

Conceptual analysis and specification of Morgan's metaphors using the CAST method

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4.2. *An overview of Morgan's metaphors*

Morgan (1986) distinguishes eight metaphors for organizations: machine, organism, brain, culture, political system, psychic prison, flux and transformation, and instrument of domination. Each metaphor highlights other aspects of organizational life (see Figure 4.1.). For further analysis, the metaphors can be grouped into three groups: the machine group, the organism group, and the mind group. The machine group only contains the machine metaphor (Paragraph 4.3.). The organism group focuses on the dynamic relationship of organization and environment and contains the organism metaphor and the flux and transformation metaphor (Paragraph 4.4.). The mind group (Paragraph 4.5.) contains two subgroups. The first mind subgroup concentrates on the relationship between the minds of persons and the organization as a social construct; it contains the brain metaphor, the culture metaphor, and the psychic prison metaphor. The second mind subgroup focuses on coordination mechanisms and power plays, and encompasses the political system metaphor and the instrument of domination metaphor.

metaphor	highlights
machine	efficiency, quality, and timeliness of production processes in a machine made up of interlocking parts
organism	attributes, structures, and development of organizations coping with their environments; evolutionary patterns in the interorganizational ecology
flux and transformation	the logic of change of organizations that dynamically and proactively adapt to an ecological environment
brain	effectiveness of information processing, problem solving and learning based on cognitive characteristics of people in the organization
culture	organizations as socially constructed realities based on communication and cognition of people in the organization
psychic prison	organizations as socially constructed realities based on unconscious preoccupations of people in the organization
political system	cooperation mechanisms and power plays between people in organizations
instrument of domination	exploitation mechanisms and power plays between people in organizations

Figure 4.1. Morgan's metaphors

4.3. Explanation and discussion of Morgan's metaphors 1: The machine metaphor

4.3.1. The most efficient way of doing work: Taylor

The machine metaphor sees organizations as

"machines made up of interlocking parts that each play a clearly defined role in the functioning of the whole" (Morgan, 1986: 13).

In the machine, the parts (persons, groups, or real machines) have to do their preprogrammed jobs. In the ideal machine, jobs interlock in a perfectly timed manner. An example of this would be the Just-In-Time organization, where product buffers and waiting queues are minimized. For perfect interlocking of jobs, standardization is needed in order to reach product compatibility and a well-defined product quality. The machine has to be designed to run in the most efficient way.

"The whole thrust of classical management theory and its modern application is to suggest that organizations can or should be rational systems that operate in as efficient a manner as possible. While many will endorse this as an ideal, it's easier said than done, because we are dealing with people, not inanimate cogs and wheels." (Morgan, 1986: 29)

Scientific management, founded by Frederick W. Taylor (1911), focuses on the most efficient way of organization. Taylor's principles for redesigning jobs, as summarized by Morgan (1986: 30) are:

1. Shift all responsibility for the organization of work from the worker to the manager; managers should do all the thinking relating to the planning and design of the work, leaving the workers with the task of implementation.
2. Use scientific methods to determine the most efficient way of doing work; design the worker's task accordingly, specifying the precise way in which the work is to be done.
3. Select the best person to do the work efficiently.
4. Train the worker to do the work efficiently.
5. Monitor worker performance to ensure that appropriate work procedures are followed and that appropriate results are achieved." (Morgan, 1986: 30)

In studying the most efficient way of doing a job, this job is broken down into smaller parts, and these parts again in still smaller parts, up to elementary operations (Gilbreth and Gilbreth, 1924). Time and motion studies are necessary for determining the variables that affect the job such as the tools used, the surroundings, the type of motion, and so on. After that, the best method for doing a job has to be reconstructed from the elementary operations. According to Taylor (1911), wages can be increased by 30 to 100 percent if the most efficient way of doing a job is adapted. The consequences of this approach to organization design are described as follows by Morgan (1986: 30):

"...work is often organized in the minutest detail on the basis of designs that analyse the total process of production, find the most efficient procedures, and then allocate these as specialized duties to people trained to perform them in a very precise way. All the thinking is done by the managers and designers, leaving all the doing to the employees."

4.3.2. Centralized control: Fayol

According to Morgan, centralized control using a scalar chain of command is another characteristic of the machine organization.

"... the organization is conceived as a network of parts: functional departments such as production, marketing, finance personnel, and research and development, which are further specified as networks of precisely defined jobs. Job responsibilities interlock so that they complement each other as perfectly as possible, and are linked together through the scalar chain of command expressed in the classical dictum 'one man one boss'." (Morgan, 1986: 27)

Centralized control, however, is no natural consequence of seeing an organization as a machine. In a clockwork consisting of parts that are interlocked, there is no need for control. Centralized control is more compatible with seeing an organization as an organism, as Fayol (1916) does. In this organism, there is a brain or other directive part that receives all sensations and issues all commands (Fayol, 1916/1984: 74). A

close reading of Fayol (1916) indicates that Fayol did not have a machine image of organizations, but rather used the organism metaphor:

"The accounting function is the visual organ of businesses." (Fayol, 1916/1984: 12)

"But it is to the animal sphere that the social organism is most often compared. Man in the body corporate (corps social) plays a role like that of a cell in the animal . . . The nervous system in particular bears close comparison to the managerial information function. " (Fayol, 1916/1984: 36)

"Specialization belongs to the natural order; it is observable in the animal world, where the more highly developed the creature the more highly differentiated its organs; it is observable in human societies, where the more important the body corporate (corps social) the closer is the relationship between structure and function. " (Fayol, 1916/1984: 62)

"Each employee . . . does not operate merely as a cog in a machine." (Fayol, 1916/1984: 74)

4.3.3. *Bureaucracy: Weber*

Another ambiguous link made by Morgan is the link between machine metaphor and bureaucracy:

"Organizations that are designed and operated as if they were machines are now usually called bureaucracies." (Morgan, 1986: 22)

". . . Max Weber . . . observed the parallels between the mechanization of industry and the proliferation of bureaucratic forms of organization." (Morgan, 1986: 24)

According to Weber (1925), bureaucracy is a type of organization of administrative staff belonging to one of the three types of legitimate domination, namely the legal authority.

"There are three pure types of legitimate domination. The validity of the claims to legitimacy may be based on:

1. Rational grounds -- resting on a belief in the legality of enacted rules and the right of those elevated to authority under such rules to issue commands (legal authority).
2. Traditional grounds -- resting on an established belief in the sanctity of immemorial traditions and the legitimacy of those exercising authority under them (traditional authority); or finally,
3. Charismatic grounds -- resting on devotion to the exceptional sanctity, heroism or exemplary character of an individual person, and of the normative patterns or order revealed or ordained by him (charismatic authority). " (Weber, 1925/1968: 215)

"The purest type of exercise of legal authority is that which employs a bureaucratic legal staff. " (Weber, 1925/1968: 220)

A bureaucracy is an organization for the exercise of legal authority consisting of a clearly defined hierarchy of offices, in which each office has a clearly defined sphere

of competence in the legal sense, and in which personnel is appointed based on their qualifications. The bureaucratic organization works based on knowledge:

"Bureaucratic administration means fundamentally domination through knowledge. This is the feature of it which makes it specifically rational. This consists on the one hand in technical knowledge which, by itself, is sufficient to ensure it a position of extraordinary power. But in addition to this, bureaucratic organizations, or the holders of power who make use of them, have the tendency to increase their power still further by the knowledge growing out of experience in the service. For they acquire through the conduct of office a special knowledge of facts and have available a store of documentary material peculiar to themselves." (Weber, 1925/1968: 225)

These texts of Weber demonstrate that the interpretation of a bureaucracy as a political system, or as a cultural system, or as a knowledge-based organization, is more obvious than an interpretation as a machine.

It is clear that Morgan does not like machine metaphor organizations:

"In particular they:

- (a) can create organizational forms that have great difficulty in adapting to changing circumstances;
- (b) can result in mindless and unquestioning bureaucracy;
- (c) can have unanticipated and undesirable consequences as the interests of those working in the organization take precedence over the goals the organization was designed to achieve; and
- (d) can have dehumanizing effects upon employees, especially those at the lower levels of the organizational hierarchy." (Morgan, 1986: 35)

In interpreting bureaucracies as machine metaphor organizations, Morgan extends his negative evaluation of machine metaphor organizations to bureaucracies by subsuming them under the machine metaphor. This negative appraisal of bureaucracies should not be simply and unconditionally adopted because of three reasons. Firstly, bureaucracies are organizations connected to the exercise of legal authority, thus enabling forms of government such as parliamentary democracy.

". . . bureaucracy has become a means, both in capitalist and in noncapitalist countries, of centralizing power in society and legitimating or disguising that centralization" (Perrow, 1986: 5)

Experiences with more organic forms of organization, such as Japanese management, show that these forms are not always compatible with legal authority and parliamentary democracy (Van Wolferen, 1989). Secondly, bureaucracies should be interpreted as knowledge-based organizations rather than as machines, as Weber has shown. Thirdly, bureaucracies protect employees as well as clients against arbitrariness and particularism, as Perrow has indicated:

"Particularism means that criteria irrelevant for efficient production (e.g., only relatives of the boss have a chance at top positions) in contrast to universalistic criteria (e.g., competence is all that counts), are used to choose employees." (Perrow, 1986: 6)

"The development of bureaucracy has been in part an attempt to purge organizations of particularism." (Perrow, 1986: 7)

"We deplore particularism for several reasons. It goes against the values of a liberal society -- that is, it yields racial or religious discrimination; it involves using public resources for the advantage of specific groups; it promotes inefficiency in organizations." (Perrow, 1986: 13)

"In sum, rules protect those who are subject to them. Rules are means of preserving group autonomy and freedom, to reduce the number of rules in an organization generally means to make it more impersonal, more inflexible, more standardize." (Perrow, 1986: 24)

Although Perrow sees mainly positive effects of enhancing the number of rules in an organizations, negative effects of rules can also be seen, for instance if those rules are contradictory, hinder effective work, or encode shallow expertise¹.

4.3.4. The machine metaphor: discussion

According to the machine metaphor, an organization is a machine consisting of interlocking parts. The jobs of those parts interlock in a perfect way. Following Taylor (1911), each job is to be studied scientifically in order to design the most

¹An example is the system of rules for concrete mixing devised by Gilbreth containing 231 rules (Pollard, 1974: 20). No person would like to work in circumstances where he had to follow that number of rules for only a specific subtask. Such a rule system is more suitable for robots. The problem is then how to distinguish rules that have a positive effect from rules that are superfluous. In order to do that, we have to distinguish legal rules from expertise rules, and expertise rules from natural laws. The rules on which a bureaucracy is based are legal rules; for this type of rules Perrow's thesis that more rules often result in a more flexible type of behavior could be true if the rule for interpreting and applying rules admits some flexibility. The expertise rules like the rules collected by Gilbreth for concrete mixing suffer from a shortcoming that is well-known in the world of expert systems: they often only encode shallow knowledge, knowledge with which an apprentice can learn how to work, but which is insufficient to describe expert behavior, and which does not reveal deeper knowledge based on natural laws. This type of shallow expertise rules can perhaps be used for instructing robots to do work, but will only hinder the expert in doing his or her work if each rule is to be followed literally.

efficient manner in which to accomplish it. In this study, the job is broken down into parts up to elementary operations. Although Morgan considers centralized control a characteristic of the machine organization, this is no natural consequence of seeing an organization as a machine. Centralized control is more compatible with seeing an organization as an organism, as Fayol (1916) does. Morgan interprets bureaucracy as a machine metaphor organization, but texts of Weber (1924) indicate that the interpretation of a bureaucracy as a political system, or as a cultural system, or as a knowledge-based organization, is more obvious. Morgan's negative appraisal of bureaucracies should not be unconditionally adopted because of the fact that bureaucracies enable liberal values and parliamentary democracy, and protect against particularism, as Perrow (1986) has shown.

In his chapter about the machine metaphor, Morgan constructs an image of an organization using elements taken from Taylor's, Fayol's and Weber's theories. Somehow, essential elements from Fayol's and Weber's theory seem to get lost during this composition. The machine metaphor organization is a mainly negative image of organization. This negative image acts as the background to which the more positive organistic and political metaphors can be sketched. Morgan criticizes the machine metaphor in several ways when discussing the brain metaphor (Simon's theory is seen as a rationalization of the machine metaphor), the psychic prison metaphor (the machine metaphor is seen as stemming from a disturbed and neurotic personality (Morgan, 1986: 205), and acts as a psychic prison), and the instrument of domination metaphor (the machine metaphor organization is used by selfish elites as an unshakable instrument of suppression).

4.4. Explanation and discussion of Morgan's metaphors 2: The organism group of metaphors

4.4.1. The organism metaphors

The organism group of metaphors includes Morgan's organism metaphor and Morgan's flux and transformation metaphor. These metaphors see organizations as organisms that are adapted to a specific environment. It is possible to identify different species of organizations. The organization as an organism can be studied at the level of the organism itself, which is an open system adapting to its environment and proactively creating its environment, and at the level of the interorganizational ecology in which organizations are born, grow, decline and die, and in which evolutionary patterns can be detected. Furthermore, one can focus on a steady state in which the organism has adapted to its environment, and on the patterns of change of organizations.

Under the organism metaphor, Morgan subsumes a.o. the following theories:

- open systems theory;
- contingency theory;
- Mintzberg's typology;
- the population ecology view of organizations.

Under the flux and transformation metaphor, Morgan discusses a.o.:

- autopoiesis theory;
- self organizing dissipative systems theory;
- system dynamics;
- dialectical logic of change of society and organization.

This broad spectrum of theories will be discussed below.

4.4.2. Open systems theory

The open systems approach builds on the principle that organizations, like organisms, are open to their environment, and must achieve an appropriate relation with that environment if they are to survive (Morgan, 1986: 44). The characteristics of open systems are (Morgan, 1986: 46):

- open systems exist in a continuous exchange with their environment;
- open systems seek a steady state using negative feedback mechanisms (homeostasis principle);
- open systems use energy for maintaining their form, thus counteracting the tendency of the second law of thermodynamics stating that all systems strive after a maximal entropy (negative entropy principle);
- in open systems, the parts are intertwined in a complex web of interdependencies based on the specialization of parts in the system, and the integration of the specialized parts in a whole (holistic principle);
- the internal regulatory mechanisms of an open system must have a variety that matches the variety of possible disturbances from the environment (Ashby's law of requisite variety, Ashby, 1956: 105);
- an open system may have several ways to reach a specific goal; its behavior is often better understood in terms of finality than in terms of causality (equifinality principle);
- open systems can change themselves gradually in order to cope better with the challenges and opportunities posed by the environment (evolution principle).

The open systems approach emphasizes the relations of the organization with its environment and defines an organization as a whole consisting of interrelated subsystems. Subsystems regulate the flow of human, financial, material, and informational resources into and out of the system, and thereby determine the critical patterns of interaction of an organization with its environment. The principles on which open systems are based, such as negative entropy and requisite variety, can be used for analyzing the organization and designing improvements.

4.4.3. Contingency theory

The contingency theory states that the appropriate form of an organization depends on the kind of task and the environment one is dealing with (Morgan, 1986: 48). Burns and Stalker (1961) established the distinction between mechanistic and organic approaches to organization and management. Organizations can be characterized on a scale ranging from mechanistic to organic based on their organization of work, nature of authority, communication system, and nature of employee commitment. The environment is characterized as ranging from relatively stable to highly unpredictable; while the task facing the firm ranges from the efficient production of standard products to the exploitation of rapid technical change. Burns and Stalker observed that organizations adapt to their environment and to their task: unpredictable environments that require innovation-oriented production need organic organizations, while stable markets requiring efficient production of standard products need mechanistic forms of organization. Woodward (1965) found that organizational structure is dependent on the production technology used, and that the effectiveness of an organization depends on the fit between technology and structure. She distinguished unit, mass and process production. Organizational structure was measured in terms of several variables, such as: number of hierarchical levels (vertical differentiation), supervisor's span of control, manager / total employee ratio, proportion of skilled workers, overall complexity, formalization, centralization, and proportion of administrative and staff

personnel. Lawrence and Lorsch (1967) also based their research on the idea that different organizations are needed when dealing with different environments and different technologies. They added the idea that subsystems can be distinguished within the organization as well as within the environment. Each organizational subsystem has to adapt to its specific subenvironment. This can not only lead to a differentiation in tasks of subsystems, but also to a differentiation in goals. With the introduction of the subsystem idea, two new variables needed investigation: the differentiation within the organization as a whole (which can be seen as the measure to which the organization is decomposed into subsystems), and the integration that was needed as a result of this differentiation. Kieser and Kubicek (1983) provide a systematic elaboration of contingency theory. In their traditional social science methodology interpretation, contingency theory's aim is to detect correlations or cause-effect-relations between environmental and structural attributes of organizations using multivariate analysis. They do not differentiate between the organization and its subsystems like Lawrence and Lorsch do. The environmental attributes they distinguish are (Kieser and Kubicek, 1983: 346): diversification, size, geographical dispersal, size of the parent company, integration of the production process, computer use, public control, competition intensity, price sensitivity, and technological dynamics. The structure attributes they distinguish are: process differentiation, product differentiation, direct supervision, mutual adjustment, programming, planning, delegation of decision-making and formalization. It is clear that the contingency theory has developed into a Lakatosian research program investigating organizations using the path of traditional social science methodology: formulate clear hypotheses relating environmental and structural variables, operationalize these variables, measure the indicators, and use statistical techniques such as multivariate analysis to get results.

4.4.4. Mintzberg's typology

Mintzberg's (1979) theory of organizations can be seen as a synthesis using elements from systems theory, decision-making theory, and contingency theory. His theory as described in 'The structuring of organizations' (Mintzberg, 1979) starts with a first part consisting of the explanation of five coordinating principles, five basic organizational parts, and five systems of flow. The five coordinating principles can be seen as the most basic elements of organizational structure,

"the glue that holds the organization together" (Mintzberg, 1979: 3)

The coordination principles are: mutual adjustment, direct supervision, standardization of work processes, standardization of work outputs, and standardization of worker skills. In the description of these principles, the following object types can be distinguished: person (in different roles), product, informal communication flow, control flow, information flow, standardization flow. The five basic organizational parts can be seen as five organizational subsystems that are distinguished in order to make a typology of organizations possible. These subsystems consist of persons (organization members) and organization units. The five basic organizational parts are: operating core, strategic apex, middle line, technostructure, and support staff. The five systems of flow can be seen as five theories about how the organization functions: as a system of formal authority, as a system of regulated information flows, as a system of informal communication, as a system of work constellations (work processes), and as a system of ad hoc decision processes. These theories are complementary. As a result of the description of an organization using the

fifteen points of view described above, Mintzberg's theory offers a rich picture of the organization that distinguishes several system levels, and that is strongly process-oriented.

In the second part of his book, Mintzberg describes nine design parameters. These design parameters more or less correspond to the structure variables in contingency theory. They are (Mintzberg, 1979: 67):

- design of positions (job specialization, training and indoctrination, behavior formalization);
- design of superstructure (unit grouping, unit size);
- design of lateral linkages (planning and control systems, liaison devices); and
- design of decision-making system (vertical decentralization, horizontal decentralization).

The relationship of these variables with the system levels is as follows. The person level is described by the 'design of positions' group of variables, the unit level is described by the 'design of superstructure' group of variables. The 'design of lateral linkages' variable group and the 'design of decision-making system' group of variables describe the organization as a whole².

An interesting remark regarding errors in organizational design is:

"Perhaps the most common error committed in organizational design is the centralization of decision making in the face of cognitive limitations." (Mintzberg, 1979: 183)

In the third part of 'The structuring of organizations', contingency variables are distinguished, and hypotheses regarding the effects of each contingency variable are stated. The contingency factors are:

- history-related variables (organizational age, organizational size);
- technical system characteristics (technical system regulation, technical system sophistication);
- environmental variables (environmental stability, environmental complexity, environmental diversity, environmental hostility);
- human interest variables (ownership, member needs, fashion).

Intermediary variables that originate from information processing theory and systems theory (Galbraith, 1973; Perrow, 1979) are needed to link the contingency variables to the structure variables. These intermediary variables are related to the nature of the work to be done by persons or units, the information to be processed by them, and the problems to be solved by them:

- comprehensibility of the work;
- predictability of the work;
- diversity of the work;
- speed of response needed.

By using these intermediary variables, information about the person level and the unit level can be entered next to the system level information contained in the contingency variables.

²Subsystems like the five basic parts can also be described by the design of lateral linkages variables and the design of decision making system variables.

In the fourth part of his book, Mintzberg (1979) presents five structural configurations. Each configuration is characterized by the basic part that is dominant in it. Furthermore, there is a coordinating mechanism that is characteristic for each structural configuration, and a specific type of decision-making structure (see Figure 4.2.).

Structural configuration	Prime coordinating mechanism	Key part of the organization	Type of decision-making structure
Simple Structure	Direct supervision	Strategic apex	Vertical and horizontal centralization
Machine bureaucracy	Standardization of work processes	Technostructure	Limited horizontal decentralization
Professional bureaucracy	Standardization of skills	Operating core	Vertical and horizontal decentralization
Divisionalized form	Standardization of outputs	Middle line	Limited vertical decentralization
Adhocracy	Mutual adjustment	Support staff	Selective decentralization

Figure 4.2. Mintzberg's five structural configurations

One could say that Mintzberg (1979) describes his interpretation frame in the first part of his book. In the second part, definitions are given of structure variables, which are theoretical concepts to be defined in terms of the interpretation frame. The third part of the book explains a series of hypotheses relating contingency variables, intermediary variables, and structure variables. In the fourth part of the book, a major hypothesis is added, namely the existence of five more or less stable organizational configurations.

Morgan (1986: 56) subsumes the machine bureaucracy and the divisionalized form under the machine metaphor because of "their highly centralized systems of control"³. The simple structure and the adhocracy are seen as organistic forms of organization, while the professional bureaucracy is seen as a mitigated form of machine metaphor

³One of the characteristics of the divisionalized form is that control is decentralized up to the level of the division managers. Morgan's argument, therefore, does not seem to be correct.

organization. Furthermore, the matrix organization is seen as a form of adhocracy⁴. This interpretation of Mintzberg's five structural configurations by Morgan does not seem to be correct, oversimplifying Mintzberg's theory in order to fit this theory into the mechanistic-organistic scheme.

4.4.5. Population ecology

The population ecology view of organizations is a critique on organization theories such as the contingency theory that emphasize the adaptation of organizations to their environment (Morgan, 1986: 66). According to the population ecology view, organizations can be seen as organisms competing for scarce resources. In this competition, only the fittest organizations survive. A cyclic Darwinistic model can be applied, consisting of the phases variation, selection, retention and modification. In the analysis of the competition process, the resource dependency of organizations plays a prominent part.

While population ecology stresses competition, the related organizational ecology view stresses collaboration and interdependency patterns (Morgan, 1986: 69). Collaboration of organizations in an organizational ecology is a means for survival that is as important as competition. Interorganizational relationships can make the turbulence of the organizational environment more manageable. An organizational ecologist analysis of organizations therefore focuses on interorganizational relationships.

4.4.6. Autopoiesis theory

Organization theories based on the idea that organizations depend on their environment are challenged by Maturana and Varela's (1984) autopoiesis theory (Morgan, 1986: 235). This theory states that organisms proactively select and create their own environment. Organizations do likewise. According to Maturana and Varela, all living systems are autonomous, circular, and self-referential. Living systems are autonomous because they are able to specify their own identity as expressed in behavior patterns or natural laws. They are circular because they engage in continuous circular patterns of interaction with their environment. They are self-referential because they only enter into interactions that are specified in their own program of interactions aiming at the creation and renewal of their own organization and identity. Important in the organization are the structures that define the system boundaries. These structures distinguish the system from its environment as well as permit interaction between system and environment.

"Thus a system's interaction with its environment is really a reflection and part of its own organization." (Morgan, 1986: 236)

Autopoiesis is defined as the capacity for self-production (creation and renewal of their own organization and identity) through a system of circular patterns of

⁴In my opinion, a matrix organization is already too 'organized' to be called a form of adhocracy. It can as well be a complicated form of machine bureaucracy trying to create more decentralized or market-oriented units while retaining the power of the centralistic functional departments.

interaction. The autopoietical system has its own life cycle, inherited by reproduction. The autopoiesis theory can be seen as a life cycle theory as well as a ecological network theory.

Maturana and Varela have related their autopoiesis theory to chaos theory. The dynamic patterns of interaction between system and environment may have a cyclic or chaotic character. Chaos theories are mathematical theories about system states dependent on nonlinear feedback loops or other recurrent behavior patterns. Under certain conditions, recurrent behavior patterns lead to a stable system state (e.g. a normal thermostat). Under other conditions, systems may cycle between two or more definite system states (cyclic behavior), or even between an infinite number of system states (chaotic behavior) (Peitgen and Richter, 1986). If a system behaves chaotic, its future states are unpredictable by mechanistic models.

Chaotic states seem to be necessary in living systems to be able to observe the environment in an open way (Varela, 1989). A system that is as closed as the autopoietical system and its self-defined environment would never be able to perceive anything new if no fluctuations, cyclic states, and chaotic states would be allowed. In a similar way, there is a problem concerning the change and growth of autopoietical systems:

"For if systems are geared to maintaining their own identity, and if relations with the environment are internally determined, then systems can evolve and change only along with self-generated changes in identity. How does this occur? . . . we quickly see that the problem of change hinges on the way systems deal with variations that influence their current mode of operation. . . ." (Morgan, 1986: 239)

The variation and openness created by fluctuations, cyclic states, and chaotic states of interaction are necessary for any changes in the autopoietical system. The changes in the autopoietical system are brought about by processes of enactment: organizations assign patterns of significance to the world in which they operate.

". . . development of organizations must give primary attention to the factors that shape an organization's self-identity, and hence its relations with the wider world." (Morgan, 1986: 240)

The theory of autopoiesis demonstrates to us the interdependence of the organization and its environment in a semi-closed system. This has important consequences for the way organizations survive:

"In the long run, survival can only be survival with, not survival against the environment or context in which one is operating." (Morgan, 1986: 246)

This means that egocentric organizations, for instance those that treat the physical and social environment as a sort of dumping ground for their toxic chemicals, are causing long-run problems that will treat their future viability.

". . . the future of many firms in agriculture or the chemical business will depend on how government, consumers, and citizens will react to and punish their activities . . ." (Morgan, 1986: 244)

4.4.7. Self-organizing dissipative systems theory

Fluctuations, cyclic states, and chaotic states enable autopoietical systems to escape from the predetermination that otherwise would be the result of the closed system of interaction of system and environment. But how does the autopoietical system escape

from those fluctuations, cyclic states, and chaotic states into new, ordered, patterns of structure and interaction? The theory of self-organizing dissipative systems (Morgan, 1986: 239) focuses on this question. It explains how order can arise from chaos (Prigogine and Stengers, 1984).

A dissipative system is a system that is going through irreversible processes, thereby producing entropy. The thermodynamics of irreversible processes is a scientific subdiscipline that studies dissipative systems. It distinguishes rates of irreversible processes called fluxes, and generalized forces that "cause" the fluxes (Prigogine and Stengers, 1984: 135).

"We can divide thermodynamics in three large fields . . . Entropy production, the fluxes, and the forces are all zero at equilibrium. In the close-to-equilibrium region, where thermodynamics forces are weak, the rates . . . are linear functions of the forces. The third field is called the nonlinear region, since in it the rates are in general more complicated functions of the forces." (Prigogine and Stengers, 1984: 137)

The interaction of a system with the outside world in far-from-equilibrium conditions, where nonlinear relation between forces and fluxes exist, may give rise to dynamic states showing a new kind of order called dissipative structures. In chemical and biological systems, these structures often are cell-like. While equilibrium and close-to-equilibrium thermodynamics study systems that could be described as chaotic because of their property of maximizing the number of allowed states, far-from-equilibrium thermodynamics can use nonlinear dynamics in situations where feedback loops are present to account for the structures emerging from the chaos⁵. Generally spoken, one could say that nonlinear dissipative systems respond to external forces by regulating matter, energy, and information fluxes through internal structures.

From a modeling point of view, we could say that self-organizing dissipative systems theory uses a set of variables to describe the system level, a set of variables to describe the system element level, and a machinery of differential equations to account for the relationships between those variables. The theory does not relate the variables at the system level in a direct way, but explains them based on ensembles of

⁵Note that the word chaos refers here to a state in which a maximum entropy is obtained, that is, a state with a maximum number of possible states of the system. It does not refer to chaotic dynamics. Nonlinear thermodynamic systems can have stable states, cyclic states that are apparently connected to the dissipative structures, and chaotic states in the sense of showing chaotic dynamics. Prigogine and Stengers (1984) are not very clear about this distinction of chaos as maximum entropy and chaos as a chaotic dynamic state. So the questions how structure can emerge from a system that sometimes has a chaotic dynamic state, and how a system can escape from a chaotic dynamic state, are apparently not solved.

possible system states that are processed by the differential equation machinery. The possible system states are, in turn, derived from the properties of the system elements.

4.4.8. System dynamics

System dynamics (Forrester, 1961) does not use a computational machinery that is as complicated as self-organizing dissipative systems theory, but relates the variables at the system level in a direct way by differential equations. The variables and their relationships form a network in which positive feedback loops, and negative feedback loops, can be present. Random events can lead to large effects caused by deviation-amplifying processes that are amplifying just because of these feedback loops:

"Together, these feedback mechanisms can explain why systems gain or preserve a given form, and how this form can be elaborated and transformed over time." (Morgan, 1986: 247)

System dynamics is an example of continuous simulation, to be contrasted with discrete event simulation techniques.

4.4.9. Dialectical logic of change of society and organization

The dialectical logic of change of society and organization states that each change in the societal or organizational system tends to produce a countereffect (Morgan, 1986: 261). Often, this countereffect is created by people whose interests are harmed by the original change. Dialectical logic has been formulated by Engels (1873) into three laws. The first law of dialectical logic concerns the struggle of opposites. It can be explained as follows. The existence of something (the thesis) has the tendency to evoke something counteracting it (the antithesis). After a "struggle" of the thesis and the antithesis, something new (the synthesis) will emerge that "unifies" the thesis and the antithesis. The synthesis, in turn, will evoke its opposite, and so on. The second law of dialectical logic concerns the negation of the negation. This law can be explained as follows. The law states that the negation (denial or withholding) of the rights or interests of some social group ultimately will lead to a reaction which, in turn, negates the original negation. The third law of dialectical logic concerns the transformation of quantity in quality. This law can be interpreted as stating that a large quantity of small changes, each of which is only a small disturbance of the state of a system, together can lead to a qualitative change, which is an important state change or revolution of the societal or organizational system concerned.

A dialectical analysis of society or organization focuses on the interests of people, carefully analyzing potential or actual tensions and oppositions.

"In this kind of dialectical analysis it is important to consider which tensions and oppositions are primary and which are subsidiary, since, as we have already noted, oppositions tend to arise within oppositions, creating patterns of change where the importance of the primary opposition may be masked by a variety of more superficial differences. The successful analysis of change, and of the dispositions and tendencies inherent in the present, thus requires that we come to grips with the basic forces shaping organization and society. If Marx's analysis is correct, we may well find that these lie in the structures through which we produce and sustain our material conditions of existence, i.e., in our economics. Interestingly, many business men and women will readily agree with this." (Morgan, 1986: 265)

The problem with this kind of analysis is that each situation can be interpreted in a number of ways because each interpreter will indicate his or her own primary tensions

and oppositions. It may be because of this that in practice numerous schools of Marxist analysis have arisen in the past, each with its own code of interpretation. An improvement of this situation requires a more clear statement of the basic computational mechanism of the theory (the dialectical logic), and a clear elaboration of what is meant with key concepts such as "the material conditions of existence", "productive labor", "proletariat", and "surplus value" (Gazendam, 1972).

4.4.10. *The organism metaphors: discussion*

The organism metaphor and its dynamic variant, the flux and transformation metaphor, serve as a main alternative to the machine metaphor. Most organismic theories present us an open systems theoretical picture of organization, only differing in degrees of sophistication and complexity of the mathematical apparatus used. Open systems theory, the contingency theory, autopoiesis theory, self-organizing dissipative systems theory, and system dynamics are examples of the systems theory approach discussed by Morgan. The most clear definition of an organism metaphor organization is offered by Morgan in his discussion of open systems theory (Morgan, 1986: 46; see Paragraph 4.4.2.). The problem with this definition is that it describes a framework for understanding and analyzing organizations, but does not offer guidelines for designing organism metaphor organizations.

Theories that do not fit in the systems theoretical picture are population ecology, Mintzberg's theory, and dialectical logic of change of society and organization. Population ecology focuses at the level of populations rather than individual organisms, but seems to be compatible with systems theory. Mintzberg presents a theory that is a synthesis of the contingency theory, decision-making theory, and elements from classical organization theories. Therefore, Mintzberg directs attention to the individual as well as to the system level. Mintzberg's theory is simplified by Morgan in order to fit it in the mechanistic-organismic scheme. Dialectical logic of change of society and organizations (Marxism) is a classical political and economical theory that is discussed in more detail under the instrument of domination metaphor.

In the design and management of organizations, the organism metaphor is a main alternative to the machine metaphor. According to the machine metaphor, the designer must focus on the analysis of tasks and design the best ways to perform them. Control is to be designed in a centralistic way and based on rules and procedures. These rules and procedures register the result of task analysis and decision-making. What has to be done in design according to the organism metaphor is less clear. Examples of organism metaphor organizations are, according to Morgan (1986: 57; 73), adhocracies based on project teams and matrix organizations. These examples are compatible with the guideline that, according to the organism metaphor, the designer has to design self-contained organization units that have capabilities for self-organization. The management of organizations according to the organism metaphor has to aim at survival with, not against the environment (Morgan, 1986: 246).

The organism metaphor is criticized by Morgan because of its lacking political dimension and its 'unified system' assumptions. In the analysis of organizations, the organism metaphor's systems theoretical analysis instruments have to be complemented by political analysis instruments focusing on interests and power. In the design of organizations, the unified system of the organism metaphor should be replaced by the pluralistic system resulting from the political system metaphor.

4.5. *Explanation and discussion of Morgan's metaphors 3: The mind group of metaphors*

4.5.1. *The mind metaphors*

The mind group of metaphors encompasses: the brain, the culture, the psychic prison, the political system and the instrument of domination. These metaphors focus on the human mind in all its aspects as the basic phenomenon accounting for the existence of organizations. The brain metaphor sees the organization as an information processing organ or organism -- and therefore is partially organismic in character -- as well as based on the problem solving and learning characteristics of people in organizations. The culture and the psychic prison metaphors see an organization as a socially constructed reality. The culture metaphor observes the cultural system constructed and maintained by people. The psychic prison metaphor investigates those cultural phenomena that restrict human thinking and acting, and explains them based on unconscious psychic phenomena. The political system and instrument of domination metaphors see organizations as social constructs in which people participate based on their own interest, leading to political arenas in which these interests have to deal with each other. If this results in a situation where people are exploited by organizations, one can speak of the organization as an instrument of domination.

4.5.2. *The brain metaphor*

Morgan subsumes several decision-making and information processing theories of organizations, including cybernetics, under the brain metaphor.

The *decision-making approach* to organizations has been created by Simon (1945 / 1976) and March (March and Simon, 1958). The principle of bounded rationality has been explained in Paragraph 3.4.2. The bounded rationality of organizational decision-making does not only stem from the bounded rationality of human decision-making, but also from the fact that decision-making in organizations often can be described as a process in which each subsystem solves the problem with respect to the task domain it is responsible for, a process which does not necessarily lead to an optimal decision for the organization as a whole (Simon, 1945 / 1976: 272). Morgan criticizes this view of Simon as follows:

"In Simon's view these limits on human rationality are institutionalized in the structure and modes of functioning of our organizations. . . . While Herbert Simon has made much of the link between bounded rationality and the limited cognitive capacities of human beings, there are grounds for believing that this scenario is a somewhat pessimistic one. Most organizations reflect a bounded rationality because they are bureaucratized, not because they are populated by people. . . . Thus, Simon's valuable reinterpretation of the nature of bureaucratic organization from an information-processing perspective is probably best understood as providing a rationalization for bureaucracy, rather than demonstrating limits on the nature of organizational rationality. Holographic and other organizational designs that break free of bureaucratic controls . . . go well beyond the capacities of any single individual. Also, modern brain research shows that there is another side to cognitive capacity: the holistic, analogical, intuitive, and creative capacities of the brain's right hemisphere." (Morgan, 1986: 81, 107)

Morgan's characterization of Simon's theory as a rationalization of bureaucracy does not rest on any arguments. His statement that holographic (and other) organizations

do not suffer from bounded rationality because they are not bureaucratic does not seem to be very well-founded, because it does not take the edge off Simon's argument. This argument is the following one. Organizations consist of several persons in order to have a decision capacity that goes beyond the one person capacity. Organizational-decision-making, therefore, has to be spread over these persons. Each person suffers from bounded rationality. Therefore, no person can calculate the effects of his or her decision on the organization as a whole, especially because other persons do also make decisions. As a result, the organization also has to demonstrate bounded rationality. Morgan's statement that modern brain research indicates that human decision-making is not necessarily bounded seems to be in conflict with the wealth of evidence in favor of the bounded rationality character of the human mind (see for instance Newell, 1990).

The failure of first generation management information systems (MIS-management systems) led to a correction of the more naive cybernetic theory of organizations in the early nineteen-seventies. Simon's principle of bounded rationality was rediscovered. It appeared that aspects of information processing capacity of the controlling managers had been overlooked. In this situation, Galbraith (1973) devised an information-processing theory of organizations:

"Hierarchy provides an effective means for controlling situations that are fairly certain, but in uncertain situations can encounter information and decision overload. . . . Galbraith . . . identifies two complementary strategies for dealing with uncertainty. The first involves procedures for reducing the need for information -- e.g., through the creation of slack resource and self-contained tasks. The second involves increasing capabilities to process information -- e.g., by investing in sophisticated information systems and improving lateral relations . . ." (Morgan, 1986: 82)

Cybernetics has brought us the negative feedback mechanism, the principle of specifying constraints rather than goals, and the basic control loop which, for instance, De Leeuw (see Chapter 3) also uses:

"First, . . . systems must have the capacity to sense, monitor, and scan significant aspects of their environment. Second, . . . they must be able to relate this information to the operating norms that guide system behavior. Third, . . . they must be able to detect significant deviations from these norms. And fourth, . . . they must be able to initiate corrective action when discrepancies are detected." (Morgan, 1986: 86)

Morgan stresses the *holographic* character of the brain, that is, the capability of each of its parts to contain all essential information of the whole. This means that the organizational system is composed of subsystems in a very special way. Each subsystem must have the following properties (Morgan, 1986: 98):

- redundancy of functions;
- requisite variety;
- learning to learn;
- minimum critical specification.

Redundancy of functions means that each subsystem is able to engage in a range of functions that is wider than the functions that are necessary to perform the specific task of the subsystem. This principle defines what is meant by 'the holographic character of a system' in terms of systems theory. Ashby's law of requisite variety (Ashby, 1956: 105) states that the internal regulatory mechanisms of an open system

must have a variety that matches the variety of possible disturbances from the environment. With 'learning to learn' Morgan means double-loop learning (Argyris and Schön, 1978). Double loop learning is the learning focusing on the adaptation of norms, strategies, and learning processes to changing circumstances. Minimal critical specification is the principle that one should not attempt to specify or predesign what should occur, such as in narrowly defined plans, but that one should define a range of acceptable behavior by giving some general rules. Using general behavior rules defines a space of acceptable behavior within which individuals can self-organize.

4.5.3. *The culture metaphor*

According to the culture metaphor, organizations can be seen as socially constructed realities based on communication and cognition of people in the organization.

"When we talk about culture we are typically referring to the pattern of development reflected in a society's system of knowledge, ideology, values, laws, and day-to-day rituals. The word is also frequently used to refer to the degree of refinement evident in such systems of belief and practice. . . . Nowadays, . . . , the concept . . . [is] . . . used more generally to signify that different groups of people have different ways of life." (Morgan, 1986: 112)

The way people construct organizations depends on a society's stage of development, varies from one society to another, and varies between and within organizations.

Anthropologists and sociologists (Durkheim, 1934) have distinguished *societies that are based on households* from *industrial societies*. In societies based on households, work has a completely different meaning and occupies far less time. Systems of attitude and belief are much more cohesive. Industrial societies are based on division of labor and specialization, leading to cultural differences between occupational groups rather than to regional differences (Morgan, 1986: 113)

The success of Japanese firms has triggered interest in cultural differences between Japanese, American, and European organizations (Morgan, 1986: 114). In Morgan's account of the investigations resulting from this interest, no theory or method can be found other than the method of observing organizations as if one were a cultural stranger:

By adopting the standpoint of a cultural stranger, we can see organizations, their employees, their practices, and their problems in a refreshingly new perspective." (Morgan, 1986: 120)

Organizations can be seen as consisting of groups and suborganizations that have their own specific patterns of culture or subculture. The characteristics of a specific culture have to be observed in terms of

". . . patterns of interaction between individuals, the language that is used, the images and themes explored in conversation, and the various rituals of daily routine." (Morgan, 1986: 121)

The formal leaders of organizations often have a decisive influence on the organizational culture as expressed in norms, rituals, and expected behavior. Culture develops during the course of social interaction. Often, a range of subcultures can be observed in organizations. This may be connected to the internal political arena:

"For example, the politicking through which organizational members sometimes advance careers or specific interests can result in the development of coalitions

sustained by a specific sets of values. These coalitions sometimes develop into forms of counterculture, in opposition to the organizational values espoused by those formally in control. . . . Foremost among all organizational countercultures, of course, are those fostered by trade unions." (Morgan, 1986: 127)

The process of the creation and maintenance of organizations as socially constructed realities is described by Weick's enactment theory. Weick states that we proactively shape and structure the reality we live in. People understand situations by imposing various interpretation frames⁶. By understanding situations in a specific way, we enable them to develop in a specific way.

"The point is that the norms operating in different situations have to be invoked and defined in the light of our understanding of the context. We implicitly make many decisions and assumptions about a situation before any norm or rule is applied. Many of these decisions and assumptions will be made quite unconsciously, as a result of our previous socialization and taken-for-granted knowledge, so that the action appears quite spontaneous. . . . It requires that we take an active role in bringing our realities into being through various interpretive schemes, even though these realities may then have a habit of imposing themselves on us as 'the way things are'" (Morgan, 1986: 130)

The culture metaphor presents us several problems. The first problem is that the culture metaphor apparently discourages further explanation and analysis:

". . . many management theorists view culture as a distinct entity with clearly defined attributes. . . . , such as beliefs, stories, norms, and rituals. Such a view is unduly mechanistic. . . ." (Morgan, 1986: 139)

Instead, the culture metaphor directs attention to magical phenomena that cannot be explained further:

"One of the major strengths of the culture metaphor rests in the fact that it directs attention to the symbolic or even magical significance of even the most rational aspects of organizational life." (Morgan, 1986: 135)

A second problem is the use of the culture concept in a very restricted way, namely as an 'organizational culture', which is seen as something that can and should be ideologically manipulated and controlled by top management:

"What is new in many recent developments is the not-so-subtle way in which ideological manipulation and control is being advocated as an essential managerial strategy. There is a certain ideological blindness in much of the writing about corporate culture, especially by those who advocate that managers attempt to become folk heroes shaping and reshaping the culture of their organizations." (Morgan, 1986: 138)

This restricted use of the culture concept in a way that discourages further analysis and explanation is very different from the rich concept of culture that is used in anthropology, sociology (Durkheim, 1934) and semiotics. The use of the culture metaphor as described by Morgan is mainly descriptive and interpretative.

⁶This observation motivates the development of the CAST method for the description, analysis, and comparison of interpretation frames.

4.5.4. *The psychic prison metaphor*

According to the psychic prison metaphor, organizations are seen as socially constructed realities based on unconscious preoccupations of people in the organization. These socially constructed realities or cultures may be experienced as problematic and confining, which is the reason why Morgan uses the term 'psychic prisons'. Morgan subsumes several explanations of human behavior based on psychological mechanisms under the psychic prison metaphor, including the theories of Janis, Freud, Becker, the Tavistock school of psychoanalysis, Jung, and Mitroff. Most of these theories assume that people develop unconscious mechanisms, and construct realities, in order to handle anxiety and desire, and that these mechanisms and realities are reflected in organizations.

An example of a phenomenon that restricts thinking is groupthink (Janis, 1972). In groupthink, the members of a group develop shared illusions as a result of self-affirming processes that produce conformity, and screen group members from information that might damage the shared beliefs.

Freud's (1953) theory is based on the idea that the unconscious is created by the repression by humans of their innermost desires and anxieties. A person's personality results from the way he or she learns to control his or her impulses from early childhood on. Freud believed that

". . . in order to live in harmony with one another, humans must moderate and control their impulses, and that the unconscious and culture were thus really two sides of the same coin . . ." (Morgan, 1986: 203)

Freud and his followers distinguish a rich repertoire of mechanisms that people use for controlling their impulses: denial, displacements, fixation, projection, rationalization, regression, sublimation, and so on. A special type of dealing with impulses is learnt by people in patriarchal families, leading to a persistence of male dominance and male values in society:

". . . patriarchy operates as a kind of conceptual prison, producing and reproducing organizational structures that give dominance to males and traditional male values." (Morgan, 1986: 211)

Becker (1973) explains human culture and human artifacts, such as organizations, based on the way people handle a special kind of fear: the fear for death.

"Though we may in quiet times confront the fact that we are going to die, much of our daily life is lived in the artificial realness created through culture. This illusion of realness helps to disguise our unconscious fear that everything is highly vulnerable and transitory." (Morgan, 1986: 213)

The Tavistock school of psychoanalysis, represented by a.o. Klein (1965) and Bion (1959) adds several mechanisms to those already distinguished by Freud. It is interesting to note Bridger's theory about transitional phenomena in organizational life. This theory states that

"Just as a child may rely on the presence of his or her doll or teddy bear as a means of reaffirming who and where they are, managers and workers may rely on equivalent [transitional] phenomena for defining their sense of identity." (Morgan, 1986: 221)

If people or organizations keep clinging to a special privilege, structure, task, or other phenomenon in a way that cannot be explained by rational motives, this may be due to their status as transitional phenomena.

Jung's (1953) theory of the collective unconscious and of archetypes has metaphysical connotations which, unlike Morgan, are not supported by the author of this thesis. According to the philosophical principle of Occam's razor, it is not right to assume the existence of unnecessary special phenomena such as the collective unconscious, which in addition violates physical laws by transcending time and space⁷. Interesting are Jung's theory of interpretation connected to the use of archetypes, and his theory of perceiving and judging reality. According to Jung, we are able to perceive the world around us in a patterned way because we can use archetypes, which are

" . . . structures of thought and experience, perhaps embodied in the structure of the psyche or inherited experience. . ." (Morgan, 1986: 224)

By explaining archetypes as pre-existing and stemming from the common unconscious, Jung adds a misleading and unnecessary metaphysical hypothesis to the theory saying that people perceive their environment by imposing interpretation frames (the enactment theory). Jung's theory of perception and judgment distinguishes two ways of perceiving reality (sensation and intuition), and two ways of judging reality (thinking and feeling). These two dimensions have been used by Mitroff and Kilmann (1978) to distinguish four types of scientists, and four related types of scientific research.

The psychic prison metaphor depicts a layer of organizational reality that is uncontrollable by nature, and, therefore, should be used in a descriptive and interpretative way:

"In highlighting the role of the unconscious in organization, there is a danger that many will now want to find ways of managing the unconscious as well. This, of course, is impossible, because the unconscious is, by nature, uncontrollable." (Morgan, 1986: 231)

In his discussion of Taylor's personality that is used as an example of the application of the psychic prison metaphor, Morgan (1986: 205) finds another argument to invalidate the machine metaphor:

"Taylor's life provides a splendid illustration of how unconscious concerns and preoccupations can have an effect on organization. For it is clear that his whole theory of scientific management was the product of the inner struggles of a disturbed and neurotic personality."

⁷Morgan defends such assumptions based on a very subjectivistic and outdated interpretation of modern physics, especially Heisenberg's uncertainty principle. I do not like such interpretations, especially since I have read Feynman's theory stating that the contents of Heisenberg's uncertainty 'range' are used for information exchange between particles, thus making unnecessary the field concept. The fact that Feynman's theory makes the field concept superfluous and explains interaction between particles based upon information exchange is a real revolution in physical thought.

4.5.5. *The political system metaphor*

If we see organizations as political systems, we see them as systems of government that vary according to the modes of political rule that are employed. Rather than seeing organizations as unified systems, as the machine metaphor and the organism metaphor do, the organization is understood as a system consisting of individuals that have divergent interests. The organization must provide a means to its members to reconcile their differences through consultation and negotiation.

Morgan (1986: 145) distinguishes several modes of political rule: autocracy, bureaucracy, technocracy, codetermination, representative democracy and direct democracy. These modes of political rule can be used for describing the way power is exercised in organizations. A further analysis of organizations as political systems involves the investigation of interests, conflicts and power. The interests of each person can be analyzed in terms striking a balance between an interest to do the task in the organization in an optimal way, an interest to develop career opportunities, and an interest to live one's personal life outside the organization. Conflicts can be understood as stemming from these underlying interests (hidden agendas), and from conflicts that are built in in the organization through the functional and other task divisions on which the organizational structure is based.

" . . . people begin to identify with the responsibilities and objectives associated with their specific role, work group, department, or project team, in a way that often leads them to value achievement of these responsibilities and objectives over and above the achievement of wider organizational goals. . . . As the actors in their various roles attempt to do the job for which they have been appointed, interpreting their task interests in a way that seems ideally suited for the achievement of organizational goals, they are set on a collision course."
(Morgan, 1986: 157)

Power can be analyzed by looking at the numerous sources of power distinguished by Morgan (1986: 159). Important sources of power are:

- formal authority (described by Weber's (1925) theory of legitimate domination);
- control of scarce resources and dependency of others on it (Pfeffer and Salancik, 1978);
- control of decision processes (setting the agenda);
- control of key technologies.

Morgan (1986: 178) also discusses traditional male and female stereotypes, and strategies for the management of gender relations in the context of the power aspect of organizations.

The political system view on organizations reflects a pluralist approach to describing organizations.

"The term 'pluralism' is used in political science to characterize idealized kinds of liberal democracies where potentially authoritarian tendencies are held in check by the free interplay of interest groups that have a stake in government. . .
" (Morgan, 1986: 185)

The pluralist approach stands in contrast with an organic or unitary view of organizations, and with radical views of organizations that emphasize antagonistic class interests. These three approaches do not only serve as analytical tools, but also as organizational ideologies.

". . . much organization theory has been built on the assumption that organizations, like machines or organisms, are unified systems . . . The political metaphor suggests otherwise, pointing to the disintegrative strains and tensions that stem from the diverse sets of interests on which organization builds. . . . Many organizations have the characteristics of loosely coupled systems, where semiautonomous parts strive to maintain a degree of independence while working under the name and framework provided by the organization." (Morgan, 1986: 196)

The political system metaphor sees organizations as multi-agent systems. The participating agents are guided by their interests and struggle for power. In the political system metaphor, Morgan presents his most refined analysis instruments (interest analysis and power analysis) and the type of organization that he appreciates most (the pluralist organization).

4.5.6. The instrument of domination metaphor

If the power distribution in a political system is very unbalanced, the system may be denoted as an instrument of domination (Morgan, 1986: 273).

"Organizations are often used as instruments of domination that further the selfish interests of elites at the expense of others. And there is often an element of domination in *all* organizations." (Morgan, 1986: 275)

Morgan illustrates this domination aspect of organizations by pointing at the adulteration of food, environmental pollution, hazardous work environments, and exploitation of labor, the latter especially in the Third World.

Domination can rest on brute force, or can be accepted as being legitimate. Weber (1925) has studied forms of legitimate domination in different cultures and historical epochs. As a result of this, he has distinguished three main forms of legitimate domination: legal, traditional and charismatic (see Paragraph 4.3.3.). In a further study of the legal form of domination and the connected bureaucratic form of administration, he concluded that even this most rational form of administration can act as a power instrument that is confining and unshatterable. A similar conclusion is drawn by Michels (1915/1962) in his 'iron law of oligarchy', which states that even the most democratic forms of government have the tendency to develop oligarchies.

"It is organization which gives birth to the domination of the elected over the electors, of the mandatories over the mandators, of the delegates over the delegators. Who says organization says oligarchy." (Michels, 1915/1962: 15)

". . . even democratically elected leaders with the best intentions have a tendency to become part of an elite furthering their own interests, and to hang onto their power at all costs." (Morgan, 1986: 278)

Both tendencies, the tendency of rational domination to develop into a confining way of administration, and the tendency of democracy to develop an oligarchy, can be seen as tendencies of a society to leave the difficult path of pluralism. The tendency to develop a confining bureaucracy is a tendency toward a unitary form of organization, while the tendency to develop oligarchies is a more deep-rooted tendency that can be explained as the development of group interests or class interests. Both tendencies show the weakness of a rational and democratic form of organization that is not firmly rooted in a form of pluralism that has mechanisms to provide an access to power of a diversity of people, of a diversity of ideas, and of a diversity of policies.

The development of forms of domination that serve the interests of a privileged group has been explained by Marx (1890/1975) based on the dynamics of economy. The quest for surplus value and the accumulation of capital is the basic mechanism explaining domination. This leads to class-based forms of domination. The modern and most powerful form of organization of capital is the multinational corporation. These multinational corporations have powers equaling those of many smaller and middle-sized national states (Morgan, 1986: 302).

"Whenever we examine the multinationals, therefore, we are quickly brought face to face with their monolithic power. Of all organizations, they come closest to realizing Max Weber's worst fears with regard to how bureaucratic organizations can become totalitarian regimes serving the interests of elites . . ." (Morgan, 1986: 303)

In his discussion of the instrument of domination metaphor, Morgan explains an important reason why he disapproves of the machine metaphor organization: these organizations can be used as practically unshatterable instruments of selfish elites.

4.5.7. The mind metaphors: discussion

The mind metaphors have in common that they see the human mind as basic for the existence of organizations. Organizations are socially constructed realities. People participate in organizations having their own interests and interact with each other following patterns of power.

The brain metaphor is used by Morgan to explain his disapproval of Simon's theory of bounded rationality as a rationalization of machine metaphor bureaucracies. The holographic organization discussed under the brain metaphor is, in fact, an elaboration of some characteristics of the open system explained under the organism metaphor.

The political system metaphor is forwarded by Morgan as the main alternative to the machine metaphor. Morgan presents his most refined analysis instruments (interest analysis and power analysis) here, as well as the type of organization that he most appreciates (the pluralist organization). The pluralist organization is contrasted with the unified system organization supposed by the machine and organism metaphors. However, no concrete examples or design advices are given concerning pluralist organizations.

The culture metaphor and the psychic prison metaphor can only be used in a descriptive and interpretative way. Morgan uses the psychic prison metaphor to generate an argument against the machine metaphor theory as stemming from a disturbed and neurotic personality.

In his instrument of domination metaphor, Morgan returns to the theories of Weber and Marx that were discussed earlier under the machine metaphor and the organism metaphor. The main argument of the instrument of domination metaphor is that rational and democratic societies and organizations tend to develop oligarchies and confining bureaucracies, a tendency which is compatible with the Marxist observation that the accumulation and organization of capital leads to the present-day situation where powerful machine metaphor organizations (multinational corporations) serve selfish elites. This argument shows one of the most profound motivations of Morgan's disapproval of machine metaphor organizations.

Morgan's mind metaphors present us three important theories: Simon's theory of bounded rationality, Weber's theory of legitimate domination, and Marx's theory of the organization of capital. Of these theories, Simon's theory is disapproved of by

Morgan⁸. Furthermore, Morgan's mind metaphors include a diversity of descriptive and interpretative frameworks regarding cultures, psychological mechanisms, political systems, interests, and power. Morgan presents the pluralist organization as the 'good' organization, and the multinational corporation, which is seen as a machine metaphor organization used by selfish elites, as the 'bad organization. The pluralist organization, however, is not elaborated into a clear model.

4.6. Conceptual analysis of Morgan's metaphors

4.6.1. Lines of reasoning

Morgan's line of reasoning begins with the construction of the machine metaphor organization with Taylor's theory as its kernel and components added from Fayol's theory and Weber's theory. Many negative points of this metaphor are explained. Then, the organistic organization is explained as an antithesis. The theory (especially contingency theory) stating that organistic organizations are needed to survive in turbulent environments, is quoted. The organistic organization is defined most clearly as an open system; practical examples are the adhocracy based on project teams and the matrix organization. The main weak point of the organistic organization is the lack of a political dimension. This political dimension is elaborated in the political systems metaphor, offering descriptive instruments as well as an idealtypical pluralistic organization. However, no concrete example or design parameter of this pluralistic organization is provided. Other metaphors mainly serve as explanations of negative aspects of the machine metaphor, such as the description of Simon's theory as a rationalization of machine metaphor organizations, the description of the machine metaphor perspective as stemming from a disturbed and neurotic personality, and the negative appraisal of the machine metaphor organization as an instrument of suppression used by dominant elites.

The line of reasoning explained above is, of course, a reconstruction with a special goal. This special goal is the identification of the main hypotheses underlying Morgan's book. Above, we have identified the first main hypothesis, which is the one concerning the mechanic-organic organization antithesis. A second main hypothesis concerns the necessity of pluralistic organizations. This hypothesis can be (re)constructed as follows. A particular important line of Morgan's reasoning seems to be that rational and democratic societies and organizations tend to develop oligarchies and confining bureaucracies. Although not explicitly stated by Morgan, one could connect this line of reasoning to his approval of pluralist organizations by stating the hypothesis as: only organizations and societies that are genuinely pluralistic can counteract the tendency towards the development of oligarchies and confining bureaucracies.

The reconstruction of the main lines of reasoning in Morgan's book points to the main theories underlying his reasoning: (1) Taylor's theory serving as a definition of the machine metaphor, (2) Weber's theory about legitimate domination and the development of bureaucracies to confining forms, (3) Fayol's theory about centralized

⁸As explained in Chapter 3, I consider Simon's theory of bounded rationality as fundamental for the further development of organization theories that take the human mind into account.

control, (4) open systems theory serving as a definition of organic organizations, (5) Burns and Stalker's theory stating the mechanistic-organic dimension and the connected notion of the adaptation of organic organizations to turbulent environments, (6) Morgan's own theory about interests, sources of power, and the pluralist organization, (7) Michels' iron law of oligarchy, and (8) the Marxist interpretation of the emergence of oligarchy as being the result of a dialectical logic of change in which a new ruling class emerges.

4.6.2. Approach of the formalization

A further conceptual analysis of Morgan's book has to make choices, because the formalization of all theories described by Morgan and discussed above would lead to an unmanageable amount of formulas⁹. In the choice of what we will describe of Morgan's metaphors, we will focus on the line of reasoning described above and the subdivision into machine metaphor, organism metaphors, and mind metaphors because this subdivision roughly corresponds with three main types of organization models that can be distinguished.

4.6.3. Key concepts

In this paragraph, we turn to the key concepts that are distinguished by the three main types of metaphor. The basic organization model is applied in order to determine how the concepts of whole, part, action and symbol structure are used. This leads to a list of key concepts documented in Appendix B. After that, the concepts that are used as design parameters are selected out of the total list of concepts. These design parameters can be seen as those aspects of the organization that the designer or manager can influence (subjective interpretation), or as basic mechanisms driving the actions of the system (objective interpretation). An example of a subjective interpretation is the organization of work, which is seen as a design parameter in Burns and Stalker's theory. An example of an objective interpretation can be found in Michels' theory, which sees the struggle for power as a basic mechanism, and in Marx's theory, which sees a.o. the technological change as a basic process driving organizational change. These design parameters and mechanisms driving the system are documented in Appendix C. The goals of the organization to be reached by the designer or manager are another subset of the total list of concepts. These are documented in Appendix D. An example of a goal in Burns and Stalker's theory is the nature of employee commitment. Some theories do discern external influences in the form of contingency factors and key performance indicators. The key performance indicators are observable variables that are the result of influencing design parameters

⁹A rough estimate demonstrates that the description of all theories subsumed under Morgan's metaphors and discussed above at a reasonable level of detail would lead to approximately 200 pages of formulas. Therefore, a description has to be made selecting key features of Morgan's approach and staying at a level of description that is rather abstract, but detailed enough to show interesting differences in interpretation frames and model types.

and striving toward goals. Examples taken from Burns and Stalkers theory are the environmental stability (a contingency factor), and the match of the organization form with the predicted successful form (key performance indicator). The contingency factors and key performance indicators that could be selected out of the gross list of concepts are documented in Appendix E.

4.6.4. Main hypotheses

In this paragraph, we pay attention to the main hypotheses associated with the three types of metaphor. Generally, the main hypotheses reason back from (1) the key performance indicators and the contingency factors, via (2) the design goals and organization types, to (3) the design parameters or fundamental actions driving the system.

(1) Taylor's theory: organizational productivity

If managers design the optimal work methods scientifically, and managers select the best personnel for each job, and workers are sufficiently trained, and workers work according to that optimal work method, and workers are stimulated to work productively by an adequate remuneration system, productivity of work will be 30% to 100% higher than in situations where these conditions are not met. Situations to be especially avoided are those in which each worker designs his or her own optimal work method. Productivity has to be measured per worker in order to be able to determine remuneration bonuses and to determine total productivity.

(2) Fayol's theory: performance, organizational discipline, unity of command

The formal authority relations that are created by the organizing activity of management determine whether the organization has unity of direction. An organization has unity of direction when every person (except the topmost manager) has one, and not more than one, boss. Unity of direction is a condition for the realization of unity of command, which is realized when no person receives commands from more than one other person. Unity of command is a condition for discipline, another condition for a person's discipline is personal authority of his or her boss. Furthermore, the remuneration rule system quality is a determining factor for discipline. The performance of a worker depends on his or her discipline and his or her specialization. Likewise, the organizational performance depends on organizational discipline and organizational specialization.

(3) Weber's theory: legitimation of authority, arbitrary rule avoidance

The legitimation of authority leads to the obedience of persons to commands and rules. Rational-legal domination of authority is the form of legitimate authority that is appropriate for industrialized societies. Legitimation of authority of in a society is defined to be based on rational-legal domination if a sufficient level of arbitrary rule avoidance is reached. A sufficient level of arbitrary rule avoidance is realized when a bureaucratic administration of sufficient quality is realized and when the rule system is sufficiently sophisticated. A bureaucratic administration of sufficient quality is reached if there exists a hierarchy of offices, each with a restricted competence sphere, that covers all legal rules, and if persons are appointed to offices based on their qualifications.

(4) Open systems theory:

If an organization wants to maintain a steady state or reach a goal state, it must have a sufficient variety of regulatory mechanisms, an adequate level of energy use, and an adequate form. The variety of regulatory mechanisms is sufficient if it matches the variety of the environmental disturbances, and if goals are present that match the environmental challenges and opportunities. An adequate level of energy use and an

adequate form result from an adequate specialization and interdependency of parts, and a sufficient variety and capacity of exchanges with the environment.

(5) Burns and Stalker's theory:

Organizations can be characterized on a scale ranging from mechanistic to organic based on their organization of work, nature of authority, communications system, and nature of employee commitment. The environment is characterized as ranging from relatively stable to highly unpredictable; while the task facing the firm ranges from efficient production of standard products to the exploitation of rapid technical change. It is assumed that organizations adapt to their environment and to their task: unpredictable environments and innovation-oriented production need organic organizations, while stable markets and efficient production of standard products need mechanistic forms of organization.

(6) Morgan's political system theory:

The organization type (unitary, pluralist, or class-based), and the mode of rule (autocracy, bureaucracy, technocracy, codetermination, representative democracy, or direct democracy) is determined by the interests of persons and groups and the power of persons and groups. Persons strike a balance between task interest, career interest, and personal life interest. Power stems from several sources, of which formal authority, resource control, and control of the decision process are the main types. Interests and power are modified and shaped by factors such as group membership, goals, organization structure, assigned tasks, formal authority structure, resource control, resource dependency, and decision process control.

(7) Michels' theory:

Even leaders with the best intentions form or enter dominant elite groups. Elite groups further their interests in the decision processes they control. Throughout their struggle for power, dominant elite groups tend to maintain their power.

(8) Marx's theory:

The ruling class in a society is the class having control of the productive forces, while the ruled class has no control over these productive forces. This distribution of power, termed the productive relations, changes due to three basic processes. Firstly, The ruling class tends to maintain its power, unless the technological development of the productive forces bring other groups in control and a new ruling class is formed. Secondly, the control of the productive forces concentrates, which means that weaker groups within the ruling class lose their control to stronger groups. Thirdly, the ruled class will struggle with the ruling class for power. The tendency of rational and democratic societies to develop oligarchies and confining bureaucracies can be explained as the first process mentioned above in which those that have control over the productive forces become the ruling class, and as the second process explained in which concentration of power leads to confining bureaucracies.

(9) Pluralism hypothesis:

Rational and democratic societies and organizations tend to develop oligarchies and confining bureaucracies, a tendency that is stimulated by the interest of the dominant elite in control of the productive forces, a tendency that can only be counteracted by organizations and societies that are genuinely pluralistic. A society or organization is pluralist if the power is distributed over multiple persons or groups, if there is a variety of groups that can become dominant, if there is a variety (in time) of dominant policies, and if the culture of the dominant elite allows for a variety of ideas. Whether pluralism is present depends on the distribution of interests of people and groups, and the distribution of power over people and groups. Persons strike a balance between task interest, career interest, and personal life interest. Power stems from several

sources, of which formal authority, resource control, and control of the decision process are the main types. Interests and power are modified and shaped by factors such as group membership, goals, organizational structure, assigned tasks, formal authority structure, resource control, resource dependency, and decision process control. Decision processes can produce an assignment (to persons or groups) of formal authority, resource control, decision process control, and other factors upon which power is dependent.

4.6.5. Organization design

The concepts identified in Paragraph 4.6.3. are the basis for a further analysis and investigation of the verbal theory on the point of organization design. What do the theories explained by Morgan state about organization design?

The machine metaphor theories have the most clear list of design parameters and associated design goals. The most important design goals are:

1. (remuneration) rule system quality;
2. formal authority structure based on hierarchy and task domain;
3. work method efficiency;
4. qualification of workers and management;
5. assignment of the right man to the right task.

The organism metaphor provides a less clear picture of design goals. This is due to the fact that organism metaphor theories are mainly descriptive, not prescriptive. The organization must be able to cope with the quantities and disturbances present in the exchange with its environment by using a matching technology, and an organization structure supporting that technology. Open systems theory offers the following design parameters:

1. goal;
2. specialization of parts;
3. interdependency of parts;
4. exchange processes;
5. feedback mechanisms.

These parameters are interrelated because the specialization of parts is dynamically realized by exchange processes and feedback mechanisms, and parts are interrelated by exchange processes and feedback mechanisms. Special feedback mechanisms can adjust goals. Open systems theory has the following design goals:

6. a requisite variety of regulatory mechanisms (in this case: feedback mechanisms);
7. maintenance of form; possibly growth;
8. an adequate level of energy use.

These design parameters and design goals are rather abstract. Contingency theory offers more detailed design parameters, but it is often not clear which theoretical background these parameters have in terms of systems theory. Burns and Stalker's theory, for instance, offers the following design parameters:

1. organization of work (which has to be seen as the measure to which detailed task specifications are present, in connection with the possibility to specify tasks in a relatively stable manner);
2. nature of authority (ranging from clear hierarchical authority patterns to constantly changing authority patterns mainly based on skills and abilities);
3. communications system (ranging from formally defined communication based on the hierarchical authority pattern to completely free and informal communication).

As a result of these parameters, the employee commitment, which is another important structure variable for Burns and Stalker, will range from commitment of employees to their own clearly defined tasks to commitment to the changing central tasks of the organization as a whole.

The mind metaphor theories are mainly classificatory-descriptive (Morgan's political system theory, the pluralism hypothesis¹⁰), or based on fundamental processes or actions that drive the system rather than on design parameters (Michels' theory and Marx's theory). With some extra interpretative effort, we could see the following design parameters in Morgan's political system theory as parameters that affect power distribution and interests:

1. organization structure;
2. formal authority;
3. group membership;
4. resource control;
5. resource dependency;
6. decision process control;
7. goals.

These design parameters are also valid for the pluralism hypothesis. The design goal in Morgan's political system theory is an organization type, of which the pluralist organization seems the most attractive.

4.6.6. Dynamics

Generally spoken, dynamics rules state the preconditions of actions. The effects of those actions are stated in the hypothesis rules and design rules.

The machine metaphor dynamics can be described in terms of a process consisting of a.o. the following actions: plan, determine the most efficient way of doing the job, organize (a.o. create a remuneration rule system), select personnel, train personnel; coordinate, command and control (a.o. supervise the job), do the job, pay personnel.

The dynamics of the organism metaphor organization are more complicated and can be described in various ways ranging from the complex machinery of Prigogine's dissipative system theory to more simple statements of open system principles such as stated by De Leeuw's theory found in Chapter 3.

The dynamics of the mind metaphor organization are very complex, which is the reason why most mind metaphor theories discussed by Morgan are mainly descriptive¹¹. As far as dynamics are stated, they are contained in rules expressing tendencies, which means that they are valid for populations of organizations, but do not hold for individual organizations¹².

¹⁰The pluralism hypothesis is a variant of Morgan's political system theory. This hypothesis is explained in Paragraph 4.5.4.

¹¹An attempt to escape such descriptive theories for mind-metaphor organizations can be found in recent developments in the field of multi-agent systems.

¹²The problem that was observed by Glorie, Masuch, and Marx (1990) in their formalization of Mintzberg's theory, namely apparent contradictions between

4.6.7. Some concluding notes on the conceptual analysis

The conceptual analysis of Morgan's metaphors can be used for a comparison of theoretical contents of those metaphors. The attention that the metaphors pay to six subjects is summarized in Figure 4.3.

From this comparison, we can see that the machine metaphor (1) theories -- which are

Subject	Machine metaphor theories	Organism metaphor theories	Mind metaphor theories
formal authority structure	++	+	++
organization of work	++	+	
personnel policy	++		
communication and decision-making system	+	+	++
resource control and resource dependency			++
legitimation of power	+	.	+

Figure 4.3. Subjects to which metaphors pay attention

in fact the classical organization theories of Taylor, Fayol, and Weber -- give a rather rich image of organizations, and that the image of organizations presented to us by the more abstract organism metaphor theories is less rich than the machine metaphor image, although it may be of a more sophisticated nature with respect to the mathematics used. This may be due to the fact that most organism metaphor theories distinguish only one level of organization (the organization itself), and do not or only marginally pay attention to persons and organization units.

Because Morgan (1986) compares organizations mainly at the system level, he does not include the full richness of the machine metaphor (1) theories at the agent level in his version of the machine metaphor (2). Furthermore, Morgan uses organization metaphors not primarily as a starting point for analysis, as we have done in this chapter, but as a starting point for imagination, synthesis, and construction. These two points of difference explain the unexpected result that machine metaphor theories are *analytically* superior to organism metaphor theories: the analytical evaluation of machine metaphor (1) theories compared to organism metaphor theories can give a result that is different from a comparison of the machine metaphor (2) with the

Mintzberg's rules, can be explained as an example of the fact that most organization theories only state tendencies that hold for populations of organizations, not for individual organizations.

organism metaphor from a synthesis point of view. A comparison of the levels of organization that the metaphors regard is given in Figure 4.4.

Before the start of the work on the formalization of Morgan's metaphors, the author was inclined to accept two initial hypotheses. Firstly that the organism metaphor was superior to the machine metaphor, which is one of the dominant themes in Morgan's (1986) book. Secondly, that the mind metaphor theories were interesting because they see organizations as socially constructed realities, and the human mind as basic for the

Organization level	Machine metaphor theories	Organism metaphor theories	Mind metaphor theories
society			+
class			+
organization network		1	
organization	+	+	+
organization unit	2	3	+
group			+
person	+	4	+
1. With the exception of population ecology theories. 2. With the exception of Weber's offices. 3. With the exception of Lawrence and Lorsch's subsystems. 4. With the exception of marginal attention paid, like in Burns and Stalker's employee commitment variable.			

Figure 4.4. Organization levels to which metaphors pay attention

existence of such socially constructed realities. Both hypotheses proved to be wrong. The conceptual analysis showed that the machine metaphor (1) theories were in fact richer than the organism metaphor theories, who provide a rather abstract and flat picture of organizations¹³. Most mind metaphor theories were not concerned with the human mind, but with concepts such as culture, power, and interests; the only exceptions being the bounded rationality theory of Simon and March, disapproved of by Morgan, and the psychic prison theories. The latter theories, however, are merely descriptive and offer no possibilities for organization development or organization design because they are concerned with a phenomenon that is beyond control by definition. The conceptual analysis of Morgan's metaphors did not only falsify my initial hypotheses mentioned above, but has also led to a renewed interest in the conceptually rich classical theories (Fayol, Weber, Marx), in the synthesis of theories

¹³This qualification of organism metaphor theories does not imply that mechanistic organizations are better than organic organizations. It is not a statement about organization types, but about theories.

by Mintzberg, and in the mind metaphor theories of the Simon and March school, including the recent developments in the direction of multi-agent systems.

4.7. Interpretation frame specification of Morgan's metaphors

4.7.1. The machine metaphor

The task we are faced with now is (1) to integrate the key concept specifications of Taylor's theory, Fayol's theory, and Weber's theory, (2) to devise a specification that is modular, top-down, and object oriented, (3) to assign symbol structures to persons or to the organization as a whole¹⁴, and (4) to describe the main organizational process and decompose it into actions that can be attached to agents, while (5) avoiding overspecification. The main organizational process consists of a management process and a work process.

```

<machine metaphor organization> ::=
    {<the organization>, <person> +, <office> +, <job> +, <whole
    quality> +, <symbol structure> +, <main process> +}.
<whole quality> ::=:
    {performance(<the organization>)|
    organizational productivity(<the organization>, <productivity measure>)|
    efficiency of work(<the organization>, <efficiency measure>)|
    specialization(<the organization>)|
    rule system quality(<the organization>, <quality measure>)|
    organizational discipline(<the organization>)|
    unity of command(<the organization>)|
    unity of direction(<the organization>)|
    centralization(<the organization>)|
    scalar chain of command(<the organization>)|
    bureaucratic administration(<the organization>, <quality measure>)|
    legitimation of authority(<the organization>, <legitimation measure>)|
    arbitrary rule avoidance(<the organization>)}.
<person> ::= {<manager> | <worker>}.
<person> ::=
    {<a person>, ,
    qualification(<a person>, <qualification description>),
    knowledge(<a person>, <knowledge description>);
    training received(<a person>, <training description>),
    specialization(<a person>),
    discipline(<a person>)}.
<worker> ::=
    {ako: <person>, productivity (<a worker>, <productivity value>),
    <work process>}.
<manager> ::=
    {ako: <person>, personal authority(<a manager>), <management
    process>}.

```

¹⁴In doing so, one decides about the nature of the symbol structure: is it resident in a person's mind, or is it external to the person in the sense that (1) people discuss about it as existing objectively, and (2) a copy on paper or on another medium exists that can act to resolve interpretation differences..

```

<job> ::=
    {<a job>, job structure(<a job>, <higher job>, <order number>),
    work method(<a job>, <method description>, <efficiency measure>)}.

<office> ::=
    {<an office>, sphere of competence(< an office>, <competence
    description>),
    office structure(<an office>, <higher office>)}.

<symbol structure> ::=
    {organization membership(<the organization>, <a person>)|
    assigned job(<a worker>, <a job>, <wages>)|
    assigned office(<a person>, <an office>, <remuneration>)|
    formal authority(<a manager>, <a worker>)|
    rule(<rule id>, <rule text>, <competence description>)|
    sensation(<a manager>, <message contents>)|
    command(<a manager>, <a worker>, <message contents>)}

<main process> ::=
    {plan(<a manager>, <job structure>);
    determine most efficient way of doing a job(<a manager>, <work
    method>);
    organize(<a manager>, <sphere of competence>, <office structure>,
    <rule>);
    select personnel(<a manager>, <organization membership>, <assigned
    job>, <assigned office>);
    train personnel(<a manager>, <training received>);
    assign boss(<a manager>, <formal authority>);
    coordinate(<a manager>, <a job>);
    do a job(<a worker>, <a job>), "note the comma indicating parallel
    execution"
    supervise a job(<a manager>, <a job>, <command>);
    control(<a manager>, <a job>, <sensation>);
    pay personnel(<a manager>, <a worker>, <rule>)}.

<management process> ::=
    {plan(<a manager>, <job structure>);
    determine most efficient way of doing a job(<a manager>, <work
    method>);
    organize(<a manager>, <sphere of competence>, <office structure>,
    <rule>);
    select personnel(<a manager>, <organization membership>, <assigned
    job>, <assigned office>);
    train personnel(<a manager>, <training received>);
    assign boss(<a manager>, <formal authority>);
    coordinate(<a manager>, <a job>);
    supervise a job(<a manager>, <a job>, <command>);
    control(<a manager>, <a job>, <sensation>);
    pay personnel(<a manager>, <a worker>, <rule>)}.

<work process> ::=
    {select personnel(<a manager>, <organization membership>, <assigned
    job>, <assigned office>);
    train personnel(<a manager>, <training received>);
    assign boss(<a manager>, <formal authority>);
    do a job(<a worker>, <a job>);
    pay personnel(<a manager>, <a worker>, <rule>)}.

<wages> ::= {<a wage sum> ako: <number> depending on: (<a job>, <rule>)}.

```

The main process consists of a number of actions. Two actions are parallel: do a job (by the worker) and supervise a job (by the manager). Part of the actions can be allocated to the manager, part to the worker. Note that manager and worker have to

cooperate on the actions they have in common: select personnel, train personnel, assign boss, and pay personnel.

In the machine metaphor, the focus is on job decomposition and a sequence of processes or actions. This can be highlighted using a subset of the machine metaphor specification, the process decomposition model. In the somewhat modified form described below, this process decomposition model is often used in information system design, where jobs are decomposed and optimized.

```

<process decomposition model> ::=
    {<the organization>, <job> +; <main process 1> +}.
<job> ::=
    {<a job>, job structure(<a job>, <higher job>, <order number>),
    work method(<a job>, <method description>, <efficiency measure>)}.
<main process 1> ::=
    {plan(<a manager>, <job structure>);
    determine most efficient way of doing a job(<a manager>, <work
    method>);
    select information system(<a manager>, <assigned job 1>); "assigning
    tasks to information systems is an information planning task"
    train information system(<a manager>, <training received 1>); "this
    training is mostly done by programming"
    assign boss to information system(<a manager>, <formal authority 1>);
    do a job 1(<an information system>, <a job>), "note the comma
    indicating parallel execution"
    supervise a job(<a manager>, <a job>, <command>);
    control(<a manager>, <a job>, <sensation>)}.
<assigned job 1> ::=
    {assigned job 1(<an information system>, <a job>)}.
<training received 1> ::=
    {training received 1(<an information system>, <training program
    description>)}.
<formal authority 1> ::=
    {formal authority 1(<a manager>, <an information system>)}.

```

4.7.2. *The organism group of metaphors*

In this paragraph, we have to integrate open systems theory and Burns and Stalker's theory in order to get a first approximation of the conceptual frame used by the organism metaphor. The main problem seems that open systems theory and Burns and Stalker's theory offer key concepts that seem to describe different worlds. An integration, therefore, will have an artificial flavor.

```

<organism metaphor organization> ::=
    {<organization>, <environment>}.
<organization> ::=
    {<the organization>, <part> +, <organization quality> +, <exchange
    process> +, <feedback mechanism> +}. "exchange processes and
    feedback mechanisms work in massive parallelism"
<environment> ::=
    {<the environment>, <environment quality>}.
<organization quality> ::=
    {state(<the organization>, <state variable>, <state value>)|
    steady state(<the organization>, <state variable>, <state value>)|
    energy use(<the organization>, <energy use value>)|
    form(<the organization>, <form type>)|
    variety of regulatory mechanisms(<the organization>, <variety value>)|
    goal(<the organization>, <state variable>, <state value range>)|

```

organization of work(<the organization>, <task allocation form type>)|
 nature of authority(<the organization>, <authority form type>)|
 communication system(<the organization>, <communication form type>)|
 nature of employee commitment(<the organization>, <commitment form
 type>)|
 organization task(<the organization>, <task type>)|
 predicted successful form(<the organization>, <form type>)}.
 <environment quality> ::=
 {variety of disturbances(<the environment>, <variety value>),
 challenge(<the environment>, <challenge description>),
 opportunity(<the environment>, <opportunity description>),
 stability(<the environment>, <environment stability type>)}.
 <part> ::=
 {<a part> part of: <the organization>,
 specialization(<a part>, <specialization description>)+,
 interdependency(<a part>, <depending part>, <dependency type>)+}.
 <exchange process> ::=
 {exchange process(<the organization>, <process id>, <item type
 processed>, <processing rate>, <process source>, <process
 destination>)}.
 <process source> ::=
 {organization| environment}.
 <process destination> ::=
 {organization| environment}.
 <feedback mechanism> ::=
 {feedback mechanism(<the organization>, <mechanism id>, <norm> ,
 acts upon: {<exchange process>}+)}.
 <norm> ::=
 {steady state | goal state}.
 <form type> ::=
 {mechanistic | moderately mechanistic | moderately organic | organic}.
 <environment stability type> ::=
 {relatively stable| moderate rate of change | high degree of change | highly
 unpredictable}.
 <task type> ::=
 {efficient production of standard products| efficient production of basic
 products subject to modification according to customer requirements |
 design, production, and marketing of new products | exploitation of rapid
 technical change}.

A somewhat abstract specification of contingency theory expressing its research methodology is:

<contingency theory organization> ::=
 {<the organization>, <attribute>+, <relationship between attributes>+}

Lawrence and Lorsch's theory uses a model that allows for decomposition of the system into subsystems. We specify the interpretation frame of this type of theory as an example of a specification that uses an earlier specification. An open system decomposition model can be characterized as:

<open system decomposition organization> ::=
 {ako: <organism metaphor organization>,
 (<subsystem>, <function of subsystem with respect to the
 organization>)*,
 (<environmental system>, <function of the organization with respect to
 environmental system>)*,
 <mode of integration>*}.

<subsystem> ::=
 {<open system decomposition organization>}.

<environmental system> ::=
 {<open system decomposition organization>}.

Note that the specification has become recursive.

We can go on by adding a life cycle to an open system decomposition organization, and putting it in an ecological system. As a result, we get a specification of an ecological system theory:

<ecological system theory> ::=
 {<the ecological system> ,
 <ecological system state variable> + ,
 <ecological system macro method> + ,
 (<open system decomposition organization> ,
 <system life cycle state> + ,
 <system environment interaction method> + ,
 <system life cycle method> +) + }.

<system environment interaction method> ::=
 {<force flux relationship> |
 <autopoiesis method> |
 <ecological cycle method> }

4.7.3. *The mind group of metaphors*

In our specification of the interpretation frame of the mind group of metaphors, we have to integrate Morgan's political system theory, Michels' iron law of oligarchy, Marx's theory (very partial), and the pluralism hypothesis we formulated in Paragraph 4.5.6. The main problem here is that these theories discuss a number of levels of organization that we have to distinguish carefully. In an ontological engineering analysis of the objects at the different levels of organization we can possibly simplify and generalize¹⁵.

<mind metaphor organization> ::=
 {<organization> , <society>}.

<organization> ::=
 {<the organization> , <person> + , <group> + , <organization
 quality> + , <organization structure> + , <decision process structure> + }.

<society> ::=
 {<the society> , <class> + , <societal group> + , <society quality> + ,
 <society change process> + }.

<class> ::=
 {(<the ruling class> | <the ruled class>), <class quality> + , <class
 structure> + , <class control> + , <class membership action> + }.

<societal group> ::=
 {<the dominant elite> | <another societal group>}.

<societal group> ::=
 {<a societal group> , <societal group quality> + , <societal group
 control> + , <class membership action> + , <societal group decision
 action> + , <elite membership action> + }.

¹⁵Note that the type of generalization used here is the adding of attribute slots and slots for other characteristics to objects following an object type hierarchy. It does enhance the possibilities to register information rather than oversimplify observations leading to loss of information, which is the case when generalizing data.

<group> ::=
 ({<the dominant group> | <a nondominant group>},
 {<an organization unit> | <another group>}).

<group> ::=
 {<a group>, <group quality> +, <group structure> +, <group
 control> +, <group decision action> +, <group membership action> +}.

<organization unit> ::=
 {ako: <group>}.

<person> ::=
 {<the leader> | <another person>}.

<person> ::=
 {<a person>, <person quality> +, <person control structure> +, <group
 membership action> +, <elite membership action> +, <person decision
 action> +}.

<society quality> ::=
 {organization type(<the society>, <organization type>)|
 distribution of power(<the society>, <power> +)|
 variety of dominant group(<the society>, <variety value>)|
 variety of dominant policy(<the society>, <variety value>)|
 variety of culture of dominant group(<the society> | <variety value>)|
 mode of rule(<the society> | <ruling type>)}.

<organization quality> ::=
 {is like: <society quality> where: <the whole> is replaced by: <the
 organization>}.

<person quality> ::=
 {goal(<a person>, <goal description>)|
 interest(<a person>, <interest type>, <interest strength>)|
 power(<a person>, <power source>, <power strength>)|
 power maintenance(<a person>)}.

<group quality> ::= +
 {is like: <person quality> where: <a person> is replaced by: <a group>}.

<societal group quality> ::= +
 {is like: <person quality> where: <a person> is replaced by: <a societal
 group>}.

<class quality> ::= +
 {is like: <person quality> where: <a person> is replaced by: <a class>}.

<class structure> ::=
 {class membership(<a societal group>, <a class>)}.

<group structure> ::=
 {group membership(<a person>, <a group>)}.

<organization structure> ::=
 {organization structure(<an organization unit>, <higher organization unit>,
 <a task>)}.

<personal control> ::=
 {formal authority(<a person>, <an organization unit>) "a person controls
 formally an organization unit"|
 assigned task(<a person>, <a task>)|
 resource control(<a person>, <a resource>)|
 resource dependency(<a task>, <a resource>)|
 decision process control(<a person>, <a decision process>)}.

<group control> ::=
 {is like: <personal control> where: <a person> is replaced by: <a
 group>}.

<societal group control> ::=

{is like: <personal control> where: <a person> is replaced by: <a societal group>}.

<class control> ::= {is like: <personal control> where: <a person> is replaced by: <a class>}.

<decision process structure> ::= {agenda(<time>, <a decision process>, <decision item> +)| decision outcome(<decision id>, <decision item>, <interest furthered> +, <power effects> +)}.

<group membership action> ::= {enter group(<a person>, <a group>)| leave group(<a person>, <a group>)}.

<class membership action> ::= {is like: <group membership actions> where: (<a person> is replaced by: <a societal group>) and: (<a group> is replaced by: <a class>)}.

<elite membership action> ::= {is like: <group membership actions> where: <a group> is replaced by: <the dominant elite>}.

<personal decision action> ::= {(setting the agenda(<a person>, <a decision process>, <an agenda>); decision process(<a person>, <another person> +, <decision item>, <decision outcome>))| struggle for power(<a person>, <another person>, <power> +)}.

<group decision action> ::= {is like: <personal decision action> where: (<a person> is replaced by: <a group>) and: (<another person> is replaced by: <another group>)}.

<societal group decision action> ::= {is like: <personal decision action> where: (<a person> is replaced by: <a societal group>) and: (<another person> is replaced by: <another societal group>)}.

<society change process> ::= {technological change of productive forces(new productive force, group in control)| concentration of productive force control(control gaining group, control losing group, productive force)}.

<organization type> ::= {unitary| pluralist| class-based}.

<ruling type> ::= {autocracy| bureaucracy| technocracy| codetermination| representative democracy| direct democracy}.

<interest type> ::= {task interest| career interest| personal life interest}.

<power source> ::= {productive force control| formal authority| resource dependency| decision process control}.

<power effects> = {formal authority assigned| resource control assigned| decision process control assigned}.

<organization structure of productive force control> ::= {multinational corporation| other forms of organization of capital}.