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# Managing Problems of Postmodernity: Some Heuristics for Evaluation of Systems Approaches

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# Managing Problems of Postmodernity: Some Heuristics for Evaluation of Systems Approaches

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# Abstract

According to social scientists the contemporary western societies manifest an unparalleled scientific, technological and economic development, and, at the same time, a normative, ethical and spiritual crisis. This imbalance makes the management of societal problems very difficult. In this research, the question of investigation is: What help does the contemporary scientific problem-management approaches provide to our postmodern societies? Hence in order to manage its problems, the contemporary western societies – that is us – have designed an amount of intellectual problem-solving instruments – called here systems approaches – such as Operations Research & Management Sciences, Systems Analysis, Systems Engineering, Decision Sciences, Cybernetics, Soft Systems Thinking, etc. This self-referentiality asks for investigation, that is, what is the relation between the characteristics of the contemporary western societies and the problem-solving instruments that these societies have conceived? By means of meta-modelling, a set of evaluation heuristics have been constructed and employed to some of the main contemporary problem-solving systems approaches. Two types of results have been obtained. First, evaluation heuristics have provided some new intelligibility that previous findings have not been able to do; therefore they seem to be a valuable addition to support an understanding of scientific problem-solving approaches. Second, the diversity of systems approaches promises to become a powerful support in managing societal problems when combined in the form of a tool-box, but, at the same time, an impotence of systems thinking has been identified with regard to its various religious ground-motives. The latter makes any prospects of human advancement pessimistic.

**Keywords:** Problem-solving; Postmodernity; Evaluation; Systems Approaches: Operations Research & Management Science, Systems Analysis, Systems Engineering, Systems Dynamics, General Systems Theory, Cybernetics, Soft Systems Thinking, Critical Systems Thinking, Multimodal Systems Thinking; Religious Ground-Motives, Meta-modelling.

# Acknowledgments

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# Managing Problems of Postmodernity: Some Heuristics for Evaluation of Systems Approaches

*Darek M. Eriksson*

**Prologue:** One of the main motivations of this work is my frustrated search for orientation within the domain of systems thinking. It is a search for a firm and stable foundation that would allow to exercises scientific endeavour in order to help solve societal problems, whether local or global, in a *morally good* way. Inevitably, such a search leads to some investigations, descriptions, and comparisons of what is available. This study presents therefore some of the ideas and thinking that has governed me for some time. It has not solved the problem of orientation, but nonetheless provided some new valuable intelligibility. My hope is that it could serve in this way not only for its author but also for its eventual readers, yet bearing in mind that because of the very nature of this work, it can never be really considered finished…

## 1. INTRODUCTION

*"The quest for understanding and self-understanding includes the quest for knowing present history, the historical present, our own society as ourselves."*

- Agnes Heller (1990: 12)

Since World War II a significant amount of new sciences have emerged, which aim to support problem-management and decision making in organisations and societies. For reasons that will be discussed later, they are labelled here systems approaches. To mention some may imply Operations Research and Management Science, Systems Analysis, Systems Engineering, Decision Sciences, General Systems Theory, and Cybernetics. This study presents and employs some heuristics that helps to make these various approaches and their mutual relationship intelligible in a certain way. This intelligibility is related to the conditions of the contemporary situation of our western civilisation. The fundamental and underlying question is: *What help does the contemporary systems approaches provide for the problems of the postmodern societies?*

The introduction is followed with a justification of the present endeavour by articulating some of the problems of our societies, characterising the systems approaches, and a discussion of the relationship between the two. Then follows a brief account of our methodological approach. An exposition of some main previous evaluation heuristics is given thereafter, and the heuristics and their employment is presented and argued in the following section. The paper concludes with a discussion of the implications of our contribution and some conclusions.

# 2. JUSTIFICATION

In the following three sections we argue that today's societies are manifesting some serious problems. While these societies – that is us – have developed particular intellectual instruments in order to manage these problems, the same societies need to be critically self-reflective about the relation between their situation and the problem-solving instruments that they have constructed.

## 2.1. PROBLEMS OF THE CONTEMPORARY SOCIETIES

*"It turned out, in fact, that we had set ourselves nothing less than the discovery of why mankind, instead of entering into a truly human condition, is sinking into a new kind of barbarism."*

- Theodor W. Adorno & Max Horkheimer, (1972:xi)

It is not difficult to notice the repeating announcements of new advances of our societies, especially in technology, sciences and economic profit generation. This leads to postulates that we live in the most advanced age ever, and that the advances of the 20th century can not find any equivalence in the history of human civilisations. We may, however, ask in what manner is the present western civilisation superior to the previous ones? Proponents that postulate the superiority of the present civilisation may argue with examples like: It is possible to build nuclear power stations that can generate electricity for billions of people. That our hospitals can cure people that were previously deemed to death. That we can send space shuttles to Mars, etc. Given these types of examples it is reasonable to conclude that the present civilisation is very superior to, for example, the ancient Greek, which existed more then two thousands years ago. Because the supercomputers that we use today were not even conceived at that time. Another perspective of difference between the present and the past civilisations may be conceived as well, though. Namely by posing the question: Are people of today's civilisation and their various societies equally superior happy about their life, if compared to the past civilisations? Especially when we consider the amount of problems that contemporary societies manifest, such as: hunger, injustice, drug problems, criminal explosion and terrorism, social unrest as created by unemployment, budget cut-downs, inflation and recessions, environmental disasters – just to mention some. A short example given by von Wright (1986) may very well illustrate this distinction. It concerns the criminal acts that have been exercised by people since man conceived laws. Hence, although today's civilisation is able to depress criminality, terrorism and sabotage with greater and more sophisticated control of individuals by employing new technology, the very source of the evil actions is not confronted – only the symptom! This is most probably leading to an amplification of the generative mechanisms of criminality and terrorism. Thinkers from various disciplines, like de Raadt (1997), von Wright (1986) and Habermas (1981, 1984a), have argued that while the physical, material, technological or determinative aspects of human life has had unparalleled development, the mental, ethical, spiritual or normative aspects have not only been less successful but also oppressed by the former.

*"In a world of food plenty, we starve millions of people, especially little kids. There is the image of a refugee camp in Somalia where at one time in a field were termite mounds, until the children found that handfuls of termites soothed their thirst and hunger. Another image is of a man in a small house with one window, located in the Ganges Valley. He had just energy to move away from the hot sunlight pouring through the window.*

*How dare humans treat other humans so that the latter must live their lives in this manner? Where is the compassion that humans are supposed to have with respect to one another? If the city management of San Francisco daily selected six prisoners in the city jail to be tortured in Union Square wouldn't the public rise in moral outrage? But starvation is a torture, carried out in the cruelest of ways"*

- C. West Churchman (1984:3)

## 2.2. SYSTEMS APPROACHES

Among the great diversity of disciplines that today's sciences manifest, there are systems approaches/science that emerged just before and after World War II. Two of their well-known early thinkers and practitioners were Churchman and Ackoff. One of these approaches was characterised by them *"/.../ as the application of scientific methods, techniques, and tools to problems involving the operations of systems so as to provide those in control of the operations with optimum solutions to the problems."* (Churchman et al. 1957: 8-9). While the purpose was stated: *"/.../ to provide managers of the organizations with a scientific basis for solving problems involving the interaction of the components of the organization in the best interest of the organization as a whole. A decision which is best for the organization as a whole is called optimum decision /.../"* (Churchman et al. 1957: 6). We would like to discuss four aspects that we believe characterise systems approaches as distinct from regular scientific inquiry.

Systems approaches concern is to solve problems, whether the problems concerns performance increase of production in a company, optimisation of water supply in some African country, design of new business processes, or managing the ozone whole, et cetera. The notion of a problem as such implies a distinction of two positions: what is and what ought to be (Simon 1976a), therefore systems approaches occupies a fundamentally different epistemological position then the natural sciences as conceived in their notion since the enlightenment. Science as such, and especially natural sciences, postulates production of objective, value-free knowledge that is descriptive and eventually explanative founded on the deterministic hypothesis. This is, while the notion of systems approaches implies not only a description but also prescription for human affairs, whether they are business or public, technological, economical, political, or other. These approaches imply – therefore and necessarily – a mode of not only descriptive logic but also imperative logic, which generates *ought* for the systems' decision-makers. Science as such is fundamentally concerned with production of knowledge of human experiences for its own sake. Systems approaches are occupied also with prescribing how these experiences ought to be in order to help humans in managing their problems; hence designing our environments, organisations, societies, and therefore our life!

A second observation, which is a consequence of the above mentioned, is that systems approaches – due to their production of imperatives – have, to a various extent,

an explicit ethical position. This actualises the importance of the particular system of values that is inherent in the various systems approaches – as well as in the problem solvers and decision-makers. This becomes very clear when we pay attention to the previously provided definition, where it is stated: *"/.../ in the best interest of /.../"*. Thus some necessarily questions emerge of what is best, who's best, and why?

A third important distinction is that science – since enlightenment – studies phenomena from a particular theoretical perspective, such as: physical, chemical, biological, psychological, social, etc., with a notorious lack of interaction with other disciplines. This is since systems approaches do not limit themselves to some a priori defined boarders of disciplines. They rather seek to produce knowledge that is necessary for the faced problem, whether it requires knowledge classified as nuclear physics and psychology, software engineering and cultural anthropology, or business administration and arts. Systems approaches are not supposed to worry about the disciplinary borders since they need to be non-disciplinary, rather they need to be problem-oriented. This is since real life problems seldom, if ever, are limited to one particular discipline. Thus, already the pioneers of systems approaches explicitly stated that: *"The comprehensiveness of O.R.'s aim is an example of a "systems" approach, since "system" implies an interconnected complex of fundamentally related components."* (Churchman, et al. 1957: 7). Churchman (1979b:12-13) articulated this distinction as follows: *"/.../ I had come to realize that there are two 'sciences': the one represented by the collection of the disciplines, and the other by the systems approach. The first contains a collection of ideas about methodology and is essentially isolated by its disciplinary politics. The other is an attempt to engage in those areas of inquiry which are most relevant to the social good."* Since the period around World War II a significant amount of intellectual contributions have been generated that may be associated with problem-solving approaches that is not limited to one discipline. Mentioning some dominating implies: Operations Research (Churchman, et al. 1957; Ackoff & Sasieni 1968), Systems Analysis (Atthill 1975; Miser & Quade 1985), Systems Engineering (Hall 1962; Jenkins 1969), Systems Dynamics (Forrester 1961, 1971), General Systems Theory (von Bertalanffy 1968; Mesarovic, et al. 1975; Le Moigne 1977-1994; Rapoport 1986) Living Systems Theory (Miller 1978), Cybernetics (Wiener 1948; Ashby 1956, 1960), Viable System Model (Beer 1959, 1966, 1974, 1979, 1981), Soft System Methodology (Checkland 1978, 1981; Checkland & Scholes 1990), Interactive Planning (Ackoff 1981a, 1981b), Social Systems Design (Churchman 1971, 1979a, 1979b), Strategic Assumptions Surfacing and Testing (Mason & Mitroff 1981), Critical Systems Heuristics (Ulrich 1983, 1987), Total Systems Intervention (Flood & Jackson 1991a, 1991b; Jackson 1991; Flood 1994, 1995; Flood & Romm 1996), Multimodal Systems Thinking (de Raadt 1989, 1991, 1995, 1996, 1997, 1998a, 1998b; Mirijamdotter 1998), et cetera. In line with Churchman we will use a common label for an approach that is focused on general problem-management, namely Systems Approach. He provides the following definition of this concept: *"On the broadest level, the systems approach belongs to a whole class of approaches to managing and planning our human affairs with the intent that we as a living species conduct ourselves properly in this world. Everyone adopts at least one such approach during her/his life, even if he/she is a recluse, an agnostic, a nihilist."* (Churchman 1979b:8) To be a little more precise, by approach we mean here the

theories, methodologies, methods and techniques that provides support for problem-management.

Fourthly and finally, an important distinction between traditional sciences and systems approaches is that necessarily the latter implies some intervention, while the former limits itself to knowledge production. Hence, the investigation of what is and what ought to be is followed by some actual implementation of the design in order to reach the desired goals. This implies that the knowledge produced is, at least to some extent, praxis oriented. Or to use a metaphor, it is not enough to study books in order to learn how to swim or cycle...

## 2.3. NECESSITY TO REFLECT UPON SYSTEMS APPROACHES

The discussion above has focused on the problematics of our societies and the intellectual tools that these societies have designed in order to manage their problems. The organisational and societal problems seem to be more and more serious – even with postulates that our civilisation may collapse (von Wright 1986) – and today's problem solutions tend to create tomorrow's problems. Therefore, we hold that it is important to reflect on the very problem-management instruments – here systems approaches – which have been conceived with the purpose of managing our problems. Thus, it would be reasonable to pose some questions, such as: How good are the contemporary systems approaches especially in relation to the main characteristics of our societies? What are their possibilities and limitations and why? Attention to these thoughts was paid in Burrell's (1989:61) discussion on the relationship between the contemporary systems approaches and the societal situation and its changes: *"/.../ I would submit that this period of 'new times' needs to be taken seriously by those in O.R."* And this is our aim. These questions seem to be especially important if considered in the following contexts.

The intellectual support in the form of various available systems approaches that are employed in problem management do determine, to an extent, the processes and therefore the results of problem management. This is because, among others, every theoretical construct is founded on some assumptions which were held by its conceivers, both explicitly and implicitly. Further more, some of these foundational assumptions can never be proven scientifically but are due to the particular belief systems (Dooyeweerd 1955-58, Clouser 1991) as well as the socio-cultural contexts of the conceivers.[1] Still another and related problem is that practitioners employ their instruments rather uncritically without being aware of the respective determinants, i.e. how the systems

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[1] In order to illustrate the argument with a simple example, let us imagine a situation where an organisation has acquired a new computerised information system (IS) for support of its work processes. Before its construction and implementation a design phase is necessary that is guided by user requirements specification. The latter is most often based on the needs of the prospective users. In this case, the future users were asked for their requirements, which they specified accordingly. The manager who would not be a prospective user did, however, intervene with some specification modifications. After the construction and implementation, the new IS had some functionalities that no one had use for, at the same time, some functionalities that were needed by its users were missing. This failure of the IS happened because of the imposition of the manager. Or we would rather say that it also happened because the employed systems approach did not offer any instruments for identification and management of the present power structures in the faced problem situation. Instead, in practice, the employed systems approach amplified this situation's political relations and therefore supported an oppression of people.

modelling instruments affects the perception and design of a particular system (Shon 1992).

Another important problem that we would like to pay attention to is that practitioners tend to be 'married' to one or a few systems approaches where the employed instrument is selected on emotional, historical, cultural, commercial, political or other basis. An alternative way, which is our position, would rather promote a toolbox approach of various systems approaches, where a suitable instrument would be selected according to the faced problematic to be managed.

In conclusion the employment of contemporary systems approaches has important implications and consequences on the problems of societies. Indeed, these approaches do to a certain extent design our societies. Hence, it seems of pertinence to reflect on these foundations of the various systems approaches in order to determine their suitability for a faced problem situation.

Although there is a certain amount of contributions where particular systems approaches have been evaluated from a certain point of view, the amount of modelling instruments that can systematically support description, evaluation and comparison of systems approaches is limited. This is especially so if such an exercise would be performed in reference to the situation and demands of our contemporary societies. This need was suggested by Burrell (1989: 59): *"/.../ the current debate between modernism and postmodernism opens up issues which are rarely if ever considered in O.R. literature and that a position needs to be taken with regard to a number of choices facing us in a self reflective way rather than merely out of habit."* Our view is that a critical and self-reflective position, rather then *"...merely out of habit..."*, is what is necessary in order to improve possibilities for more successful management of our problems and thus societies. This concern about the lack of a well worked out relation between our societies, the social sciences that studies these and the systems approaches was also expressed in United Kingdom by The Operational Research Society. The latter has organised two international conferences on the theme *"Operational Research and Social Sciences"*, first in 1964 – held at Gonville and Caius Collage, Cambridge – and the second in 1989 – held at Queens' College, Cambridge. In their preface to the proceedings of the second conference the editors stated, among others, that: *"In the ensuring twenty five years, although debate has continued about the relationship between O.R. and social sciences, mutual understanding has proved more difficult to achieve than many must have hoped for in 1964. There remains a feeling that the full potential of bringing together the two sides to address current problems of organisations and society remains to be realised."* (Jackson, et al. 1989: v). Our aim is to make a contribution that aspires to help to overcome this difficulty. We would like to further develop and generalise our previous experience from an evaluation of a particular school of systems thought (Eriksson 1997b), namely Le Moigne's Systemics (Le Moigne 1990, 1994, 1995a, 1995b; Eriksson 1997a).

# 3. METHOD

*"/.../ when a field does not seek renewal and self-examination of its epistemological foundations, it is bound to repeat itself, unable to innovate or to depart from its established modes and procedures."*

- John P. van Gigch & Leo L. Pipino (1986: 72)

The present inquiry's objects of investigation are systems approaches that support problem-solving. Hence the inquiry does not focus directly on the very real-life problems as such. Therefore it must be carried out at a different level of abstraction and logic than would be the case during construction of a theory or methodology for some real-life problem. Because of this situation, Meta-Modelling Methodology ($M^3$) as constructed, motivated and employed by van Gigch (1987, 1991), (see also van Gigch and Pipino (1986), van Gigch and Le Moigne (1989)) is employed to support the present endeavour. A brief description of $M^3$ is given below.
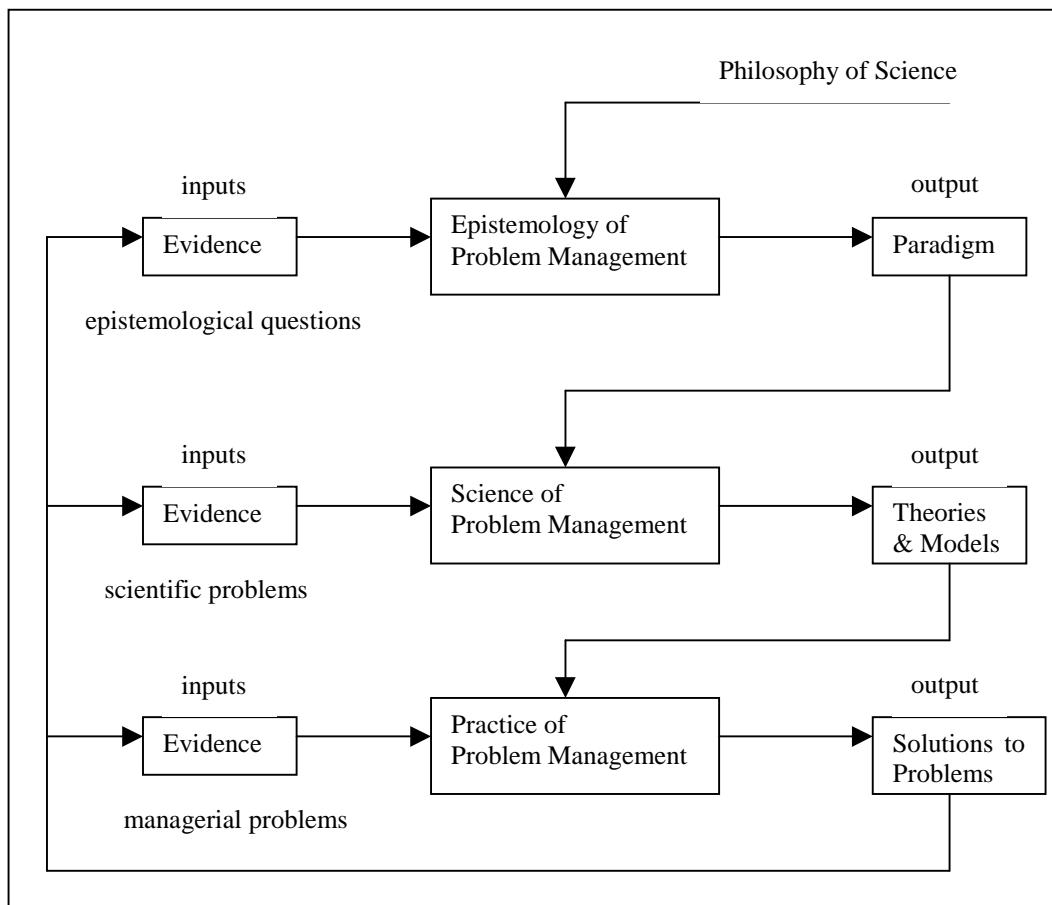


**Figure 1**. Illustrates the hierarchy of inquiring systems and their relation to each other, as conceived in meta-modelling methodology. Adapted with modification from van Gigch and Pipino (1986).

M$^3$ consists of several levels of inquiry (van Gigch 1991). The first level is the lower level, also called the implementation level, the practice level, the operational level or the level of intervention. This level is where people – managers, citizens, clients, etc. – participate in activities involving the management of real life problems. Here the theories, models, techniques, technology, et cetera, are employed to the real world of organisations and societies. The practice designed and prescribed by the various systems approaches is carried out at the implementation level. The next level consists of those activities by which the theories and models used to describe, explain, and predict problems and their management are developed. This level is called the level of science, or tactical level, or object level, or modelling level. Third, is the level where concern is focused on the generic issues of systems approaches, it *"/.../ involves the activities of inquiry which seek to define the origin of knowledge of the discipline, to justify its methods of reasoning, and to enunciate its methodology."* (van Gigch & Pipino, 1986:73). This level is sometimes called the strategic level, or the epistemological level, or the meta-modelling level. Figure 1 illustrates the hierarchy of inquiring systems and their relation, inputs and outputs, as conceived by meta-modelling methodology. Its epistemological inquiry receives inputs from the philosophy of science as well as from the practice and the science levels. Then the science inquiry receives inputs both in form of the paradigm[2] as defined by the epistemological inquiry and in the form of the evidence as defined at the practice level. Finally, the practice inquiry receives theories and models from the science inquiry level, as well as from the solutions of the managerial problems.

## 4. SOME PREVIOUS WORKS

There are several available frameworks for the evaluation of systems approaches. In this section we give a more explicit account to two such approaches, but also mention very briefly some others. These two have been selected because of their domination in the systems thinking community and that they relate the investigated systems approaches to societal notions. We compare these two frameworks to our contribution, later in the present investigations. That comparison will show that different frameworks lead to different intelligibility of seemingly the same objects of inquiry. Such a discrepancy opens doors for an important debate and discussion.

### 4.1. SYSTEM OF SYSTEM METHODOLOGIES

System of Systems Methodologies (SOSM) was proposed for the first time by Jackson and Keys (1984), but has since evolved (Jackson 1987, 1988, 1990a, 1990b, 1991, 1997; Keys et al. 1988). We present here SOSM's basic idea that does not seem to have changed very much. Hence, Jackson (1991: 27) says, *"The formative idea of the system*

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[2] Meta-modelling Methodology follows the conception of a paradigm as given by Kuhn (1970), which it interprets as: *"/.../ a paradigm represents the way that problems are conceptualized. It is made up of commitments, shared by the scientific community, to accept certain approaches, theories, methods and models. A paradigm reflects the values by which the scientists judge how to configure or define a problem, as well as their attitude toward any likely answer(s) or solution(s)."* (van Gigch & Pipino 1986: 72).

*of systems methodologies is that it is possible to construct an ideal-type grid of problem contexts that can be used to classify systems methodologies according to their assumptions about problem situations."*

SOSM considers that there are two aspects of problem contexts that are particularly pertinent to the characterisation of the very problem-managing situation. One is the system(s) in which the problem(s) are located, the other is the relationship between the participants, i.e. those who can make decisions that affect the behaviour of the system(s). Systems are classified to be either simple/mechanical or complex/systemic. Simple systems *"/.../ are characterised by having a small number of elements with few, or at least regular, interactions between them. Such systems are likely to be governed by well-defined laws of behaviour, to be largely closed to the environment, to be static over time, to be unaffected by behavioural influences, and to have subsystems that are passive and do not pursue their own goals."* (Jackson 1991: 28) At the other end there are the so called complex systems which are *"/.../ characterised by having a large number of elements that are highly interrelated. Such systems are probabilistic, open to the environment evolve over time, are subject to behavioural influences, and have purposeful parts."* (Jackson 1991: 28)

The other aspect of a problem-management situation is the relationship between participants. SOSM offers here three alternatives. First is the unitary problem context. It occurs when *"/.../ the participants associated with a particular problem context are in genuine agreement on objectives, share common interests, have compatible values and beliefs, and all participate in decision making /.../"* (Jackson 1991: 28). The second situation is called pluralist and occurs when *"/.../ the participants have divergent values and beliefs and, to some extent, differing interests and objectives, but a genuine accommodation or compromise can be reached upon which all agree /.../"* (Jackson 1991: 28). Finally, the third position is called coercive and occurs when *"/.../ there is little common interest between the participants, there is a fundamental conflict, and the only consensus that can be achieved is through the exercise of power and through domination /.../"* (Jackson 1991: 28).

Combining the two qualities of problem-solving situations may give a six-cell matrix, with the following problem categories: simple-unitary, complex-unitary, simple-pluralist, complex-pluralist, simple-coercive, and complex-coercive.

The next step is the allocation of the contemporary systems approaches to the model described above. This implies the following (Flood & Jackson 1991b): the simple-unitary cell contains Operations Research, Systems Analysis, Systems Engineering, and Systems Dynamics. The complex-unitary cell is said to contain Viable Systems Model, General Systems Theory, Socio-Technical systems thinking, and Contingency Theory. Next, the simple-pluralist cell has Social System Design and Strategic Assumptions Surfacing and Testing approaches. While the pluralist-complex cell contains Interactive Planning and Soft Systems Methodology. Further, the simple-coercive cell has only Critical Systems Heuristics, while the last cell the complex-coercive, is said not to have any approach, since there are no known methodologies that can support such problem situations. For an overview of this description see Table 1. System of Systems Methodologies is meant to enable potential users to assess the strengths and weaknesses of different methodologies for their purposes.

**Table 1.** Illustrates the classification of systems approaches as exercised by the Systems of Systems Methodologies. Adapted with modification from Flood and Jackson (1991b). Explanation of the acronyms is as follows. OR: Operations Research, SA: Systems Analysis, SE: Systems Engineering, SD: Systems Dynamics, VSM: Viable Systems Model, ST: Socio-technical systems thinking, CT: Contingency Theory, SSD: Social Systems Design, SAST: Strategic Assumptions Surfacing and Testing, IP: Interactive Planning, SSM: Soft Systems Methodology, and CSH: Critical Systems Heuristics.

|         | *unitary*         | *pluralist* | *coercive* |
|--------:|-------------------|-------------|------------|
| *simple*  | OR, SA, SE, SD    | SSD, SAST   | CSH        |
| *complex* | VSM, GST, ST, CT  | IP, SSM     | --         |

## 4.2. SOCIOLOGICAL PARADIGMS

The second framework for an evaluation of systems approaches described below builds on Burrell and Morgan's (1979) model of sociological paradigms. It has been employed in systems thinking by Jackson (1982, 1991).

Burrell and Morgan's model of sociological paradigms represents the various assumptions about how we should learn about reality, and about the nature of that reality. Hence in systems terms, it can provide an instrument for illuminating the assumptions about the various systems approach methodologies of investigations, as well as about the social systems that are to be investigated with the support of these systems approaches. The model states that the social world and its investigations can be conceived in terms of four main paradigms. This distinction is founded on two aspects, first the nature of social science, that can be considered as either subjective or objective, and second about the nature of society that can be considered emphasising either regulation or radical change. Returning to the first aspect, the nature of social science, there are four characteristics that together determine its position. These are the ontological, epistemological, anthropological and methodological domains of inquiry. If a theory is labelled as objective, it has the realist ontology, positivist epistemology, determinist anthropology, and nomothetic methodology positions. On the other hand, if a theory is found to be subjective it has nominalist ontology, anti-positivist epistemology, voluntarist anthropology and ideographic methodology positions. This distinction between objectivist and subjectivist assumptions about the nature of social science makes up the first dimension of Burrelll and Morgan's (1979) model.

The second dimension considers the assumptions about the nature of society. Sociology of regulation is concerned with understanding of the status quo. Society is thus seen as being fundamentally consensual, therefore the mechanisms by which social order is maintained are studied. Sociology of radical change, on the other hand, studies radical change in social systems. Society is thus seen as being fundamentally contradictory and manifesting structural conflicts.

Combining the two dimensions gives a four-cell matrix. Radical change sociology and the subjective nature of social science imply the so-called radical humanism paradigm. Secondly, radical change sociology and objectivist nature of social science results in the so-called radical structuralism paradigm. Thirdly, regulation sociology and subjectivist nature of social science implies the interpretative paradigm. And finally, regulation sociology and objectivist nature of social science yields functionalist paradigm. For an illustration see Table 2.

We will now briefly characterise the four paradigms. Functionalist paradigm implies that the studied systems are easy to identify and describe, and possess existence that is independent of its observers. Their study searches for regularities and relationships between the various components. Human being behaviour is considered to be determined by its environment and the studied system as such is characterised by status quo. Quantitative models are built as representations that are meant to facilitate prediction and control of the studied systems. Secondly, the interpretative paradigm implies that there are individual interpretations of the observers, which may very well vary according to the observer. The voluntarism of humans makes it in practice very hard to construct a feasible quantitative model, the models are rather qualitative where knowledge is obtained by involved studies. Still the idea of the study is to identify some status quo, so that understanding and eventually prediction and control may be obtained. Thirdly, the radical structuralist paradigm postulates an independent existence of the studied social reality. It searches for regularities of deterministic system behaviour. This implies representation with quantitative models of radical changes and conflicts. Finally the radical humanist paradigm considers the social reality to be a construction of its observer, which implies that personal involvement is necessary in order to inquiry these systems, and qualitative representation will be its result. Again there is a notion of transformation and change of the social systems.

Finally, Jackson (1982, 1991) allocated the various systems approaches into this model of sociological paradigms as following. The approaches labelled as Hard Systems Thinking, that is Operations Research, Systems Analysis, Systems Engineering, and Systems Dynamics, were found to belong to the functionalist paradigm. Secondly, approaches belonging to Soft Systems Thinking, that is Soft Systems Methodology, Interactive Planning, and Social Systems Design, were allocated to the interpretative paradigm. Thirdly, Critical Systems Heuristics of Critical Systems Thinking was found to be radical humanist in orientation. See Table 2 for an overview.

**Table 2.** Illustrates the four sociological paradigms together with the various systems approaches. Modified after Burrell and Morgan (1979) and Jackson (1982, 1991). Acronyms, OR: Operations Research, SA: Systems Analysis, SE: Systems Engineering, SD: Systems Dynamics, SSM: Soft Systems Methodology, IP: Interactive Planning, SSD: Social Systems Design, CSH: Critical Systems Heuristics.

| | *Radical Change* | *Sociology* | |
|---|---|---|---|
| *Subjective social science* | Radical Humanism: CSH | Radical Structuralism: | *Objective social science* |
| | Interpretative: SSM, IP, SSD | Functionalist: OR, SA, SE, SD | |
| | *Regulation* | *Sociology* | |

## 4.3. SOME OTHER FRAMEWORKS

There are several other frameworks for modelling and evaluating the various systems approaches. We would like to mention very briefly some of those.

One approach is to represent the various systems approaches in terms of metaphors. Morgan's (1986) account of the various images of organisations implied organisations as machines, organisms, brains, cultures, political systems, psychic prisons,

flux and transformations, and instruments of domination. Some of these metaphors are used (Jackson 1991, Flood & Jackson 1991b) to represent the various systems approaches. Hence, for example, Operations Research and Systems Analysis are found to be machines, Viable Systems Model to be brain, while Soft Systems Methodology is conceived as culture.

Flood and Romm (1996) in their "Triple Loop Learning" notion of employment of systems approaches associates the various systems approaches with three questions of a situation. These are how-to-solve problem, what-is the problem, and why is it a problem. Here, Operations Research, Systems Analysis and Systems Engineering are associated with the issue of how to solve a problem, Soft Systems Methodology with conceiving what is the problem, while Critical Systems Heuristics with justifies why is a problem what it is. Further on in the paper, we will see that one of our heuristics have a very similar approach to modelling the systems approaches. However, our account will provide a different context, which we believe gives some more intelligibility of the investigated objects.

There are more evaluation approaches, that are more or less coherent like Ullrich's (1981) comparison of Churchman's (1971, 1979a, 1979b) and Simon's (1969) systems approaches, or his (Ullrich 1983) evaluation of Viable Systems Model (Beer 1979, 1981). Jayaratna (1994) constructed the NISAD approach for understanding and evaluating methodologies. Its rationale focuses four main elements, the problem situation, i.e. the methodology context, the intended problem solver, i.e. the methodology user, the problem-solving process, i.e. the methodology, and finally the evaluation of the three just mentioned. More meta-modelling approaches are provided by Hildebrant (1982), Miser and Quade (1985), Bowen (1986), Eden and Radford (1990), Agrell (1992), Beath and Orlikowska (1994), Hirschheim et al. (1996) and Mingers and Gills (1997).

## 5. EVALUATION HEURISTICS

This section presents evaluation heuristics together with their employment to some various systems approaches. They are organised into three main groups. The first group includes four related heuristics, which are the theory-generation investigation, the paradigmatic-historic development investigation, the epistemological orientation investigation and the decision-making process investigation. The second group investigates the potentiality of systems approach's to deal with complexity. It includes three related heuristics, which are reductionism-by-science investigation, procedural reductionism-in-science investigation, and substantive reductionism-in-science investigation. Finally, the third contribution presents an investigation of the religious ground-motives that every systems approach necessarily grounds itself on.

**5.1. INTERPRETING SYSTEMS APPROACHES FROM FOUR RELATED PERSPECTIVES: THEORY-GENERATION SOURCE, PARADIGMATIC-HISTORIC DEVELOPMENT, EPISTEMOLOGICAL ORIENTATION, AND DECISION-MAKING PROCESS**

The following sections offer an alternative way of making the various systems approaches and their mutual relationships intelligible. This intelligibility is based on four types of discriminators that provide support for organising these objects of investigations. The discriminators are the theory-generation sources, the paradigmatic-historical development, the epistemological orientation, and the decision-making process. The investigation ends with a discussion and conclusions.

*5.1.1.1. Objects under investigation*

The following systems approaches are objects of this investigation. Operations Research & Management Science [OR&MS], (Churchman et al. 1957; Ackoff & Sasieni 1968); Systems Analysis [SA], (Atthill 1975; Miser & Quade 1985); Systems Engineering [SE], (Hall 1962; Jenkins 1969); Systems Dynamics [SD], (Forrester 1961, 1971); Cybernetics – including both first order cybernetics [1st Cyb.], (Wiener 1948; Ashby 1956, 1960) and second order cybernetics[3] [2nd Cyb.], (von Foerster 1984; von Glaserfeld 1984, 1995) – General Systems Theory [GST], (von Bertalanffly 1968); Living Systems Theory [LST], (Miller 1978); Viable Systems Model [VSM], (Beer 1974, 1979, 1981); Autopoietic Systems Theory [AST], (Marurana & Varela 1980); Interactive Planning [IP], (Ackoff 1981a, 1981b); Soft Systems Methodology [SSM], (Checkland 1981; Checkland & Scholes 1990); Critical Systems Heuristics [CSH], (Ullrich 1983, 1987); Living Social System model [LSS], (de Raadt 1991); and Multimodal Soft Systems Methodology [MSM], (Mirijamdotter 1998).

**5.1.2. Discrimination due to the theory-generation source**

The first proposed discriminator is the empirical source of theory generation. This implies the attention of the phenomena that were the sources of scientific observations and investigations, and then led to theory generation.[4] Our position is that such a source necessarily and in a certain way determines the theory of the various systems approaches. A question for our investigation that follows is, which empirical phenomena to account for and how many should be considered? Starting with the second question, an alternative is to account for all – or as many as feasible – types of phenomena that have provided a source and therefore obtain a rich model, another alternative is to limit our account to a

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[3] Recently (Umpleby 1997) a distinction has been made between Engineering Cybernetics (what we call 1st order cybernetics), Biological Cybernetics (what we call 2nd order cybernetics), and Social Cybernetics, that is a set of cognitive systems (humans) that interact. Since our position that the last mentioned notion is still to establish itself, we do not consider it in our investigation.

[4] We would like to note that the empirical theory generation source is not completely determinative for this outcome. A theory is constructed also due to some intellectual activity of its constructor(s). The impact of the intellectual process is not investigated here, however.

few types and thus obtain a more comprehensive model. The second alternative is pursued in this investigation.

Turning to the second question, three types of phenomena are proposed to act as a point of reference. These are the mechanical/physical phenomena, the biological phenomena and the social phenomena. The mechanical/physical phenomena will be associated with the metaphor of Machine Thinking. It comprises both artificially constructed physical systems such as steam engines or computers, and natural systems such as solar or weather systems. The biological phenomena will be labelled Biological Thinking and comprises both plants and animals. Finally the social phenomena will be labelled Social Thinking and covers groups of people, families, organisations, etc. We are well aware that important differences may be found within these three types of phenomena, yet our position is that the proposed classification will serve our purpose well enough.

*5.1.2.1. Allocation of systems approaches*

We would like to assign the classical Operations Research & Management Science approaches to Machine Thinking. They use mathematics and statistics due to classical mechanics and thermodynamics. Also the classical school of Taylorian management was founded on a mechanistic division of labour. We would like, as well, to assign Systems Analysis, Systems Engineering and Systems Dynamics to Machine Thinking. They are all founded in observations of deterministic states and processes, and use quantification due to classical mechanics and statistics. These approaches do not posses any qualities that are unique for biological or social systems, such as free will and culture or love and hate. Cybernetics, on the other hand, seems to have been generated due to investigations in both machine and biological domains. From an epistemological point of view it provided a breakthrough when compared to classical mechanics and thermodynamics. This is since the latter two are founded on determinism of a closed system, while cybernetics provides the teleological hypothesis, and considers systems as open. The latter was clearly derived from biological phenomena. Cybernetics became the foundation of control theory and is used for conception of modern machines as well as explanation of some biological processes. Therefore, we would like to assign first order cybernetics to both Machine Thinking and Biological Thinking. Next, second order Cybernetics considers the studies of the observing system, rather then of the observed system. It has its origin in biological and psychological investigations of cognition, therefore should be assigned to Biological Thinking.

Considering General Systems Theory in the notion of biologist L. von Bertalanffy (1968), it is clear that its origins belong to Biological Thinking. It provided some concepts like open system and eqvifinality that mechanical approaches did not. The Autopoietic Systems Theory (Maturana & Varela 1980) belongs also to the Biological Thinking domain. Its aim is to provide a notion of what is life, which it states to be autopoietic, i.e. self-producing. Living Systems Theory (Miller 1978) provides a seemingly universal theory for all living systems. It states that there are seven levels or types of living systems and these must have twenty subsystems or processes in order to be viable. This theory has its origins in the biological domain and should therefore be assigned to Biological Thinking. The Viable System Model is founded on the cybernetic

theory together with the studies of human brain functions. Hence, it also belongs to the domain of Biological Thinking.

Soft Systems Methodology (SSM) was conceived to support formulation of changes or problems in human activity systems. It poses qualities like owner and customer, which clearly belong to social phenomena. Also, SSM supports accommodation of different views, which arise due to various cultural, knowledge and experience backgrounds. This is something that is unique to social phenomena. Interactive Planning should also be assigned to Social Thinking since it takes into account pluralism manifested by the parts of a system, i.e. human beings. This systems approach has been generated due to the experiences in social organisations. Strategic Assumptions Surfacing and Testing investigates the various assumptions held by members of an organisation, by challenging them. Since mechanical or biological phenomena do not challenge their own assumptions about an issue, this systems approach should be assigned to Social Thinking. Next, is Critical Systems Heuristic that emphasises the conceptual boundaries or assumptions of systems design. It provides a contrast between an *is* and an *ought* situation. This approach is said to be particularly suitable to deal with political structures. Since the latter can only be found in social phenomena, the approach must be assigned to Social Thinking. Finally, we would like to assign both the Living Social System model and the Multimodal Soft Systems Methodology to Social Thinking. This is because one of their main features is Multimodal theory that accounts for all the various human experiences, from the most physical, like energy, to the very human and social, like ethics and aesthetics. A summary of our discussion so far is illustrated in Figure 2.

| Machine | Biological | Social |
|---------|-----------|--------|
| OR&MS | GST | SSM |
| SA | AST | IP |
| SE | LST | SAST |
| SD | VSM | CSH |
| | $2^{nd}$ Cyb. | LSS |
| $1^{st}$ Cybernet. | | MSM |

**Figure 2.** Illustrates classification of systems approaches
in reference to their empirical source of theory generation.

### 5.1.3. The paradigmatic-historic development of systems approaches

The systems thinking community articulates the various systems approaches in terms of paradigms[5] (see for example Flood & Jackson 1991c, Jackson 1991). Therefore it is possible to articulate their historical development, i.e. what we call here the paradigmatic-historical development. The paradigms that may be easily identified are the Hard Systems Thinking (HST), Soft Systems Thinking (SST), Critical Systems Thinking (CST), and Multimodal Systems Thinking (MST). In order to be able to relate these systems paradigms with our previous investigation, we consider the latter consisting of three meta-paradigms, i.e. Machine Thinking (MT), Biological Thinking (MT) and Social

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[5] This refers to T. Kuhn's (1970) conception of paradigm.

Thinking (ST). Our studies have shown that Machine Thinking consists of Hard Systems Thinking – i.e. Operations Research & Management Science, Systems Analysis, Systems Engineering and Systems Dynamics – together with first order Cybernetics. Biological Thinking consists of General Systems Theory, Autopoietic Systems Theory, Living Systems Theory, Viable System Model, and first and second order Cybernetics. Finally, Social Thinking may be articulated in the paradigms of Soft Systems Thinking, Critical Systems Thinking and Multimodal Systems Thinking. Soft Systems Thinking, in turn, contains Soft Systems Methodology, Interactive Planning, and Strategic Assumptions Surfacing and Planning. The Critical Systems Thinking paradigm contains Critical Systems Heuristics, and the Multimodal Systems Thinking paradigm contains Living Social System model and Multimodal Soft Systems Methodology. The result of this articulation is illustrated in Figure 3.
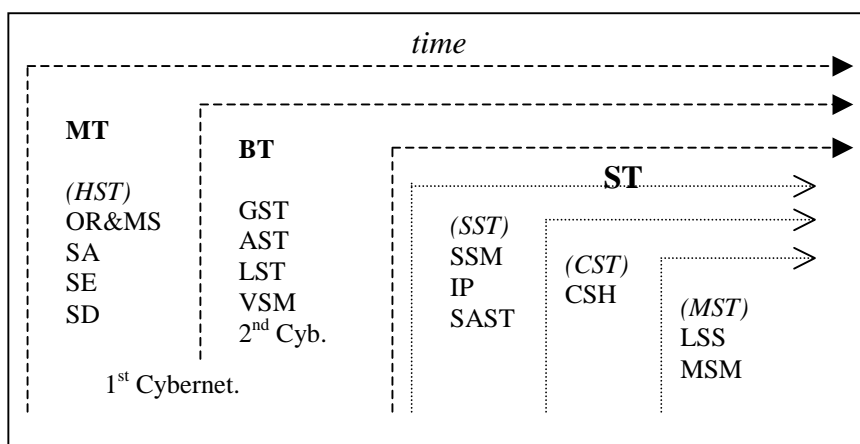


**Figure 3.** Illustrates a discrimination of systems approaches due to their empirical sources of theory generation, i.e. Machine Thinking (MT), Biological Thinking (BT) and Social Thinking (ST). This together with the paradigmatic-historic development, i.e. Hard Systems Thinking (HST), Soft Systems Thinking (SST), Critical Systems Thinking (CST), and Multimodal Systems Thinking (MST).

This historical-paradigmatic discrimination illustrates the approximate order of development of systems thinking in the Twentieth Century. It started with the Hard Systems Thinking of Machine Thinking (before and just after WWII), proceeded almost simultaneously to Biological Thinking (in post WWII) with its various systems approaches and then to Social Thinking. The latter gave rise first to Soft Systems Thinking (1960's and 70's) followed by Critical Systems Thinking (1980's and 90's) and then Multimodal Systems Thinking (1990's). We will discuss a possible reason and nature of this development later in the paper.

### 5.1.4. Epistemological orientation of systems approaches

Bellow we provide even more intelligibility to our model by considering the development of systems approaches from an epistemological point of view. An inquiry into the very basic structure of epistemology tells us (Piaget 1967) that there are three fundamental questions about knowledge. These are the how-of-knowing, that is, how do we construct or acquire knowledge, it is a methodological question. The second question is the what of knowing, that is the very basic assumptions of what is knowledge. Thirdly is the why of

knowing, that is the means of validating knowledge. The why of knowing has a particular role since it provides the interface between the realms of epistemology and of ethics. That is, validation has necessarily and by its very nature some ethical conditions and implications, which shows that epistemology may not be comprehended completely without considering the ethical domain, among others.

We will now attempt a conceptualisation of our model of systems approaches in terms of the three basic epistemological questions. Considering the Hard Systems Thinking approaches – Operations Research & Management Science, Systems Analysis, Systems Engineering and Systems Dynamics – we may ask to which of the three basic epistemological questions does Mechanical Thinking/Hard Systems Thinking provide support? Our answer is to the how-question. This is since these systems approaches provide intellectual tools for solving problems. That is, searching for optimisation but not for their conception or definition, neither for their justification. These approaches are most often founded on some dialect of positivist epistemology, where assumption about the existence of positive facts seem to have made these to assume that the problems to be managed exists independently of their observer and are given, hence no need to support their conception.

Turning our attention to Biological Thinking, it can be stated that systems approaches under this label are not problem-solving methodologies but rather models of systems. They present models of biological systems – i.e. descriptions and explanations. Hence, there is an epistemological difference in reference to a problem situation. While methodologies provide procedural knowledge (Simon 1976b), that is knowledge of how to proceed from *is* to *ought*, the biological systems theories provides substantive knowledge (ibid.), i.e. a presumed ideal model, that is knowledge of a biological phenomenon. Both approaches may, however, be used for problem management. Independent of this difference, the biological systems approaches provide a description of how a system/situation works, in reference to some goal(s) or cause(s) (most often the goal to survive). Therefore we assign the Biological Thinking systems approaches to the how-question of our epistemological investigation. We think that both first and second order cybernetics should also be assigned to the how-question. First order cybernetics provide knowledge of how to control a observed phenomenon in relation to some given goals – most often imposed on that phenomenon by the observing system. Second order cybernetics, on the other hand, provides some models of cognition, i.e. how the observer cognises. The purpose of the cognitive function is stated to be biological, that is, to give a system possibility to survive, or be viable (von Glaserfeld 1984, 1995). This implies that this systems approach should be assigned to the how-question as well. It can be argued though, that the knowledge of human cognitive functions may be used successfully for providing means to support problem definitions as well. Although we accept that argument, we think that at present second order cybernetics provides a problem-solver mainly with substantive knowledge of a cognitive phenomenon. It does not provide the problem-solver with procedural knowledge that employs this cognitive theory in problem-solving. That is the reason why we maintain our position that second order cybernetics should be assigned to the how-question.

We turn our attention now to Social Thinking. Conceiving Soft Systems Thinking approaches – such as Soft Systems Methodology, Interactive Planning and Strategic Assumptions Surfacing and Testing – we ask which epistemological question do these

support? Our answer is that Soft Systems Thinking provides support to the what-question. This is because these provide intellectual instruments – such as Soft Systems Methodology's Rich Pictures or Interactive Planning's participation and co-ordination principles – for accounting of various conceptions of seemingly similar situations, that may emerge due to variation of an actor's culture, knowledge and experience backgrounds. These variations are attempted to be accommodated into one common consensus by means of communication and learning. Soft Systems Thinking is founded on various interpretative epistemologies, such as hermeneutics, pragmatism and constructivism. This implies that different actors have different interpretations or conceptions of phenomenon, and all these are accepted. Therefore, Soft Systems Thinking does not provide any support for conceiving what is right or wrong, which implies that no support for validity or the why-question may be given by these systems approaches. The latter issue is what the Critical Systems Thinking and Multimodal Systems Thinking systems approaches have set as their goals to provide. That is, how can a judgement or decision of systems design be justified? This position implies that the two systems approaches attempt to provide support for answering the why-question. Critical Systems Heuristics attempts this task by surfacing the ethical positions of the involved actors in a system study and challenging them with an *ought to* position. The latter is built on the Kantian moral imperative that implies the fundamental law that one should not do an act only if one would will that anyone in similar circumstances would do the same thing. This is a democratic approach where the ethics of all involved are considered, so that a consensus may be found. Multimodal Systems Thinking's Living Social System model (de Raadt 1991), on the other hand, is founded on the Christian tradition which is also its source for its ethical judgements of what is right or wrong. The result of this epistemological investigation is illustrated in Figure 4.
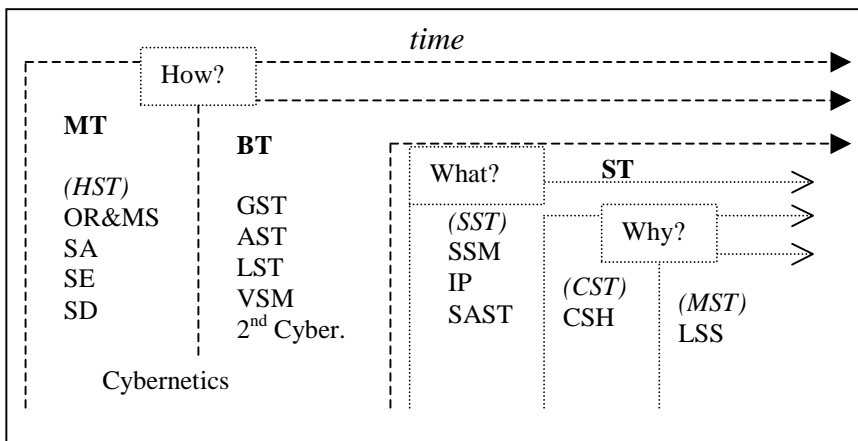


**Figure 4.** Illustrates a discrimination of systems approaches due to their empirical sources of theory generation, i.e. Machine Thinking (MT), Biological Thinking (BT) and Social Thinking (ST). This together with the paradigmatic-historic development, i.e. Hard Systems Thinking (HST), Soft Systems Thinking (SST), Critical Systems Thinking (CST), and Multimodal Systems Thinking (MST). As well as due to epistemological capability of supporting the basic inquiries of knowing, that is, how-to-do, what-to-do, and why-to-do.

### 5.1.5. The decision-making process and systems approaches

We will present now an alternative interpretation of systems approaches in reference to the decision-making process. More specifically, the question is: What kind of support does the investigated systems approaches provide for the process of decision-making? This investigation makes use of the previously presented inquiry to the epistemological orientation of the investigated approaches. The next section begins with a description of a model of human decision-making process and then continues with an investigation of the relationship between that model and the inquired systems approaches.

### 5.1.5.1. A Model of Decision-Making Process

We rely here on Herbert Simon's (1976a) widely accepted conception of human decision process. This states that decision-making process comprises three main activities of mind, which are Intelligence, Design and Choice. Further, Implementation and Evaluation often follow these. The three first phases are, however, of interest in this investigation. The Intelligence phase implies the very conception of a distinction between is and ought situations. This implies that there are some inherent criteria of what ought to be. Secondly, the Design phase implies the creative act of constructing one or several alternatives for bridging the gap established in the Intelligence phase, i.e. means of solving the conceived problem. Thirdly, there is the Choice phase that selects the most suitable alternative for solving the problem. This is in accordance with the previously established criteria. Following Simon, Le Moigne (1990) articulated the cognitive loops of decision-making process that are exercised by the Choice function. The following is our interpretation of Le Moigne's conception.

The decision-making loops are exercised if the Choice function has been unsuccessful in selecting a suitable design option. This can be for various reasons. One is that in complex and multi-criteria decisions it is seldom possible to identify one optimal solution. Another reason is that none of the designed alternatives are satisfactory for reaching the ought situation's criteria. If such an inability of making a choice emerges – regardless whatever reason causes it – the Choice function can activate the Re-Design loop. This feeds back from Choice to Design, where the latter is supposed to generate some alternative options. After such a re-design act it is again the function of Choice to attempt a selection. This process of activating the Re-Design loop may be done several times until an adequate option is selected. However, if such an option may not be found due to several Re-Design loops, then the Re-Finalisation loop may be activated. This loop feeds back from the Choice phase to the Intelligence phase. The latter is asked to re-conceive the problem, that is, the definition of the gap between is and ought situations. After such a re-conception the Deign phase exercise its task and the Choice attempts a selection again. As with the Re-Design phase, the process of Re-Finalisation may be looped several times until a successful solution is selected. If however, the Re-Finalisation loop also fails, then there is the possibility of activating the Re-Justification loop. This implies a re-conception of the very processor that exercises the conception in the Intelligence phase. This may imply that the basic criteria, which are the various assumptions and values, that ground conception of the is-ought gap are to be challenged

and modified. Similarly to the previous phase, this looping may be done until a satisfactory position is established. In conclusion, the three cognitive loops of decision-making, together with the three phases, make it possible to exercise decision-making.

The intelligibility of the three described cognitive loops may be articulated more easily in the following way. Since decision-making is fundamentally about producing knowledge, it is also about epistemology. Therefore we may ask what epistemological question(s) do the cognitive loops support. The Re-Design loop is about constructing options for solving a problem, that is, about how to bridge the is-ought gap, the how-question is, therefore, supported by this loop. The Re-Finalisation loop is about conceiving the is-ought gap, that is, what is the present and what is the goal. Therefore, the what-question is supported by the Re-Design loop. Finally the Re-Justification loop is about conceiving the criteria, assumptions and values that ground and motivate the conception of a problem. Therefore, the why-question is supported by the Re-Justification loop. For an illustration of the decision-making process see Figure 5.
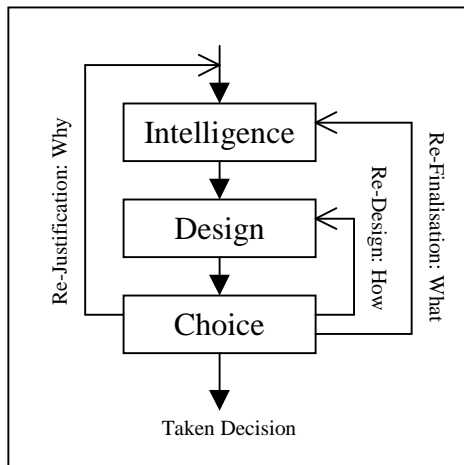


**Figure 5.** Illustrates the canonic model of decision-making process. It articulates its three basic phases – Intelligence, Design and Choice – together with its three cognitive loops: Re-Design, Re-Finalisation and Re-Justification.

*5.1.5.2. The Relation Between Systems Approaches and the Decision-Making Process*

We will now attempt to allocate the investigated systems approaches to the functioning of the decision-making process, as expressed in the model above. The previous investigation indicates that the Re-Design loop of the decision-making process may be supported by those systems approaches that provide support for the how-question. These approaches are the Machine Thinking approaches – i.e. Operations Research & Management Science, Systems Analysis, Systems Engineering and Systems Dynamics – and the Biological Thinking – General Systems Theory, Autopoietic Systems Theory, Living Systems Theory, Viable Systems Theory – together with Cybernetics.

The Re-Finalisation loop may be supported by the systems approaches that provide help for investigating the what-question. These approaches belong to the Soft Systems Thinking paradigm of the Social Thinking group – i.e. Soft Systems Methodology and Interactive Planning.

Finally, the Re-Justification loop may be supported by the systems approaches that provide help for investigation of the why-question. This would mean the Critical Systems Thinking – i.e Critical Systems Heuristics – and the Multimodal Systems Thinking – i.e. Living Social System model and Multimodal Soft Systems Methodology – paradigms within the Social Thinking group.

## 5.1.6. Discussion

In the investigation above we have provided four means – spectacles – for interpretation of the various contemporary systems approaches. These are the empirical sources of theory generation, the historic-paradigmatic development, the epistemological support and the decision-making support that is provided by these approaches. All these seem to point in the same direction of development. We would like to state a hypothesis that may provide some explanation for this trend.

The development of the Western world's after WW II implied a rebuilding Europe, as well as switching the focus somewhat from military industry to civil, both in Europe and North America. This preoccupation with industrialisation implied a focus on materiel things rather then on cultural or ethical. It seems that the main issue was not what should be done or why, but rather how? Also the traditional hierarchical models in organisations and societies provided an authoritarian structure where the what and why questions were given answers by those in charge without options for challenge. However, as development went on, and provided welfare growth for the western societies, attention seems to have moved in the 1960's from how-to-do things to what-to-do. The acute post-war crisis with lack of everyday commodities was over, and therefore more time and reflection seems to have been given to the issue of what should be really done? The emerged trends of participatory design in industries seem to be one of these manifestations. Finally, the western world went beyond the main concern of the materiel world. The rapid development of information technology as a foundation of virtual worlds, and also the cultural and political changes in societies in the 1980's made the question of justification of doing things emerge in systems thinking. That is, why should something be done – this is an ethical concern.

This hypothesis seems to gain some support if we consider the postulated switch by social scientists (Harvey 1989; Lyon 1994) in our western civilisation from a modern to a postmodern society. While the first mentioned was founded on optimistic believe in scientific truth and established norms, the second one seems to erase these foundation questioning the validity of scientific knowledge and societal norms, which becomes meaningless in the virtual world (Lyon 1994). Hence, while the modern age provided societal sources for the what and why questions, the postmodern does not. Therefore systems approaches seem to reflect this trend in the opposite way. Another support for our hypothesis can be found in the systems approach community of the post-Soviet states, like Russia or Ukraine. They all have a very well developed tradition in mathematical-cybernetic modelling as well as in systems analysis and operations research. Soft Systems Thinking, Critical Systems Thinking and Multimodal Systems Thinking are hardly known there, however. The communist regime did not consider that the Soviet academic activity should work with the issues that the latter mentioned systems approaches focus, i.e. cultural and ethical aspects of human lives.

### 5.1.7. Conclusion

In the present investigation we have provided four means of making the investigated systems approaches intelligible. This is by investigating the empirical sources for theory generation, the paradigmatic-historical development, the epistemological conditions, and the decision-making process. The presented framework seems to provide some useful intelligibility of the investigated systems approaches. It articulates some of their respective characteristics and relates them to each other. The emerged trend seems to be reasonable in the light of our hypothesis – which still is suggestive rather then explanatory. Yet, the framework does not make it possible to distinguish between Critical Systems Thinking and Multimodal Systems Thinking, which manifest its limitations.

### 5.2. POTENTIALITY OF COMPLEXITY MANAGEMENT

"*The world is as Aldous Huxley put it, like a Neapolitan ice cream cake where the levels – represent the chocolate, strawberry, and the vanilla layers. We cannot reduce strawberry to chocolate – the most we can say is that possibly in the last resort, all is vanilla, all is mind or spirit.*"

- L. von Bertalanffy (1968)

The following sections investigate the various systems approaches' basic potentiality in dealing with complexity of the studied systems. Systems Science postulates itself to be the discipline of the various systems approaches. It has a very central theme in its studies, which is makes complex systems intelligible (see for example Flood & Carson 1988; Le Moigne 1990; Klir 1991; van Gigch 1991). Flipping the opposite side of this coin, it implies attempts to avoid reductionism in system studies (see for example the so-called father of systems science L. von Bertalanffy (1968) for a discussion of reductionism in natural sciences, and von Bertalanffy (1967) for a discussion of reductionism in human sciences). In order to use that criterion for discrimination of systems approaches, it is necessary to operationalise it, that is, define in a way that makes it possible to exercise a comparison with the investigated objects. Systems Science literature presents a wide range of notions of the meaning of reductionism. The model given below is our composite of these, being coherent and meaningful, yet without aspiring for exclusiveness. This model postulates the existence of three kinds of reductionism. First is the reductionism that is exercised by science itself compared with non-scientific, an every day naive thought. Secondly is the procedural reductionism exercised within science, and thirdly is the substantive reductionism also exercised within science. For an illustration see Figure 6. In order to make the model of reductionism more intelligible, we will discuss its content in the next section.
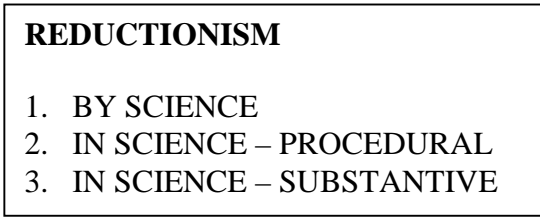
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┌─────────────────────────────────────────┐
│  REDUCTIONISM                             │
│                                           │
│  1.  BY SCIENCE                           │
│  2.  IN SCIENCE – PROCEDURAL              │
│  3.  IN SCIENCE – SUBSTANTIVE             │
└─────────────────────────────────────────┘
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**Figure 6.** Illustrates a model of reductionism that is used in the present investigation.

*5.2.1.1. The reduction by Science*

Reductionism *by* science considers the very notion of what science is, its role in our society and its relation to everyday human knowledge and behaviour. In the present definition we draw on the elegantly elaborated distinction presented by Strijbos (1995), which he uses to evaluate several schools of systems thought.

Strijbos (1995: 366) distinguishes science from human wisdom. In that notion the latter is considered as a correct insight into the situation of concern, a correct insight into what needs to be done, and finally an appropriate action in relation to that insight. While science implies the aspiration for knowledge inquiry that starts by a wonder, which puts the inquirer onto a certain track, namely the scientific method. This method is focusing on a certain issue, which is abstracted and analysed. Its aim is to produce general and universal knowledge (Strijbos 1995: 366). Hence, while wisdom is always concerned with both thinking and acting, science focuses the act of knowing which requires a certain independence from the inquired. While wisdom is concerned with a particular situation that is here and now, science postulates a certain distance between the object and the subject and focuses on general knowledge. Wisdom is therefore necessarily personally and intimate connected with a reality of concern, and is necessarily comprehensive. In contrast, science has a particular, not every day, relation which focuses and isolates a specific issue or problem in a larger context. Table 3 below, presents a distinction between the two discussed by contrasting some of their respective properties.

**Table 3.** Presents a distinction between a scientific approach and everyday human wisdom.

|  | SCIENCE | WISDOM |
|---|---|---|
| *Concerned with:* | Acquiring general knowledge | Thinking and acting in a particular situation |
| *By means of:* | Scientific method | Everyday human reflection & action |
| *characteristic 1* | distance to the inquired | intimate nearness |
| *characteristic 2* | independence | personal involvement |
| *Focuses:* | Certain isolated aspects | Whole (comprehensive) situation |

Strijbos' position is that science must necessarily be a servant to humans and our wisdom, since "*The scientific approach to reality does not provide comprehensive insights that would make possible the removal of all evil and harm from the world.*"

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(Strijbos 1995: 367). Hence, a reduction by science implies the attempts to absolutization of science with pretension to give us a way to, and control of, reality – as its masters and possessors. This is an inadequate position since science by its very nature does not provide such a potentiality.[6] Therefore attempts to absolutize science and use it as a substitute for everyday human personal insight, rather than as a servant and supporter, is to reduce human full potential insight to a particular and limited scientific approach. A similar argument is given both by Churchman (1971: 12) in his brief outline of scientism and by Ackoff and Emery (1972: 4) in their discussion of the discrepancy between the structure of reality and the structure of scientific inquiry that studies that reality.

The present investigation will attempt to find out whether the evaluated systems approaches postulate a position that implies a reduction by science, or not.

### 5.2.1.2. Procedural and Substantive rationality in science

In order to make the distinction between procedural and substantive reductionism *in* science, we first present very briefly the distinction between procedural and substantive rationality, as conceptualised by H. A. Simon (1976b). Simon did not discuss the issue of reductionism in this context, we believe however, that his distinction between the two kinds of rationality is instrumental in establishing a distinction between the two kinds of reductionism in science.

Starting with rationality, Simon (1976b) states that it is the appropriate behaviour to the achievement of given goals, within the limits imposed by given conditions and constraints. Further, Simon (1976b) distinguishes between two types of rationalities. The substantive: "*Behaviour is substantively rational when it is appropriate to the achievement of given goals within limits imposed by given conditions and constraints*." (Simon 1976b: 130) And the procedural: "*Behaviour is procedurally rational when it is the outcome of appropriate deliberation*." Simon (1976b: 131) Discussing an illustrative problem, Simon (1976b: 132) concludes that "*From a procedural standpoint, our interest would lie not in the problem solution /.../ but in the method used to discover it*." Hence, while procedural rationality focuses on the procedure or method that is required in rational reasoning, the substantive rationality is interested in the substance or content of that rational reasoning.[7] In short, the former refers to the *how* of reasoning while the latter to the *what* of reasoning. Further, Ackoff's (1963: 117) postulated seemingly a parallel distinction in his notion that science refers both to a process of inquiry and its result. Given this background we will go on and define procedural and substantive reductionism in science.

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[6] A brief example of such an in-adequateness may be illustrated with a project carried out to design a system. Although there are several scientific theories that may support a designer in his work, all these are a general abstraction that provide only support for some characteristics of the system design act, and not for all issues. For example, if in a particular situation a designer as a person may be disliked (or the reverse, loved) by another designer as a person in the same project, lets say, because of hers or his colour of hair, or some other personal reasons. This situation may very well affect – and often does in practice – the outcome of the design process, i.e. the system. Yet science as such is not capable to handling such particular and local situations, because of its very intention and method – a system design theory does not provide any guidance in such situations.

[7] Simon (1976b) argues for the priority of procedural rationality over the substantive, which is something that is not relevant for our model of reductionism.

*5.2.1.3. Procedural Reductionism in Science*

Procedural reductionism in science refers here to the kind of procedure that is employed in an investigation of a phenomenon. Three positions may be distinguished. First the analytical, or atomist approach which attempts to understand a phenomenon by dividing it into its parts, i.e. to analyse. This approach considers the superiority of the individuals of a particular system over the whole system that they are a part of. The second position is the holist approach, which considers that the fundamental explanation of a phenomenon is to be found in the action of the superstructure over the parts of the system. The limitation of both of the two approaches was conceptualised already by B. Pascal (1963), who wrote: *"/.../ I hold it equally impossible to know the parts without knowing the whole and to know the whole without knowing its parts."* A third position is postulated by, among others, Morin (1977) in his *La Méthode*. It states that the emerging system is, at the same time, both more and less than the sum of its elementary parts. This implies a dialectical or interactionist approach that uses an interaction of the two previously mentioned. Operationally considered, an interactionist position implies an account of a system's structure, functions, transformation, goal(s) and environment (Le Moigne 1977-1994).

Consequently, if a systems approach is postulating an analytical (deterministic structure) or a holist (teleological functioning) position only, it will be considered as procedurally reductive, since it excludes the other position and therefore decreases its potentiality of making systems intelligible. In contrast the third position of interactionst will not to be considered as procedurally reductive.

*5.2.1.4. Substantive Reductionism in Science*

Substantive reductionism in science implies *"/.../ the attempt to express phenomena by representations which can not represent the essential aspects of it."* (Eriksson 1997b: 397) This is because the representations that are employed for modelling were generated from observations of phenomena that exhibits a lower (or different) complexity than the ones that are attempted to be represented with these representations. For example, theories that were generated due to empirical investigations of machines cannot make full justice to social phenomena. The latter manifest characteristics that may not be found in machines, for example love and hate, or reflexivity and self-consciousness. This notion is build on a hypothesis of levels of human experiences of its reality. Bunge (1959) posed it as following: "*A level is a section of reality characterised by a set of interlocked properties and laws, some of which are peculiar to the given domain, and which are assumed to have emerged in other time from other (lower or higher) levels existing previously.*"

Throughout the years, several schools of systems thought have presented different notions of levels. One of the first frameworks was Boulding's (1956) hierarchy of complexity that proposed nine levels of complexity, and which Mingers (1997b) recently proposed to re-conceptualise in regard to its notion of complexity. Another major work is Miller's (1978) Living Systems Theory that postulates the existence of eight levels of living systems. In his La Méthode, Morin (1977) has proposed the loop of physis - bio -

anthropo-social systems, which are said to be irreducible. Ackoff and Gharajedaghi (1996) have proposed the levels of deterministic, animate, social, and environmental levels of systems. Finally, a more recent school of systems thought, Multimodal Systems Thinking (de Raadt 1997), has proposed 17 levels of human experience that are irreducible to each other. These are inherited and modified from H. Dooyeweerd's (1955-58, Vol. II) proposition of 15 levels in his General Theory of Modal Spheres. All these works, and some others, have their different arguments and criteria for levels of identification and distinction. However, in our investigation an academic model of levels will be employed as a model of reference. The main reason for this is its generality, simplicity and usability. It postulates the following levels: *physical systems, chemical systems, biological systems, psychological systems and social systems.* These are thought to be irreducible to each other and therefore their order is not accidental. Every successive level has some new properties that cannot be found in a previous one.

In this study, if the investigated systems approach has been generated by empirical studies of, for example, machines and if the theory postulates itself to be appropriate to make intelligible, for example, biological systems, without any mentioned restrictions or limitations, the theory will be then found to be substantially reductive.

## 5.2.2. Systems approaches and reductionism

This section aims at investigating some of systems approaches with regard to their reductionism position. We will discuss Hard Systems Thinking together with first order Cybernetics, Soft Systems Thinking, Critical Systems Thinking and Multimodal Systems Thinking.

### 5.2.2.1. Hard Systems Thinking and Cybernetics

The notion of Hard Systems Thinking usually connotes systems approaches like Operational Research & Management Science, Systems Analysis, Systems Engineering and Systems Dynamics (Jackson 1991). In this investigation we would additionally like to include first order Cybernetics.

Considering the first attribute of our evaluation model – reductionism by science – Hard Systems Thinking and Cybernetics (HST&C) focuses exclusively on the rationality of the studies system. It is clearly founded within the natural science tradition, and aspires to describing, explaining and prescribing the behaviour of the studied systems, by employment of the analytical-mathematical method. These approaches do not give any account for non-scientific thought, nor do they provide any relation to such. They do postulate implicitly the supremacy of rationality. Therefore we find HST&C to manifest reductionism by science.

Secondly, considering HST&C from the procedural reduction in science point of view, the following may be noted. The HST approaches mainly employ mathematical tools of classical mechanics and statistics – the latter emerged due to thermodynamics. The first articulates the structure-functions determinism of a closed system, while the latter the structure-transformation determinism of a closed system. Cybernetics provided a novel approach in this regard, since it focuses the goal-oriented behaviour of an open system. Hence, both HST and Cybernetics as such exercise procedural reduction in

science. HST does not take into account the goal-oriented behaviour of an open system, while cybernetics ignores the content of a system, by reducing its structure-function-transformation to a single feature of behaviour.

Thirdly, considering HST&C from the substantive point of view, we would like to observe the following. The HST's approaches have their theory generation origin in mechanical-physical and chemical domains. They provide powerful algorithms for description, explanation and prescription of systems that manifest mechanical-deterministic behaviour. They do not account for emergent characteristics of biological, psychological and social systems. For example there is nothing in HST approaches that account for legal or ethical norms of a system, yet they are frequently employed in managing such systems. Cybernetics has its origin both in mechanical and biological domains. Similarly to HST, it does not provide any emergent features of psychological (this does not yield second order cybernetics which is not the object of the present investigation) and social systems. Cybernetics has however, been employed to the management of social systems, most clearly in the form of the Viable System Model (Beer 1979, 1981). The latter attempts management of such systems on the basis of its mechanical and neuro-physiological origins. The inadequacy of such a reduction has been argued strongly by Ullrich (1981). We may thus conclude that both HST and Cybernetic exercise substantive reductionism.

### 5.2.2.2. *Soft Systems Thinking*

Under the label of Soft Systems Thinking (SST) we find, among others, systems approaches like Soft Systems Methodology and Interactive Planning.

Firstly, considering the reduction by science, SST assigns primacy to rationality (Strijbos 1995). It assumes that by taking account of all the various perspectives of different actors, and accommodating these by communication and learning, it will find congruence between scientific knowledge and human everyday reality. Therefore we find that SST manifests reductionism by science.

Secondly, considering SST from a procedural-reductionism in science point of view, it is more difficult to make the judgement, mainly because the formalism of SST is non-mathematical. Our position is, however, that SST is taking account of systems' functions, structural transformations, goals and environments. Therefore we do not find SST to manifest procedural reductionism.

Thirdly, SST as such is generated from experiences in the social domains to which it is also employed. Hence, for example, Soft Systems Methodology accounts features like owner, worldview, customer, et cetera, all to which are specific for social systems and can not be found within biological or mechanical domains. Therefore, we could seemingly conclude that SST does not exercise substantive reductionism. Critique has been delivered to SST however, mainly from Critical Systems Thinking (CST), (Flood & Jackson 1991c) but also from Multimodal Systems Thinking (de Raadt 1995). CST accuses SST, among others, for being unable of taking account of political relations in social systems. Since politics is a peculiar feature of social systems that can not be found in neither biological nor physical systems, it would seem that SST still exercises some substantive reductionism.

*5.2.2.3. Critical Systems Thinking*

Under the label of Critical Systems Thinking (CST) we can find two main methodological supports, the Critical Systems Heuristics and the Total Systems Intervention.

Critical Systems Thinking's position with regard to reductionism by science has been investigated by Strijbos (1995). He states that Critical System Thinking has succeeded to broaden the notion of rationality compared with the previous systems approaches, which implies that the normative and ethical questions are not excluded but assigned a clear position within its framework. Strijbos (1995:373) concludes however, that rationality in Critical Systems Thinking *"/.../ retains its place as the necessary, all-embracing framework for approaching reality."* The problem is that Critical Systems Thinking's critical thinking or rationality subjects science to criticism, yet the very critical rationality itself remains autonomous. Therefore we find Critical Systems Thinking manifest reductionism by science.

Secondly, similarly to the situation of Soft Systems Thinking, it is somehow difficult to judge whether CST does manifest procedural reductionism or not. Our position is though, that like Soft Systems Thinking, Critical Systems Thinking does not exercise procedural reductionism. This is since Critical Systems Heuristics provides a similar account to the one of Soft Systems Methodology, and also Critical Systems Thinking's complementarism commitment considers SST to be a part of CST.

Thirdly, investigation of Critical Systems Thinking's substantive reductionism may show the same duality as SST's position showed. Critical Systems Thinking is generated in and employed to the domain of social systems. For example, it stresses very much the political features of a system. The latter may not be found in biological or physical systems. Therefore, Critical Systems Thinking could be assigned as being substantively not reductionist. This conclusion may be however challenged. As Dooyeweerd (1955-1958, Vol. I) notes, Kant absolutises morality into an autonomous law giver. CST seems to have inherited this feature and thereby exercises substantive reductionism, because it does not account to the credal sources of morality, something that Multimodal Systems Thinking does.

*5.2.2.4. Multimodal Systems Thinking*

Finally, our reductionism investigation has arrived at Multimodal Systems Thinking (MST). Here we would like to focus the Living Social System model (de Raadt 1991). It is partly founded on the Multimodal theory, as inherited from Dooyeweerd's (1955-1958, Vol. II) General Theory of Modal Spheres, however with some modifications. The other influence comes from Cybernetics, mainly due to Ashby (1956, 1960) and Beer (1974, 1979, 1981).

From a reductionism by science point of view, we can follow Strijbos' (1995) investigation that did not find MST to manifest reductionism in this regard. This is because MST rejects the intellectual supremacy of rationality, the latter is rather considered to be embedded within a transcendental normative order, which is to determine the status of reason and science.

Secondly, from a procedural reductionism point of view, MST employees the cybernetic modelling approach. As we have discussed previously, cybernetics does account for a systems goal-oriented behaviour in an environment; but ignores the structure-function-transformation aspects. Therefore we find MST manifests procedural reductionism.

Finally, from a substantive reductionism point of view, our position is that MST does not manifest reductionism. This is because its modelling approach presents one of the most elaborated models of human experiences. In MST's notion it manifests seventeen distinct levels that may not be reduced to each other, ranging from the most determinative of the physical world to the most normative of the social world.

### 5.2.3. Implications of reductionist investigation on the System of Systems Methodologies

We would like to compare our notion of complexity to the notion that is employed by the System of Systems Methodologies meta-model. The latter organises systems approaches along two variables, one is the complexity of the problem situation, and the other is the relation between the decision-maker of the problem situation. Focusing on the first aspect, the exercised classification by this meta-model implied that Operations Research, Systems Analysis, Systems Engineering, Social Systems Design, Strategic Assumptions Surfacing and Testing, and Critical Systems Heuristics were found to be appropriate for simple situations. This is while General Systems Theory, Viable Systems Model, Soft Systems Methodology and Interactive Planning all were associated with complex problems. In our notion of distinction between physical, chemical, biological, psychological and social systems, there is an increasing complexity, where, for example, systems biological for are more complex then physical, and social more complex than the two previously mentioned. Our investigation above would therefore give us the following relationship between complexity and systems approaches. The approaches that would have the least potential to deal with complexity would be Operations Research, Systems Analysis, Systems Engineering and Systems Dynamics. Then come the biological approaches, like General Systems Theory and Viable System Model. Thirdly would come the social approaches, starting with Strategic Assumptions Surfacing and Testing, going on to Soft Systems Methodology and Interactive Planning, passing on to Critical Systems Heuristics. The latter has the ability to deal with political phenomena, which is an emergent property of social systems that the previous approaches are unable to deal with.

It is clear that two different conceptions of systems approaches are obtained with the two different notions of complexity. There is always room for debate concerning which is more appropriate, we think though that the important lesson is that one should be open to alternative views and investigate what these may contribute to an additional intelligibility of the studied objects.

### 5.2.4. Conclusion

The above exercised investigation has shown that non of the investigated systems approaches has been found to be completely non-reductionistic. While Hard Systems Thinking and Cybernetic approaches were found most reductionistic, the Multimodal Systems Thinking approach was found to be least reductionistic. Soft Systems Thinking

and Critical Systems Thinking approaches were in-between. See Table 4 for an overview of the result.

The investigation showed that although Soft Systems Thinking and Critical Systems Thinking have their origin in social domains, they still do manifest substantive reductionism in regard to the social world, by not providing any support for some fundamental characteristics of that world – i.e. ethics and credality, respectively.

Finally we may conclude that the employed reductionism-oriented framework for discrimination of the investigated systems approaches has provided us with some interesting intelligibility and also direction for further research. This was clearly visible when the reductionist model was compared with the Systems of Systems Methodologies model, and differences were identified.

**Table 4.** Shows an overview of the result of the reductionism investigation.

|  | Hard Systems Thinking & Cybernetics | Soft Systems Thinking | Critical Systems Thinking | Multimodal Systems Thinking |
|---|---|---|---|---|
| Reduction by science | Yes | Yes | Yes | No |
| Procedural reduction in science | Yes | No | No | Yes |
| Substantive reduction In science | Yes | Partly | Partly | No |

## 5.3. INTERPRETATION OF SYSTEMS APPROACHES FROM THE POSITION OF THEIR RESPECTIVE RELIGIOUS GROUND-MOTIVES

*"FIRST DISCOVER: 'Does God Exist?' Is the most important question of systems thinking."*

- C. West Churchman (1987: 139)

This section presents a framework for interpreting the contemporary systems approaches from their respective religious ground-motive position. We start by defining what is meant by religious ground-motive and expose four such alternative motives. Then an allocation of some of the systems approaches to their respective position within the framework is done, and followed by a comparison of our model with the model of sociological paradigms. The section concludes with a discussion of implications of that framework and of its use.

### 5.3.1.1. Religious ground-motives

In his original philosophical work, the Dutch philosopher Herman Dooyeweerd (1894-1977), focused his attention on the conditions of theoretic thought (Dooyeweerd 1955-1958). He has shown that all human thought are necessarily and unconditionally

grounded in some religious[8] foundations. This means that all-philosophical activity, as well as all of human life, is prompted by a religious ground-motive, which is the origin of the formers. The religious ground-motive implies the actual transcendent dynamis (Greek word for power, used in the New Testament) that takes hold of a persons heart, fills, motivates and dominates his every action – whether consciously or unconsciously. Religious motive can be said to be a moving power, that may be the dynamic working of God's Spirit or an idolatrous spirit at the very roots of man, who so captured works it out with fear and trembling, and curiosity.

### 5.3.2. The four religious ground-motives

In his histographical studies of western philosophy, Dooyeweerd has laid bare the basic religious commitments of theoretic thought. He has identified four religious ground-motives, all of which identify the religious nature of philosophical activity in the western world. Three of the four motives are apostate and are said to contain an inner tension. (Dooyeweerd 1955-1958) Although our investigation shows that not all of the four ground-motives are necessary to provide a conceptualisation of the investigated systems approaches, they are still presented in order to provide the intelligibility to those ground-motives that show a direct pertinence for our investigation.

*5.3.2.1. The matter-form ground-motive*

The first of the four ground-motives is called the motive of matter and form. This notion should not be directly related to the concepts of matter and form in the Aristotelian philosophy. It is stated that the matter-form dialectic characterises all pagan Greek philosophy. To make it more intelligible we will give a very brief background of it. (Dooyeweerd 1955-58, Vol. I)

Firstly, during the early period of Greek history, worship centred essentially on natural powers thus the Greek religion was a nature-religion. It implied a worship of formless stream of life out of which periodically generations of being emerged. These were all subjected to death, fate and decay. This implied a continuous process of coming-into-being and passing away. The stream of life can only continue if individuals at the end of their allotted life are absorbed again. Individual man and things are doomed to die and decay in order that the cycle may continue.

Secondly, at a later stage of development a new type of religion arouse, that was the culture-religion, as represented in the Homeric gods dwelling on Mount Olympus. These gods had left mother earth with her eternal cycle of life and death, and acquired a personal and immortal form of splendid beauty. They became gods of abiding form, measure and harmony. These two religions – the nature-religion and the culture-religion – combined gave rise to the inner dialectic of the Greek matter-form motive. The nature-religion contributed the principle of matter, i.e. mortality and change, the elements of unpredictable mystery and the formless dark. The culture-religion, on the other hand, contributed the form principle, i.e. abiding being, light and heavenly splendour, as well as

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[8] Dooyeweerd (1955-1958, vol. I: 57, original emphasis) understands religion as *"/.../ the innate impulse of human selfhood to direct itself toward the <u>true</u> or toward a <u>pretended</u> absolute Origin of all temporal diversity of meaning, which it finds focused concentrically in itself."*

reason. According to Dooyeweerd (1955-1958, Vol. I), the two mutually principles controlled all Greek thought.

### 5.3.2.2. The Biblical ground-motive

The second motive was the Biblical ground-motive of creation-fall-redemption. This central point of Scripture constitutes the Archimedean point that determines all Christian activity. Further, this Christian religious ground-motive is beyond the reach of theoretical investigation. It is said to be the religious presupposition of any theoretical thought, which may claim a biblical foundation.

### 5.3.2.3. The nature-grace ground-motive

The medieval synthesis philosophy that combined biblical themes with pagan thought is characterised by the third ground-motive, which is the nature-grace motive (Dooyeweerd 1955-1958, vol. I). In essence this motive is a product of a synthesis mentality that adopted the tension-ridden matter-form motive of the ancient Greeks and incorporated it as nature. Hence, the dialectical character of the nature-grace motive is compounded. It implied a notion that philosophy – including natural theology – belongs to the lower level of nature, while revealed theology belongs to the higher level of super-nature. It articulated dualism, such as the view that God as a transcendent pure form, on the one hand, and a non-transcendent material world, on the other hand.

In the synthesis philosophy, Christianity developed a synthesis that culminated in the great scholastics of the Middle Ages. Thomas Aquinas – who can rightly be called the Dean of Scholasticism – influenced all the medieval theologians. The theme of the nature-grace came to its most articulate expression in his philosophy. Basically, it stated that human nature is weakened by the Fall and directed by a common natural law and the natural light of reason. Christianity, the Bible, faith, all these are specially added items, (donum supperadditum). The natural man is not the radically fallen, but a man endowed with reason that is one and the same in all men, and therefore the basis off all common neutral and autonomous areas of life. In the nature-grace ground-motive there was an implicit possibility of secularism. However if it is true that there is a whole realm of nature and if this nature posses a certain amount of autonomy, then there would be nothing that would prevent that area of nature to go alone. There would be no reason why whole areas of life can not be secular. Thomas Aquinas though, stated that the realm of nature was the primer necessary step toward the realm of grace. Hence there was a necessary link between these two. William of Ockham however, was determined to show that this link or relation was not necessary. Ockham drove a wedge between these two areas in order to drive them as far apart as possible. In that notion, the area of grace, i.e. of Bible and faith, was postulated not to have anything whatsoever to do with the area of nature, i.e. the state, society, science.

### 5.3.2.4. The nature-freedom ground-motive

While philosophy of the Middle Ages was based on and determined by the nature-grace ground-motive, it can be said that the modern period has adopted a different ground-

motive, that of nature-freedom (Dooyeweerd 1955-1958, Vol. I). Thus as soon as the realm of grace was eliminated, the nature realm came into conflict with freedom. Because if nature is conceived as a set of scientifically discerned mechanical laws and processes – as the renaissance and early rationalist postulated – then there is no room for autonomous freedom. The problem of modern philosophy was to reconcile the two, that is, how can man maintain his autonomous freedom in a mechanically determined world? Hence, Dooyewerd saw the history of philosophy as swinging back and forth between two antithetical poles within the various apostate ground-motives.

In order to illustrate this problematic we will briefly mention Kant's works, which had a tremendous impacted on western thinking and societies, and who is the father of the nature-freedom motive (Dooyeweerd 1955-1958, Vol. I). These works attempted an idealistic solution to the nature-freedom tension. Kant's (1998) Critique of Pure Reason investigated the conditions that determine the possibility of human knowing, that is what could the human mind know. One of the significant postulates was that the impressions humans receive from external objects are shaped and determined by an apriori structure of our mind. Kant rejected therefore the long-standing assumption that human knowledge depends on objects and replaced it with the claim that objects depend on our knowledge. The ultimate conditions or principles of knowing, however, that Kant called ideas, were postulated to exceed the possibility of human experience. People could search for the soul and the world, but would never find them. God, the soul, immortality, freedom, as such can not be known. Thus the best humans can do is to act if they had already reached those ultimate principles, and allow these regulative ideas to guide their further investigations.

In his second major work – Critique of Practical Reason – Kant (1997) explored the conditions of moral action. He stated that man's morality is essentially a matter of obligation and freedom. Kant's categorical imperative implied that individuals are capable of formulating laws of conduct for themselves and that the fundamental law is that one should not perform an act only if one would will that anyone in similar circumstances would do the same thing. The moral law is a direct result of human reason, and moral goodness is determined by nothing other than reason. The right and wrong rests in man's autonomy, man is a rational being who knows a priori what is good without any help from out side.

In order to reconcile the tension between the realm of nature and of freedom – that is, combining the pure scientific ration with the practical ration – Kant (1987) wrote a Critique of Judgement. He attempted to construct the bridge within the domain of imagination. This work, however, seems to be generally considered as an unsuccessful theory. Also, in practice, the Critique of Pure Reason has received a lot of attention, while the Critique of Practical Reason received attention only to a lesser extent; while the Critique of Judgement is very neglected.

### 5.3.3. Systems approaches and the ground-motives

In this section an attempt is made to identify the religious ground-motive of some of the systems approaches. Four systems paradigms will be considered in this investigation, these are Hard Systems Thinking, Soft Systems Thinking, Critical Systems Thinking and Multimodal Systems Thinking.

*5.3.3.1. Hard Systems Thinking*

Hard Systems Thinking (HST) represents normally the systems methodologies that are labelled as Operations Research & Management Science, Systems Analysis, Systems Engineering, and Systems Dynamics. They all seem to have some common theoretical features that justify their classification into this paradigm. Hence, onto-epistemologically considered they are all founded on some dialect of realist-positivist positions. This implies, among others, that the mentioned systems approaches all focuses rationality of the investigated objects by means of quantification. They assume that the problem to be solved or managed is given and well defined, and the issue is to find some alternative solutions and then choose the optimal one. Therefore, they do not provide any support for problem identification and justification. They do not provide any explicit normative framework for problem management either.

Considering HST from the point of view of the religious ground-motives, we would like to assign it to the nature realm of the nature-freedom ground-motive. HST's position is that human reality and the universe is conceived in terms of mechanical and predetermined states and their changes, due to the so-called natural laws. This implies that by means of natural science (as conceived since enlightenment) – rationally and instrumentally – human and societal problems can be managed. This approach excludes the option of human freedom or autonomy, human intentions and non-rational behaviour, such as emotional and spiritual, seen in reference to the axiomatic analytic-rational epistemologies. This position implies that the realm of freedom of the nature-freedom motive, is not only ignored but also oppressed and conditioned by the principles of the nature realm. Systems Approaches of HST do not only consider that it is good to control human reality by means of natural science, they also assume that it is possible! Finally, because of its position within the nature realm, HST does not provide any normative framework for problem management.

*5.3.3.2. Soft Systems Thinking*

Soft Systems Thinking (SST) can be said to represent, among others, Soft Systems Methodology and Interactive Planning. Its onto-epistemological foundation is the set of theories known as nominalism, hermeneutics or interpretativism, pragmatism, constructivism, etc. This implies, among others, that these systems approaches do recognise the problematic of conceiving the very problem to be managed. They provide various modelling instruments – like SSM's Rich Pictures – for accommodating different perceptions and conceptions of seemingly similar situations, that may have origin due to different cultural, knowledge and experience backgrounds. Therefore SST has much more modest aspirations compared with HST. Accepting different positions, it accepts seemingly non-rational opinions, which it aspires to accommodate with each other through a process of communication and learning. It does not hope to control human reality by identifying the optimal solutions. Rather to manage with it in a suitable way that is feasible at the moment of problem management.

Considering SST from a religious ground-motive point of view, we would like to assign it to the freedom realm of the nature-freedom motive. This is since SST emerged as a reaction against HST aspirations of controlling human reality through means of

natural science method. SST recognises and emphasises human teleology or free will and his communicative behaviour. SST is very much process-oriented, which follows well the existentialist motto that man never is but always becomes. Human reality can never be known for sure and certainly, and especially not due to some data from empirical measurements.

SST does not, however, provide any normative framework for problem management. Thus, in practice, all views and opinions are equally appropriate and there is no guidance for what is good or bad. SST seems therefore to follow Kant's assumption that all human beings are capable of formulating laws of conduct for themselves. And that no external normative framework is needed to guide human's actions. It does not though, promote Kant's moral imperative. Further, SST does not either provide any theoretical foundation for establishing a bridge between the realm of nature and the realm of freedom – or between HST and SST. It only assigns itself superiority in reference to HST.  In conclusion, SST's position in the realm of freedom is not very successful, since it is unable to provide moral guidance for human actions and neither to establish a firm and stable relation with the realm of nature. The latter imbalance manifests only the inherent tension in the nature-freedom ground-motive, which makes SST impotent to provide the compass needle that our societies needs today.

### 5.3.3.3. Critical Systems Thinking

Critical Systems Thinking (CST) has developed out of the critique of HST and SST paradigms. Theoretically considered it is founded mainly on Kantian philosophy and Habermasian critical social theory (Habermas 1974, 1984b, 1987). Its program may be articulated in three commitments. CST is guided by critical as well as social reflection, emancipation, and theoretical, methodological and practical complementarism. So far, CST offers two methodologies, Critical Systems Heuristics that implements the critical and emancipatory commitments, and Total Systems Intervention that implements the critical and complementarity commitments. While CST shares the critique of HST with SST, it criticises SST for being not critically reflective and also unable to manage social power structures. The two failures are postulated to be dangerous, since they may serve the already existing interests. CST aims at democratic management by involving all affected in a systems study.

Due to its Kantian and Habermasian foundation, CST accounts for three kinds of rationality or inquiry. The empirical analytical science that focuses instrumental-reason, provides nomological causal knowledge and aims at prediction and control of nature. The historic-hermeneutic science that provides the practical understanding of other human beings, and the critically-oriented sciences, such as psychoanalysis and critical social theory, that provides emancipatory interest in freedom and overcoming unconscious compulsion. This implies that CST may be allocated to the nature-freedom religious ground-motive. Compared with HST and SST however, CST provides a serious attempt to manifest the whole nature-freedom motive. It not only articulates both domains of this ground-motive but also the link between these. Hence, the empirical approach governs the realm of nature, the hermeneutic approach the realm of freedom, and the critical approach is meant to provide the link that secures the stability between the two former.

In the following, we will present some of the critique that Dooyeweerd (1955-1958) has delivered to the Kantian philosophy, and which also applies to the Habermasian system of thought, since the latter is fundamentally based of the primer, and thus to CST. To start our argument Dooyeweerd has shown that "*All meaning is <u>from</u>, <u>through</u>, and <u>to</u> an origin, which cannot itself be related to a higher origin.*" (Dooyeweerd 1955-1958, Vol. I, p. 9, original emphasis) Further, he (ibid. p. 89) has shown that truly critical thinking must accept the three transcendental Ideas, which in their trinity must be considered as the transcendental ground-Idea. These three are the Idea of the universe (which in Kant reduced to the sphere of nature), the Idea of the ultimate unity of human selfhood, and the Idea of the absolute origin. Hence, a "*Truly reflexive though, therefore, is characterized by the critical self-reflection as to the transcendental ground-Idea of philosophy, in which philosophic thought points beyond and above itself towards its own apriori conditions with and beyond cosmic time.*" i.e., its origin (ibid. p. 87). Further, Dooyeweerd has shown that "*A sharp distinction between theoretical judgements and the supra-theoretical pre-judgements, which alone make the former possible, is a primary requisite of critical thought.*" (ibid. p. 70). Therefore "*Every philosophical thinker must be willing to account critically for the meaning of his formulation of questions. He who really does so, necessarily encounters the transcendental ground-Idea of meaning and of its origin.*" (ibid. p. 70) The Kantian and the Habermasian systems of thought never fulfilled the latter request, however. Instead their thinking is grounded in a dogma that posses a nature-freedom tension, which has not been resolved so far. More specifically Kantian epistemology (as well as Habermasian) is involved in a theoretical dogmatism because it starts from the dogma of the autonomy of theoretical thought. (ibid. p. 35) Kant did not accept the three transcendental ground-Ideas in their trinity, as the real hypothesis of his critical philosophy. Therefore he could not see that "*/…/ in their very theoretical use, they must have a real content which necessarily depends upon supra-theoretic pre-suppositions differing in accordance with the religious ground-motives of theoretic thought.*" (ibid. 89) Instead, "*He* [Kant] *restricted their significance theoretically to a purely formal-logical one; they have, according to him, only a regulative, systematic function in respect to the use of the logical concepts (categories) which are related apriori to sensory experience.*" (ibid. 89) When asking why did Kant, at this critical point, abandon the real transcendental motive, Dooyeweerd said that Kant "*/.../ had become aware of the unbridgeable antithesis in the ground-motive of nature and freedom, and now rejected every attempt at dialectical synthesis.*" (ibid. 89) Therefore, the problem is that Kant "*/.../ did not see, that his theoretical epistemology itself remained bound to a transcendental ground-Idea, whose contents were determined by this very basic motive.*" (ibid. 89)

Focusing the Habermasian system of thought for a moment, as a consequence of the above discussed problematic, an issue has been made of its criterion of validation. It is founded in Habermas' theory of communication that postulates a consensus theory of truth. According to that a statement is true if and only if it would be accepted by all in an ideal speech situation. The genetic fallacy of this argument implies that a statement is accepted as true by any number of speakers, however, free they may be from coercion or prejudice, does not entail that it is true. (Dancy & Sosa 1992, p. 167). Finally, Strijbos (1995) in his investigation of some various systems approaches, concluded that CST does broaden the notion of rationality, when compared with the earlier approaches, which

implies that the normative and ethical questions are not excluded but assigned a clear position within that framework. Yet, he (Strijbos 1995:373) emphasises that rationality as such *"/.../ retains its place as the necessary, all-embracing framework for approaching reality."* The problem is then that "*Science as an instrument of control is subjected to criticism by "critical systems thinking" but this critical thinking remains subject itself to an autonomous rationality.*" (ibid. 1995:373-374).

### 5.3.3.4. Multimodal Systems Thinking

Multimodal Systems Thinking (MST) is one of the very recent systems approaches that emerged at the end of the 1980's and beginning of the 1990's, and is still in its development phase (de Raadt 1991, 1995, 1998a, 1998b; Strijbos 1995; Bergvall-Kareborn & Grahn 1996a, 1996b; Mirijamdotter 1998). As our investigation will show, it differs fundamentally and radically from the three previously discussed approaches.

MST has its main foundations in the Cosmonomic philosophy of H. Dooyeweerd (1955-58) which is founded in the Christian Reformation. It is also, however, to some extent founded on cybernetics due to R. Ashby (1956, 1960) and S. Beer (1974, 1979, 1981), as well as General Systems Theory of L. von Bertalanffy (1968). Onto-epistemologically MST states that it is *"/.../ based upon the presupposition that the universe is ordered and that this order encompasses the totality of natural phenomena and human life. This implies that there exists a truth that is absolute and autonomous from man and nature."* (de Raadt 1996) This truth has the following relation to our knowledge "*While the human intellect is limited and subjected to error, truth is not completely elusive and it is the task and responsibility of man to seek this truth and to live under its guidance.*" (ibid.) MST's epistemology follows Dooyeweerd who maintained that human thought is based upon and bound to his experience, and that this experience exhibited a variety of modalities or levels of law. While Dooyeweer's (1955-1958) General Theory of Modal Spheres presents fifteen such modalities, de Raadt's multimodal theory (de Raadt 1996, 1997) has added two more. Hence all knowledge that humans posses is to be manifested within these modalities. Further, the criterion of validity is postulated to be ultimately relied upon personal experience and relation with God.

Considering MST from the religious point of view, it assigns itself explicitly to the Biblical ground-motive of creation-fall-redemption[9]. Thus MST rejects the intellectual supremacy of rationality, the latter is rather considered to be embedded within a transcendental normative order and hence should determine the status of reason and science. Therefore, reason is considered to be dependent upon and determined by faith. Viewing MST from the problematic of the nature-freedom ground-motive – which it is not founded on – God is providing the laws that are to govern the relation between humans and nature. The latter is articulated in MST's multimodal theory that articulates this relation in terms of determinative and normative order.

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[9] It may be noted, however, that MST seems to have entered some kind of unfortunate Schizophrenia in regard to its ground-motive. This is since the works of MST's two main proponents – de Raadt (1991, 1998) and Strijbos (1995) – refers to the Biblical ground-motive, while the works of Bergvall-Kareborn and Grahn (1996a, 1996b) and Mirijamdotter (1998) grounds themselves in the nature-freedom motive.

Similarly to the previously discussed systems paradigms, MST may be interrogated. The first issue concerns MST's postulate of the existence of an absolute truth. This is said to be obtained by considering the modal kernels that are to guide the ultimate mission and meaning of a system. Here, for example, de Raadt (1991) accuses Beer of postulating a system's mission in relation to an observer. Since the multimodal theory has been identified by some observers – Dooyeweerd and de Raadt – the question may be posed: What status of validity or justification can be assigned to the multimodal theory and its kernels? Thus, what makes them distinct from other observers – like Beer –to identify and impose the framework of ultimate missions of systems? Hence, for example, the re-definition of the multimodal theory from Dooyeweerd's notion to de Raadt's, illustrates this point well, because it implies that the conceptions made due to Dooyeweerd's notion could not be true. Also it is unknown whether de Raadt's notion is final and true? Secondly, the source of the truth in itself is to be found in the personal relation with God. A problem emerges for those who do not accept unconditional faith in God and Jesus Christ. Thirdly, it could be stated that the history of the western civilisations has provide enough prove that a Biblical foundation does not guarantee a just government of our societies…

### 5.3.5. Implications of the religious ground-motive investigation on the classification according to Burrell and Morgan's model of sociological paradigms

We would like to relate our investigation of systems approaches' religious ground-motives to the framework of sociological paradigms, as conceived by Burrell and Morgan (1979) and employed in the interpretation of systems approaches by Jackson (1991). The model of sociological paradigms is a matrix along two variables. One is about the nature of social science, and the other is about the nature of social systems. The first variable may take either an objectivist or a subjectivist value. An objectivist position implies a realist ontology, a positivist epistemology, a determinist anthropology and an nomothetic methodology. A subjectivist position implies, on the other hand, a nominalist ontology, anti-positivist epistemology, voluntarist anthropology, and ideographic methodology. The second variable implies assumptions about the nature of society. One position is the sociology of regulation of status quo social systems, while the other is sociology of radical change, which considers social systems to be conflicting and dynamic. Burrell and Morgan combined these positions and thus obtained four possible sociological paradigms. These are the functionalist paradigm (objectivist-status quo), the interpretative paradigm (subjectivist-status quo), the radical humanism paradigm (subjectivist-dynamic), and the radical structuralism paradigm (objectivist-dynamic). Next, in order to make systems approaches intelligible, Jackson (1991) allocated them into that model.

Whatever the result of this allocation may be, the religious ground-motive framework shows the limitations of Burrell and Morgan's model of sociological paradigms, and therefore of an eventual allocation of systems approaches into it. This is because Burrell and Morgan's model is grounded on the nature-freedom ground-motive, which makes it both articulate and forces the inquired systems approaches into the unbridgeable tension of dualism, founded on dogmatism of autonomous reason. Hence, more specifically, the nature-freedom ground-motive is manifested perfectly in the

assumptions of dualism of the nature of social science. The realist ontology, positivist epistemology, determinist anthropology and nomothetic methodology expresses the nature realm, while the nominalist ontology, anti-positivist epistemology, voluntarism anthropology and ideographic methodology expresses the realm of freedom.

The problems of such a framework as an instrument for meta-modelling is that it is unable to identify the problems of the nature-freedom ground-motive that govern the various systems approaches, since it founds itself on the same ground-motive. Secondly, because of this situation, the framework is to miss-conceptualise systems approaches that do not find themselves on that ground-motive – such as Multimodal Systems Thinking.

## 5.3.6. Discussion

The historical development of systems paradigms, from HST to SST and then to CST seems to show an implicit awareness of the problematic of the nature-freedom motive. In this respect, CST seems to manifest advancement. This position does not seem to be very promising however. Its foundation on a theoretical dogma that exhibits seemingly un-resolvable conflict between the realms of nature and freedom, makes this seemingly promising approach blind and unable to provide the compass needle that our societies need. Given this problem, MST presents a more promising position, as founded on a firm and stable foundation. We can observe though that such a foundation does not guarantee a just society, and that it does not possess the societal contract that is needed for its implementation, as CST's democratic position does.

Therefore, we must conclude that neither CST's democratic nor MST's Christian normativity seems to manifest a viable alternative by itself. Should we then work on an improvement of these, or search for some radically different alternatives, or is such a search an impossible mission and therefore to be ignored…

From a methodological point of view, we would like to conclude that the employed discriminator of religious ground-motive has proven to provide an alternative kind of intelligibility of the investigated objects. This has manifested their similarities and differences, together with their respective problematic, in a way that has not been done before – as far as we know. Also the provided intelligibility, seems to us, to be of fundamental importance, because while academicians and practitioners fight about cosmetic issues of systems approaches, very little attention has been given to the determining foundations of these approaches. The usefulness of the religious ground-motive model became well articulated also when compared to the model of sociological paradigms. Then the latter's limitations and misconceptions were manifested.

## 5.4. SUMMARY OF EMPLOYMENT OF THE FOUR HEURISTICS

We would now like to summarise our findings so far. The first group of evaluation heuristics is composed of i) the source for theory generation investigation, ii) the paradigmatic-historic investigation, iii) the epistemological orientation investigation, and iv) the decision-making process investigation. These tools provided intelligibility by discriminating the investigated systems approaches from different perspectives. Yet, although different spectacles were used, they all articulated clearly a similar pattern. A development from the more simple or primitive systems approaches founded on

mechanical notion of reality, through biological thinking into social notions of various kinds. This identification of the trend within systems approaches made us to hypothesis an explanation, which relates systems thinking to the development of the post-war western societies. Yet, these heuristics did not provide any explanative discrimination of the differences between Critical Systems Thinking and Multimodal Systems Thinking, both are considered to belong to the same class.

The second group of evaluation heuristics investigated the potentiality of the investigated systems approaches to deal with complexity. This was done by inquiring the reductionist profile of the investigated objects. The result showed that there are no systems approaches that qualify as completely non-reductionist in reference to our reductionism-model. While the Machine Thinking/Hard Systems Thinking approaches were found most reductionist, the approaches that qualified under Social Thinking manifested less reductionist tendencies. Differences within the latter group were, however, identified. Hence, Soft Systems Thinking was found to be the most reductive in that group, Critical Systems Thinking was given an intermediate position, while Multimodal Systems Thinking was found to be least reductionist. This group of evaluation heuristics provided a discrimination between Soft Systems Thinking and Critical Systems Thinking on the one hand and the Multimodal Systems Thinking on the other hand. Yet it did differentiate between Soft Systems Thinking and Critical Systems Thinking.

Finally, the last evaluation approach investigated the religious ground-motives of systems approaches. This evaluation approach proved to be very powerful, by being able to identify the progressive development from Hard Systems Thinking through Soft Systems Thinking, to Critical Systems Thinking, all within the nature-freedom ground-motive. It also provided intelligibility to Multimodal Systems Thinking's radical distinction, because of its foundation on the creation-fall-redemption ground motive. This investigation showed that systems approaches founded on the nature-freedom ground motive are fundamentally impotent because of its internal non-coherence, which is due to their foundation in the dogma of an autonomous reason. In such regard, Multimodal Systems Thinking manifests a more promising attempt, by being founded on a coherent foundation. The historical evidence of its limitations, however, as well as the lack of social contract with the Christian faith makes it very doubtful whether this systems approach can have any significant impact.

## 6. SYSTEMS APPROACHES AND POSTMODERNITY

This section relates to the findings about systems approaches as provided above, to the contemporary social situation – the so-called postmodernity. We first provide a brief account of our notion of postmodernity, and then show the relationship between that model and the contemporary systems approaches.

## 6.1. POSTMODERNITY

*"Post-modernism signals the death of such 'metanarratives' whose secretly terroristic function was to ground and legitimate the illusion of a 'universal' human history. We are now in the process of wakening from the nightmare of modernity, with its manipulative reason and fetish of the totality, into the laid-back pluralism of the post-modern, that heterogeneous range of lifestyles and language games which has renounced the nostalgic urge to totalize and legitimate itself /.../. Science and philosophy must jettison their grandiose metaphysical claims and view themselves more modesty as just another set of narratives."*

<div align="right">- T. Eagleton (1987)</div>

There is an ongoing debate on whether our civilisation has entered the postmodern era or not. It seems, however, to be mainly a discussion about labels, since most of the discussant do agree about the change as such, namely, whether we call it postmodernity, postmodernism, late modernism, high modernism, or something else. Huyssens expressed this as follows:

*"What appears on one level as the latest fad, advertising pitch and hollow spectacle is part of a slowly emerging cultural transformation in Western societies, a change in sensibility for which the term 'post-modern' is actually, at least for now, wholly adequate. The nature and depth of that transformation are debatable, but transformation it is. I don't want to be misunderstood as claiming that there is a wholesale paradigm shift of cultural, social, and economic orders; any such claim clearly would be overblown. But in an important sector of our culture there is a noticeable shift in sensibility, practices and discourse formations which distinguishes a post-modern set of assumptions, experiences and propositions from that of a preceding period."*

<div align="right">- A. Huyssens (1984)</div>

We maintain the label of postmodernity here, which is thus postulated to be differentiable with the modern era, as well as with pre-modern or classic times. Below we make an attempt to outline some of the dominating characteristics of postmodernity. In this endeavour we rely mainly on Lyon's (1994) characterisation.

Modernity is associated with the Enlightenment project which worshiped reason as its Archimedian point in one way or another, and manifested itself most clearly in the industrialisation process. Postmodernity on the other hand, is said to start somewhere in the 1960's or 70's, and challenges the very foundations of modern thought. For example the works of Feyeraend (1975) and Quine (1964) criticised modernity for being dogmatic when postulating ideas of truth and statements of fairness. It did so by focusing attention on the dilemmas, creating doubts, and being suspicious of the scientific methods of validation.

It should be noted though that the social and the cultural are intertwined. This turns our attention to the change from the modern focus on the workers and the capital to the postmodern heavy domination of the consumption culture. It implies lifestyles of

eclectic fashion and taste and an endless quest for new market niches. This phenomena implies not only the production of the needs and wants, but also on a more or less conscious imposition of products by the markets, as well as a consumption only for the sake of consuming – window shopping… It implies also the constant search for optimisation of efficiency, whether it is car production, kindergartens or hospitals, or even Churches. Another domination is the societal reliance on technology, and lately the impact of information and communication technology. The metaphorisation of the human mind as a symbol-manipulating machine – computer – is frequently used (for a very clear example of this trend see Simon 1976a). The sense of time and place is not rigid anymore with constant access to an almost endless amount of data through the Internet. Next is the dramatic change and erasure of norms and values, by the questioning of what is right or wrong and why, everything seems to go. As a symptom of all this, our societies are said to manifest an ever increasing complexity, which makes it virtually impossible to plan and understand social phenomena. Yet the latter is over and over attempted, tragically enough, with the frameworks of machine thinking.

We can thus summarise our inquiry into postmodernity as being characterised by the technologisation – which we will label metaphorically the machine man – the commercialisation – that we label the economic man – and the relativisation – metaphorised as the nihilistic man. Indeed the three should not be seen as disconnected. The materialistic and economical development's domination – as expressed in the mechanical and the economic man – over the normative – as expressed in the nihilistic man – manifests postmodernity. The reason for the perception of the increasing complexity becomes intelligible when norms and rules change and disappear, the societal order becomes less clear – or a mess as Ackoff (1981a) puts it. Therefore the question of our investigation is how well can systems thinking contribute to the management of this mess? The answer will be looked into in the next section.

## 6.2. RELATION BETWEEN SYSTEMS APPROACHES AND POSTMODERNITY

Finally, we have arrived of the point where the relation between the inquired systems approaches and the societal situation is performed. Focusing on the symptom of an increasing complexity of human reality, we can state that systems thinking – if anything – ought to be a clear candidate to support our societies. Our investigation has shown that although none of the inquired systems approaches on its own can be found to be completely non-reductionist, together they create a powerful toolbox that has this possibility. When asking what can systems thinking do about the mechanical man, we can see that its Social Thinking oriented approaches should be a contribution to a de-technologising of our worldviews and life. This is because those approaches do include social issues in their conception of situations – i.e. culture, politics, faith, et cetera. Posing the same question concerning the economic man, a similar answer may by given. That is, systems approaches within Soft Systems Thinking, Critical Systems Thinking and Multimodal Systems Thinking paradigms have all made an attempt to move the attention from the how-questions, that implies optimisation and efficiency search, to the what- and why-questions. The latter implies a quest for doing right things rather then doing things right, which may be wrong… When we finally ask what can systems thinking do about

the nihilistic man, two answers may be given. The first – an optimistic one – implies that systems thinking indeed is concerned with norms and values, as manifested by Critical Systems Thinking and Multimodal Systems Thinking. Therefore, the question of right and wrong should be manageable. The investigation of the religious ground-motives however, provided us with a less positive image. This is because Critical Systems Thinking that is established on the dualism of the nature-freedom motive, is founded in the dogma of autonomous reason, which implies that it is unable to provide the compass needle that our societies needs today. On the other hand, Multimodal Systems Thinking is more promising from that point of view. Being founded on a firm Christian foundation it can provide the requested compass needle. Its problems are, however, that the history of human civilisations has shown that the Christian source for norms do not guarantee a just management of our societies. Secondly, the Christian source of normativity does not posses the necessary social contract of acceptance by the western societies, which the Critical Systems Thinking's democratic source does. This drama may be metaphorically expressed in Einstein's statement. *"The situation may be expressed by an image: science without religion is lame, religion without science is blind."* (Einstein 1941, p. 285) In our case Critical Systems Thinking is blind, while Multimodal Systems Thinking is lame…

## 6.3. CONCLUSIONS AND FUTURE STUDIES

We would like to end this journey with a short summary. This work has proposed a number of heuristics for evaluation of the contemporary systems approaches in relation to our western societal situation. The employment of these heuristics has shown on the one hand that these systems approaches seemingly manifest a powerful toolbox that may help our societies. However, on the other hand we have found that the most critical shortcoming of the contemporary systems thinking is its inability to provide acceptable support for managing the societal normativity; though the latter seems to be the very source of today's main problematics.

We believe that further research would benefit by focusing on the following. Explicitly providing frameworks to support combinations of the various systems approaches – a trend that seems to be recently emerging, see Mingers and Gill (1997). Secondly, there is a serious need to investigate the very foundations of systems thinking so that a coherent and acceptable position may be provided. Finally, more evaluation heuristic is necessary in order to obtain more intelligibility of the contemporary systems approaches potentiality and limitations. Some examples that we would like to mention are the kind of substantive and procedural (Simon 1976b) support that is provided. The correlation between the general model of problem solving (Intelligence-Design-Choice-Implementation-Evaluation (Simon 1976a)) and the various systems approaches. The kind of descriptive versus imperative support that is supplied, as well as the kind of object versus subject support that is given in a problem management situation.

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