate organizational flexibility and stability'



From a competence-based-perspective, the effects of the attribute of autonomous decision-making feed the system with flexibility in quantitative, qualitative, timely and spatial dimensions. In leaving operative decision-making in its sub-systems, -units and -elements, while giving a general decision-making direction to the flat organized system, higher flexibility of the entire system regarding decision-making processes will be achieved by focusing on smaller organizational units and their relations to the top-management. Thus, autonomous decision-making has unlocking effects in two ways. First, through a distributed coping with complexity and dynamics the company could avoid the risk of getting caught in its own complexity. The second unlocking effect is connected with the previous. The coping with complexity could render adaptations to environmental demands for regaining and keeping system stability of the separate system elements more flexible and thereby more capacities for discovering alternative ways of handling things would be available. The generation and preservation of various alternatives of acting are significant for an unlocked organization.

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The higher degree of interaction in an autonomous cooperated system could result in a higher degree of system robustness. Through interaction, effects such as redundancy and emergences arise. Redundancy describes a plentiful existence of similar abilities and competences and enables employees to act flexible within different functions if necessary. Therefore, the company could concentrate its resources and competences on one specific problem (for example to cope with complexity and dynamics in this specific case) if vitally needed. Another possible feature of the attribute of interaction is emergence. These synergetic effects which result from the interaction of the system elements also assist in the task of coping with complexity and dynamics by maintaining a permanent robustness of the system against radical environmental influences. Thus, the effects of redundancy and emergences in a company could contribute to the system's stability and therefore avoid the risk of locking.

Autonomous cooperated system are non-deterministic which means that the behaviour of the elements is only predetermined to a certain degree and thus not predictable. This freely selectable way of problem solving shall stimulate the individual creativity of the employees and therewith a various choice of alternatives. In this way, the individual capability of each element could be mobilized at the best and with it the avoidance of getting locked by means of the various arising alternatives of decisions.

Overall, applying the concept of autonomous cooperation to unlocking organizations assumes the functioning of two basic requirements. The first focuses on the functionalization and instrumentalization of the concept in a business management system. To implement the concept in business structures it is necessary to generate configuration tools. These tools, which could be a higher degree of autonomous decision-making for instance, enable the employees to handle the specific tasks of autonomous cooperation. Deducing these functions

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of autonomous cooperation is one further necessary research task.

The second requirement is the need for a measuring system of autonomous cooperation. For a targeted appliance of autonomous cooperation and its measurement control and steering abilities are necessary. The process of measuring presumes visibility as well as predetermined goals of achievement. One task will therefore be to detail the concept of autonomous cooperation in its constitutive attributes to gain higher visibility. Another research requirement will be to generate a measuring system which is able to quantify the level of autonomous cooperation in a system and to evaluate these results in comparison to the desired achievements. These questions are part of the work of the CRC 637 “Autonomous Cooperating Logistic Processes: A Paradigm Shift and its Limitations”.

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References

Bea, F. X. and Göbel, E. (1999). *Organisation – Theorie und Gestaltung*. Stuttgart.

Böse, R., and Schiepeck, G. (1989). *Systemische Theorie und Therapie*, Heidelberg.

Colecchia, A. and Schreyer, P. (2002). *"The Contribution of Information and Communication Technologies to Economic Growth in Nine OECD Countries"*, in: OECD Economic Studies, No. 34, 2002andI, pp.154 – 170.

Dörner, D. (2001). *Die Logik des Misslingens: Strategisches Denken in komplexen Situationen*, 14. Ed., Hamburg.

Foerster, v. H. (1960). *On Self-Organizing Systems and their Environment*. In: Self-Organizing Systems, Yovits, M. C. and Cameron, S. (eds), London.

Freiling, J. (2002). *Strategische Flexibilität und Strategiewechsel als Determinanten des Unternehmenswertes*, Wiesbaden.

Gebert, D. and Boerner, S. (1995). *Manager im Dilemma – Abschied von der offenen Gesellschaft*. Frankfurt a. M. et. al.

Gharajedaghi, J. (1982). „*Social Dynamics (Dychotomy or Dialectic)"*, in: General Systems, 27, pp. 251 – 268.

Göbel, E.(1998). *Theorie und Gestaltung der Selbstorganisation*. Berlin.

Haken, H. (1973). *Synergetics: cooperative phenomena in multi-component systems*. Proceedings of the Symposium on Synergetics from April 30 to May 6, 1972, Schloß Elmau. Stuttgart.

Haken, H. (1983). *Erfolgsgeheimnisse der Natur: Synergetik, die Lehre vom Zusammenwirken*. 3rd Edition. Stuttgart.

Haken, H. (1993). „*Synergetik: Eine Zauberformel für das Management ?*", in: Rehm, W. (ed.): Synergetik: Selbstorganisation als Erfolgsrezept für Unternehmen; ein Symposium der IBM, Stuttgart. pp. 15-43.

Hamel, G. (1994). *"The concept of core-competences"*, in: Hamel, G. and Heene, A. (eds): Competence-based competition. Chichester: Wiley. pp. 11-33.

Hamel, G. and Heene, A. (1994). *Competence-based competition*. New York.

Hamel, G. and Prahalad, C. K. (1989). *Strategic intent*. Harvard Business Review.

Hoffman, L. (1984). *Grundlagen der Familientherapie*. Hamburg.

Hülsmann, M. (2005). *Dilemmata im Krisenmanagement*. In: Burmann, C. ; Freiling, J. and Hülsmann, M. (edt.): *Management von Ad-hoc-Krisen – Grundlagen - Strategien – Erfolgsfaktoren*, Wiesbaden. pp. 401 – 422.

Hülsmann, M. and Berry, A. (2004). „*Strategic Management Dilemma: It's necessity in a World of Diversity and Change", i*n: Conference Proceedings of SAM and IFSAM VII World Congress: Management in a World of Diversity and Change. Wolff, R. (eds) et al. Göteborg.

Reference: Hülsmann, M.; Wycisk, C.: Unlocking Organizations through Autonomous Cooperation - Applied and Evaluated Principles of Self-Organization in Business Structures. In: Proceedings of the 21st EGOS Colloquium. Berlin, 2005, web-publication, 25 pages

Hülsmann, M. and Windt, K. (2005). *Selbststeuerung – Entwicklung eines terminologischen Systems*. Bremen. (forthcoming)

Hülsmann, M. and Wycisk, C. (2005). Contributions of the concept of self-organization for a strategic competence-management. The Seventh International Conference on Competence-Based Management: "Value Creation through Competence-Building and Leveraging". 2. - 4. Juni 2005. Antwerpen, Belgien. (forthcoming).

Kappler, E. (1992). *Autonomie.* In: Handwörterbuch der Organisation, Frese, E. (ed), 3rd Edition, Stuttgart. pp. 272-280.

Laux, H. and Liermann, F. (1993). *Grundlagen der Organisation*. 3rd Edition. Berlin et al.

Luhmann, N. (1973).*Zweckbegriff und Systemrationalität.* In Series Suhrkamp-Taschenbuch Wissenschaft, Vol. 12, Frankfurt am Main.

Luhmann, N. (1994). *Soziale Systeme: Grundriss einer allgemeinen Theorie*. Reihe: Suhrkamp-Taschenbuch Wissenschaft. Band 666. 5th Edition. Frankfurt a. Main.

Macharzina, K. (2003). *Unternehmensführung – Das internationale Managementwissen.* Wiesbaden.

Malik, F. (2000). *Strategie des Managements komplexer Systeme: Ein Beitrag zur Management-Kybernetik evolutionärer Systeme*, 6th ed., Bern.

Manz, C. and Sims, H. P. (1980). "*Self-management as a substitute for leadership: A social learning theory perspective*", in: AMR 5and1980. pp. 361-367.

Maturana, H. R. and Varala, F. (1980). *Autopoiesis and cognition: the realization of living.* Reidel.

Mullins, L. J. (2005). *Management and organizational behaviour*. 7th Edition. Harlow et al.

Ottens, M. (2003). "*Statistics on the information society in Europe"*, in: Statistics in focus: Industry, Trade and Services, Theme 4 – 38and2003, European Communities (eds.), Luxembourg.

Prahalad, C. K. and Hamel, G. (1990). "*The Core Competencies of the Corporation", i*n: Harvard Business Review, 68 (3). pp 79-91.

Prigogine, I. / Glansdorff, P. (1971). *Thermodynamic Theory of Structure, Stability and Fluctuation.* London et al.

Prigogine, I. (1996). *The End of Certainty: Time, Chaos, and the New Laws of Nature*. New York.

Probst, G. J. B. (1987). *Selbstorganisation, Ordnungsprozesse in sozialen Systemen aus ganzheitlicher Sicht.* Berlin et al.

Sanchez, R. (1993). "*Strategic flexibility, firm organization, and managerial work in dynamic markets - A strategic options perspective"*, in: Advances in Strategic Management 9, pp. 251-291.

Sanchez, R. (2004). "*Understanding competence-based management: Identifying and managing five modes of competence"*, in: Journal of Business Research 57. pp. 518-532.

Reference: Hülsmann, M.; Wycisk, C.: Unlocking Organizations through Autonomous Cooperation - Applied and Evaluated Principles of Self-Organization in Business Structures. In: Proceedings of the 21st EGOS Colloquium. Berlin, 2005, web-publication, 25 pages

Sanchez, R. and Heene, A. (1996). *"A systems view of the firm in competence-based competition"*, in: Dynamics of Competence-Based Competition by Sanchez, R., Heene, A. and Thomas, H. (eds). Oxford. pp. 39-42.

Sanchez, R., Heene, A., and Thomas, H. (1996). *Dynamics of competence-based competition: Theory and practice in the new strategic management.* Oxford: Pergamon.

Schreyögg, G. (1998). *Organisation – Grundlagen moderner Organisationsgestaltung*, 2nd Edition, Wiesbaden.

Schreyögg, G., Sydow, J. and Koch, J. (2003). *"Organisatorische Pfade – Von der Pfadabhängigkeit zur Pfadkreation?"*, in: Schreyögg, G. and Sydow, J. (edt.): Strategische Prozesse und Pfade, Managementforschung 13, Wiesbaden.

Siegele, L. (2002). *"How about now ? A survey of the real-time economy"*, *i*In: The Economist 362. pp. 18-24.

Simon, H. A. (1972). „*Theories of Bounded Rationality*", in: McGuire, C. B. and Radner, R. (edt.): Decision and Organization, Amsterdam. pp. 161 – 172.

Staehle, W. H. (1999). *Management - eine verhaltenswissenschaftliche Perspektive*, 8th ed., München.

Tapscott, D. (1999). *Creating Value in the Network Economy*. Harvard Business School Press.

Varela, F. J. (1979). *Principles of biological autonomy.* New York: North Holland.

Wolf, J. (2003). *Organisation, Management, Unternehmensführung – Theorien und Kritik*. Wiesbaden.