White box, black box and self-organization

A system-to-environment approach to leadership

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Abstract

Purpose – The purpose of this paper is to present two system identification models – "white box" and "black box" – as useful tools that help understand self-organization processes within and outside the organizations facilitated by leaders. Every leader is presented as a "systems designer" who plays a fundamental role in the process of self-organization, both within and outside the organization under study.
Design/methodology/approach – First, "white box" and "black box" system identification models are presented as a basis for an integrated model of the "system" and its "environment." Next, the ideas of "closed" and "open" systems as the prerequisites of self-organization processes are described. Finally, two basic leadership tactics as well as their combination are characterized and discussed.
Findings – Two system identification models give a complementary view to the reality, as they combine both reductionist and holistic perspectives. The argument presented in the paper shows that there is a far reaching complementarity of the two system identification models.
Practical implications – Since leaders need to comprehend complex adaptive processes taking place in the organizations and in their environment, they search for the best strategy to approach this task. The tactics presented in the paper could serve as a cognitive tools that help approach the reality leaders are immersed in.
Originality/value – The paper utilizes two categories that are well recognized in systems theory and cybernetics, combines them with the idea of self-organization and puts it all in the context of leadership. It provides an integrated, yet relatively simple cognitive scheme that may be of theoretical and practical use.

Keywords Open systems, Systemic thinking, Leadership, Self-organization
Paper type Conceptual paper

Introduction

> A systems designer or planner not only must construct systems that work harmoniously individually and in tandem, he must also know a lot about the environment that the system is intended to match (Hall and Fagen, 1956).

Reality is sometimes depicted as an ever-changing "system," which consists of other "subsystems." Such a system may present the properties of a self-organizing one (Ashby, 1962; Haken, 1983). It is also sometimes assumed that each "subsystem" is in fact an entity that mirrors all properties of the "system" under study, but at a lower level of analysis. In many fields of scientific inquiry – from physics to social studies – this assumption seems to underlie the general logic of investigation (Rowe, 2006; Meadows, 2008).

However, despite many attempts, the idea of a "system" itself has not been sufficiently understood and remains a subject of a reasonable and long-lasting dispute (Altmann and Koch, 1998; Backlund, 2000; Bailey, 1994; Banathy, 1996; Hernandez *et al.*, 2011; Hoffman and Lord, 2013; Laszlo and Krippner, 1998; Silberstein and McGeever, 1999; Thalos, 2011; Yammarino *et al.*, 2005).

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The ambiguous nature of the "system" is especially visible in contemporary leadership studies, where the world seems to be perceived as constantly evolving and thus posing major challenges to leaders. It is often argued there that since every organization may be viewed as a "system," and since leaders are the ones who influence reality at different levels – from ideological and psychological to procedural – the leaders' perceptions of "systems" determine the ways in which organizations function and adapt to the environment. Such an approach is presently widespread in leadership studies referring to the problems of complexity and emergence (Hazy *et al.*, 2007; Rowe, 2006; Uhl-Bien and Marion, 2008), and to the problems of ambiguity of the multi-layer and multi-dimensional relationships in organizations (Johannessen and Skålsvik, 2013). But what are the deeper roots of this reasoning, and what might be the consequences of such a rationale?

It seems that one of the ways leaders may cope with the world's growing complexity is the utilization of self-organization processes on various levels of social systems (Zelený and Hufford, 1992). In the paper it will be argued that every leader may be regarded as a "system designer" by definition. This "system designer" not only continues to define the structure of the surrounding "subsystems" (e.g. a "group" or an "organization"), and specifies its desired functions and operations, but also participates in the process of its modification (Geoghegan and Pangaro, 2009; Hall and Fagen, 1956). Leadership is defined as a goal-oriented interaction of the "system designer" with the system's environment, in which the "system designer" plays a fundamental role. One of the premises of this argument is that the constant interaction between the "system designer" and the "system" is dynamic and results in the adaptation of both parties.

Moreover, it is assumed here that if the leader is to succeed in the dynamic world (e.g. in terms of supporting the long-lasting capability of adaptive behavior of the people in the organization and the organization itself), the leader should make his or her vision as consistent with the structure of the projected reality and with the perceptions of people in the organization as possible (Ackoff, 1974; Hunt, 1999; Küpers and Weibler, 2008). At the same time, in order to influence reality, every leader first needs to envision the projected "system" to himself or herself. Only then is one able to present his or her ideas to others.

It will be shown that the problem with accurate conceptualization of the "system" reflects some of the most fundamental ontological dilemmas faced by leaders. These ontological problems pose further major epistemological problems, as they expose practical discrepancies in the logic applied by leaders. However, these ambiguities may also serve as a valuable source of insight into leadership practice. Thus, the appropriate definition of the "system" may not and will not be treated here as a technical problem or the issue of conventional "naming of objects," but as a part of the method aimed at dealing with leadership phenomena.

In consequence, it will be shown that the dilemmas generated by the idea of a "system," namely, whether one should consider an entity as composed of interlinked objects ("white box" model) or as a transformation tool ("black box" model) could be a useful heuristic for leaders while generating their particular visions of their organizations.

The argument will be presented on the basis of works presented much earlier and thus seems to be consistent with the basic conceptual frameworks of general systems theory and cybernetics (von Bertallanfy, 1950; Wiener, 1948). Hence some of the introductory statements might look like recapitulations of commonly known ideas. Still, these statements are necessary here as they could hopefully help understand some of the qualities of systems. They expose basic cognitive problems, which determine the decision-making processes of every leader.

System identification models – white box and black box

Many techniques of system identification are widely known and used (Åström and Eykhoff, 1971; Ljung, 1987). In engineering these are categorized and called the "white box," "black box" and "gray box" models of system identification. The white and black box models seem especially useful here, as they most clearly depict the qualities of leadership tactics discussed in detail later on. The gray box model may be considered as a mix of the white and black box models, and will also be discussed at the end of the paper, but only as a consequence of the analysis of the basic leadership tactics.

The illustration depicting a white box model is a direct representation of what a system is most often declared to be – a set of objects and relations between them. It always remains a decision of a system designer (here: a leader) to include certain objects into the system or exclude them, and such a choice may be either random, wholly arbitrary or subordinated to specific criteria (like organizational structure or the leader's goals). Figure 1 shows this idea – there are multiple links (arrows) between multiple objects (circles) in it. Although this is not presented below, the links may exist between all circles. Thus, each of the circles could be linked to all remaining ones, similarly to the circle in the middle.

In order to identify a system within a white box model, it is necessary to study the seemingly relevant behavior of observable objects and their relationships. This model seems especially consistent with philosophical reductionism, which entails the belief that larger entities are composed of smaller ones (Quine, 1951). The main methodological reason for such a standpoint is that if one possesses knowledge about the characteristics of basic elements of an entity, one finds a clue to understanding of its larger parts. This is a well-recognized assumption in contemporary particle physics (Braibant *et al.*, 2012; Close, 2004; Feynman *et al.*, 1964). A similar belief is inherent to many subfields of social sciences such as anthropology, economics, sociology and political science, and functions in a form of methodological individualism (Chmielewski, 2011; Hodgson, 2007; Udehn, 2001).

In the white box model every system exists only because particular relations and links are sustained between particular objects. In effect, in order to describe the operation of the system, one must define the nature of the relations between the objects constituting it. In short, if there is no "space" (relation) between the objects, there is also no possible link in the system. No cause-and-effect relationship may be identified or projected by a leader. For leadership students and practitioners this seems to be an essential issue – in many cases the leader will not influence the followers (and motivate them) if he/she is not able to identify them, understand the reasons for their behavior or observe the results of their individual actions. Moreover, the leader will not be able to

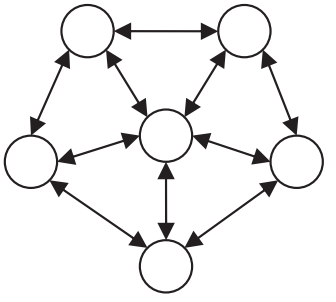


Figure 1.
The system as a white box

adapt his or her behavior in the organization if the individual actions of the organization's members do not have space to take place. But such is not the only possible logic of leadership processes, as there is also an alternative model of system identification.

The black box model is visualized differently than the white box one. In the black box model, the system is presented as all that is not its environment. Every system is usually pictured as a rectangle with two arrows – one pointing to it and one extending outwards from it. As a rule, one does not show the system's environment, although it is always a part of the model. Figure 2 shows the standard way a black box system is usually presented.

In the black box model it is assumed that one does not possess actual knowledge about the way the system operates inside, and sometimes there is actually no need to know anything about its inner operations. The environment is viewed here as a source of impulses toward the system and a field of reception of the system's reactions. In dynamic, self-referencing models, a feedback loop between the system and its environment is also included in the picture.

In the black box convention, the system is mainly defined in terms of its function of transformation. In other words, it is understood as the object with the ability to change "inputs" into "outputs." In this model, in order to understand what the system is, one actually needs to understand how the system operates, and uncover its characteristics as a means of transformation. The system's function is deduced from the input-output operations. In short, when studying the system in the black box model, one should be able to observe what goes into the black box and what goes outside of it. This precludes that in order to identify the system, a leader needs to be able to influence the behavior of the inspected entity (or totality) and observe its reactions. This viewpoint is consistent with philosophical holism, in which objects are described as indivisible units. The holistic perspective may also be found in physics, as well as in social sciences (Bohm, 1980; Phillips, 1976).

It is worth noting that sometimes the students of a particular system have no practical means of understanding the system, not only because of its high complexity or its emergent properties. Most frequently, the researchers stand before an epistemological problem stemming from the very fact that the system under observation interferes with the environment, which includes the observer. Interference with the system changes the system's properties. This may be compared to the phenomenon of measuring the quantum superposition, where a physical system (e.g. an electron) is thought to exist partly in all its theoretically possible states in a particular space-time, until its properties are measured (Peskin and Schroeder, 1995). More importantly, in the black box model, the system appears always in relation to its context, and it is not possible to identify it without referring to the environment. This provokes further theoretical questions.

System, environment and structure

In both system identification models, defining a specific system (e.g. a person, a group of people or an organization) equals dividing the reality into two separate parts: a

Figure 2.
The system as a black box

system and its environment. At first glance it might appear that since the environment is everything other than the system under consideration, the system is everything other than the environment. At this level of analysis one may imagine a system without any reference to the environment – they may both be pictured as separate. In fact, the environment may be considered only as a background for the system's operation (note the standard vision of a system as a black box shown above). However, at a closer look, this system-environment dichotomy does not seem so clear.

In the white box model, system functioning is determined mostly by a set of links between objects. In the following figure, the linkage with the environment is shown by dotted arrows (see Figure 3).

As an example, one may analyze the situation of a group consisting of 50 survivors on an island (gray circles). If the island had been uninhabited, almost all that could happen to the survivors depends on their actions and non-actions. Although they could know that there are other people somewhere outside the island, the "outsiders" have no direct influence on the survivors' life on the island. One can assume that the potential influence of the "outsiders" (white circles) on the survivors would be mostly a reflex of the survivors' memory. In this sense, the outer social environment may serve as a psychological incentive or obstacle to the inner one. For instance, if previous relations of the survivors and their families had been mutually positive, this might support the survivors' everyday attitude, e.g., by strengthening their day-to-day optimistic attitude and activity aimed at returning home.

On the other hand, in the black box model, the system exists only thanks to its connection with its environment. In fact, it is the mutual interrelation that constitutes the system and environment, and this changes the perspective on the system-environment dichotomy. In the black box model the mutual interrelation of the system and environment might resemble the one in Figure 4.

The idea behind Figure 4 may become more clear when a different perspective is applied to the example of survivors. If one compares the group of survivors to an indivisible system and the island to an environment, than what happens to the survivors depends as well on them as on the island (Mazur, 1976). Theoretically, the group of survivors influences the island as a whole. In practical terms, the group might decide to cut down trees, hunt animals, utilize the stream to mill grain, etc. In other words, the group might utilize the matter and energy of the island to improve the living conditions

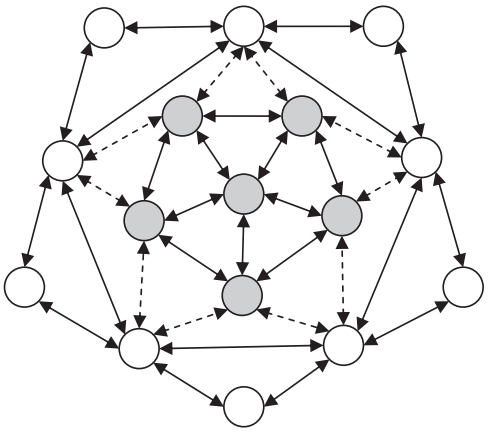


Figure 3.
System and environment – a white box model

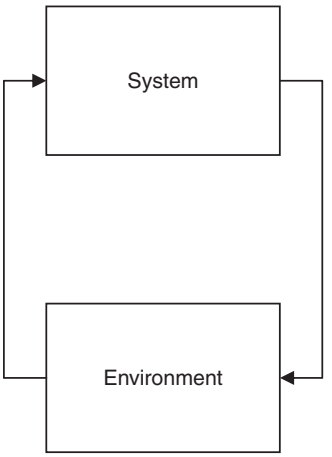


Figure 4.
System and environment – a black box model

of all and each of survivors. In turn, this would obviously change the structure and functioning of the island's ecosystem. On the other hand, the island influences the survivors' behavior, simply by constituting their living space at a particular time. The island forces the survivors to organize their daily behavior and frames the possibilities for actions. For instance, in effect of island's influence, the survivors might not be able to build a boat from the supplies present on the island at a specific point (e.g. if there is not enough trees), and would need to wait for the rescue team.

A closer analysis of Figure 4 draws attention also to other consequences of a black box model of system identification. The analysis shows that the set of possible options is finite here – there is seemingly nothing else than a system and its environment. This means that there is no other action possible than dividing either of these systems into smaller parts of similar features. This premise has been one of the building blocks of e.g. the Viable System Model, developed by Stafford Beer (1979, 1985). Beer assumed that the structure of reality could be modeled on the basis of self-similarity and recursive nature, and the interaction between the systems should conclude in their transition into a coherent meta-system, capable of sustaining in the ever-changing environment. This problem will also be addressed in the paper later on. However, the very logic behind Figure 4 also suggests something more fundamental that the system and its environment together define a "totality of the reality," including its basic structure. This argument may bring the leader to some interesting conclusions, some of which will be discussed further on.

Closed and open systems

According to many scholars, including Hall and Fagen (1956) and von Bertallanfy (1950), two kinds of systems exist – closed (or isolated) and open systems. Closed systems do not exchange anything and in any way with the environment – no influence of one on the other takes place. Conversely, open systems are always interlinked and communicated with the environment.

However, almost all systems seem to be more or less open. This is visible both on the theoretical and empirical level of analysis. On the theoretical level, the argument presented in the previous section suggests that an exchange always exists between the system and environment, as the system is co-created by the environment by input-output operations (a black box model). At the same time, every system may be composed of

many subsystems, which in fact makes it open, as it allows for many types of interactions of subsystems with the environment composed of other subsystems (a white box model). On the empirical level, it is also extremely difficult to observe an isolated system. Not only in quantum physics, but also in leadership studies one of the key epistemological problems is how to distinguish the units of analysis; in essence, how to isolate the system under study. We have not yet found a satisfactory tool that would help us draw an undisputable line between any particular system and its environment – the object of analysis and the rest of reality – and this has significant consequences on the definitions of leadership.

If one applies the black box model, leadership should be defined as the communication between the leader (or the system possessing specific qualities) and the rest of the world (or a singular outer system). If one applies the white box model, leadership should be defined as the process of communication between the leader and the followers (outer subsystems defined in plural). In the first case, one should focus on the factors that predetermine the leader's actions and reactions, such as cognitive schemes, vision, ideology, competences, etc., since the leader is treated as the "converter" of reality. In the second case, one should focus on the behavioral aspects of the relation between the leader and his or her followers.

However, the argument presented in previous paragraphs also suggests that only one closed system exists – namely, the "reality." If the system occupying the highest position in the hierarchy of all systems is called a "meta-system," it could be composed of two subsystems: a super-system and its environment. Its basic structure is similar to Figure 4. Consequently, it seems feasible to argue that the leader (a "super-system") could either act upon: the environment as a whole (a black box model), its specific parts (a white box model) or to combine different tactics at different moments.

At this point it should be noted that this model incorporates the totality and the partiality, and seems consistent not only with the reductionist view of reality, but with the holistic one as well.

Self-organization

The open nature of systems may have profound consequences for the way leadership is understood and practiced, since it gives the leader a space to utilize self-organization processes. However, two other assumptions should be made at this point. First, it should be assumed that leaders influence the way individual and social energy is utilized (Bailey, 1994). Second, it should be agreed that the law of conservation of energy still holds. According to this law, the amount of energy in an isolated system remains constant and energy can be neither created nor destroyed (Feynman *et al.*, 1964). Also, the energy exchange is permanent – every action upon a system finds a reciprocal and direct reaction in its environment. Consequently, if one assumes that the leader functions in a self-organizing field, the way the leader identifies the system automatically and instantly affects the way the energy is structured and utilized. This is called "a system-to-environment approach to leadership" and is a basis for the analysis of tactics available to leaders in subsequent paragraphs.

Conceptually, for every system identification model, distinct self-organization mechanisms should take place (Crossan *et al.*, 2008). This could be illustrated by the more detailed inspection of the already introduced example of the survivors on the island.

First, what could happen directly after the survivors landing on the island? Basically, they could try to live either in an unorganized or organized manner, which could be a subject of a conscious or unconscious choice. In the white box model, every

survivor could try to live on his or her own – individually gather food and water, build a shelter, signal for help, etc. At this level, self-organization processes would take place due to the existence of many survivors. The space of the island would be the total physical space of the self-organization processes. However, the scarcity of resources could make the daily situation hard to bear, and the probability of conflict between individuals could grow extremely high.

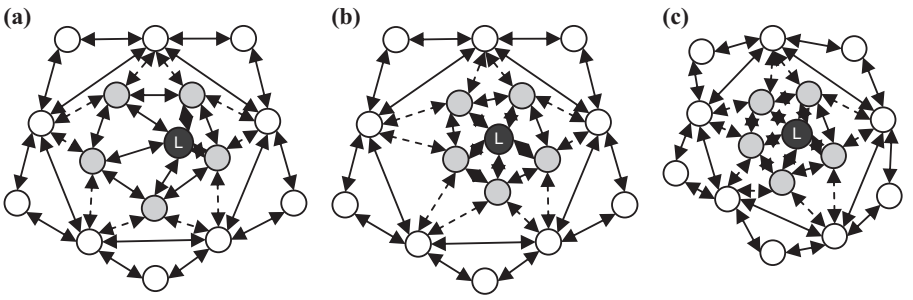
On the other hand, in the black box model, the survivors could consciously form a group through which they could try to cope with the scarcity of resources and unfavorable actions of particular individuals. In this model, the social space of the group would create additional space for the members' activity.

The leadership mechanisms would thus be different in each situation. In the first one, described by the white box model, leadership would probably emerge as the consequence of communication between particular survivors who observe others, and evaluate, e.g., the effectiveness of activity undertaken. Since everyone would be in almost exactly the same situation, the ones who would cope better with daily problems and challenges on the island could be perceived as better candidates for leaders. They could attract others basing on their individual yet comparable activity, since they, e.g., could show the effective way for survival. In the alternative (black box) model, the leader could emerge when communication problems in the group start. The one who, e.g., would find an adequate and effective way of communicating within the group could be the best candidate for the leader. For instance, the leader could facilitate discussion within the group, so that many standpoints and many competences could be revealed.

But would it make any difference whether the leader in fact perceived a number of unorganized followers (a white box model) or a community of survivors (a black box model)? Let the example of survivors on the island guide the argument further.

The leader on the island could be the one who understands that the only way of survival is to leave the island. Such a leader would motivate the rest of survivors to build rescue boats with him. Since the hypothetical leader has sailed around the world in the past and all of the survivors seem to know this, all could decide to split into subgroups, each with a specific role in the boat building process. Some survivors would be expected to cut down trees, some to cut lianas, some to search for food for expedition, some to gather the daily supplies and other to construct boats. The all-competent leader would instruct and train all groups in all necessary skills at each step of their tasks.

In a white box model the leader – the dark gray circle in Figure 5(a)-(c) – would move around the island everyday, talk with people in subgroups (light gray circles) and communicate what should be done at a particular stage of the process. The leader would



Note: L, leader

Figure 5.
Phases (a)-(c). The leader's interaction with the followers within the environment

decide whether the wood is of sufficient quality, whether the lianas are strong enough, whether the food is well preserved for a long journey and whether the boat is durable. The leader would also have a chance to understand the daily problems of the survivors and support their individual motivation. From the leader's perspective, people in subgroups would be more responsible for their actions, as personal communication with the leader would probably facilitate emotional relations with him. In effect, the leader would form a tighter bond with the followers. The penetration of the island in search for appropriate supplies and social processes would thus be easier to manage directly by the leader.

In that model, self-organization processes would take place predominantly outside of the relation between the leader and subgroups. For instance, the animals that had been living in the trees (white circles) might migrate to other parts of the island. In consequence, the structure of the situation between the system of survivors and the environment would also change – e.g., there might not be enough food for an escape. In this way, the mutual adaptation of different subsystems in the network (the leader, the followers and the animals together) would constitute a self-organizing process.

On the other hand, in the black box model, another type of self-organization processes might take place. Every action of the leader toward the group of survivors (considered as the community) might stimulate the reaction of the whole group, which in turn may affect the environment. In the example above, the same leader might work in a different way (see Figure 6). The leader might, e.g., gather every evening the whole group of survivors (community) and talk with them about the events of the day, discuss the state of the supplies and boat building process and finally, decide together with them what further steps should be necessary to leave the island. By doing this, all subgroups would be aware of the situation of the remaining ones.

In the black box model, the leader would focus on planning the action of the whole group and on the integration of the community. However, the communal decision-making processes would force the leader to share his or her knowledge and experience with the whole group, and make his competences disputable at the group level. Also, the actions of particular people would be less effectively controlled by the leader, and these people might not feel fully responsible for the final quality of the attempt to escape the island. This model makes the leader unable to directly manage the actions of individual people. They would be forced to decide on some parts of the tasks by themselves. The model suggests that perpetual feedback loops between the leader, community and environment would encourage self-organization processes at lower levels, namely, within the whole group (a community) and within subgroups.

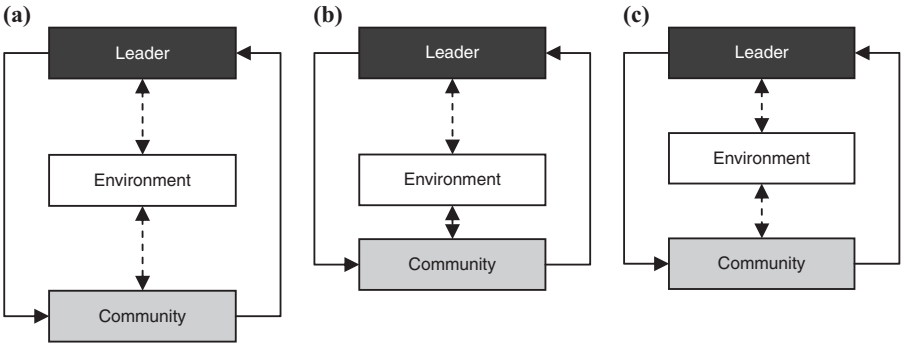


Figure 6.
Phases (a)-(c). The leader's interaction with the community within the environment

Note that in both system identification models, neither the type of relationship between the leader and the group of followers nor the one between the leader and the community is an everlasting one. In both models, the energy exchange should be constantly controlled, but at different levels and in different ways. In the white box model the leader could control the exchange by sustaining direct, interpersonal relationships with every survivor or subgroup. In the black box model, the control and evaluation available to the leader are parts of a more general social process. Consequently, in order to achieve predefined goals and optimize the potential operations of the system simultaneously, the leader should know how this control on different levels of analysis should take place.

Modeling the reality – two basic leadership tactics

The system-to-environment approach to leadership phenomena presupposes the existence of a constant, mutual interdependence and exchange between the leader, the system (regardless the type of identification model) and the environment. In the preceding paragraphs it was argued that system identification models pose ontological and epistemological problems. This section is devoted to the presentation of two basic leadership tactics, which gives the argument a more practical value.

The tactics utilize self-organizational processes and are based on a number of assumptions detailed as follows:

(1) the leader, the system and the environment are all the observable parts of reality – a totality divided into a number of subsystems;

(2) every system is open, since every system and environment are mutually dependent; and

(3) the leader, the system and the environment constitute a self-organizing structure, in which the leader possesses the capability for intentional action.

The leader may employ two kinds of tactics, which inherently work as a mode for self-organization processes. The two leadership tactics are:

(1) opening a system; and

(2) closing a system.

In essence, "opening a system" and "closing a system" means changing the nature of the system within the environment. When the leader opens the system, it becomes less distinct from the environment. When the leader closes the system, it becomes more distinct from the environment. Opening and closing the system triggers self-organization processes. Conceptually, self-organization processes take place in two ways: inside the system or in relation between the system and its environment.

A systematization of tactics and tools is presented in Table I.

In the white box model, the leader is by definition an "insider." He or she plays a role of similar nature to other objects in the system – his or her means of influence is based on the capability to communicate, attract and repulse other people in the system and in the environment. Here, leadership is the phenomenon that stems from the mutual relationships between all objects in the system, out of which the leader is the most influential one.

If the leader defines the system as a white box, he or she should mostly work on its internal structure – identify and operate (include or exclude) the goals, interests and competences of people (and other relevant objects of the system). The leader should design adequate links between the objects to make the desired mechanisms possible. Leadership activity toward followers should be subordinated to his or her knowledge

Table I.
System identification models and self-organization tactics

		Self-organization tactics			
		Opening the system		Closing the system	
		Objects	Links	Objects	Links
System identification model	White box model ("a composite")	Including new objects into the system	Weakening the ties between existing objects in the system	Excluding existing objects from the system	Tightening the ties between existing objects in the system
	Black box model ("a whole")	Neglecting and deconstructing the boundaries between system and environment	Extending the range and character of system influence in the environment	Sustaining and building the boundaries between system and environment	Limiting the range and character of system influence in the environment

about the characteristics of followers and other objects capable of action within the system. In this way, the leader should focus on controlling the inner structure of the system. This means creating and following appropriate standard operating procedures and organizational norms in the network, either hierarchical or flat. In the white box model, system structure (schemes, patterns and modes of action) seems more significant than human agency. In effect, this tactic gives rise to the self-organization processes mostly occurring between the system and the environment. In particular, the subsystems that constitute the environment, if left uncontrolled, would adapt to the system.

On the other hand, if the leader designs a black box system, he or she is an "outsider," who is capable of forming (shaping) a framework of reference for agents inside the system. The leader should focus on laying out the right boundaries between the system and environment and the links between the two. Such a framework would create the necessary space for other processes to emerge – unpredicted, but conditioned by the leader.

In the black box tactic, the leader should enable the system to work unattended and organize itself. This suggests that the leader should treat people in the organization as individuals with a broad scope of autonomy, leaving their goals and interests to themselves. The leader's main task should be to control the formation of the system's boundaries. In this model, it remains the leader's decision whether organizational goals and interests overlap and conflict with the ones of the organization's members or not. Nevertheless, a proper formulation of the organizational mission, consistent daily practice of the declared values by a leader, and creating an appropriate atmosphere of trust should all be equally important and help form the organization's identity. In this way, the leader should increase the chances of self-organization processes inside the system.

Combining tactics in leadership strategies

Should a leader rather think in a reductionist or holistic way, in a white box or a black box manner? What should be done in order to achieve the goals the leader envisions? The answer is: the leader should combine both tactics in a complementary way and seek synergy in the actions of people around him.

To accomplish the predefined goals, each of the leaders needs to answer three introductory questions: what to include and what to exclude from the system? How to define the system objects' boundaries? What processes should be controlled and what should be left unattended?

System identification models suggest that certain processes might render system consistent and stable (black box model), while other processes may enable the system to be flexible and dynamic (white box model). Combining the two basic tactics helps the leader design the system adequately – to enhance the chances for consistency and flexibility at the same time. In other words, the leader should seek balance between the "white box" and "black box," and find the shade of gray that would suit the predefined goals. Different shades of gray would be appropriate in different situations.

For example, in business, a leader of a start-up company would need to view the whole company predominantly in terms of its basic function, which could be the realization of goals determined at the beginning of the business process. In the reality of start-ups, the goals are supposed to be attained in the extremely turbulent situation both internally (within the organization), and externally (in the re-defined market situation). Frequently, many of the pre-stated visions of the company (e.g. regarding the business model), need to be re-evaluated by leaders and so the basic structure of the company would need to be transformed too. To the leader, it is frequently not important how exactly the business goal is attained, since the process is hardly traceable. Also the investors might seek for an integrated group of people, who would follow the clearly recognizable leader. This provokes the conclusion that a start-up company would probably benefit from the leader applying a black box model when it comes to the goal attainment strategy. It is the leader, who guarantees the company its stability, consistency and flexibility combined with dynamics.

On the other hand, an executive board of an already existing multi-national corporation would rather prefer the white box strategy, implemented by multiple leaders who are capable of implementing effective coordination and transformation procedures in the fragmented and autonomous structure of the company. In these cases, the flexibility and dynamics could be the result of the work of many leaders, who properly recognize the local market specifics and grant the local managers appropriate scope of autonomy, while presenting and sustaining a clear vision of what the common goals are.

Vitally, the suggested tactics have two major effects: stabilization and destabilization of the system. White box tactics are relatively easy to implement, provided that it is possible to identify important people in the leader's environment, as well as their individual goals, interests and logics of action. Still, this requires substantial effort and high-interpersonal skills, as well as adequately enforced procedures. Black box tactics appear suitable for all those situations in which it is possible to utilize the difference and exceptionality of the organization treated as a whole, as well as the vision of common goals, interests and the system's function in the environment.

If a system is "too closed," which means that the system-environment exchange is radically restrained, the system may continue to evolve until the internal self-organization process stops. In effect, both regulatory processes might end up with system malfunction or even system disintegration. When the system hardens its structure, it also lowers its innovation and adaptation capacities. On the other hand, if a system is "too open," which means that the system-environment exchange is radically increased, the system continues the self-organization process within its environment. Thus, the system evolves toward dissolution within the environment.

In this situation, the main task for the leader is to determine what the system should do. This is the main reason why the leader should have a vision. Once the leader knows the system's purpose, he or she will be capable of deciding what is really important for the system's proper functioning, what should be included and what should be excluded, where the boundary lines should be drawn and what should be controlled.

Simultaneously, there is a constant need for the leader to recognize the way in which people in the system (organization) see reality, as well as how do they understand the relations within these system and between the system and the environment. The leader should know whether these perceptions of the reality in the organization stems from a white box model or from a black box model. The leader should be cautious and conscious of what parts of reality are seen in the organization in either way, and thus, what is expected to be controlled by the leader or not. Such knowledge enables the leader to shape people's ideas and perceptions, in order to enhance the coherence and chances for future effective action.

Finally, at the most fundamental level, once the leader decides to change the system and environment, he or she should be ready for a constant change of his or her own perceptions, even if it is a demanding endeavor. A radical view of the system-to-environment approach to leadership suggests that even a slight change in the way the leader perceives reality affects the way this reality works. Thus, even a slight paradigm shift would change the leader's daily perception of reality and – in effect – his or her capability of changing the organization. Once the leader's consciousness is changed, so is the leader's behavior. Once the leader's behavior is changed, so are the perceptions of individual people and the operations of the organization as a whole. Once individual perceptions and operations are changed, so is the way the environment functions in relation to the organization.

It seems that there is a thin line between a problem and a challenge in a self-organizing system. Between the two, there is space for leadership.

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