

The quality of an organization management as a complex adaptive systems

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Abstract

Organizations belong to the class of complex adaptive systems (CAS). The article presents system models (structural and functional) of an organization and connections with the environment, as well as identifies and characterizes its fundamental attributes of the system and the critical conditions for survival and development of natural, economic and social aspects. On such basis the author defined management and quality management of an organization and gave his interpretations in terms of key system attributes and critical conditions for survival and development. Due to non-variant key attributes and critical conditions considerations are significant for organizations of all types and sizes.

Paper type: conceptual article

Keywords: complex adaptive system, organization, metamodels, management, quality of management

Introduction

In terms of a system, organizations belong to the class of complex adaptive systems (CAS). As such, they have some of the key attributes of a system, and to continue and grow must meet critical conditions regarding the state, dynamics and richness of information resources and non-informative, in natural, economic and social aspects.

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The article presents the systemic patterns of organization (structural and functional), its connections with the environment, identifies and characterizes the fundamental attributes of a system and the critical conditions for survival and development. On such foundations management and quality management of an organization were defined and interpreted in terms of key system attributes and critical conditions for survival and development.

Due to non-variant ability of key attributes and critical conditions contained in the article considerations are relevant to organizations of all types and sizes.

The article focuses on the usefulness of epistemological research, which combines well with the constructivist approach (with the appropriate use of induction and deduction).

1. The organization as a complex adaptive system

The organization is a hosting entity. A hosting entity is a separate object in the social and economic and natural environment, which is a collection of resources, personal and impersonal, oriented on the duration and development and cultivating values. Appointed by the founder to meet some of the needs, expressed in the form of an order. The header is implemented in the context of cultivation, forming together with them the organization theme.

The organization – like every collection – has limits and internal structure.² This includes real and conceptual resources. Personal resources are objects in the form of social roles, resources, non-personal objects to the material-energetic objects and conceptual (information) other than the established theme/goal³ and social roles. Collectively ordered motive/purpose implies coexistence of characteristics of totality, complexity and systemic character (see Krzyżanowski, 1992, pp. 125–130). Models of metastructure organization are shown in Figure 1 and Figure 2.⁴

Imposing a theme/goal orients an organization towards the effectiveness of its implementation and its efficiency. Only organization lasting in a natural social and economic environment can implement a theme/goal efficiently and effectively, which requires the ability to adapt and grow. Living systems that belong to the class of open systems possess such abilities. In terms of systemic organizations – as hosting subjects – they are open systems. Primary features of open systems are: (1) separation, (2) penetrating zone boundaries, that is, input and output (3) flows through the input and output, i.e. the impact, (4) transformation of inputs to the outputs. Each organization possesses such features.

² The collections from the collective mathematics, see Pietruszczak, 2000.

³ Theme to ... /orientation theme.

⁴ As to limits of an organization from the perspective of a complex adaptive system, see Nowak, 2014, p. 131.

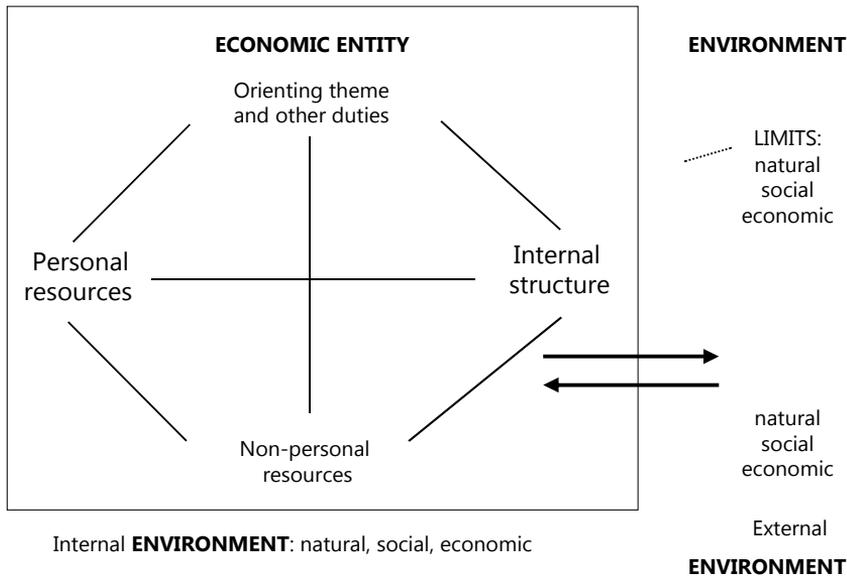


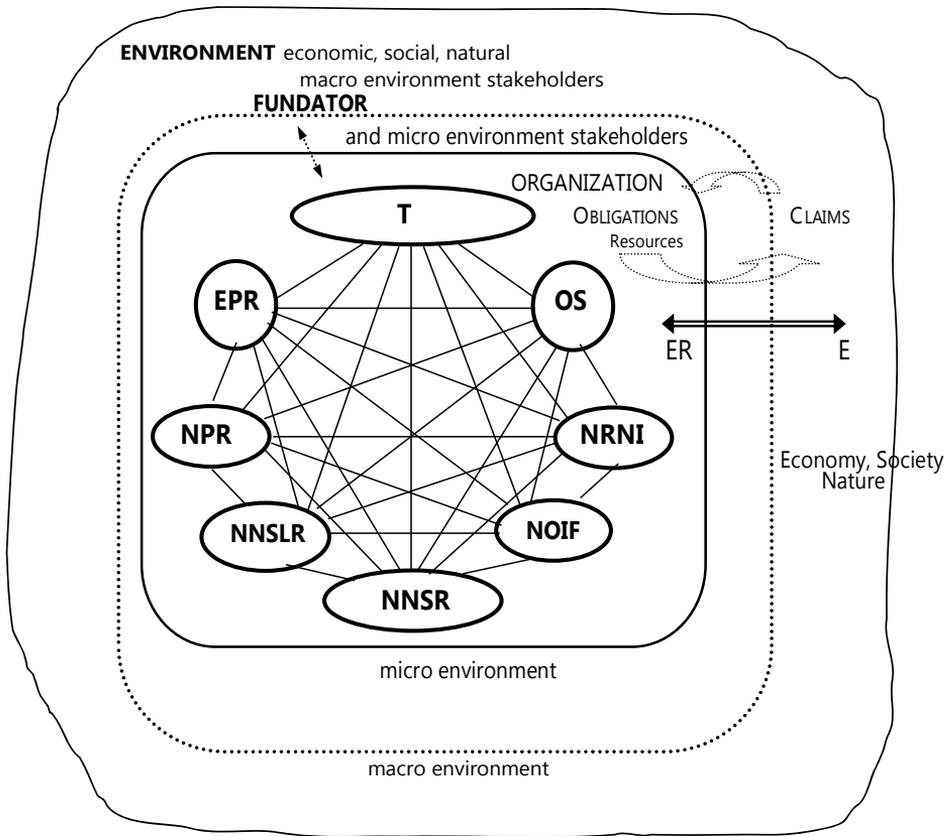
Figure 1. *Metastructure defines the organization as a subject of economic subject.*

Source: based on Nowak, 2010, p. 232.

Organizations are among the class of living systems (living systems) (Miller, 1978, Section 4.2.9; Parent, 2000), which is a subclass of complex adaptive systems (CAS) (Gell-Mann, 1994, pp. 20–21, 297). Secondary features of living systems – in short, the secondary features of a system – that is the secondary characteristics of system organization are: (1) limit, (2) feedback, (3) cyclical nature of an operation, (4) negative entropy, (5) homeostasis, (6) propensity for growth and expansion, (7) the harmonization of homeostasis and adaptability, (8) equifinality (Katz & Kahn, 1978, pp. 23–30, for Robbins, 1990, pp. 15–19). A special feature of an organization is the extensive use of money (medium of exchange), as a factor determining flows through the input and output. Models of the dynamics of an organization are shown in Figure 3 and Figure 4. The model shown in Figure 4 illustrates the immanence of stakeholders and their categories and types of inter-organizational relations that determine the formation of markets.

In terms of secondary system features, critical terms of duration and development of an organization will be (Nowak, 2014, p. 130):

- **prerequisite exchange capacity**, which is the proper intensity and a continuous stream of suitable medium of exchange/cash (*exchange capacity*),
- **sufficient condition of possible negative entropy and stable state** (stopping entropy, negative entropy), or the ability to generate adequate surpluses of objects import from the environment over their consumption and export from the environment (negative entropy + homeostasis + adaptability).



- T theme orientation (founder's need, which is satisfied and inspires the creation of an objective pursued in the framework of cultivated values),
- EPR executive (managerial) personal resources (the dominant internal stakeholders),
- NPR non-executive (non-managerial) personal resources (non-dominant internal stakeholders),
- NNSR non-personal non-informational substantial resources,
- NNSLR non-personal non-informational substance less resources,
- NRFI non-personal resources of financial information,
- NRNI non-personal resources of non-financial information,
- OS organizational structure, which is a collection of its internal formal and informal relations, including calculating relations,
- ER relations with the environment, including relations of calculation,
- E environment/economic, social, natural environment.

For eight elements:

The number of internal relationships = $[n(n-1)]/2 = [8(8-1)]/2 = 56/2 = 28$
 The number of internal interactions = $n(n-1) = 8(8-1) = 56$

Figure 2. Operationalized octagonal organizations' metastructure.

Source: Nowak, 2014, p. 128.

It should be noted that the necessary condition is a part condition for the survival and development of an organization. A complete condition is a sufficient condition. Functioning of an organization requires both conditions playing a role of imperatives, initiation of implementation which follows the principle of spontaneous self-regulation. In addition, organizations as complex adaptive systems have a general tendency to develop, which may be followed by learning, evolution, replication and/or aggregation of existing organizations with the use of favourable opportunities (Gell-Mann, 1994, pp. 19–21, 241–242). Aggregation of organizations leads to composite organizations, having the same system characteristics as a singular organization. Within composite organization exists coadaptation which involves simultaneous competition and cooperation of component organizations.

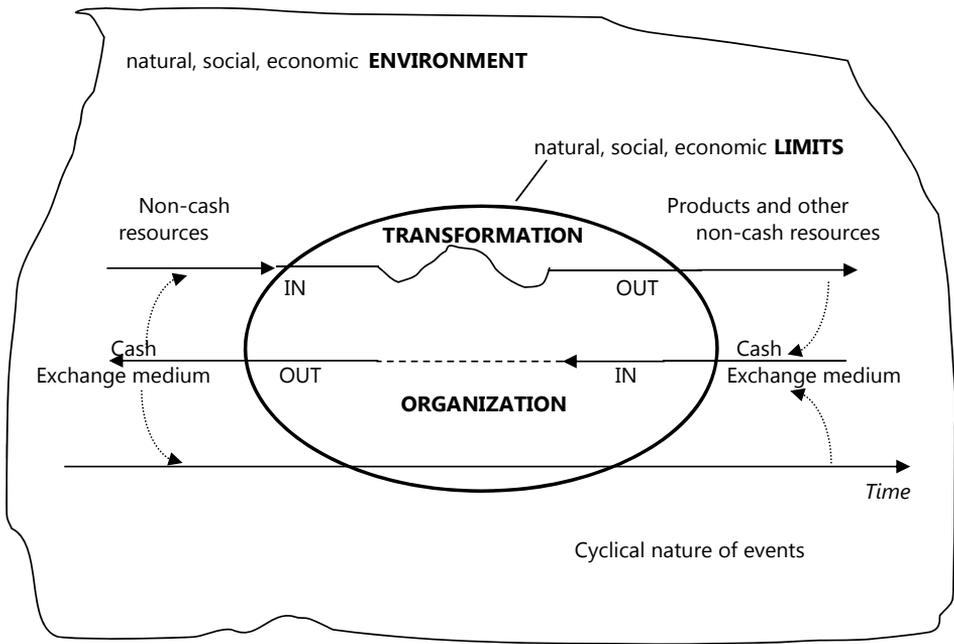


Figure 3. *Metamodel of an organization as a living open system/Process metamodel of an organization.*

Source: based on Nowak, 2010, p. 238.

2. Shaping an organization as a hosting entity

The impact on the form and functioning of an organization can take place only by means of shaping elements of a metastructure and flows within it. Such shaping requires observability – direct or indirect – and controllability, states and dynamics of characteristics significantly related with these elements and flows. Such characteristics constitute tertiary ones, superstructured system features on the primary and secondary ones. Nine characteristics of the tertiary system can be distinguished, due to its emergency, immanence and relevance called key features of the system or the fundamental attributes of the system (Nowak, 2014, p. 127). These features include: (1) identity, (2) structurability (3) periodicity (4) wealth, (5) being obliged (6) gratification provision (7) surplus creativity (8) self-description (9) the ability of signalling and communication (Nowak, 2014, p. 127).⁵ These features emerge in the formation of an organization and disappear with its collapse. Any existing organization possesses them. They are attributes of an organization as a whole, in the economic, social and natural dimensions. Their states are interrelated: the change in the status of one of them involves a change – significant (material) or immaterial (immaterial) – of the status of the remaining ones.

As system ones they are invariant with respect to place, time, size and orienting theme of a hosting entity/organization. Each feature includes a plurality of components constitutes a multicomponent.

The collection of fundamental states of system attributes (key system features) for a given moment of time is the system position of an organization or – the location of a system, the situation of the system, briefly – position, location, situation. The change in time is dynamics, therefore repositioning of an organization is its dynamics. Orienting factors of a system position of an organization will be imperative terms of duration and development of a complex adaptive system. From the perspective of the tertiary system features such conditions take the form as follows (Nowak, 2014, p. 130):

- **the condition of necessary gratification provision** (*necessary liquidity, possibility of the necessary exchange, necessary condition*) – adjustment of gratification provision (ability to pay) for collected resources and accompanying obliging, that is, the intensity of proper and adequate continuous stream of medium of exchange/cash (exchange capacity),
- **condition of sufficient surplus provision** (*sufficient surplus, deterring entropy, satisfactory/sufficient condition*) – adaptation of surplus provision to collected resources and accompanying obliging, thus the ability to generate

⁵ Communication as an action in the sense of communication by Habermas (1999, pp. 180–190). According to the systems approach, case study as a research method should include the states of these attributes and their dynamics.

adequate surplus of imported resources over used and exported resources (negative entropy + homeostasis + adaptability), and adaptation of self-report and signalling to the information needs of stakeholders and effectiveness of communication with them.

It should be emphasized that the initiation of the implementation of these mandatory conditions is based on the principle of spontaneous self-regulation, then

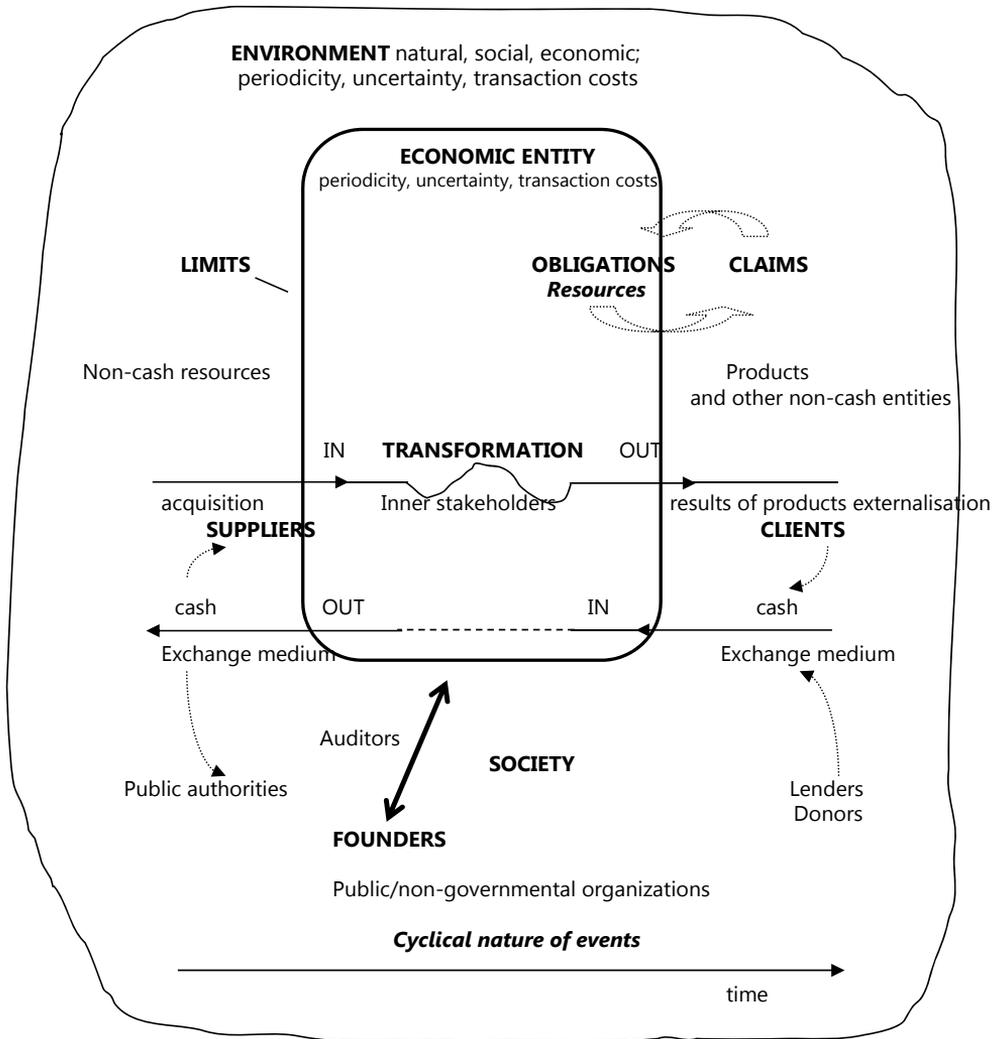


Figure 4. Operationalized metamodel of an organization as a living system with a determinant (medium) of exchange in the form of money/Process metamodel of an organization.

Source: based on Nowak, 2014, p. 129.

modified effects on the states of the fundamental attributes of the system. These interactions have their sources both inside (within) hosting entity/organization and outside it (in the environment). Some of them are observable and controllable, only part of them observable and part unobservable. Observability makes it possible to generate information, and this allows one to control.

It is worth highlighting that the information is the foundation of the operation of complex adaptive systems. Their inherent feature is collecting and disposal of data and information, forming maps of the world and keeping them within the boundaries (Gell-Mann, 1994, pp. 23–24, 154–156). It is completed in the mode of self-creation of an internal self-subsystem, which on the basis of inspection of the reality of the inner and outer reality abstracts constructs, concepts and patterns of action, organizing them into specific images, revised with the impact of the influx of new observation data (this is a complex adaptive system) from inside and – through the input and output areas – its environment (Gell-Mann, 1994, pp. 23–25, 154–156, 242, 318, 370, 373–374). This is the kind of a particular information as a result and basis for overview/self-report and prediction of reality as well as forming behavioural patterns by a complex adaptive system. The ability of a complex adaptive system to create schematum is emergent in nature i.e. it arises, develops and disappears with it. It is a product of the inherent properties of any complex adaptive system, oriented towards absorption and transformation of the data stream.

3. Management

For the survival and development as well as the implementation of orienting theme, special importance will be paid to intentional impact on the states of the fundamental attributes of the system to determine the intended position of the system entity/organization. Like any other impacts, intentional impact may have its source within the organization or outside it, or inside the organization or outside it. System position of a hosting entity/organization can be formed only by changing the states of the fundamental system attributes. Just the regulation of these changes is the subject of management.

Management is the system of empowered intentional inner shaping, or omission of forming the impact or cover, aimed at states and the dynamics of the fundamental attributes of the system, to fulfil critical conditions for survival and development and the implementation of orienting theme, or to bring these states to the levels preventing further existence. Targeting management impacts and covers is presented in a tabular form (Table 1).

Table 1 *Targeting management impacts and covers*

Fundamental system attributes	Areas		
	Economic	Social	Natural
1. Identity			
2. Structurability			
3. Periodicity			
4. Abundance			
5. Obliging			
6. Gratification provision			
7. Surplus creation			
8. Self-report			
9. Ability of signalling and communication			

Management requires observability and controllability of essential components of the fundamental system attributes, in all three areas of a broadly understood environment, that is the economic aspect, the social aspect and the natural aspect.⁶ It also requires determining the status and dynamics of the desired and real ones, and shaping the trajectory of their arrangements.⁷ This implies the need to plan (in different time horizons), determination of the current state and the regulation in management (management control). The realization of this need is supported by the information system of an organization, which critical component constitutes accounting.⁸

4. Quality of management

The concept of “quality” has two general meanings. In the first sense, the quality is a distinguishing feature or characteristic of an object and in the other – the quality is a collection of features and characteristics of an object, allowing the formation of specific relations with highlighted objects in the environment.⁹

⁶ Each of these aspects is the size of the sub aspects.

⁷ From the perspective of systems theory, management is the control of the organization, in the narrow sense – economic control rooms.

⁸ Accounting allows mapping and prediction, in terms of the medium of exchange (money), conditions and dynamics of the fundamental attributes of the system (Nowak, 2010, pp. 246–254).

⁹ According to ISO 8402–1986 “quality is generally the features and characteristics of the product or service to meet the needs stated or implied.” ISO 9001: 2000 quality is “the degree to which a set of inherent characteristics fulfills the requirements,” wider Wawak (n.d.).

As to the first, the quality of management – defined as in the previous point – is furnishing management system with features and characteristics suitable for the impact on the fundamental attributes of the system, individually and collectively. In the second meaning it is understood as the measures of the scope and structure of that remuneration. In the second sense, the quality of management is the degree of compatibility with a collection of features and characteristics of the management system with the dynamic position system of an organization. Understood as measures of quality management are: the degree of implementation of the condition necessary to gratification provision, the degree of implementation of the condition sufficient surplus provision, and the degree of realization of the orienting theme. It should be emphasized that both aspects of quality management refer to each of the existential areas of an organization, that is, areas: economic, social and natural.

At the social level, the stakeholders of an organization (Figure 4) form a system of social activity. According to the functionalist sociological theory in terms of Parsons (1961, pp. 369–372), each system of social activity has four functional imperatives, it is the function of adaptation, the function of achieving the objectives, function of integration and function of cultivating designs. Each of these functions contains a proper medium of exchange: adaptation – money, achieving goals – power, integration – influence, cultivating patterns – duty (to oblige, values). Management affects the scope, manner and degree of implementation of these imperatives and the shape of their respective media of exchange, i.e. money, power, influence and obligations of stakeholders. Quality of the management in the social area can also be measured by the scale of its impact on the status and dynamics of the exchange media stakeholders.

Moreover, one should pay attention to the cost of quality management. Congruence management system for dynamic position system requires prevention of insufficient compatibility with the adequacy and levelling effects of that failure prevention. Prevention includes shaping the management and the current detection of the degree of its adequacy (audit), and require the levelling effects of the failure of this system occur inside and outside the organization. Both prevention (formation and detection), and offsetting the effects of failure (internal and external), requires an appropriate use of resources, which entail costs (these are the monetary measure of resource consumption). The costs of quality management is the sum of the costs of prevention and costs of failure. They reach a minimum when prevention costs and costs of failure are equal, which results from the theory of quality costs (e.g. Nowak, 2001, pp. 556–259).

Conclusions

The application of systems theory approach allows one to define the fundamental design and system attributes of an organization and the critical determinant of its survival and development. Through this it becomes possible to formulate the definition of system management and quality management as well as the concept of quality cost management. These results are universal and apply to all organizations. They shed new light on the nature of organization and management. At the same time they are susceptible to the operationalization.

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