The Performance of Social Systems

Perspectives and Problems

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Chapter 9

Distributed control in social systems

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1. INTRODUCTION

The performance of social systems is an object of continuous theoretical debate and of manifold practical conflicts. Many approaches to defining criteria of performance and techniques of measurement have been developed and applied. The fact that the attempts are multifarious indicates that the domain of inquiry at hand is still at an immature stage, with pragmatism and eclecticism dominating the mainstream. Experts have called the subject area an "enigma" (Cameron 1984) and ascertained "a paradox of performance: organizational control is maintained by not knowing exactly what performance is" (Meyer & Gupta 1994: 309). Anyway, also some promising approaches to the conceptualization of organizational performance have emerged (e.g. Venkatraman & Ramanujam 1986, Bamberger & Fiegenbaum 1996). For an overview on the discussion, see Meyer & Gupta 1994 and Lumpkin & Dess 1996.

In the present paper, an effort is undertaken to contribute to the ongoing discussion on the grounds of socio-cybernetics, - more specifically to organizational cybernetics, which has also been called "the science of effective organization" (Beer 1979). Organizational cybernetics is a science which applies principles and models of cybernetics to the design, control and development of organizations of all kinds.

The aim of this paper is to present a Model of Systemic (Self-) Control, and to combine it with the Viable System Model, in order to achieve a framework for distributed (self-) control leading to higher organizational

fitness or intelligence, and therewith enhancing sustained superior performance.

2. DIMENSIONS OF PERFORMANCE

The limited view which conceived organizational performance exclusively in economic terms has given way to a more differentiated understanding a long time ago. Systemic approaches have emphasized that organizations are systems made up by diverse constituents, - the "stakeholders" whose "stake" in the organization is a function of their specific perspective (Cf. Freeman, Mitroff). Stakeholders incorporate different values, goals and interests. In principle, the performance of an organization can and should be measured continually in relation to these different perspectives. This is necessary because ultimately an organization is only viable as long as it is legitimate. Legitimacy is only given if the legitimate claims of the major stakeholders are fulfilled (Schwaninger 1989). The set of stakeholders varies from organization to organization. For private companies, it usually comprises the customers, staff, sponsors/owners, state, and the public.

This stakeholder perspective leads to a multidimensional conception of organizational performance. A logically sound approach to measuring the performance of organizations is based on the value or benefit they create for the different stakeholders. A distinction in this sense would be:

- Product/service benefits (to customers)
- Economic benefit (to sponsors/owners and customers)
- Social benefit (internally to staff, externally to society, including state and the public)
- Ecological benefit (to nature and society including future generations)

To analyze distinctions of this type is a task undertaken by other contributions to this book.

For this paper an other focus has been chosen: The aspect of control for superior performance, with an emphasis on the self-control of complex social systems. It can be anticipated that this is a multilevel and a multi-recursion issue. With the attribute *multilevel*, a crucial aspect of organizational control is addressed: There are always several logical levels of control, with the higher logical levels exerting a pre-control function with respect to the lower ones. The attribute *multi-recursion* expresses the cybernetic insight that viability is a recursive property of complex systems. Viability resides in (self-)control being a distributed activity (one can even talk of *property*), recursively exerted along the "fronts" on which the complexity confronted unfolds.

3. A MODEL OF SYSTEMIC CONTROL

This section will deal with the multilevel issue of control just mentioned.

The cybernetic concept of control embraces regulating and steering of a system in order to achieve its purpose or goals, or in a more limited sense, to carry out its tasks or activities („what it has to do“ or „what it does“). In all of this, the aspect of intrinsic control (“self-control”) is more important than that of extrinsic control (cf.: Geyer/van der Zouwen 1978 I: 2, Schwaninger 1996, Espejo et al. 1996)³, an aspect to which I shall revert later (section 4).

Effective (self-) control implies a dynamic equilibrium, at a satisfactory level of performance, between a corporation (or an organisational unit) and the milieu in which it operates. But which variables define adequate performance?

Traditional corporate control models take their bearings largely or exclusively from the goal of „profit“; i.e. they are economic. It has been demonstrated that such models no longer meet today's requirements. Under the „evolutionary pressure“ of increasing complexity and turbulence the criteria of competent management are rather defined in terms of a comprehensive organizational fitness or intelligence⁴.

In this context, a Model of Systemic Control has emerged. It is based on the insight that one and the same system must govern itself with the help of control variables that may contradict each other because they belong to different logical levels: the levels of operational, strategic, and normative management (Schwaninger 1989, Gälweiler 1990).

³ If Heinz von Foerster (1984) designates social systems as „observing systems“ as opposed to „observed systems“, he therewith addresses such aspects as self-control, self-reference, self-organization and self-transformation, - which are among the main concerns of organizational cybernetics (cf. Schwaninger 1994a).

⁴ An intelligent organization shows the following faculties (Schwaninger 1998):

1. to adapt to changing situations,
2. to influence and shape its environmental milieu,
3. if necessary, to find a new "playing field" or to reconfigure itself anew with its environment, and finally,
4. to make a contribution to the viability and development of the larger whole(s) into which it is embedded.

Figure 1: Goals and orientators at different logical levels of management

As shown in Figure 1, there are interrelationships between these levels. Particularly, the control variables of the higher logical levels exert a pre-control influence on those of the lower levels. This has been outlined and specified elsewhere for the case of business organizations in a more detailed way (Schwaninger 1989, 1993).

In section 2 it has been outlined, that the general goal at the operational level is creating value for the stakeholders of the organization (particularly customers, personnel and owners). Specific control variables to achieve this are customer benefit, social and ecological benefits, and shareholder value.

The traditional steering models of firms for example were almost exclusively orientated towards profit and liquidity. But profit behaves in an inherently short-term-mode, and its level is largely predetermined by parameters of another nature (just as liquidity is largely predetermined by profits). The importance of this predetermination or pre-control expresses itself in the fact that – according to comprehensive empirical studies of more than 3000 business units (PIMS database: cf.: Buzzell/Gale, 1987) strategic variables account for 70% of the variance in the ROI (Return on Investment), while only 30% is explained by variables representing operative decisions and tactical skills. In a similar vein, a study of a sample

Fortune 1000 firms leads to the conclusion that the impact of organizational factors on profit rates is twice as high as that of economic factors (Hansen/Wernerfelt, 1989).

Good managers have always known that the attainment of operative goals is bound to preconditions that have to be created in advance. Practitioners

and writers in many domains of management have become aware of this, more and more. Tentatives have been made, to link the operative and the strategic logic, e.g. in production (Underwood, 1994), logistics (Bowersox et al., 1992), and marketing (Kotler, 1994). Beyond that however, there has emerged a comprehensive theory which provides access to the relevant higher-order criteria.

The value which a company can generate is largely predetermined by the value potentials created beforehand. Value potentials are defined as the set of all applicable business-specific prerequisites (e.g. in the form of resources, competencies or capabilities), that must be fulfilled when value is to be provided (In extension of: Gälweiler, 1990). They represent operational and calculable categories. Their patterns of behaviour can be foreseen and influenced („controlled“). Value potentials must be controlled separately from value, on the basis of independent criteria.

Research on strategic management has clarified the nature of these criteria and shown, for instance, how to apprehend the critical success factors (such as market share, relative market share, quality/-customer benefit, cost/price, speed, flexibility etc.) in a given business system (for details see: Buzzell/Gale 1987). With the help of the PIMS database and a statistical toolbox for quantitative analysis, valuable conclusions about the strategic position of a business and the actions to be taken can be derived. However, such a calculus remains in the domain of *extant value potentials* and is therefore of limited usefulness in turbulent environments.

The management of *new value potentials* includes changing established patterns, taking into account the dynamics of customer problems, problem solutions, technological substitution along the value chain. This involves a sustained long-term effort for innovation, and it often requires a redesign of the business system. Hamel and Prahalad (1994) have emphasized, that too much of strategic efforts rests on established modes, while the essence of genuine innovation is rethinking the system completely, which often leads to the emergence of new modes of doing business, creates new opportunities and may reshape entire industries.

For strategic business units a mature methodology has become accessible. This methodology has made more transparent and controllable the essential variables of the strategic level - as, a long time ago, bookkeeping did for the operational domain. Gälweiler (1990) for the most part, but also Porter (1980, 1985), Schwaninger (1987, 1989), and other authors have elaborated on this methodological concept. The support for strategy at the corporate level has grown into a relatively mature methodology as well (Pümpin, 1991; Hamel/Prahalad 1994; Schoemaker, 1992), although the heuristic devices available must rest more general and abstract. The main idea is building and strengthening core competencies - or capabilities - to ensure new value potentials.

Long term empirical evidence and solid conceptual reflection (cf.: Utterback 1994) cogently suggest that organizations must consistently embrace innovation, even when this appears to undermine traditional strenghts. The respective authors plead for continually renewing core capabilities, while abandoning the logic of past successes: Innovating incrementally is not enough, because in the long run, the regeneration of a corporation's business relies on radical innovation. A "strategic architecture" is needed, "that is less concerned with ensuring a tight fit between goals and resources and .. more .. with creating *stretch goals* that challenge employees to accomplish the seemingly impossible" (Hamel/Prahalad 1994: 23). In the language used here, the requirements of building up new core competencies to ensure new value potentials may contradict those of extant value potentials, but in the long run, it must have priority, if viability is to be warranted.

To resume, in broad outline, profit is not a strategic control variable, and consequently not a strategic aim either. Rather, its appearance or absence is a consequence of good or bad strategies. This divergence from the traditional view, which regarded profit (or other monetary values statically related to it) as the fundamental corporate objective, has also been expressed to a certain extent in more recent attempts to integrate finance theory with strategic considerations. The methodologies developed for assessing shareholder value of companies calculate net present value, which is derived from discounted future free cash flows, a corporation can potentially generate at a certain point in time, in function of possible strategies (cf. Rappaport, 1986; Copeland/Koller/Murrin, 1994). The crux in these assessments is not - as it may seem - the calculus, which relies on more sophisticated accounting techniques, but the proper knowledge of the variables pre-controlling profits, and their interrelationships.

Meanwhile, insights into the referents of normative management have also improved. The research which has led to this is primarily based on systems theory and cybernetics and once more presents independent criteria for the assessment of the viability and development of organisations. Viability, understood as the ability to maintain a separate existence (Beer 1979: 113), i.e. a distinct configuration which makes a system identifiable as such, can be assessed on the grounds of structural considerations which are not bound by the orientators of the strategic and operational levels.

To date, the most advanced theory for assessing the viability of an organisation in functional terms is Stafford Beer's VSM, - to be outlined in section 5. This model is an excellent device for diagnosing and maintaining the degree of viability of an organization, independent of the steering criteria of the lower levels (strategic and operative).

As far as the „soft factors“ of organisation are concerned - referred to under the common denominator of „culture“ - some models have been elaborated which, for the time being, appear more appropriate for description

and diagnosis than for design purposes (e.g. Deal/Kennedy, 1982, Schein 1985). Beyond that, the emerging paradigms of the „learning organisation“ (cf. Argyris/Schön, 1978; Senge, 1992) and of organizational knowledge (cf. Nonaka/Takeuchi 1995) are about to outline a developmental and transformative orientation to structure as well as to culture.

From a systemic point of view, however, we can adopt the position that an organization must and should aim at *viability beyond survival*. Systems thinkers have become more interested in designing evolving structures, in which an organization's identity may completely change, than in sticking to viability in the narrow sense; this, after all, has often led to the self-maintenance or self-production of systems which show a disfunctional behaviour vis-a-vis the larger wholes into which they are embedded. This negative effect on the larger whole is referred to sometimes as „pathological autopoiesis“⁵ (cf. Beer 1979). Progressive managers are increasingly adopting a systemic viewpoint in which they enlarge their reference system, eliminating narrow boundaries: This is corroborated by the growing rate of economic, juridical and structural transformations of companies with the aim of creating new viable organizational entities. „Development“ in the sense used by Russell Ackoff is a good term for such viability beyond survival.

At the level of development - defined as a system's growing ability and desire to fulfil its own and others' needs (after Ackoff, 1994: 65) - the quest of an organization is in fact viability beyond survival. At this level, indicators become even more hazy. Yet social system theories provide important insights to diagnose a system's propensity for development, as a function of its ethos (e.g. openness), and the pattern of a system's trajectories or dynamics: criteria such as catalytic reinforcement, instability, consensus, self-governance and learning help to judge whether a change process qualifies as „development“ or not (cf. Etzioni 1968; Jantsch/Waddington 1976).

In sum, the field of indicators at the normative level is multifaceted; social, political, cultural and ecological aspects have to be taken into consideration, giving adequate space to ethical and esthetical concerns for the pursuit of ideals such as beauty, truth, good and plenty (cf.: Ackoff 1981). Multiple constituents and viewpoints ascribe different purposes to a social system, which leads to an emphasis on different criteria of fitness. For a corporation to be viable in the long run, the legitimate claims of these different stakeholders must be met adequately (Cf.: Kotter/Heskett 1992).

The concept of „control“ which applies at the level of normative management is in a certain sense incompatible with the understanding derived from traditional sciences: instability is no longer a feature to be

⁵Pathological autopoiesis, as used here, is the self-maintenance or self-production of a system despite a negative balance of its effects on the larger whole.

eliminated completely. In a sense and to a certain extent it is a necessary and valuable precondition for development (cf. Prigogine, 1989); (self-) control must nevertheless maintain instability within acceptable levels and frequencies. The coming turbulent decades will increasingly demand for „control by development“, „control by learning“ or „control by transformation“⁶.

So much for a survey of the design parameters and control variables. It must be noted that they cannot be compared in every respect, since they belong to three different logical levels; ultimate consistency can be achieved within, but not between, these levels⁷. The variables regulated at one level are the pre-control parameters for the next level down.

Figure 1 illustrates that operational, strategic and normative management are by no means three subsystems detached from each other; rather, each higher level envelops those below it. However, a rigid view of embedment would be too static. If a normative framework expresses a certain identity, this encapsulates a huge set of possible strategies. However, at a certain stage, strategy making may find new ways of relating to the environment, which may reach out beyond the borders of the identity defined by the actual normative framework. In many companies, such attempts are out of the question a priori, - a trait, which sooner or later turns out to be pathological. Also the distinctive features of an identity and its normative implications must be reviewed over time. Most industries are subject to fundamental change; boundaries between industries collapse, so organizational intelligence demands reinventing the company, forgetting („unlearning“) outdated recipes of success and building new competencies. Constant creative tension between normative management and strategy making are necessary for a company to evolve. The pertinent connection is not an algorithmic one, but it must express itself in a strenuous process of organizational discourse. In a large empirical study, Collins and Porras have given an empirical account of this „dynamic interplay between core ideology and the drive for progress“ (Collins/Porras 1994: 85).

Figure 1 further demonstrates that the relevant time horizon increases from operational to normative management. At the same time, the factual horizon is also extended, as is the complexity which is to be coped with. The dotted arrow indicates that certain principles relevant to normative management (e.g. ethical and aesthetic ones) are largely timeless.

⁶ The terms in apostrophes should be read with the prefix "self-", i.e. as "self-control by (self-)development", "self-control by learning", "self-control by (self-)transformation", to indicate the priority of intrinsic control (or eigen-control) over extrinsic control.

⁷ In logical terms, the strategic level offers a metalanguage to the operative, the normative to the strategic and the operative levels.

The diagram also shows that the concerns of the higher levels are not detached from those of the lower ones. A company can only survive if it is in possession of value potentials that are actualised; that is, converted into value. An equilibrium between the sacrifices incurred in building up value potentials and reaping their fruits is a further necessary precondition of viability which normative management has to ensure.

At the three levels of management, different *criteria of organisational fitness* - or, to speak more generally, *systemic effectiveness* - apply:

1. 1. at the operational level, the criterion is that of efficiency, mainly in terms such as productivity, profitability and quality;
2. 2. at the strategic level, it is effectiveness in both the competitive and the co-operative sense;
3. 3. at the normative level it is legitimacy, defined as the ability to fulfil the claims of all relevant stakeholders.

The key duty of an integral or systemic management is to meet all three requirements in the long run. In order to achieve such a delicate task a corporation will require - as has been illustrated in detail in Schwaninger (1993) - considerably higher developed mental models than established ones, and more complex control systems than the simple feedback systems traditionally used.

The logical hierarchy of control variables delineated here results in a *multilevel* control structure (cf. Figure 2), which makes clear that one and the same state of affairs cannot be pre-controlled by means of the variable by which it is controlled⁸. If, at the operative level of a firm, control is exercised in the interests of profit - by means of revenues and costs - then profit cannot be pre-controlled by means of these traditional accounting variables. For pre-control other variables are required: Extant and new value potentials, which in turn are pre-controlled by viability and development. This is why I maintain that profit is not a strategic goal. A closure of the hierarchy of control variables is provided insofar as (final) liquidity outcomes at the operational level not only result from higher level pre-controls, but they also pre-control higher level „parameters“ to a certain extent. For instance, not only the innovative capabilities, but also the actually available liquid financial resources might play an important role: at least, substantial own funds can add a degree of freedom in the building-up of value potentials.

⁸It has been argued (cf. Jackson 1989: 428) that the use of 'control models' prevents organisational learning, leading to 'increasing dominance of history' (De Zeeuw 1986: 139). A concept of control that embraces development as a goal defies this argument in principle, although it cannot guarantee that there will be learning in every organisation that uses the concept.

Figure 2: Control as a multilevel cycle with controls and pre-controls

4. INTRINSIC VERSUS EXTRINSIC CONTROL

Cybernetics originated from the world of engineering. The early applications were centered on mechanical systems. With the study and use of cybernetics in the context of social systems some conceptual reframing took place. Social systems are constituted by individuals or groups which have their own goals and adhere to their own values. They are self-conscious and reflexive. Therewith, social systems are capable of self-control, self-reference and self-transformation. This induced a conceptual distinction between first order cybernetics and second order cybernetics. In first order cybernetics, the controller is seen as outside of the system (figure 3). The system is purposive⁹, in the sense that goals are established from outside or

⁹Cf. the distinction between purposiveness, as „the effectiveness and efficiency of means or tools“, and purposefulness, as „the critical awareness of self-reflective humans with regard to ends or purposes and their normative implications for the affected“ (W. Ulrich 1983: 328).

“above”. This view is applicable to mechanical systems, but inadequate to capture the purposeful, intentional and also largely voluntaristic character of individuals and groups which constitute modern organizations.

In second order cybernetics the controller is an integral part of the system. The system is purposeful, i.e. it develops its goals internally and it is made up of subsystems which pursue their own goals. In this conception, goal formation is a process of conversation and reciprocal alignment between a system and the larger whole into which it is embedded. Heinz von Foerster, the eminent cybernetician, defines the difference as follows (von Foerster et al. 1974: 1):

- First order cybernetics: “the cybernetics of observed systems”
- Second order cybernetics: “the cybernetics of observing systems”.

Not only the human and social nature of organizations, but also the complexity faced by them makes it necessary to emphasize intrinsic control

First Order Cybernetics

Extrinsic Control

Second Order Cybernetic

Intrinsic Control

Figure 3: Control according to first and second order cybernetics

(the terms “intrinsic control”, “eigen-control” and “self-control” are used synonymously here) as opposed to extrinsic control. If intrinsic control is to predominate, this must lead to a recursive process of intrinsic control, in the case of organizations with several layers of basic units, i.e. units which create the value that is at the core of the organization’s mission (e.g. divisions - business units – business segments).

5. A MODEL OF RECURSIVE CONTROL

This section will deal with the multi-recursion issue, which is at the heart of distributed control. The structure-theoretical foundation for distributed control can be found in the Viable System Model (VSM) by Stafford Beer, the founder of management cybernetics. This model answers the question, how an organization must be structured to make its (self-) control possible in a way that its viability and development can be maintained.

A set-theoretic model, in which Beer (1962) defined the organizational prerequisites for the viability of systems, was later operationalized in a topological model, known as the „VSM“ (Beer 1979, 1981, 1985). In this model, a set of functions is distinguished, which ensure the viability of any human or social system (Figure 4). These functions and their interrelationships are specified in a comprehensive theory, the propositions of which can be summarized as follows:

1. 1.) An organization is viable if and only if it disposes of a set of management functions with a specific set of interrelationships, identified and formalized in the model:
 - System 1: Regulatory capacity of the basic units, optimization of ongoing activities by which value is created (e.g. the business areas of a private or public enterprise).
 - System 2: Attenuation and amplification to damp oscillations and coordinate activities via information and communication (e.g. information systems, service units and coordination teams, standards of behavior)
 - System 3: Establishing an overall optimum among basic units, providing for synergies, resource allocation (e.g. an executive corporate management)
 - System 3*: Investigation and validation of information flowing between Systems 1-3 and 1-2-3 via auditing/ monitoring activities (e.g. internal auditing, „management by wandering around“)
 - System 4: Dealing with long term and the overall outside environment, diagnosis and modeling of the organization in its environment (e.g.

corporate development, strategy, research and much of knowledge management)

- System 5: Balancing present and future as well as internal and external perspectives; moderation of the interaction between Systems 3 and 4; ascertaining the identity of the organization and its role in its environment; embodiment of supreme values, rules and norms, - the ethos of the system (normative management).

Summing up, Systems 1-2-3 (including 3*) make up the operative management, System 4 (in interaction with System 3) strategic management, and System 5 the normative management of the organization.

In this structure, the primary units (basic units with the regulatory capacity supplied by System 1) must dispose of high autonomy in order to be able to adapt to their respective environment or milieu. The combined activities of Systems 1, 2 and 3 (including 3*) provide for cohesion, while System 4 is the fulcrum for long-term adaptation, and System 5 the embodiment of the ethos, - the basic principles and values governing the orientation of the organization as a whole.

Figure 4: The Viable System Model - Overview¹⁰

- 2.) Any deficiencies in this system, such as missing functions, insufficient capacity of the functions or faulty interaction between them impair or jeopardize the viability of the organization.

¹⁰This is a slightly adapted version. For the full-fledged original, please see: Beer 1985: 136; and: Beer 1979, 1981.

The viability, cohesion and self-organization of an enterprise depend upon these functions being recursively present at all levels of the organization (Figure 5). A recursive structure comprises autonomous units within autonomous units. Moreover, a viable organization is made up of viable units and it is itself embedded in more comprehensive viable units. Each unit, inasmuch as it is producing the organization's task, rather than servicing or supporting this producing, replicates - in structural terms - the totality in which it is embedded: It has all the functions outlined under (1.), to be able to manage, from start to finish, the processes for the purpose of which it exists. If we take such a viable organization as a „system-in-focus“, depending on the perspective adopted, it „may have more than one next higher and next lower recursion“ (Beer 1985; for a pertinent application, see Leonard 1989).

According to the VSM all three levels of management – operative, strategic, normative – are distributed functions; control, intelligence and ethos being properties of the system as a whole, inherent in all levels of recursion. This model has been transduced into the language of business and also been widely applied, as documented in several books (e.g. Espejo/Harnden 1989, Espejo/Schwaninger 1993, Espejo/Schuhmann/Schwaninger 1996), and on a CD-ROM edited as a festschrift for Stafford Beer (Espejo/Schwaninger 1998). One of my doctoral candidates has also applied it to the Swiss democracy and discerned important insights (Willemsen 1992).

Figure 5: Recursive structure of viable organizations (after Beer 1979)

6. PUTTING THE THREADS TOGETHER

As shown in section 5, the viability of an organization is determined, first of all, by whether the organization has command over certain specific management functions which work together in a manner precisely defined by Beer's theory (cf. Figure 4).

Secondly, this system of management functions can be ascertained recursively. Viability is, in principle, to be structurally anchored down to each work-team or to each and every workplace.

The most important consideration at this point is as follows. There is need not only for operational but also for strategic and normative management in any subsystem of an organization, in so far as it has to meet the criterion of viability.

The cybernetic theory of organization advocated here contradicts the oft-repeated comments that "vision is the concern of the entrepreneur" or "strategy is the duty of the board of directors". Vision is a function of the meta-system: to be precise, it is one of the functions of the normative management of every viable unit. Strategic thinking is necessary even in the smallest units, if such units are conceived as viable wholes.

That is the reason why "meta-systems" have to turn to orientators other than those of the corresponding "systems". In small units, it is often the case that the operational, strategic and normative functions of management as well as the basic activities are discharged by the same persons. In spite of this, it is vital for any unit in focus that it does not restrict itself to the operating functions (always under the assumption that the unit concerned is supposed to be viable). Such a system must be so led that the control variables at all the three levels are taken into consideration and simultaneously kept under control. This holds true even when contradictions arise between these control variables.

It is incumbent upon the management at each recursion level to define for its purposes, the specific orientators in a level-appropriate manner and to realize a correspondingly "integral" leadership. Figure 6 illustrates this aspect in a highly simplified manner. Starting from a more abstract scheme of the control variables than in Figure 1, regulatory variables and orientators are presented as examples which could be of significance for three recursion levels consisting of an enterprise, a subsidiary company and a business unit.

Figure 6: Operative, strategic and normative management are distributed functions

With the help of the broken line an attempt is made to illustrate the point that for a given unit, information about units at recursion levels other than those in the immediate neighbourhood can be of relevance. The dotted line indicates that in principle the logic of the presentation can be transferred to further recursion levels and holds good for other structured, more complex networks.

The same logic applies also to "virtual organizations". In principle, a virtual organization (from "virtus" meaning virtue) is capable of materializing its potential through the most diverse variants. This would mean, for example, that out of the available resources, project teams are formed in many different constellations, tailor-made according to the task that needs to be accomplished. In this connection, the meaning of the word "available" can be expanded almost indefinitely. What is not available "in house" can mostly be acquired through partnerships and cooperation. The goals "viability" and "development" can also be meaningful in connection with projects (compare sections 3 and 4.2). Even projects having a limited life-span need a specific identity during the period of their existence. Looking at the situation from the inside, the question "what is to become of us when the project is completed" can be of burning importance for the members of the project team.

Therefore, the system of regulatory variables for an integral management illustrated in Figure 6 can also be transferred to the project level (Figure 7).

A more detailed account of recursive management and an underlying cybernetic theory of human action in organizations is given in a book on organizational transformation and learning (Espejo/Schwaninger/Schuhmann/Bilello, 1996).

Figure 7: Orientators for an integral management of projects

7. FROM HIERARCHY TO HETERARCHY

It must be added that this concept of layers of basic units, in the face of market complexity, is a multidimensional one. Therefore, in the recent literature on organization, heterarchical networks are being considered as more suitable than "tree-like" hierarchical structures, for handling issues in an environment characterized by uncertainty, complexity and dynamics (Gomez/Zimmermann 1997; Hedlund 1986, 1993; Probst 1992; Schwaninger 1994b; Weber, 1994, and other literature cited therein). Such organizations possess, in principle, a greater capacity for absorbing complexities. To express it in the language of cybernetics, heterarchical organizations are superior to hierarchical systems as far as their "redundancy of potential command" (McCulloch 1988) is concerned, i.e. in their excess capacity to control themselves. However, networks are not necessarily heterarchies, although all heterarchies are structured in the fashion of networks. For this reason, it is important in what follows to make precise the concept of heterarchy in contrast to that of hierarchy. Both of these concepts are derived from the Greek "archein" which means 'to reign'; hierarchy (derived from the word "hieros", meaning holy, belonging to the gods, priestly) stands for the command of the few, "initiated" ones, and heterarchy (derived from the word "heteros", meaning different, many) refers to the command vested in different and distributed instances.

The structure and the culture of an organization are very closely interconnected. The ideal-types of two models of organization are presented below (Figure 8).

Each of them embraces both of the aspects mentioned, namely the cultural and the structural:

- - "HAT": the hierarchical-authoritarian type,
- - "HPT": the heterarchical-participative type.

Hierarchical structures are associated with autocratic patterns of behaviour including monological commands emanating from one single centre. As opposed, a heterarchical organization can have many centres of command and it is characterized by a culture involving a high degree of participation and dialogue. In such a form of organization, participation and "empowerment" are so deeply entrenched that any unit whatsoever within the organization is in a position to take command of the entire organization, with reference to a specific aspect, while at the same time in a subordinate role with reference to other aspects (cf. Hedlund 1986, 1993).

The HAT is characterized by a high degree of control (extrinsic control) and very little autonomy in the workplace. The emphasis is on long-lasting structures and a high division of labour. The HPT, in contrast, endows units at all levels with considerable autonomy, which encourages high levels of

Figure 8: Two ideal-types of organization

self-determination and intrinsic control (Figure 8). Here, the emphasis is laid on temporary structures, on multiplication and recombination. While hierarchies are strong at utilizing available resources, the power of heterarchies lies in their flexibility and innovativeness.

At this point it needs to be added that in reality, organizations do not conform rigorously to one or the other of these ideal-types. Hierarchical systems will always exhibit some elements of a dialogue, even if they operate in a rather placid environment. On the other hand, network-type heterarchical systems will never be completely free of some characteristics of hierarchies, since certain units within the organization will have to assume the global responsibility in some specific area in their relation to the superordinate systems. Earlier publications by the author have elaborated on this aspect (Schwaninger 1994b, 1996, 1999).

At this point, it is important to emphasize that the framework presented here is fully compatible with the need for heterarchical control. In the first place the control structure outlined is essentially one of a network type (see figures 2 and 3).

Figure 9: One and the same organization as part of different recursions

Secondly, the concept of recursive control is multidimensional, and therewith heterarchical. One and the same organization or organizational unit can function simultaneously both as a sub-system and a super-system within the framework of different recursive organizational configurations (see Figure 9). Not only can it "function" in this way, but it can also be conceived or can perceive itself in this fashion. A simple example illustrating this point is an enterprise which is a part of a concern, and is itself composed of several divisions (recursion A in Figure 9). In order to

cope with ecological challenge, the firm in focus joins other enterprises to form a suitable association (recursion B). Additionally, this enterprise is a member of a consortium for research and development (recursion C). It is possible to conceive of other recursions. A recursion D, for example, can be introduced in the form of companies in which the enterprise has a share, to keep the enterprise close to innovative developments in its areas of interests.

Thirdly, networks should – at least as far as their durable manifestations are concerned – be conceived as viable systems, and viable systems are also networks of networks, where these networks can (although they need not) be of a heterarchical nature. Pertinent examples were given elsewhere (Schwaninger 1994b, 1996, 1999),

Finally, as already shown earlier (Schwaninger 1994b), recursions do not necessarily run "from top to bottom". In a system of concerted mutual controls, e.g. in the context of alliances and holdings, it is possible to have a configuration as illustrated in Figure 10. This scheme, which shows a subset of a more comprehensive network, illustrates how companies can be "locked" into each other across the recursion levels V to Z. The company at the recursion level W is a subsidiary of the company at the recursion level V, and so on. The company at the recursion level Y is a joint venture of companies at the recursion levels X1 and X2.

A paradox crops up in this scheme in the sense that company 1 is at once "great-grandmother" and "daughter" of company 5. An analogous situation characterizes companies 2 to 5. This situation is in conformity with the paradox of the recursion levels relating to each other as follows:

$$V > W > X1 > Y > Z < V$$

It is obvious that the solution of the paradox lies in the fact that here we have a case of a circular recursion. (From a certain point of view, this can also be called a self-referential recursion).

Figure 10: Recursive and heterarchical relationships of control are compatible

8. CONCLUSIONS

As demonstrated, the viability of an organization rests on multilevel control in recursive structures. "Viability" as understood here means more than "autopoiesis" (self-production). This term stands for more than survival at any price: Intelligent organizations are committed to the goal of "development". In borderline cases, they eliminate themselves when, with their given identity, they are not capable of fulfilling meaningful functions in the service of the more comprehensive whole, (i.e. in the service of the systems at the next higher recursion level in which they are embedded, to put the matter in the language of cybernetics). In the last consequence, intelligent organizations strive for viability beyond survival.

As empirical studies suggest, viability is also grounded in certain recursive ("self-similar") socio-cultural properties. Kotter and Heskett subsume them under an ideal-type which they call "adaptive culture"¹¹ (Kotter/ Heskett, 1992; see also: Espejo/Schuhmann/Schwaninger/Bilello, 1996, Chapter 8; Schwaninger, 1989).

Organizational viability is recursive, and organizational intelligence is recursive, as well. If organizational viability is a recursive property, it requires recursive organizational intelligence as a necessary prerequisite. The key to organizational intelligence is a distributed control in both senses: It must be a dominantly self-controlled process of recursively viable units, which in each case maintain the control variables of all three logical levels – operative, strategic, and normative – under control, simultaneously. As shown, these propositions are compatible with the need for heterarchical control in complex settings.

Finally, it must be said, that the models outlined and integrated in this paper have been applied in all kinds of organizations. This has been documented in an extensive literature. There is a large body of writings which document applications of the VSM, e.g. Beer (passim), Espejo/Harnden 1989, Espejo/Schwaninger 1993, Brocklesby & Cummings 1996. A smaller set of sources on integrated applications of both models is also available (Schwaninger 1988, 1989, 1993). Many of these sources contain empirical evidence about the effectiveness of the models and framework discussed in this paper.

¹¹In a nutshell this is a culture that emphasizes close attention to all the key constituencies of the firm (customers, stockholders, employees). It also values people and processes that create change when needed to serve the legitimate interests of key constituencies. Finally, adaptive cultures are based on a leadership from managers at all levels, who convey these concerns convincingly to their staff.

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