A Multi-Modal Approach to Soft Systems Methodology

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Doctoral Thesis

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ABSTRACT

The main aim of my research is to explore ways of enriching Soft Systems Methodology, when used as a methodology for systems design, by developing intellectual tools that can help designers to conceptualise, create and evaluate different design alternatives. This directs the focus on the methodology’s modelling phase even though some ideas related to analysis also will be presented.

In order to realize this objective the study proposes the following supplements. Firstly, a framework of 15 modalities (knowledge areas) is suggested as a supplement to existing analysis techniques, with the aim of helping the analyst identify important aspects and, thus, relevant issues for modelling. Secondly, a concept called qualifying function is proposed as an additional modelling tool for drawing out different perspectives of a particular problem situation, discussing desirable purposes for the design, and for exploring the underlying rationale behind a suggested transformation or a stated Weltanschauung. Thirdly, an expansion of the measures of performance used in SSM modelling, for evaluating conceptual models of possible design alternatives, is suggested. This expansion also builds on the modal framework.

Based on my theoretical and practical work I conclude that using the modalities as a general framework in analysis, modelling and evaluation, as well as using the concept qualifying function to tease out and clarify relevant transformations and underlying value systems has practical benefits and therefore can be said to enrich Soft Systems Methodology.

Keywords: Systems Design, Systems Thinking, Soft Systems Methodology, Dooyeweerdian Philosophy, Modalities, Qualifying Function, Analysis, Modelling, Evaluation
"THE HEART HAS ITS REASONS, WHICH REASON KNOWS NOTHING OF"

(Blaise Pascal)

TO JONATAN, LIV AND VIKTOR
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Luleå, December 2002

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CONTENTS

COVER PAPER
1. Introduction ............................................................................................................... 1
2. Theoretical Foundation ........................................................................................... 9
3. Research Strategy .................................................................................................... 35
4. A Multi-Modal Approach to Soft Systems Methodology.................................. 41
5. Critical Issues ........................................................................................................ 53
6. Conclusions and Further Research..................................................................... 63
7. Summary of the Articles ....................................................................................... 69
References .................................................................................................................. 75

ARTICLE 1: .................................................................................................................
Expanding the Framework for Monitor and Control in Soft Systems Methodology

ARTICLE 2 .................................................................................................................
Multi-Modal Thinking in Soft Systems Methodology’s Rich Pictures

ARTICLE 3 .................................................................................................................
The Role of the Qualifying Function Concept in Systems Design

ARTICLE 4 .................................................................................................................
Enriching the Model Building Phase of Soft Systems Methodology

ARTICLE 5 .................................................................................................................
Qualifying Function in SSM Modelling – A Case Study
"Systems methodologies, in and of themselves, are artefacts. They are tangible manifestations of their developers' beliefs and assumptions about the nature of, and 'state-of-play' in, the world".

(Brocklesby and Cummings 1995, p. 242)

1. **INTRODUCTION**

This thesis is about systems design, as it is viewed within the systems thinking community, and focuses on developing intellectual tools that can help designers to conceptualise, shape and assess different design alternatives. Systems design is a broad concept that represents the systemic process by which design visions are confronted with physical and mental constraints and by that moulded and modified until a change that alters an existing situation into a preferred one can be achieved. Hence, the idea of betterment or progress is almost inherent in the concept of systems design. The only difference being how betterment and progress is defined and for whom it is intended.

In systems design, systems methodologies constitute an important foundation for the design activity. Methodologies and methods are often presented as part of the design process since they specify what is considered as important activities as well as how these activities should be carried out. Löwgren and Stolterman (1998), however, discuss the interrelationship between the designer, the process, and the product in such a way that methodology and method, to some extent, become a part of all three. Because, even if methodologies and methods are strongly related to the design process they also influence the designer by helping her to develop necessary design abilities, such as creative and analytical skills, critical judgement, social and communicative talents, etc. Besides this, methodologies and methods also influence our view on ourselves, as designers, as well as our view on others, such as managers and users. Due to this designers tend to develop and use methodologies that are in accordance with their rationality; their view of the world. As to the relation between the product and certain methodologies and methods the two latter are usually created with a particular product in mind, while they affect the qualities of the product indirectly through their effect on the designer and the process. Finally, all these elements are in mutual dependence with and within a context.

While there are a large number of different systems methodologies (Checkland 1981; Flood and Jackson 1991a; Jackson 1992; Lane and Jackson 1995; Laszlo and Laszlo 1997) they all have their base in systems science or systems thinking, and, as such, focus on the study of “wholes”. One of the most common classification schema used to structure the
different methodologies includes the following three categories: Hard Systems Thinking (HST), Soft Systems Thinking (SST), and Critical Systems Thinking (CST). Checkland (1978; 1981; 1983; 1999) contributed with the first two categories by distinguishing between Hard and Soft Systems Thinking. Later, Flood and Jackson (1991b; Jackson 1991) expanded the classification schema by introducing Critical Systems Thinking.

The methodologies within Hard Systems Thinking (HST) constitute the starting point of the systems movement, and, is traditionally represented by theories like Systems Analysis (McKean 1958), Systems Engineering (Chestnut 1967; Hall 1962), and Operational Research (Churchman, Ackoff et al. 1957). However, besides new versions of these methodologies (Blanchard and Fabrycky 1998; Keys 1991; Sage 1992; Sage and Armstrong 2000), hard systems thinking could also include methodologies like Systems Analysis and Design (Kendall and Kendall 2002), Systems Dynamics (Forrester 1961; 1994) and Management Cybernetics (Strank 1982). Common for these methodologies, according to Checkland (1999), is that they, to a large extent, build on the natural sciences with their positivistic view on reality, communicate the view that the world contains systems that can be modelled and engineered, and focus on finding economically efficient means for achieving known and defined ends. Finally, and most importantly, the word “system” is used as a label for something taken to exist in the world outside ourselves.

Soft Systems Thinking (SST), is best represented by Churchman (1971; 1984), Ackoff (1981; 1988; 1993), Checkland (1981; Checkland and Scholes 1990; 1999), and Mason and Mitroff (1981). It developed as a reaction against the view on reality adopted by the hard approaches and against their inability to deal with multi-faceted and ill-structured real-world problems; the kind of problems, which constitute the focus of attention for the soft approaches. According to the above authors, the social world is radically different from the physical world. Mingers (1984) interprets this separation as follows: “The physical world consists of entities and structures which are independent of the observer’s concepts but the social world consists only of the individual’s concepts, constructs and intentions. There are no separable social objects or structures” (p. 85).

Social reality cannot, therefore, be investigated or understood by applying positivistic theories and methods, instead some kind of interpretative sociological methodology, like phenomenology or hermeneutics, should be applied. This view of sociology is subjective in two senses, according to Mingers (1984). Firstly, it views people as active and creative individuals who take part in the process of shaping and creating the social world through their interpretations and interactions. Secondly, it is subjective,
rather than objective, in its prescriptions for social science and rejects the
idea of objective descriptions or theories of the social worlds existing
beyond an individual’s consciousness.

Within the soft approach the word “system” is no longer applied to the
world, it is instead applied to our process of inquiry into the world. “It is
this shift of systemicity (or ‘systemness’) from the world to the process of
inquiry into the world which is the crucial intellectual distinction between

Within Critical Systems Thinking (CST) two streams can be noticed.
Common for both are their philosophical relation to the critical school
within sociology and especially to the work of Habermas (1966; 1970a;
1970b). The first stream, most commonly referred to as Critical Systems
Heuristics, developed as a continuation of soft systems thinking (Ulrich
1988; 1998). Here, the focus is on identifying and rationally unfolding the
value judgements that inevitably flow into problem definitions and
improvement proposals. Equally important is to debate the practical
consequences and side-effects that the propositions may impose on people
and to lay bare the hidden value content on which a proposal is judged as
acceptable or unacceptable. ”Critical Heuristics seeks to provide both the
involved planners and affected citizens with a conceptual framework for
identifying and discussing the normative implications of problem
definitions, systems designs, program evaluation, etc” (Ulrich 1987, p.
276).

The second stream developed as a response to the critique against the
underlying philosophy of traditional management science and hard systems
thinking and as a reaction against the soft approach (Flood and Jackson
1991a; Flood and Ulrich 1990; Jackson 1982; 1991). It was argued that the
soft approach had a limited domain of application, a regulative character,
and a tendency to retain status quo due to its subjectivist approach to social
science, its interpretative assumptions, and because the approach did not
try to ensure the conditions for “genuine” debate. “The kind of open,
participate debate which is essential for the success of the soft systems
approach, and is the only justification for the results obtained is impossible
to obtain in problem situations where there is fundamental conflict between
interest groups which have access to unequal power resources “ (Jackson

Besides using Habermas’ vision of the “ideal speech situation” as a base
for criticisms these authors also argue that because Habermas’ social theory
retains positivism as a necessary method in social analysis it is able to
understand the dependence of certain Weltanschauung on the social
structure. Further, it is argued that “because it possesses a critical aspect it is in theory capable of discovering which Weltanschauungen are historically contingent and which are permanently fixed because they represent ‘universal’ structures of subjective orientation in the world” (Jackson 1982, p. 26).

According to my beliefs and assumptions about the nature of, and “state-of-play” in, the world it is within the soft tradition that I find my base. This is because I do not agree with the positivistic principle of scientific objectivity and neutrality that governs Hard Systems Thinking. Rather, I argue that our worldviews always affect our research by influencing our problem definitions, our choice of theory and methodology, our interpretations, etc. I also claim that people shape the social world through their interpretations and interactions.

The choice between Soft Systems Thinking and Critical Systems Thinking is not as straightforward. I feel sympathetic towards the issues brought forth by Critical Systems Thinking, and in the work of Ulrich (1987; 1988) I find some ideas and concepts, such as his “boundary judgements” and “boundary questions” (Ulrich 1998), that would fit very well within the soft tradition. These concepts have the potential to help unfold underlying rationalities related to problem definitions and suggested solutions, which represent important issues within the soft approach. However, contrary to critical systems thinkers I do not take my starting point in a conflict view. Nor is my work aimed at finding ways to balance the power structures within society, which constitute one of the main aims of the critical approach. Instead I argue that, often, it is possible to find accommodation between different groups. Based on this, I have chosen to focus on situations characterised by some kind of harmony view where people want to achieve a change, and where there are a desire and willingness to learn from each other. Within this context, my research interest is to develop conceptual tools that can help people involved in a change process to conceptualise, give form to, and assess design alternatives.

I am aware that my chosen focus will affect the context within which my conceptual tools will be applicable. My focus on situations characterised by some kind of harmony view where people want to achieve change, and where there are a desire and willingness to learn from each other means that this also constitutes the context within which my tools can be expected to make a contribution. One new example of such a context is found in the literature on virtual organizations, meta-organisations and communities of practice. These organisations are characterised by mutual learning and cooperation (Brown and Duguid 1991; Lam 1997; Malhotra 2000; Wenger 2000). However, my focus rules out situations such as the ones reported on in Yugoslavia between Serbs, Bosnians, and Croatians, as well as less
hostile situations where there is a strong inequality in the power distribution.

Further, when it comes to the process of systems design I consider concepts like Weltanschauung, learning, participation and accommodation to be central. Viewing the design process as a continuous learning process, where differences in Weltanschauung are seen as something natural and positive, becomes more and more important as the rate of change is increasing in today’s societies and organisations, and considering the growing diversity in norms and cultures existing among people living and working together. The benefits of active involvement or participation from people in a problem situation, as well as the importance of reaching accommodation in decision making, have been extensively recorded (Ackoff 1979; Callo and Packham 1999; Checkland and Scholes 1999; Churchman 1984; Hwang and G. 1999; Lin and Shao 2000).

Within the soft tradition, Soft Systems Methodology (SSM) is a methodology that has taken particular interest in these issues. SSM (Checkland 1981; Checkland and Scholes 1999; Flood 2000; Jackson 2000) is a well-known methodology for tackling real-world problems of management. As such, it has been used both for information systems design (Checkland 1984a; 1988; Checkland and Griffin 1984; Checkland and Holwell 1993; 1997; Wilson 1992; Winter, Brown et al. 1995) and for systems design and learning in general (Callo and Packham 1999; Checkland and Scholes 1990; Kartowisastro and Kijima 1994; Mirijamdotter 1998; Reid, Gray et al. 1999; Rose 1997). Within the discipline of information systems, SSM is often combined with traditional methods and methodologies for information systems development (Avison and Fitzgerald 1995; Avison and Wood-Harper 1994; Fitzgerald, Russo et al. 2002; Stowell 1995; Wood-Harper, Antill et al. 1985).

Soft Systems Methodology aims at extending the area in which systems ideas can be used to find a structure in, and hence, help improve real-world problems within the realm of social systems. As such, it has been argued to be “one of the most thought-provoking methodologies to emerge in recent years” (Jayaratna 1994, p. 175). Even among its main critics, SSM is recognised as “the most self-conscious (and certainly the most rigorous) attempt at an interpretative systems methodology” (Jackson 1982, p. 22). The methodology focuses on “models of perceptions, not models of complex reality” (Checkland 1982, p. 11) and is especially suited for problem situations labelled as complex and pluralistic (Flood and Jackson 1991a; Flood and Jackson 1991b). Hence, the focus of attention for SSM is on people’s perceptions of reality, their worldview, rather than on external reality as such.
Some underlying assumptions of the methodology is that people in general want to solve their problems or improve problematical situations and that, in order to do this, some kind of consensus or accommodation between stakeholders needs to be achieved. Further, it is assumed that many problems and conflicting situations involve disagreements related to needs, objectives, measures of performance, etc., and have their base in either misunderstandings, or differences in interests or culture. These misunderstandings and differences are usually due to a lack of understanding or information, or due to different and incompatible worldviews. Either way, by understanding each other, and these differences better, one can solve, or at least improve, many problematic situations.

Important characteristics arising from the above assumptions are that SSM views the design process as a learning process and points to the importance to make plain many different perceptions of the problem situation, as well as the underlying rationale, of these perceptions. It stresses the importance of trying to break away from self-imposed constraints and frames of mind; and, finally, it tries to reach accommodation through discussion.

However, even though Soft Systems Methodology has been used both for information systems design and for systems design and learning in general, the methodology was originally developed for design and implementation of an agreed change, rather than of a system. Or as Checkland (1972) argues “any design and implementation is, in general terms, the design and implementation of an agreed change rather than of a system. Design of a system emerges as a special case, appropriate when the problem definition is sufficiently sharp to enable objectives and measures of performance to be defined and hence to allow the thinking to be in terms of model building, simulating performance and optimising” (p. 97). He continues by saying that design in relation to softer studies “is not the creation of something which will perform in some specified people-proof way to achieve some defined objective, it is the creation of some modification to which purposeful individuals are prepared to give their commitment” (p. 119).

This means that, while changing people’s perceptions is a very good way, perhaps the only way, to bring about changes in the world, when it comes to systems design, design of changes and design of systems need to come together, and it is not always easy to tell where one ends and the other begins. “Putting together ideas in order to imagine goals, we mentally construct a reality, later to be materially constructed. And when the material construction has done its job, we have to mentally interpret the result and relate it to our goals” (Dahlbom 1992, p. 110). Thus, when using Soft Systems Methodology with the aim of designing and implementing both a mental change and a real-world system it is of special importance to support the process of discussing and coming to agreement or consensus on
issues like objectives and measures of performance for the system to be
designed. However, it is important to point out that even though Checkland
favours mental changes, with the argument that through these, structural
and process changes will come about, he does not say that mental changes
are easily accomplished. Rather, he seems well aware of the inertia that
appears to be inherent in most changes, and which partially, is the reason
why changes need to be seen as processes. This inertia can also partly
explain many methodologies’ tendencies towards regulatory changes that
retain status quo on some level.

In this thesis I explore different ways of enriching Soft Systems
Methodology in the process of conceptualising, forming and assessing
different design alternatives, especially when it is used as a methodology
for systems design. This is done by incorporating concepts and ideas from
the philosophy developed by Herman Dooyeweerd (1997; Kalsbeek 1975).

This thesis can also be seen as a continuation of the work done within the
so-called Multimodal Systems Thinking approach. This is an umbrella term
for a variety of attempts to bring the ideas of Herman Dooyeweerd to bear
on social systems. Modest advances have already been made in several
fields: cybernetics (de Raadt 1989a; 1991; 1995b) knowledge elicitation
(Winfield, Basden et al. 1996), information systems design (de Raadt
1995a; Eriksson 2001; Winfield, Basden et al. 1995), systems design
(Bergvall-Kåreborn 2000; 2001; 2002a; 2002b; Bergvall-Kåreborn and
Grahm 1996a; 1996b; de Raadt 1989b; 1997c; 2001; Mirijamdotter 1998),
urban planning and design (Lombardi 1998; 1999; 2001; Lombardi and
Basden 1996; Lombardi and Brandon 1997), ethics (de Raadt 1996; 1997a;

1.1 RESEARCH OBJECTIVE

The main aim of my research is to explore ways of enriching Soft Systems
Methodology by developing intellectual tools that can help designers to
conceptualise, create and evaluate different design alternatives. This directs
the focus on the methodology’s modelling phase even though some ideas
related to analysis also will be presented.

In order to realize this objective the study proposes the following
supplements:

• Firstly, a framework of 15 modalities (knowledge areas) is
  suggested as a supplement to existing analysis techniques, with
  the aim of helping the analyst identify important aspects that
  need to be understood in order to identify relevant issues for
  modelling.
Secondly, a concept called qualifying function is proposed as an additional modelling tool for drawing out different perspectives of a particular problem situation, discussing desirable purposes for the design, and for exploring the underlying rationale behind a suggested transformation or a stated Weltanschauung.

Thirdly, an expansion of the measures of performance used in SSM modelling, for evaluating conceptual models, is suggested. This expansion also builds on the modal framework.

1.2 Thesis Structure

The thesis consists of a cover paper and a collection of five articles. The purpose of the cover paper is to introduce and synthesise the five articles by providing a common base for them, and is divided into six sections or chapters. Following this introduction, the second section outlines the theoretical foundation of my thesis. It provides a fuller description of Soft Systems Methodology, a description of selected concepts and ideas from the philosophy of Herman Dooyeweerd, and some critical issues in relation to both SSM and the Dooyeweerdian philosophy. Section three describes the research strategy for analysing the strengths and weaknesses of using SSM as a methodology for systems design and for exploring different ways of enriching the methodology.

In section four, my findings of incorporating selected concepts from the philosophy of Herman Dooyeweerd, into different phases of Soft Systems Methodology are discussed. After this, in section five, critical issues are discussed followed by conclusions and issues for further research in section six. Finally, in section seven, a summary of each of the five articles is given whereby the cover paper ends.

The collection of articles follows directly after the cover paper and the articles are included in the same order as they were published.

Considering that this is a so-called “collection thesis” and, therefore, comprising a number of articles that all try to explore the benefits of incorporating selected concepts from the philosophy of Herman Dooyeweerd into Soft Systems Methodology, some repetition is perhaps unavoidable. I, therefore, find confidence in the words of Vickers (1959, p. 13) when he says that “some repetition is needed to convey anything that is new enough to be worth saying at all”. I hope that what I have to say is new enough for the reader to appreciate this repetition and to see it as a help to grasp that which is new.
"A theory should be like a bridge: it should have its foundation in the ground of reality but raise itself above that ground in a wide arch"  
(After Frank Heller in Pallin 2002)

2. THEORETICAL FOUNDATION

This section gives an overview of the theoretical base for the thesis and it is divided into four subsections. The first subsection describes Soft Systems Methodology in more detail with focus on its model building phase, while the second subsection discusses some critical issues when the methodology is used for systems design. After that, in the third subsection, selected parts from the philosophy of Herman Dooyeweerd are outlined. Finally, the fourth subsection reflects on critical issues in relation to the philosophy of Dooyeweerd.

2.1 SOFT SYSTEMS METHODOLOGY

Soft Systems Methodology (SSM) evolved through an action research programme at Lancaster University (Checkland 1979b; Checkland and Jenkins 1974), starting at the end of the 1960’s, as a reaction against the inability of contemporary management science in handling complex real-world problems (Checkland 1970; 1972; 1981; 1984b; 1994; Checkland and Haynes 1994).

In order to find a complement to these management theories Checkland began to investigate whether approaches like Systems Analysis and Systems Engineering could be used. This was done by studying what happened when these approaches were applied to “soft” problems, such as those of policy makers, administrators and managers. However, these approaches were also found to be inadequate for managerial real-world situations due to their emphases on structured problems, and hence, on finding efficient means of achieving known and defined ends. An inappropriate focus for managerial problems, characterised by Checkland as ill-structured, fuzzy and “soft” and where the real difficulty lies in defining the problem itself (Checkland 1979a).

Based on the experience gained by applying the hard systems thinking approaches to soft and unstructured problems, the Lancaster group started to redefine Systems Engineering until it was clear to them that a new methodology had evolved: Soft Systems Methodology. This new methodology took its philosophical foundation within the interpretative tradition of hermeneutics and phenomenology. It also built on the work of Sir Geoffrey Vickers (1970; 1983a; 1983b) on “appreciative systems” and of Churchman (1971; 1984) and his writings on Inquiring Systems.
Soft Systems Methodology “is a cyclic learning system which uses models of human activity systems to explore with the actors in a real-world problem situation their perceptions of that situation and their readiness to decide upon purposeful action which accommodates different actors’ perceptions, judgements and values” (Checkland 1984b, p. 98).

The SSM process consists of four main phases: finding out about a real-world problem situation; modelling relevant systems of purposeful activity; comparing perceptions of the real world with conceptual models of relevant systems; and, taking action to improve the situation, as illustrated in Figure 1. It is not the phases, in themselves, that make SSM particular, because, as Checkland (1981) himself points out, they are all “everyday mental acts” (p. 214), and can be found in most methods and methodologies aimed at change. Rather SSM’s particularity is the way in which these phases are perceived, due to the epistemological and methodological base of the originators of SSM.

![Figure 1. The basic shape of SSM (Checkland and Holwell 1993, p. 14)](image)

Even though it is possible to start the process at any phase (it is the relation between the phases, rather than their order, that is important), it usually starts in the first phase through an exploration of a real-world situation of concern (the left centre of the figure) initiated because someone perceives a situation as problematic and wants to do something about it. The purpose of the exploration is to provide a better understanding of the situation in question and to identify relevant issues that need to be addressed. The findings from this phase are usually summarised in a so-called “rich picture” (Checkland and Scholes 1990). In the earlier writings (Checkland 1981), the process of gathering information, appreciating the situation, and
through that identifying relevant issues, was guided by the recommendation to look for “elements of slow-to-change structure” and “elements of continuously-changing process” and how these elements relate to each other within the situation climate (p. 164). This recommendation has in later versions of SSM, been developed and replaced with the recommendation to explore the situation through analysis of the intervention, social system analysis, and political system analysis, i.e., SSM’s Analysis One, Two, and Three (Checkland and Scholes, 1990: p. 47ff).

From the rich picture, issues, judged by the analyst or someone else to be relevant for improving the problem situation, are selected and modelled using system concepts. These models, depicted as square boxes in the upper right-hand corner of Figure 1, are intellectual devices used to stimulate and structure debate about the problem situation under study, and focus on concepts of pure purposeful activity from a certain perspective or worldview. Because of this, they are referred to as conceptual models of “human activity systems” (Checkland 1971; Checkland 1981; Checkland and Scholes 1999), and the class, human activity systems, comprises all activities that are carried out by human beings. In order to form a whole, these activities are linked to each other by some principle of coherence or some underlying purpose or mission. Further, these models should be neither accounts of the real world, nor Utopian designs, but rather epistemological devices which help to structure a debate.

In the third phase, (the right centre of the figure) the models of human activity systems are set against actual perceptions of the situation, based on individuals’ appreciative settings, and to some extent, depicted in the rich picture. Through the comparison, and the debate it creates, new insights are revealed and appreciative settings may be changed, hopefully, in such a way that accommodations between different interests and views can be reached. These accommodations need to be viewed as both feasible and desirable and should lead the way towards actions to improve the situation. This represents the fourth phase and is depicted as an arrow at the bottom of the figure. After implementing an agreed-upon change or actions to improve a situation the originally problematic real-world situation either has become resolved (at least for the time being) or has been changed into a new problematic situation of concern. However, if changes cannot be agreed upon, a more extended examination of relevant systems will be necessary.

The purpose of the systems thinking part, or modelling phase, is to draw out different perspectives of the problem situation and to structure the thinking of the same. In order to do this, some precise techniques have been developed, consisting of Root Definition (RD), CATWOE, PQR, and
Conceptual Models (CM) of Human Activity Systems (HAS). Root definition means naming, in a short statement, a system of purposeful activity. The formal rules for a well-formulated root definition is that it should contain the elements of the mnemonic word CATWOE (Smyth & Checkland 1976) or PQR\(^1\) (Checkland 1999; Checkland and Scholes 1990). PQR refers to the statement “Do P by Q in order to contribute to achieving R” and answers the three questions: What to do (P); How to do it (Q); and Why do it (R)? (Checkland 1999, p. A23.), while CATWOE stands for:

- **Customers** - the persons that would be beneficiaries or victims of the system;
- **Actors** - the persons who perform the transformation process;
- **Transformation** - an input-output process by which some entity is changed to some new form of that same entity;
- **Weltanschauung** - a worldview which makes the transformation meaningful;
- **Owners** - the persons who can stop the transformation;
- **Environmental constraints** - elements which affect the system, but which cannot be controlled.

The aim of the conceptual model is to represent the minimum number of logically contingent activities that need to be carried out, in order to accomplish what has been defined in the root definition, and which the actors could, in principle, carry out right away. These models are not models of parts of the real world, as was pointed out in the above, but rather “ideal types” in Weber’s (1949) sense. This means that each model is formed by the one-sided accentuation of a certain perception of the world, that is, by a worldview or Weltanschauung. Since the Weltanschauung is different for different people and since a particular Weltanschauung of a particular person changes through time, Checkland (1981) argues that there is no such thing as the real human activity system. Hence, in a sense, “human activity systems do not exist; only perceptions of them exist, perceptions which are associated with specific Ws” (p. 219). This means that the concepts human activity system and conceptual model cannot exist without the concept Weltanschauung.

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\(^1\) In earlier writings PQR has always been referred to as XYZ, but in Checkland (1999) it is changed with the argument that Y might be confused with why represented in the question why carry out the transformation?
In accordance with the systems idea of communication and control, a monitoring and control system of the conceptual model is a necessity. The monitoring and control system evaluates the activity system's performance against three, or if broader consideration seems relevant, five, measures of performance. These measures are normally referred to as the 3 (or 5) Es (Checkland, Forbes & Martin 1990):

- **E1 - Efficacy** - does the means work; are these activities accomplishing the transformation?
- **E2 - Efficiency** - are minimum resources used; could the transformation be accomplished with less resources?
- **E3 - Effectiveness** - are we doing the right thing; does the transformation help to attain the long-term goals related to the Owner’s expectations?
- **E4 - Ethics** - is the transformation a morally correct thing to do?
- **E5 - Elegance** - is the transformation aesthetically pleasing?

These measures of performance are meant to judge the “in-principle performance of a human activity system” (Checkland and Scholes 1999, p. 42) and are, as such, focused on the transformation process (T) within CATWOE. The first three measures (efficacy, efficiency, and effectiveness) originate from the question “How could the system fail?” (Checkland 1989, p. 90), and are said to cover “only the most basic idea of transformation” (Checkland and Scholes 1999, p. 42). As such, they can be supplemented with other considerations of a broader nature if it seems appropriate in a particular situation. Hence, ethics and elegance seem to be such supplements and could, therefore, be neglected, replaced, or complemented by others of free choice.

There is also a second difference among the five measures. E1 and E3 evaluate one modelling concept against another modelling concept; efficacy, evaluates the activities in the conceptual model in relation to the stated output of the transformation, and effectiveness, judges the transformation in relation to the Weltanschauung of the Owner. The remaining three measures (efficiency, ethics and elegance), on the other hand, are related to something outside the systems thinking phase, economy of resource use, ethics and elegance.

As to the relation between the four different techniques, it is argued that every concept in the root definition (which should include CATWOE and/or PQR) should find expression in the conceptual model, and the
conceptual model should reflect all aspects of the root definition, but no others. The aim is to achieve a root definition and a conceptual model that are mutually consistent. The root definition is an account of what the system is while the conceptual model is an account of the activities that the notional system must do in order to be the system named in the root definition. (Checkland 1981, p. 169). It might also be worth saying again that the resulting conceptual model is not to be a description of any actual human activity system known to exist in the real world. This would negate the whole purpose of the approach, which is to generate radical thought. “If descriptions of the real world slip into the model then in the comparison stage we shall be comparing like with like, and novel possibilities are unlikely to emerge” (Checkland 1981, p. 170).

Until recently, it was argued that conceptual models ought to represent what rather than how since they originate from root definitions and these latter usually define a what (Checkland 1981; Wilson 1992). It was also argued that in order for the comparison phase to produce an outcome that is as effective as possible the what of the conceptual model should be compared with the how of the real world.

Schregenberger (1982), however, argues that “we cannot expect a CM to be ‘deduced’, or in a deterministic sense, ‘derived’ from a RD, since the modelled original (the human activity system) cannot be considered to behave deterministically. CM’s derived from RD’s cannot be more than ‘systematic associations’; representations of abstract stored knowledge about analogous originals. Two different persons will derive different CM’s from a given RD; since they will have different abstract concepts about the real world, being as they are to a large extent the result of formal education and training” (p. 97).

This is also in line with Mingers’ (1990) argument that from each root definition, a number of different conceptual models can always be conceptualised; “there can never be a completely specified expansion of an RD into one and only one CM, unless the RD explicitly includes all the main activity verbs, in which case it could be argued that it is specifying a how anyway” (p. 23). Because of this, Mingers suggests that conceptual models should not be seen as a what, but rather as a fairly general how, detailing the way in which the what, expressed in the root definition, is to be carried out. Due to this, but also in accordance with their own practical experience, Checkland and Tsouvalis (1997) argue that “CMs should, therefore, better be seen as ‘hows’ rather than ‘whats’ ” (p. 168).

Checkland and Scholes (1990) also argue that it is important that the formulation of these four techniques are consistent with each other, “since credibility (and the participants' confidence in the process) can be
diminished if some smart person in the situation points out a basic logical flaw in the model” (p. 41). In this effort, the concepts Transformation process and Weltanschauung can be seen as a kind of glue that helps to keep the four techniques in coherence with each other. These two concepts also form the base for the whole of the modelling phase; together they constitute the foundation for both the root definition and the conceptual models.

The importance of the concept Weltanschauung and its central position within SSM, have also been argued by other authors (Checkland and Davies 1986; Fairtlough 1982; Jackson 1982; Jayaratna 1994). Within SSM, the concept refers to a set of assumptions taken as given in communication between people which can help an observer understand social situations. This can be illustrated by an example given by Checkland (1981) where he says that when we observe people voting, we do not see marks being made on pieces of paper, but rather human beings taking part in the democratic process. Hence, whether we realise it or not, we view raw data via a particular mental framework, worldview or Weltanschauung, and we attribute meaning to the observed activity by relating it to this larger framework that we supply from our minds. Even more, the observed activity is only meaningful to us in terms of a particular Weltanschauung, which, in general, we take for granted.

As a response to Fairtlough’s (1982) article, pointing at eight different meanings associated with how the term Weltanschauung was used in SSM, Checkland and Davies (1986) distinguish three categories of the term: W1, W2 and W3. W1 is a taken-as-given set of assumptions that make a particular root definition meaningful and is there only to help in model building. It has nothing to do with the dynamic flux of events that represents social reality and should be stated as purely and as simply as possible. W2 is related to a version of the problem situation, and thus, related to the taken-as-given assumptions in W1 in the sense that W2 makes W1 relevant. Finally, W3 is of broader concern and related to the social reality in which the problem situation is embedded. W3 is linked to our beliefs and assumptions about reality and makes us understand social situations.

This means, that while W1 is related to the systems thinking and modelling phase, W2 and W3 are not, they are both related to the problem situation existing in the real world. Because of this, neither W2 nor W3 is included in the modelling techniques developed for SSM (Checkland and Davies 1986; Fairtlough 1982). Checkland and Davies also say that the concept Weltanschauung should be reserved for W2 and W3, while W1 can be referred to as simply W. I understand and agree with the distinction made by Checkland and Davies, but argue that W2 and W3 should be included in
the SSM process to a larger extent. By mainly focusing on W1 much of the richness and understanding related to the concept Weltanschauung will be put at risk.

In the above description of SSM there has been a strong focus on the modelling phase. This is meant to reflect the focus for the thesis as a whole, but it is also an expression of where the focus for the methodology as such, lies. In the following subsection, dealing with critical issues related to SSM, I have also chosen to concentrate on the aspects that specifically relate to my aim.

2.2 CRITICAL ISSUES WHEN USING SOFT SYSTEMS METHODOLOGY FOR SYSTEMS DESIGN

Considering the fact that Soft Systems Methodology is one of the most well-known methodologies within systems thinking and has been used in several hundred studies, it is not surprising to find that it has also been under critical scrutiny by a number of scholars. In this section, I will address the main criticism that is relevant when using SSM as a methodology for systems design.

A review of this criticism reveals that it is possible to cluster it in accordance with some very important design issues, such as the ability to break away from traditional ways to view a problem situation and self-imposed constraints, as well as the ability to appreciate the quality and consequences of different design alternatives.

Regarding the first issue, the ability to break away from traditional ways to view a problem situation, it has been argued by many authors (Jackson 1982; Mingers 1980; 1984; Naughton 1979; Prévost 1976; Schregenberger 1982) that Soft Systems Methodology has a tendency to result in conventional and regulatory, rather than radical, agendas for change. One argument is that this is an inherent characteristic of the methodology, due to its functionalistic and/or subjective character (Jackson 1982; Mingers 1984; Prévost 1976). Jackson (1991), for example, argues that there is no attempt within SSM to make sure that conditions for genuine debate can be provided. “The kind of open, participative debate which is essential for the success of the soft systems approach, and is the only justification for the results obtained is impossible to obtain in problem situations where there is fundamental conflict between interest groups which have access to unequal power resources “ (Jackson 1991, p. 133). He also argues that in social systems “political or economic factors often act as the main catalyst of change” (Jackson 1983, p. 113).

In relation to this Hägerfors (1994) argues that “even though SSM is said to be based on genuine participation values there are no guarantees that real
life applications of SSM provide participation and emancipatory learning opportunities. It is up to the good will and competence of the participative systems designer to realize the genuine participation values” of SSM (p. 53). Her line of reasoning goes as follows: the “client” in SSM is defined as “the person or persons who caused the study to take place” (Checkland and Scholes 1990, p. 47) and persons who initiate studies are often decision makers. Further, people who order and pay for something are ordinarily named customers and customers are usually the persons who the designer tries to please. So, if a designer can please the customer without adopting a participatory approach what then, within SSM, is there to stop her from doing that? According to Hägerfors nothing. Mingers (1992) also points to this danger by arguing that existing power holders can control the direction of a study and this way also control the expression of alternative views. 

Jayaratna (1994), brings in an additional and important dimension by emphasizing that SSM users require a high level of political skills in order to manage their relationships with clients, problem-owners, and other involved persons. “If SSM users exercise their considerable political skills then the chances of generating and debating radically different ‘root’ definitions may be possible. However, if they attempt to do this without these skills, the chances of their continuing with the project will be extremely low” (p. 182).

Jayaratna (1994) also argues that the epistemological meaning underlying concepts and ideas within SSM, such as human activity systems’ models, are hard to understand for people not familiar with the interpretative tradition. This means that such concepts also become hard to apply and use in the intended sense. I agree with this observation, and argue that if perceived from a more positivistic viewpoint, human activity systems’ models easily become descriptions of the real world. This leads to comparing like with like in the comparison phase, and as was said earlier such a comparison is unlikely to generate novel or radical thoughts. This is also in line with the argument made in the previous subsection, that it is not the phases in themselves that make SSM particular since they can be found in most methods and methodologies aimed at change, it is the way in which these phases are perceived. This issue has, however, been addressed in the new constitutive rules (Checkland and Scholes 1999) which state that as a user of SSM “you must accept and act according to the assumption that social reality is socially constructed, continuously” (A35).

Finally, there are a number of authors who argue that SSM’s tendency to result in conventional and regulatory agendas for change stems from the context within which these studies have been carried out, people’s inherent resistance to change, or lack of insight and originality on the part of those using the methodology, rather than from an intrinsic defect in the approach.
itself (Checkland 1982; Mingers 1980; Naughton 1979). As an example of the last reason, Naughton (1979, p. 70) points to his own experience and says that when making the transition from root definition to conceptual models “inexperienced analysts invariably plump for bureaucratic-type models”.

To sum up, I agree with Checkland and Naughton and argue that there is nothing in the methodology per se which forbids or makes radical changes impossible. I do, however, sympathise with Jackson in his effort to achieve an open and participatory debate, characterised by “unconstrained discussion”. But, I think this effort should be viewed as a vision, rather than something all methodologies need to achieve or fulfil before we can use them, because if we demand this, I think we will find that we have very few methodologies at our disposal.

Further, I agree with Hägerfors and Mingers that there are no guarantees that real life applications of SSM provide collaborative, participative and emancipative learning opportunities. Since participation is an important issue, both from an emancipative and democratic view but also because novel ideas often arise when we are able to view situations from new perspectives, it might be called for to include it as a requirement in the constitutive rules. This would be similar to the inclusion of an interpretative perspective. Jayaratna’s suggestion to equip SSM users with both epistemological knowledge of the interpretative tradition and with political skills are still good advice.

It is, however, important to point out that while a constrained discussion can prevent radical changes to be expressed, unconstrained discussions, in themselves, are no guarantee for radical change. In response to Jackson’s argument, that it is political and economic factors that drive social change, I argue that personal, organisational, and societal changes also reflect changes in Weltanschauung among people and groups. One can just as easily argue that it is changes in values and attitudes that drive the political and economic changes, rather than the other way around. Just think of the abolition of slavery in America, women’s right to vote, and the more recent opinion against circumcision, or maiming, of young girls in Africa. These are all, I would argue, radical changes, which have come about due to changes in people’s Weltanschauung, and in settings not characterised by unconstrained discussion. Hence, to be able to develop and implement novel ideas one need both the ability to see old systems from new perspectives and a climate that allows for an open and free participation and debate.

The second issue, the ability to appreciate the quality and consequences of different design alternatives, is related to Schregenberger’s (1982)
argument that SSM does not offer a standard against which different conceptual models can be discussed; “the criteria for deciding whether one or another CM is valid or ‘better’ than another are just not available” (p. 97). In practice, this can cause a feeling of frustration, although it might also have some motivating power, according to Schregenberger.

When using SSM as a methodology for systems design, evaluation is a very important issue to consider, because in this context the conceptual models easily become the foundation for different design alternatives, beside their role to stimulate and structure debate about change. As such, it is important to be able to discuss and evaluate their quality, strengths, weaknesses, etc. But in order to do this one needs first to discuss what constitutes good design and how this can be given a concrete or tangible form, such as a number of criteria against which these issues can be related and discussed. That there is a relation between the conceptual models and our perception of the world is also recognised by Checkland (1991b). He says that while the perceived world is the ultimate source of our conceptual models, the conceptual models contribute to and affect our perception of the world through the processes they imply and the behaviour these processes lead to.

The critique that SSM does not discuss, or provide criteria, for deciding whether one conceptual model is better than another is not completely true. It is true that the 3 or 5 Es are used to judge the “in-principle performance of a human activity system” (Checkland and Scholes 1999, p. 42) and not to compare human activity systems with each other. On the other hand, doing so and discussing why or why not a conceptual model is considered to fulfil the stated criteria will inevitably broaden the discussion to include other models and their use of resources, degree of goal attainment, ethical considerations, etc. However, if applying the Es in the comparison phase it is important that they include a full range of measures judged as important for social systems.

In the above, I have discussed critical issues related to SSM’s ability to help designers break away from traditional ways to view a problem situation, as well as its ability to generate and implement novel or radical thoughts. I have also pointed to the importance of being able to appreciate and discuss different design alternatives, and argued for the need to enrich SSM in this activity. In the following, I will present some concepts and ideas that have the potential to strengthen SSM on these issues.

2.3 Dooyeweerdian Philosophy

Within the philosophy of Herman Dooyeweerd (Dooyeweerd 1997; Henderson 1994; Kalsbeek 1975) there are some concepts and ideas which have the potential of enriching Soft Systems Methodology on the issues
discussed in the previous section. Herman Dooyeweerd (1894-1977) was a lawyer by profession, but it is through his philosophical work that he is best known. One important and driving factor for Dooyeweerd was to develop a philosophy that was ontologically and epistemologically consistent with his Christian and Calvinistic beliefs.

Another important factor was Dooyeweerd’s belief in the sovereignty of different sciences, as opposed to some of his contemporary legal philosophers who seemed to elevate one science as the true basis or source of legality. Dooyeweerd was convinced that one area of knowledge or science could not be reduced or explained in terms of another and opposed the view that the explanatory principles of jurisprudence could be based in another science, such as history or ethics. Instead, by speaking of different knowledge areas “he implies that each academic discipline involves a different type of knowing and that the different types could be brought into conflict with one another as fundamental explanatory categories or contexts” (Henderson 1994, p. 39).

“If I place myself on the ethical standpoint, then I cannot place myself on the legal standpoint at the same time. Both systems are sovereign in themselves and they can never both be sovereign at the same time” (Dooyeweerd in Henderson 1994, p. 42). Henderson interprets this as meaning that you can only be guided by one type of norm at a time. If interpreting the situation as an ethical situation it might be appropriate to do one thing, but another if you were following legal norms and thinking of it as a legally qualified situation. Dooyeweerd admits that psychological problems might arise from the uncertainty about which norms that should take precedence in a particular situation, but concludes that problems like this can only be resolved by appealing to an order or norm on a higher level which originates outside of the person or the particular situation in question (Henderson 1994).

Dooyeweerd starts from a belief in the existence of a created and ordered world, consisting of given structures and laws. How these structures and laws are interpreted, described, explained, named and bound lies, however, within the realm of human construction, and, as such, might differ depending on time and culture. This means that the structures and laws have both an objective and a subjective side and that the philosophy “is opposed to a way of thinking in terms of objective facts without inner quality and subjective values which have their origin in human meaning” (Geertsema 1995, p. 24). Instead, it tries to find a balance between the created and the culturally formed. Here, Dooyeweerd makes no clear

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2 (Stahl, historicism; Ratzenhofer, sociological theory of law; Krabbe, psychologism; Stammler, logicism; and Radbruch’s, ethical value theory)
distinction between a natural and a social world, or between natural and social phenomena.

Further, the structures and laws are seen as guidelines helping the individual to understand the world around her and directing her when intervening in reality through the process of human formation. Dooyeweerd also argues that we need to discover these structures and laws if we want to understand the world around us. To do this one needs to thoroughly investigate the structures revealed by temporal reality itself.

Dooyeweerd also argues that there must be some relation between these laws and phenomena and how we experience them. The phenomenon of beauty, for example, is not considered to be a mental construction of human beings since it is brought about in our relation to some entity or activity. Instead it is argued that there must be some aesthetic aspect within a flower, painting, or football match, for us to be able to recognise this aspect in our encounter with these entities.

The philosophy consists of five fundamental and coherent theories: (1) the theory of religious ground motives; (2) the modal theory; (3) the theory of time; (4) the entity theory or the theory of individuality structures; and (5) the social theory. In the following, I will start by presenting the modal theory before I move to the entity theory and the concept qualifying function. After that some critical issues in relation to Dooyeweerd will be touched upon. First of all, however, I want to clarify my position in relation to Dooyeweerd’s philosophy in order to help the reader understand the spirit in which this section should be read. This is important since there are ontological and epistemological differences between Dooyeweerd’s philosophy and Soft Systems Methodology, which otherwise easily can confuse the reader as to my position. This ontological and epistemological difference will also be dealt with further in chapter 5.

The concepts and ideas presented below will be described from the viewpoint of Dooyeweerd and his ideological associates, except for section 2.3.2, which illustrates my understanding and way of using the modalities. I do not agree with the extent to which Dooyeweerd assumes already existent laws and structures, especially, within the social sciences. I do, however, appreciate his strive to find a balance between stable and dynamic structures and processes within reality, as well as between more objective and more subjective views on these within a particular culture. Further, even if I do not agree with all of his arguments I have found concepts within the philosophy that I felt could offer pragmatic contributions to the field of systems design. My reason for including a description of the original meaning of the concepts is to give the reader an understanding of the background and context from which these ideas have developed. I also
want to be honest about the ontological and epistemological differences that exist between Dooyeweerd’s philosophy and the underlying philosophy of SSM. This way the reader has a possibility to judge the extent of my modification of the concepts.

2.3.1 The Modal Theory

The modal theory is built around a modal framework and holds a special place within Dooyeweerd’s work; it was the first to be developed, and it provides an ontological and epistemological foundation for the philosophy as a whole. As such, many of the other theories are related to, and build on, the modal theory.

Further, the modal theory came about as a result of Dooyeweerd’s efforts to investigate the structure revealed by temporal reality, a temporal reality that, according to him, is closely related to human experience. “The modal horizon of human experience corresponds to the modal aspects of empirical reality” (1997, vol. II, p. 113). Within these two modal horizons Dooyeweerd identified 15 irreducible dimensions, illustrated in Figure 2: the arithmetical, spatial, kinematic, physical, biotic, sensitive, logical, historical, lingual, social, economic, aesthetic, juridical, ethical, and pistic, which he calls modalities, spheres or aspects. With the modal theory Dooyeweerd aimed at “a theory of knowledge which accounted for the coherence of thought and reality while recognizing the boundaries and diversity of types of knowledge” (Henderson 1994, p. 89).

The modalities do not purport to exhaustively describe all of reality since Dooyeweerd clearly distinguishes between what exists in the world and our ability to get true knowledge of this world. They are, however, a product of Dooyeweerd’s attempt to understand a given structure within reality, based on his culture: the western society, his time: early 20th century, his religious conviction: Christian and Calvinistic beliefs, etc. The modalities also reflect the rich variety in human life and remind us that reality comprises a variety of discrete dimensions that cannot be reduced into one or a few single dimensions.

From this follows that the list of modalities in Figure 2 are not described by Dooyeweerd as a final one, on the contrary, he constantly emphasises that the modalities, as well as their number, should be open for corrections and elaboration. In the beginning of his work there were also only 14 modalities; the kinematic and the physical modality were clustered as one. Later on he changed his mind and instead argued that while the physical modality is governed by energy, the spatial is characterised by movement and, hence, distinguished from the physical modality. Based on this, he separated the two, which resulted in the present list shown in Figure 2. However, not all members of the school associated with Dooyeweerd agree
with this distinction. While it can be hard, scientifically, to prove who is right and who is wrong in these arguments the main principle stated by Dooyeweerd is that each modality should be fundamentally different from all the other. If this is not the case, if one modality is considered to be a variant of another modality and, thus, reducible to it, it should not be considered as a separate modality.

Figure 2. The different modalities related to their nucleus (Bergvall-Kåreborn 2001, p. 83)

The element distinguishing each aspect from the others and making it irreducible is called nucleus or kernel, and in Figure 2, all the modalities, together with their nucleus are listed. Hence, the lingual modality is characterised by its kernel symbolic representation, while the social aspect is characterised by social intercourse. As with the modalities, the kernels always indicate a how, never a concrete something. Because of this, symbolic representation should not be identified with specific languages. A language is always related to a concrete something in which all the aspects are found, not just symbolic representation (Kalsbeek 1975). Besides having their own kernel, each modality is also ruled by its own types of laws. These laws can be of two different kinds: determinative and normative. While the determinative laws always exert their own fulfilment,
the fulfilment of the normative laws is contingent on people’s inclination to follow them.

Further, although we can distinguish all of the aspects when analysing a situation or entity, they never appear in isolation, but always in an inseparable and mutual coherence. This coherence is partly visible in the order of the modalities, an order where the lower modalities (see Figure 2) are said to form the foundation for the ones above in the way that the biotic modality rests upon processes within the physical modalities, while the physical and biotic modality form the base for the sensitive modality, and so on.

In the following, a short description of each modality will be given, starting with the arithmetical and ending with the pistic. Since the modalities are said to be based on human experience and thought I will end this subsection with an illustration of my thoughts and experience of the modalities by relating them to a design situation, the design of a computer-based information system.

The arithmetical modality is qualified by the kernel discrete quantity, and Dooyeweerd (1997) argues that when analysing the modal meaning of this aspect, it is necessary to start with the natural cardinal numbers, in which the numerical meaning discloses itself in its primitive and irreducible structure. The original kernel of numerical meaning can be found only in quantity (how much), disclosing itself in the series-principle of the numerical order with its + and – directions.

Besides this, terms such as number and quantity are said to have their origin in the arithmetical sphere, because here, they can be used without a qualifying adjective. This is important because one criterion for determining to which aspect a kernel or term belongs is that it can be used within the specific aspect without a special qualifying adjective denoting its general modal sense. Hence, when the term unity, for example, is used outside the arithmetical sphere it needs an adjective before it: a logical unity, a juridical unity, a social unity, a moral bi-unity of husband and wife, etc. Finally, there is a close relation between the arithmetical modality and the science of mathematics.

Describing the spatial modality Dooyeweerd argues that it is only as dimensional extension that we can grasp the original modal meaning of space. Because of this, the kernel of the spatial modality is defined as dimensional continuous extension or more condensed, only continuous extension. Further, this modality is related to the science of pure geometry and since space may have two, three or more dimensions the modality needs the arithmetical aspect as a base. However, since the word space has the form of a substance this easily evokes the idea that space is a thing or a
substance, therefore, the adjective “spatial” (representing a how) was chosen over the substantive “space” (representing a what), as the name for this modal aspect.

The *kinematic* modality is characterised by the kernel motion and is represented by the purely geometrical theory of motion also called phoronomy (Dooyeweerd 1997). Galileo’s definition of uniform motion and the principle of inertia also refer to this pure kind of movement\(^3\). In its original modal sense movement also has a close relation to the spatial modality because it is very hard to conceive of movement without reference to space. When it comes to the *physical* modality Dooyeweerd argues that this modality is represented by the kernel energy, because physics, in all its subdivisions, is always concerned with functions of energy. The physical modality is also said to be closely related to the kinematic modality, because, energy implies cause and effect, and cause and effect needs the notion of movement.

The *biotic* modality is characterised by the kernel vitality. However, Dooyeweerd argues that this kernel could just as well have been called “life” or “vital” because life is indeed the kernel of the biotic aspect and vital might appear to be a better name to describe this kernel (Dooyeweerd 1997; Kalsbeek 1975). But, since the term life often is taken to mean something concrete, and since vital might draw the thought to the old battle between mechanists and vitalists, a dilemma which Dooyeweerd, as well as von Bertalanffy (1968), reacted against, the name of the kernel became vitality. While Dooyeweerd considers life itself to be inaccessible to scientific investigation, the various phenomena through which life manifests itself are not; to these phenomena he argues that scientific research does have access. Through these phenomena we can get access to the wonders of life itself. The *sensitive* aspect, originally called psychic, is qualified by the kernel of feeling and sensory perception. Sensory means “of the senses” and sensory feeling is closely bound up with, and founded in the biotic modality. “Sensory feeling reacts on biotic stimuli but this psychic reaction is never *biologically*, let alone *mechanically*, explicable” (Dooyeweerd 1997, vol II, p. 117).

The *logical* modality is characterised by analytical distinction and based on the concepts of “identity” and “contradiction”. There is also a strong relation between the logical and the arithmetical modality in that every analytical relation, even that of identity, implies a numerical analogy, “because analysis itself is a manner of distinction, and distinction implies at least two terms: the one and the other” (Dooyeweerd 1997, vol II, p. 80).

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\(^3\) De Raadt (1991), on the other hand, relates this modality to the science of chemistry
The following aspect, the *historical* modality, is qualified by its kernel formative power because Dooyeweerd argues that history is formed rather than created. The kind of formation that is implied by this aspect is a cultural mode of formation, represented by a human being(s) who moulds a given situation into something new, something that would not have come about all by itself. Dooyeweerd also argues that this process and its outcome are shaped by the individual and subjective preferences of the people involved, and governed by general norms of creating. As a consequence, the forming that takes place in both the plant and animal kingdoms does not belong to the historical aspect because these activities are the result of biological laws and instinctive sensitive patterns, respectively, rather than a cultural mode of formation.

Further, this modality includes both ordinary every-day life, as well as the big and famous events that the historians usually focus their attention on, because no matter what events we take part in we always work with a certain given, a priori situation, which we form or develop in a certain way. Because of this, Kalsbeek (1975) argues that it is a mistake to think that “only the most memorable formers of culture have produced events, activities, products, etc. with an historical meaning-side ... in reality all the ordinary utensils of daily life have come into existence through conscious moulding and therefore possess an historical meaning-side” (p. 99).

The *lingual* modality, with its kernel symbolic meaning, is represented by all different languages around the world, as well as by sign language, body language, and symbols, such as, pictures, flags, etc. This modality also represents an important foundation for the next dimension, the social modality. The meaning of social intercourse or social interaction, the kernel of the social modality, expresses itself in the social forms of courtesy, modesty, politeness, tact, fashion, etc. It is represented by subjective instances of social behaviour such as shaking hands, letting a superior precede you, or offering our seat to someone. Within this sphere concepts like command, control, mastery and power also play an important role, representing a modality of social relationships and implying a manner of exercising social influence or cultural authority over persons or things (Dooyeweerd 1997). Hence, understanding the relation between authority and subjection is important if we are to understand social relationships. Finally, within this modality the relation between the individual and the group is also brought to the fore.

The *economic* modality stands for “the sparing or frugal mode of administering scarce goods, implying an alternative choice of their destination with regard to the satisfaction of different human needs” (Dooyeweerd 1997, vol II, p. 66). This means that we need to order and balance our needs according to a plan and then distribute our means
according to that plan. Consequently, excessive or wasteful satisfaction of a particular need at the expense of other more urgent needs is considered uneconomic, so is a superfluous or excessive way of reaching a particular aim.

The term *aesthetics* is usually related to concepts like beauty and art. Dooyeweerd (1997), however, chose the kernel harmony to define the aesthetic modality. This modality is not only expressed in works of art, but also in other man-made artefacts, as well as in the beauty of nature. Closely related to the aesthetic modality are the economic, social, historical, and lingual modalities. The economic modality (frugality) is said to safeguard against “overdoing it”, the social aspect points to the relation between aesthetics and fashion, while the historical modality points to the fact that great artists often are shapers of style. Dooyeweerd also argues that the aesthetic harmony of something can only be apprehended on the basis of an awareness of its symbolic significance.

To characterise the *juridical* aspect Dooyeweerd (1997) uses the term retribution. This term is meant to convey the gist of balancing and harmonizing individual and social interests. It denotes a sense of remuneration and recompense and in relation to criminal law it is supposed to signify that punishment must be deserved pain where the criminal gets what is due. “This mode implies a standard of proportionality regulating the legal interpretation of social facts and their factual social consequences in order to maintain the juridical balance by a just reaction, viz. the so-called legal consequences of the fact related to a juridical ground” (vol. II, p. 129).

However, as Dooyeweerd is well aware of, the term is sometimes interpreted as representing the unreasonable instinct of revenge. Because of this, and because of the importance that intuitive feeling plays in our ability to grasp the meaning of a kernel I have chosen to use the term justice as the kernel for the juridical modality, rather than retribution. This is also in line with other authors; de Raadt has, for example, in his later publications (1997c) shifted from retribution to justice, while Lombardi (1998) and Lombardi and Brandon (1997, p. 14) combines retribution and justice by defining the kernel as “retribution/fairness/rights”.

*Ethics*, on the other hand, is normally seen as the study of right and wrong, and because of the close connection between right and just, the distinction between ethics and jurisprudence can easily become a bit blurred. A confusion that in part is caused by the shift from retribution to justice as the core for the juridical modality, but which I feel more correctly illustrates the relation between these two modalities within the Swedish society today. However, even with the kernel justice there is a border between ethics and
jurisprudence because in Dooyeweerd's conceptualisation the ethical dimension is based in love, i.e., in the willingness to judge other persons with kindness, and its core is "humanitarian love for one's neighbour" (Kalsbeek 1975, p. 102). Finally, the word pistic is in fact the Greek word for faith, and according to Kalsbeek (1975, p. 102) "faith is an essential part of the structure of being human"; the content and the direction of faith will, however, differ for different people.

2.3.2 An illustration of my understanding and experience of the modalities

In the following, I will illustrate my understanding and experience of the modalities by relating them to the activity of designing a Computer-Based Information System (CBIS). This illustration will also indicate one possible way of using the modalities in systems design; as a framework, indicating important issues that need to be analysed, discussed and assessed.

When designing a CBIS the arithmetical modality constitutes one essential aspect since the foundation for information technology, as such, is numeric. Examples of other important issues in relation to this aspect are how much money and time the project has, how many designers or developers that are needed, how many users there would be and how many of these users that would need to be active and participate in the design process. On a more technical level it is also important to consider questions, such as, how many computers that would be needed and how many databases that need to be integrated.

In relation to the spatial modality issues concerning how the information system might limit or enhance the physical, mental or social space of the organisation and its members are important to consider. This can involve discussions on the space needed for different types of technical equipment in relation to the space available for its use, or the memory space needed on servers, computers, or other technical devices. The image of space can also lead to discussions on how the information system might increase or limit the organisation’s traditional space, area, or system boundary, in relation to topics such as market reach, customer groups, competence, etc.

Some work within organisations require people to move around large areas at times, and because of this the mobility of the technology can be an important issue to consider in relation to the kinematic modality. Besides this, the kinematic modality can also point to different flows within the organisation involving people, activities, processes, information, etc, as well as the relation between these. The physical modality would instead focus on issues such as how the energy provision for the system is to be handled and how safe or vulnerable the system is towards interruptions.
When designing an information system the biotic modality can make us aware of the fact that all users might not have the same biological conditions. There might be people who do not see or hear very well, whose hands are shaky and unstable, or who have some other handicap which needs to be considered when designing the information system. The sensitive modality, on the other hand, can help to initiate debate about possible feelings that the change process and the implementation of the system can have on people and how this should be handled. It is important to carefully investigate whether the users feel that the information system is easy to learn and use, or complicated and hard to manage. If they feel secure with the system and trust that it will work, or whether they feel afraid and insecure.

In an IS design process many different distinctions need to be done, pointing to the logical aspect. It is important to distinguish between different roles, such as user, designer, client, and to discuss differences in knowledge, involvement, responsibility and authority between these roles. It is also important to question the homogeneity within groups, because, as discussed in relation to the biotic modality, the conditions of all users might not be the same, and these differences are important to identify and discuss. Besides this, one also needs to distinguish between different types of flows, such as logical flows and information flows, as well as between what should count as data, information, knowledge, experience and so on.

The historical modality constitutes an important aspect in all design activities since this modality deals with the present almost as much as with the past. This is because whatever we design today will have to start from, and will be dependent on, the norms, knowledge, tools, etc. that we have at our disposal. Further, whatever we design today will tomorrow be added to this historical environment, affecting future designs. Besides this, it is important to look at the historical context of the particular design situation one deals with; have there been earlier attempts to design and implement information systems, and if so, how have they succeeded.

The lingual modality is also central when designing an information system since all information need to be represented and communicated with the help of symbols of some kind. How to represent and model roles, structures, processes, flows, etc., is a major task of any IS project. This modality also points to the big variety of symbols that can be used for representation, as well as to the big variety of languages that exist.

The design of an information system can be seen as a social activity that affects social relationships (roles, norms and power relations) and by that creates a new social milieu. Because of this, it is very important to consider both the present social conditions as well as anticipated changes within this
dimension when discussing design alternatives. Examples of interesting questions to discuss here are: how existing roles might change, if new roles will be needed or if old roles will disappear, how power structures might change, who might gain power, who might lose power, and what commodity, attribute or quality that generates power, at present and in the future.

When investing in a CBIS economic arguments are often used as justification. However, by focusing on resources, and the frugal use of these, the modality can also direct the discussion towards defining the different types of resources needed to carry out the project, as well as an inventory of available resources. In today’s society, this would most certainly include discussions about needed and available knowledge and competence.

The aesthetic modality is probably not an aspect most designers would consider as crucial. It is a criterion that is becoming more and more important in the design of technological devices, such as computers and mobile phones, but in relation to information systems, as such, it is not traditionally considered or discussed. If, or when, discussed it is usually in relation to user interfaces. However, the aesthetic modality, with its kernel harmony, does not just deal with the beauty of something, it also points to the importance of harmonising different subsystems with each other. This can include everything from the relation between the technical and the social systems, and how the technology is integrated into the workplace, to the relation between routines and roles of the user, and between different subsystems of the designed IS.

Further, an IS project is usually a costly and time-consuming business, with many juridical agreements to direct and control the activity. Here, detailed specification as to when the project needs to be finished, what it will cost, what the system will include and how it will function, etc., is defined. Usually it is also specified what happens if some part of the agreement is not fulfilled. Discussions regarding the personal integrity of different groups could also be related to this modality.

The ethical aspect might at first sight not seem to have a place in this modern high-tech and economically driven business. However, discussions about what we can and have the right to do, on one hand, and what we feel we ought to and want to do, on the other hand, are important questions to discuss in any field, but perhaps especially important in a new and fast moving discipline such as that of information systems. Besides this, information systems designers, like people in general, carry out a number of activities, not because they have to or because they get paid to do so, but because they care for their customers.
Finally, in relation to the design process of the information system, the pistic modality governs, to a large extent, our basic attitude towards the change process. While some might believe that information technology is the answer to all problems others might believe that this technology undermines the competence of professionals and, as such, represents a big threat to modern society. In my view, the basic beliefs of a human being are influenced by her background and by her knowledge within the different modalities. At the same time, her basic beliefs influence how she conceptualises these other modalities and what they stand for. Because of this, I usually view this modality as a bit different from the other and to some extent belonging to a higher level.

After describing and illustrating the different modalities it is now time to move to the theory of entities and the concept qualifying function.

2.3.3 The qualifying function

As the name implies the qualifying function is described as the function that qualifies or characterizes a thing or activity; it individualizes the different modal functions and groups them together in a typical way, which gives a thing or activity a special identify, distinguishing it from all other things or activities (Dooyeweerd 1997). Hence, Dooyeweerd argues that the qualifying function determines the form that all of the 15 modalities need to take in order to become a specific thing or activity. Because of this it is seen as the manager, foreman or pilot of the internal structure of a particular thing or activity, and is, therefore, sometimes also referred to as the guiding or leading function. Finally, this function or characteristic is related to the modal framework, which means that the qualifying function of a particular thing or activity is related to one particular modality. To better illustrate the meaning of the concept, I will apply it to different types of systems: natural, designed and social.

Starting with the natural system of a flower Dooyeweerd argues that the qualifying function of a flower, or any other plant, is to be found within the biological modality. While the physical and chemical processes within a flower are of vital importance, it is the biological function that qualifies the plant as a structural whole. It is this modality that characterises it more than any other. However, the qualifying function should not be confused with external teleological relations, such as what end or purpose a flower can serve in reference to other beings. The fact that a flower can be used to decorate a park, garden or house or be used as food for cows or bees, lies outside of its internal structure, and does not change the latter.

While natural systems, such as a wild flower, have their origin in the origin of the universe, designed systems are the result of conscious human activity. This means that for designed systems there are a relation between
the intent of the designer and the qualifying function of the system. However, according to Dooyeweerd, this difference between natural and designed systems does not affect the concept qualifying function. To illustrate this he takes a book as an example. A book is, according to Dooyeweerd, qualified by the lingual modality through its kernel symbolic representation, and this is said to hold true for all kinds and types of books. Fiction, non-fiction, as well as children’s or picture books are all seen as characterised by the aim or function to communicate something to the reader using symbols of different kinds.

Yet, there are times when the context, in which a thing or an activity belong, plays a key role in determining the qualifying function. Glas (1995) uses a chair to illustrate this. The main function of a chair is to provide a place where people can sit. But, by which modality is this function qualified? To answer this question Glas suggests that it is this function combined with the context in which the chair is used that determines its modal qualification, and for a chair this is to be found within the social modality. “People use chairs to sit on, in order to work or to spend their leisure time. Assuming that these functions can be qualified as social, chairs can be said to possess a social object-function as qualifying function” (p. 69). Object function, here, means that the chair functions as an object, rather than as a subject in the social modality since the chair only can be said to possess a social function as an object in relation to human beings. Further, the qualifying function of a chair is said to be “expressed in and by means of the physical structure of the chair” (Glas 1995, p. 69).

Finally, analysing the social system of a union Dooyeweerd (1997, vol. III, p. 576) argues that the qualifying function of a trade-union is to be found within the ethical modality and defined as a “moral bond of solidarity between the labourers typically founded in the organized historical vocational power to elevate labour to an essential and equivalent partner in the process of production”. Other aims or purposes, like intellectual and physical development of the members, can never qualify a union according to Dooyeweerd, since they may be pursued in many other associations of quite different kind. He continues by saying that: “Only the chief aim [of the union] has a typical relation to the internal leading function of the community, without being identical with the latter. But it will not always be easy to indicate one single chief purpose. As a matter of fact a multiplicity of aims can only get its coherence and inner articulation in chief and secondary ends by its relation to the structural principle of the community to which it gives a first positive form” (p. 577).

Hence, despite all the changes that have occurred in society, in the workplace, and in the relation between employer and employee over the last centuries and decades, Dooyeweerd would argue that the qualifying
function for a union is still the same. Though Dooyeweerd recognises a relation between the main aim of a social system and the qualifying function of that system he argues that it is the qualifying function that directs the main aim, and not the other way around.

Further, while Dooyeweerd recognises a relation between the qualifying function and the intentions of a designer, or the chief aim of a social system, he repeatedly argues that the qualifying function of things and events are not to be confused with the subjective ends for which they can be used. Even for designed and social systems he still sees a fundamental difference between the qualifying function and subjective ends. He also argues that even when we use a thing apart from its original purpose this does not change its inner structure, rather, “in empirical reality the objective structure of a thing is constant so long as the latter exists” (Dooyeweerd 1997, vol. III, p. 147).

Based on this, and on the above description of the founding ideas behind the philosophy, I argue that the qualifying function represents an ought-to-be function. Not an actual function, that dominates a certain system at a certain time and determines it structure.

2.4 CRITICAL ISSUES IN RELATION TO DOOYEWEERD

In this chapter, and in the published articles, there is only limited critique in relation to the philosophy of Herman Dooyeweerd. The reason for this is linked to the aim of my thesis. My aim is to incorporate selected concepts, or intellectual tools, from the philosophy of Dooyeweerd into Soft Systems Methodology in order to enrich the latter in the process of conceptualising, creating, and evaluating different design alternatives. A theoretical analysis and critique of Dooyeweerd’s theories and philosophy, therefore, lies outside of the boundary for this thesis. Instead, my critical discussion will focus on the pragmatic contributions that these concepts have in analysis and design situations, and as such they will be examined in section 4. There are, however, a few remarks that I want to make in relation to the philosophy in general.

In connection to the modalities I argue that these can be used as an independent framework without adhering to the philosophical theory to which they belong. There are also a number of scholars who use the modalities in this way, as a useful and pragmatic framework (Eriksson 2001; Lombardi 1998; Lombardi and Brandon 1997; Winfield, Basden et al. 1995). Hence, in the following, the modalities will be used as a pragmatic framework that points at issues that I assume will be important to include in the finding out, modelling and evaluation phases of the design
process. They are not to be interpreted as a finished or correct framework, but rather the best one the author has found so far.

Based on Dooyeweerd’s description of the concept qualifying function, together with his philosophical standpoint, I interpret the concept as a representation of an ideal ought-to-be function, describing what should guide and characterise a system. Not a representation of an actual function that at a certain time and culture can be said to characterise a system and determine its inner structure. Despite this, I find it very hard to understand how Dooyeweerd can treat the concept similarly in relation to natural, designed and social systems. For me, these systems are very different when it comes to both purpose and the stability of their structure. Ackoff’s (1996) paper on deterministic, animate, and social systems illustrate the difference that exists between different types of systems when it comes to purpose and choice. The difference between the stability of their structure is discussed in Bergvall-Kåreborn (2002a).

Since I do not share Dooyeweerd’s belief in the existence of an ideal ought-to-be qualifying function, and since my interest and focus is on design, I use the concept quite differently from Dooyeweerd. Following Löwgren and Stolterman (1998) as well as Schön (1983), I argue that design is not a predictable or determinable activity, and it does not lead to insights into reality as it must be of necessity; rather, it focuses on creating the not yet existing. Hence, rather than searching for the one and only qualifying function of a certain system I use the concept qualifying function as a tool for discussing how we can develop and challenge our understanding of a particular system or problem situation by looking at it from different viewpoints.
Going fishing, any experienced fisherman will tell you that it is not pure chance that determines what kind of fish you will catch, or if you will catch anything at all, for that matter. No, rather than chance, this will be determined by where you choose to fish and what technique, tackle and bait you use. These things being, of course, determined by what kind of fish you want to catch.

3. RESEARCH STRATEGY

My research process started with an exploration into different systems theories in order to learn more about systems thinking and its relation to our real-world problems. This exploration made me aware of a classification of systems theories - hard systems thinking, soft systems thinking and critical systems thinking - often used to characterise a particular theory or methodology.

Analysing these three different approaches, or traditions, it was Soft Systems Thinking that attracted my interest, and especially Soft Systems Methodology, due to its focus on issues like worldviews, learning, participation and accommodation. However, some of the criticism offered by the critical school pointed at real and important issues, such as the importance of establishing a climate where everybody involved in, or affected by, the change process feels free to speak openly without fear of repercussions. Another important issue, brought forth by the critical school, is the need for standards against which design alternatives can be evaluated or discussed.

While these issues form the starting point of my research process, rather than the target for my work, they have been in the back of my mind during the whole process and have, therefore, most certainly affected me in my different choices. They are a part of what Checkland (1985; 1991a; Checkland and Holwell 1997) would call my framework of ideas and, as such, constitute one of three elements (framework, methodology and application area) which Checkland argues need to be defined, discussed and related to each other, regardless of which mode of research that is used (see Figure 3).

Framework refers to a particular set of linked ideas that guide the research process by constituting the base for the methodology. A methodology, on the other hand, is intermediate in status between a philosophy and a technique or method. “Where a technique tells you ‘how’ and a philosophy tells you ‘what’, a methodology will contain elements of both ‘what’ and ‘how’ “ (Checkland 1981). Hence, methodology stands for theories concerning how to go about investigating the area of application.
More precisely, my framework (represented by F in Figure 3) includes systems thinking and systems design, as viewed by the soft approach. For me, this implies that the worldviews, visions and mental models of the people taking part in the design process are recognised as important factors influencing the design process as well as the end result. My methodology (M) is SSM enriched by concepts from the philosophy of Dooyeweerd, and my area of application (A) is methodology development.

The conceptual model in Figure 4 gives a systemic view of my research methodology (M). The figure can be divided into three levels. The activities at the top of the figure (1-5) represent the operational activities. The activities in the middle (6-8) are activities needed to manage the study, while the activities at the bottom of the figure (9-12) are activities that ensure a continuous learning. Further, the 12 activities are arranged in a logical sequence. However, in reality there has been a lot of iteration between the different activities that is not indicated in the figure. Besides this iteration, the process has been carried out in full circle three times as different issues have been explored.

The first level of activities (1-5) involved learning more about the methodology, as such, but also to examine the methodology from the viewpoint of using it as a methodology for systems design. In order to get a more diversified picture of SSM, the criticism made towards the methodology was examined. Based on the information and knowledge acquired from activity 1 and 2, strengths and weaknesses of SSM as a methodology for systems design were identified. Following that, ways to enrich the methodology were explored. This was done by incorporating concepts from the philosophy of Herman Dooyeweerd into the different phases of Soft Systems Methodology. Finally, in order to explore the practical applicability of suggested modifications, the methodology, complemented with concepts and ideas from the philosophy of Herman Dooyeweerd, was applied to more or less practical studies.
Figure 4. A conceptual model of my research methodology (after Checkland and Scholes 1990, p. 294)

The activities in the middle (6-8) are activities needed in order to manage the study and involve monitoring activities 1 through 5, according to some defined criteria for evaluation, as well as to take controlling actions if needed. The suggested evaluation criteria, following Checkland and Scholes (1990), are: (1) Efficiency, defined as amount of improvement and learning, versus resources used to achieve it; (2) Efficacy, represented as improvement and learning achieved; and (3) Effectiveness, defined as
relevance of improvements and learning in context. Since these activities deal with what I have learned they will be discussed in section 4.

Finally, the last activities (9-12) are to ensure that the learning achieved through the study is connected back to that study, and also leads to improved practice in the future. In many ways, it is the last type of activities (9-12) that differentiate research from other types of knowledge acquisition and problem solving. These are also discussed in section 4, as well as, in section 6 were I present my conclusions.

In the following, a brief description of the practical application of the research methodology described in Figure 4 will be given, while a more detailed description of this is to be found in the separate articles.

In the first iteration through the model in Figure 4, the work took quite a theoretical and analytical approach; the measures used in SSM to evaluate different models were analysed and compared to Dooyeweerd’s framework of 15 modalities. The second time, the methodological approach became a bit more applied; this time the modal framework was incorporated into the finding out phase as an additional way of finding out about a problem situation. In order to explore its benefits, the framework was used to structure and analyse secondary data from a project involving young people’s perception of their situation.

In the third, and so far, last, circle around the model in Figure 4, the work focused on applying the concept qualifying function as a tool for eliciting novel ideas about a problem situation. Here, the work followed an interpretative and action-oriented approach, where the researcher enters a real-world situation with the aim of both improving it and acquiring knowledge (Baskerville and Wood-Harper 1998; 1996; Checkland and Holwell 1997; 1998; Hult and Lennung 1980; Susman 1983). Action research approaches are becoming more and more accepted and adopted within the research tradition of systems theory and information systems as the benefits of this approach are disclosed (Baskerville and Wood-Harper 1996; Checkland and Holwell 1998; Galliers and Land 1987; Jönsson 1991). When it comes to research regarding systems development methodologies Baskerville and Wood-Harper (1996) even argue that “action research is one of the few valid research approaches that researchers can legitimately employ to study the effects of specific alterations in systems development methodologies. It is both rigorous and relevant” (p. 240). However, despite this there is still some confusion as to what should count as action research (Baskerville and Wood-Harper 1998; Seashore 1976; Warmington 1980).
Baskerville and Wood-Harper (1998) present a list of different action research methodologies and use four criteria (process model, structure, typical researcher involvement and primary goals) in order to characterise and distinguish these. Following their scheme, my work is best described by the action research type developed by Peter Checkland in his Soft Systems Methodology (Checkland and Holwell 1998; Checkland and Scholes 1990). This implies a well-defined structure for the activities that need to be carried out, as well as an iterative process that cycles between action activities and problem diagnosis activities. While the model in Figure 1, describing the SSM process, in itself is rather linear, the iteration comes in through the fact that the learning from this study will most certainly generate new insights and questions which, in turn, will trigger a new process to start, and so on.

My role, or involvement, in the study has been of a facilitative nature⁴, which means that while the responsibility of solving the problem has been on the study subjects, my task has been to provide the people involved in the situation with an independent view, based on my particular knowledge.

Finally, when it comes to the goal of the research, Baskerville and Wood-Harper identify four different goals within different types of action research: organisational development, systems design, scientific knowledge and training. Organisational development implies the development of social conditions, such as higher moral; structural efficiency and/or effectiveness; and better information flows, of the organisation. Systems design involves creating or modifying organisational systems, while scientific knowledge implies contributing a generalisable understanding of the problem-setting to the scientific literature in the field. The last goal, training, has as its primary goal individual learning and improved understanding of certain types of problem situations from the study. Here, Baskerville and Wood-Harper argue that the primary goal of SSM is both systems design and organisational development, approached from the viewpoint of human activity systems.

On this point, my study differs from the description given of SSM. While my area for application is related to both organisational development and systems design it is also my aspiration that my work in some way will lead to new knowledge or understanding. In fact, I have always viewed this dual intention, where the researcher enters a real-world situation with the aim of both improving it and acquiring knowledge, as an important characteristic of action research. As to the goal related to individual learning, it seems

⁴ According to Baskerville and Wood-Harper (1998), the typical involvement of the researcher within SSM studies is of a collaborative nature, even though there are examples of studies of a facilitative nature.
almost impossible, at least according to my worldview, to be able to generate new knowledge and engage in different real-world problem situations without also improving one’s understanding of the problem situation under study. Hence, I argue that this study involves all four goals listed by Baskerville and Wood-Harper, but related to different elements and phases of the study.
“When I learn something new – and it happens every day – I feel a little more at home in this universe, a little more comfortable in the nest.”

(Bill Moyers)

4. A MULTI-MODAL APPROACH TO SOFT SYSTEMS METHODOLOGY

In this section, I describe where and how concepts from Dooyeweerdian philosophy have been incorporated in Soft Systems Methodology. I also discuss what I learnt by doing this. Throughout this section I will use the pronoun “I” rather than “we”, also when referring to work related to the co-authored articles, since I think that mixing the two pronouns might confuse the reader.

4.1 THE FIRST CYCLE: STRENGTHENING THE MEASURES AGAINST WHICH THE CONCEPTUAL MODELS WILL BE ASSESSED

The first cycle through the conceptual model, depicted in Figure 4, focuses on SSM’s measures of performance. The motivation for this work was, to a large extent, the critique given by Critical Systems Thinking, as well as other authors (Flood and Jackson 1991a; 1991b; 1991c; Flood and Ulrich 1990; Ivanov 1991; Jackson 1991; Mingers 1984) in relation to SSM’s subjectivist and interpretative philosophical underpinnings. Following this critique, especially the argument that Soft Systems Methodology lacks a standard against which different perspectives can be discussed, led me to look closer at the modelling phase of SSM and, particularly, the evaluation criteria known as the 3 or 5 Es used to measure the performance of the conceptual models. Analysing the measures seemed to reveal a residue from the engineering heritage of the methodology. They might also reflect the cultural climate within private industry in England at the time of their development.

While the importance of social and political dimensions are recognised in the finding out phase, they are not included in the evaluation measures, instead, these measures focus on logical and economical aspects. The three main measures are Efficacy (does the means work; are these activities accomplishing the transformation); Efficiency (are minimum resources used; could the transformation be better accomplished with a different

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5 This work is related to the article “Expanding the Framework for Monitor and Control in Soft Systems Methodology” (1996) co-authored with Anita Grahn, now named Mirijamdotter.
technique); and Effectiveness (is this the right thing to do; are we accomplishing the longer-term goals that are linked to the Weltanschauung). These measures are meant to answer the question “How could the system fail?” (Checkland 1989) and are said to “cover only the most basic idea of transformation” (Checkland and Scholes 1990, p. 42). Because of this, Checkland and Scholes continue, they “can be supplemented with other considerations of a broader nature if it seems appropriate in a particular field”. Thus, ethics and elegance seem to be examples of such supplements, and if so, they could be neglected, replaced or complemented by others of free choice. Further, while none of the measures directly evaluates the different perceptions, they do so indirectly by evaluating the conceptual models, which have their base in different perceptions. However, from a systems design point of view, and to be able to more fully appreciate these models and perceptions, the measures need to be expanded.

Based on this, I set out to expand SSM's present measures of performance and to find more diversified criteria against which the conceptual models could be discussed and evaluated. One such standard was found in the modal framework developed by Herman Dooyeweerd. While hard systems methodologies have already devoted attention to the more determinative aspects of systems design, the normative dimensions have, however, often been left unconsidered. Because of this, I decided to focus my attention on them. This was done by replacing or expanding the original 3 or 5 Es with a framework consisting of the nine most normative modalities, i.e., the pistic, ethical, juridical, aesthetic, economic, social, lingual, historical and logical modality. My underlying assumption was that if the modalities were kept in balance and no modality was allowed to dominate, the chances of achieving good systems would be improved. Applying the above dimensions as an instrument for structuring and guiding the discussion about the design, each needs to be analysed through its nucleus. It is also important to identify and discuss conflicting interests that might arise between the different performance indicators.

Although most of the nine dimensions or modalities are noticeable in different parts of the SSM process, for instance in modelling relevant systems and in selecting systemically desirable and culturally feasible changes, they are not clear and visible in the evaluation. The contribution of this work was to make them explicit, to structure them in order to make them apparent so that none of them is ignored or lost from neglect, and to link them to a theoretical body of knowledge. To clarify the contribution of the modal framework to SSM's monitoring and control activities, the framework was related to a real-world situation, the Estonia catastrophe in 1994. The conclusion of this work is that it is not only hard logic and
technical aspects that need to be considered when designing systems, even though these tend to predominate during the actual development phase. By concentrating on logical and technical aspects, I argue that other important dimensions are lost. Under these circumstances, it is not surprising if impacts, other than the predicted, accrue. By considering additional dimensions, as is done in my model, I conclude that unpredictable disadvantages, as well as unpredictable advantages, can come to light and thereby be anticipated. Furthermore, my model is comprehensive and rather easy to apply. The name and meaning of the different modalities also seem to fit the Swedish culture rather well which should make it possible for designers of a system to recognise the aspects of the model and take them into account when developing systems for real-world use.

In this work, the added performance indicators were used in a broader, or dual, sense compared to how they are described in the literature. They were used both as a way to evaluate the conceptual models, but also as a way to further the discussion in the comparison phase of SSM by pointing at issues that need to be considered and discussed. While this is indicated in the article, it is not clearly stated. In the literature, the measures of performance are described in relation to the modelling phase, where they are defined, and it is argued that these evaluation measures are used to judge the "in-principle performance of the human activity system" (Checkland and Scholes 1999, p. 42). Yet, it is my view that the actual evaluation only becomes meaningful in the comparison and discussion phase.

The E:s have also been suggested and used as a way to check whether a conceptual model is competently built or not. This means that one should aim at modelling the transformation process of the root definition in such a way that it fulfils the criteria of effectiveness, efficacy and efficiency (Checkland and Tsouvalis 1997). However, as was mentioned in the theoretical description of SSM, the measures efficacy and effectiveness and the measures efficiency, ethics and elegance are used in somewhat different ways during modelling. One reason for this is that the measures efficacy and effectiveness, to some extent, are inherent in the modelling techniques. Effectiveness judges the Transformation in relation to the Weltanschauung of the Owner, and Efficacy evaluates the activities within a conceptual model in relation to the output of a stated Transformation process. This is not the case with the remaining three measures (efficiency, ethics and elegance). Nor is this the case with most of my suggested performance indicators. Because they are not inherent in CATWOE, one needs to decide whether or not they should be included in the root definition and, by that, also included as activities in the conceptual model. Considering that my suggested framework includes nine performance indicators this approach
would seriously add to the length of the root definition as well as to the number of activities in the conceptual model.

This dual use is also illustrated in the article by Bergvall-Kåreborn & Grahn (1996a, p. 488) in the questions posed in relation to the lingual modality, (named informatory in the article). While the question “Are key concepts, criteria and decisions clearly stated and clearly communicated?” can be used to evaluate a conceptual model, the questions “What information is needed?” and “How should information be channelled and fed back?” are not directly formed as evaluation questions. These latter questions should rather be seen as questions aimed at broadening the discussion and bringing it forward. The same is true with some of the questions related to the social, the juridical and the ethical indicator. Finally, the clarifying question for some of the suggested performance indicators, stated in Table II in the article, should be reformulated to more directly focus on the transformation process, and this way, follow the style of the original measures.

Reflecting on the work from the viewpoint of the modal framework led me to evaluate the worldview from which I had examined the Estonia catastrophe. I realised that all discussions and conceptual models originated in the belief that there was a need for safe ferry transportation in order to reduce human suffering. However, by evaluating my assumption I realised that there were many other rationalities for achieving safe ferry transportation, one being purely economic. Accidents are bad for business. The terrorist attacks on the 11th of September 2001 made that clear once again.

The work also made me aware of the fact that each performance indicator needs to be elaborated on in greater depth, both in its nature and in its role as a performance indicator for the design. The model also needs to be studied in practical applications. Further, it became clear to me that for the performance indicators to be meaningful from a learning perspective, they must be considered already when analysing the problem situation, i.e., when drawing the rich picture. Previous knowledge of the situation is visualised in SSM's rich picture; guided by the analysis of the intervention, the analysis of the social system and the analysis of the political system. From a learning perspective, it is a weakness that the rich picture is not consistent with the conceptual model. For instance, the ethical and aesthetical criteria for measuring the performance of the conceptual models are nowhere to be found in the rich picture. Hence, two new aspects of evaluation, which have not been considered in analysing the problem situation, are suddenly introduced to the conceptual model. Therefore, the modal framework needs to be incorporated into the finding out phase in order to prepare for these dimensions when it comes to modelling and
debate. This is similar to Checkland's (1986) argument for including Analysis Three, the political analysis, into the finding out phase. “Within cultural feasibility, in real situations, of course, will be issues of politics; hence the political dimension would best be included in earlier stages of analysis, so that that dimension is ‘prepared’ when we come to the debate” (p. 4). This leads us to the second roundabout in Figure 4.

4.2 The Second Cycle: Enriching the Analysis and Making the Analysis Consistent with the Modelling

In order to prepare for these new modalities and make the rich picture consistent with the conceptual modal, the framework was introduced into the finding out phase of SSM and applied to a case study. The study was based on a survey, conducted in order to establish the conditions for young people in a municipality in the north inland of Sweden. Here, the modal framework as a whole was used as a tool to structure and cluster the gathered data. The framework was also used in order to analyse, differentiate and relate different issues to each other. Finally, it was used as a control device for highlighting dimensions that were perceived as important, as well as dimensions that were lost or ignored.

Using the modalities to structure the data highlighted a strong focus towards the normative modalities, especially the social, in relation to both the questions and the answers. Hence, by structuring the rich picture according to the modal framework it became noticeable which dimensions that seemed to be especially important and which dominated the situation, as well as which modalities that were given less, or no attention at all.

The analysis also made me aware of a segregation, between adults and youth, visible in their different perspectives on authority and responsibility. Adults usually perceived these concepts as two sides of the same coin, while the young people tended to ask for authority without recognising the responsibility that follows with it. The young people wanted authority, but did not seem willing to take on the responsibility that goes with it. Thus, the learning achieved through this study shows that the modal framework can enrich the appreciation of the problem situation in the systems analysis phase.

Besides using the framework to cluster and analyse data, it could also be used in the data gathering process, for example to elicit interview questions, because a broad approach in the information gathering should

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6 This work is related to the article "Multi-modal Thinking in Soft Systems Methodology’s Rich Pictures" (1996) co-authored with Anita Grahn, now named Mirijamdotter.
also enable a rich analysis of the problem situation. Due to the relationship between the framework and existing sciences, different issues can be appropriately categorised and analysed with the help of individual sciences.

4.3 THE THIRD CYCLE: DEALING WITH THE REGULATORY TENDENCY OF SOFT SYSTEMS METHODOLOGY

Having addressed the need for a standard against which different perspectives can be discussed and assessed, and having introduced the modalities both as a framework for evaluation and as a tool for analysis, it was time to address the second critical issue, SSM’s tendency to result in conventional and regulatory, rather than radical, agendas for change (Jackson 1982; Mingers 1980; 1984; Naughton 1979; Prévost 1976; Schregenberger 1982).

This regulatory tendency of SSM, together with the lessons learned from reflecting on my own working process in the first iteration, clarified the importance of eliciting different perspectives as to what should be achieved and why, and of questioning the underlying rationale of suggested changes. This led to the third loop through Figure 47.

In order to facilitate the process of eliciting transformations that help us break away from traditional ways of viewing an issue or a problem situation, and clarifying the worldview used to defend a suggested change, the concept qualifying function was introduced into the modelling phase. To illustrate the potential of the qualifying function and how it could be used in SSM the National Health Service (NHS) study described by Checkland and Scholes (1990) was used as a case.

The concept was first used to discuss possible functions for the National Health Care Service and can, as such, be seen as a way to include W2 and W3 into the modelling phase in order to let them set the stage for further modelling8. Besides this, the concept was used to draw out different perspectives on what makes a particular transformation meaningful, i.e., generating different W1s, as well as to clarify already stated transformations or Weltanschauungs.

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7 This work is related to the articles “Enriching the Model Building Phase of Soft Systems Methodology” (2002) and “Qualifying Function in SSM Modeling – A Case Study (2002).

8 W2 and W3 are otherwise not considered in the modelling phase. Instead, they are present in the analysis phase of SSM. In Checkland and Scholes (1990), W1 is related to Analysis One, analysis of the intervention; W2 to Analysis Two and Three, the social and political analysis, and W3 is related to the process of mounting a study.
Evaluating the learning from this work I would say that the concept qualifying function can constitute a complement to already existing SSM techniques for teasing out different perspectives of a problem situation and identifying self-imposed constraints. It can improve our understanding and help question our underlying assumptions related to established systems. This way it has the potential to model radical, as well as traditional human activity systems and design alternatives.

The concept qualifying function can also be used to clarify the meaning of a stated transformation or of a Weltanschauung and to show that many different interpretations can be made of a certain statement depending on which modality the statement is related to.

Relating a stated Weltanschauung to the modal framework could also be one way of addressing the critique that SSM does not notice similarities between different Ws or seeks an explanation for this in terms of the structure of society (Mingers 1980). SSM is said to lack an explanation of why these particular Ws have developed and, thereby, how they might be changed. While neither the concept qualifying function, nor the modal framework constitutes a critical sociology, they have the possibility to point to similarities and differences in focus between and/or within different groups of people.

In order to test the practical applicability of the concept and its use within SSM, it was applied in a case study related to two projects which both aimed at creating new work opportunities in a small inland municipality in the north of Sweden. Even though the projects formally constituted two separate projects, with separate owners, target groups, goals and financial arrangements, it was decided to run them as one, with the same project leader and reference group.

Among the involved stakeholders there were some who felt that there was a very homogeneous view on what and how things should be done, while others, such as the project leader, felt that different key members had different views on the projects. This feeling of divergent views related to the projects was the main reason for the project leader to initiate the study. My role or involvement in the study was of a facilitative nature, which means that while the responsibility of solving the problem was on the study subjects, my task was to clarify how different project members viewed the projects and this way increase their understanding of the projects and their role in them.

In order to gain an understanding of the situation in question, I used two sources for gathering my data: documents and interviews. The documents consisted of project plans, evaluation forms, advertisement for the projects and newspaper articles. The purpose of the documents was to gain a
formal, and somewhat objective, view of the projects. The interviews, on the other hand, were conducted as a mix between semi-structured interviews and open discussions, and aimed to capture a more diversified and subjective picture of how different members viewed the projects. To elicit discussion topics, a systems-model developed by Mirijamdotter (1998), summarising the basic elements of a system, or organisation, was used along with the modal framework and traditional SSM techniques. The concepts or activities in the systems-model were identified by combining the “MST\(^9\) social systems model” (de Raadt 1991; 1995a; 1997b) and the CATWOE elements from Soft Systems Methodology.

Using these frameworks resulted in topics such as: the purpose of the projects; selection criteria for participating in the projects; benefits and disadvantages with the projects; the change process; evaluation of the projects. The topics were tested in a pilot study involving four students from the projects. After the pilot study a couple of new topics were added, the most interesting being how long each student should participate in the projects.

In total, 13 persons were interviewed: six students, a tutor, the project leader, the project owners, and three persons from the steering committee and reference group. The interviews took between one and one and a half-hour each and they were all recorded. Before each interview, I called the participant both to make an appointment, but also to inform her/him about the purpose of the study, as well as about the kind of questions I was planning to ask.

In line with previous arguments (Bergvall-Kåreborn 2002a) and what was said in relation the NHS study, the modelling started from a broad perspective. The modalities were used to further understand what different rationalities that could lie behind the aspiration to create new work opportunities and why this was seen as good for the municipality. From this, two conceptual models were built, based on the same PQR statement, but related to different qualifying functions, the ethical and the historical, respectively.

After this rather broad view on the issue at hand the qualifying function was used to generate different perspectives on what makes it meaningful to develop methods and models for how work can be created; one of the relevant systems that emerged from the finding out phase. The concept was also used to generate reasons for why it is believed that the transformation can be achieved at all. Finally, the above discussed models were then

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\(^9\) MST stands for Multi-modal Systems Thinking
compared and discussed in a seminar/workshop attended by the project members.

To evaluate the learning from this study conceptual models and their related root definition were analysed and compared with each other in order to appreciate the effects that the concept qualifying function and the modal framework had on the modelling phase. The main effects analysed were whether the qualifying function had helped to elicit relevant transformation processes and worldviews, whether it had stimulated the process of finding relevant activities, and if the concept had helped to bind the root definition and the conceptual models closer together.

Many interesting issues have arisen from the case study. One such issue is the difficulty of running separate projects as one larger project. In this study, two different projects were integrated because, at the outset, they seemed to have similar aims, input criteria, ideas as to how the projects should be run, and output. However, despite these similarities, it proved difficult to run the projects as one. The difficulties were partly due to environmental circumstances and partly due to the difference in perspective between the two project owners as to how the projects were to be run (I referred to these two perspectives as the process and product view in the article (Bergvall-Kåreborn 2002b)).

The difference in perspective between the project owners had not been clear to the project members, and when it was presented to them it opened their eyes and increased their understanding. Pointing out this difference helped them to understand one possible reason for the misunderstandings that had occurred in their information to the students as to how the projects were to be run, what was expected of the students, and how long they were to be involved in the projects. It also shed light on the reasons for why the projects had been divided into two groups. One group, following a process-oriented approach and focusing on students with low self-esteem and unclear visions of what they wanted to do, and the other, following a product-oriented approach for students with a clear business idea.

Methodology-wise, the main findings of this work are as follows. Firstly, using both PQR and CATWOE as the base for root definitions revealed different benefits with the different elements. CATWOE includes more concepts and, therefore, provides a richer base for the root definition. Naming customer, actor, owner, etc., also has the benefit of illustrating how much a human activity system can change by changing our perception of these concepts. However, PQR is more powerful. After stating PQR it is almost unnecessary to also write a root definition because PQR gives such a holistic view in itself. This is not the case with CATWOE, where a root definition needs to be named. PQR also includes one more recursive level
by including the three levels of what, how and why. CATWOE only includes what, together with either how or why, but not both, as seen in Checkland and Scholes’ (1990) case study related to the National Health Service in the UK and in Checkland and Tsouvalis’ (1997) study related to production plans. Hence, it would be very useful if it was possible to combine them in some way.

Secondly, enriching the root definition by enriching T and W has the potential to strengthen the bond between a conceptual model and a root definition and, this way, strengthen the defensibility of the conceptual model. It also has the potential to enrich the conceptual models by helping the model builder find relevant activities. As such, it could be one way to help model builders, especially inexperienced ones, to make the transition from root definition to conceptual model. Because my personal experience is that starting a new task often is much more energy consuming than merely working with an already initiated task. It is the first step that often is the most difficult, and after that things somehow build onto each other. Hence, it is important to help people get started and here the modalities and the concept qualifying function can help. It can help the model builder to take the first step by providing a more focused direction for the model, in a similar way that naming the main activities of the system already in the root definition will help people get started.

Thirdly, in the comparison phase the qualifying function can be used to compare different design alternatives, as well as their consequences. The concept can be used to point at differences between design alternatives, such as the difference between designing a system for creating work opportunities from an ethical or a historical point of view. Using different modalities as the qualifying function for the relevant systems selected in the case study showed how this would affect the holons and that the holons would be different if different qualifying functions were used.

Fourthly, the study revealed that the qualifying function had a tendency to focus on perceptions related to the problem situation (W2) and to beliefs and assumptions about the social reality in which the problem situation is embedded (W3), rather than to the Weltanschauung of a particular transformation process (W1).

Additionally, although Checkland gives the advice not to structure the finding out phase in systems terms, I found the “systems-model” developed by Mirijamdotter (1998) very helpful as a complement to Analysis One, the analysis of the intervention, when trying to picture the problem situation. One reason for this could be that I was particularly interested in the structure, purpose and function of the projects and here the systems-model provides good guidance. Besides this, the model also provides a good
complement to the recommendation of identifying both structures and processes within the problem situation since it offers the analyst guidance as to how and where these structures and processes could be sought. Moreover, the systems-model is general enough to be applied to most, if not all, types of organisations. In relation to the case study, the model provided a holistic picture of the two projects' basic structures and processes. For example, it illustrates the relation between the input, transformation, output and goal. This helped to reveal the assumption that there is a positive relation between increased educational level of people and increased inclinations of people to change.

However, even though the systems-model has many benefits and can help the analyst in many ways, it is far from sufficient in order to provide a rich picture of the situation. With or without the systems-model, Analysis One needs to be complemented with the social and political analysis (Analysis Two and Three). Using the political analysis revealed the unequal power structure that existed between the two owners of the projects. This was mainly due to the fact that the owner of one of the projects, the office for Trade and Industry, had a very strong position, due to the role his organisation plays in the world of trade and industry within the municipality.

The study conveyed a difference between using the concept qualifying function as a tool for analysis or as a tool for design. While people's Weltanschauung always affects how they perceive the world around them this became very noticeable when using the concept for design. Here, the perception the designer had regarding the human activity system to be modelled very much influenced its structure and function and, hence, also its qualifying function.

Finally, only about half of the modalities played an active role in stimulating the modelling and only about a handful reoccurred on a regular basis. Common for the more actively used modalities is their relation to the social sciences (ethical, economic, social, historical), while modalities related to the natural sciences very seldom were used. This is in line with earlier experiences and strengthens the presumption that all the modalities are not considered as equally important in all situations. Rather, different studies tend to focus on different modalities. The reason for why and when different modalities are used can most certainly be explained by a mixture of issues like the context, the problem situation, the particular phase in the change process, the background and interest of the user, etc. However, in order for a pattern to emerge many diverse studies need to be carried out.

Concurrently with the work described in this chapter a different, but related process, has taken place. This process concerns the generality of my work
and is partly described in the paper “The Role of the Qualifying Function Concept in Systems Design”. In this paper, I discuss the benefits of using the qualifying function in systems design in general. I noticed that some of the benefits that I have experienced in my work with SSM are of a general nature and, as such, the concept could be used in combination with many other design methodologies, besides SSM.

The concept Qualifying Function can help people in a particular problem situation to view the situation from new and different perspectives, hence, to identify and remove self-imposed constraints. It can be used to explore and analyse the consequences of different design alternatives. Further, it can provide a common, though general, base for the design around which accommodation can be reached more easily, and from which further discussions can be continued. Finally, the concept has the potential also to point at fundamental differences of opinion between the participants and the stakeholders.

Using the modal framework for evaluation or for generating, clustering and analysing information also seems to have a general applicability, and the modalities have been used within diverse fields. Lombardi, (1999; Lombardi and Brandon 1997), for example, use the modalities in order to evaluate the sustainability of urban planning and design in a very similar way to how I have used them to assess conceptual models. Winfield (Winfield 2000; Winfield, Basden et al. 1996), has used the modalities for knowledge elicitation, when designing knowledge-based systems, and reports very positive result. He also argues for their applicability when evaluating system specifications within the field of information systems design.

In information systems, the modalities could also be used as a framework to evaluate the success and failure of systems. Here, the modalities have the potential to make a great contribution since many studies are based on vague or unarticulated failure concepts and neglect the multiplicity of reasons for, and multi-casual nature of, IS failure (Lyytinen 1988; Lyytinen and Hirschheim 1987).
“In the relation between methodology developer and methodology user, what gets (literally) transferred is the artefact. “How a systems methodology is used will be influenced by both the beliefs and assumptions already laden in the artefact by its author/s, and the ‘spin’ that the user’s own historical/cultural beliefs and assumptions impact – in other words, the way that the user, either consciously or subconsciously, seeks to enact the tool”.

(Brocklesby and Cummings 1995)

5. CRITICAL ISSUES

In this chapter, I will point to some fundamental differences between Dooyeweerdian philosophy and Soft Systems Methodology and I will reflect on these differences in relation to the more general debate of paradigm incommensurability, as introduced by Burrell and Morgan (1979). I will also reflect on my use of SSM in relation to its constitutive rules, as well as on my research process. Finally, I will reflect on my own development during the process of writing this thesis. The reason for doing this is to improve the legitimacy and the recoverability of my research.

5.1 PARADIGM INCOMMENSURABILITY OR METHODOLOGICAL PLURALISM

This thesis aims to enrich Soft Systems Methodology with conceptual tools that, on a pragmatic level, can help designers to conceptualise, create, and assess possible design alternatives. Within the philosophy of Dooyeweerd, I found concepts and ideas that could contribute to the field of systems design. It has, however, never been my attempt to combine Soft Systems Methodology with Dooyeweerdian philosophy, as such. This is an important distinction considering the ontological and epistemological differences that exist between SSM and the philosophy of Dooyeweerd.

The most important differences, in my opinion, are that the philosophy of Dooyeweerd builds on the assumption of an ordered reality governed by pre-created structures and laws that are timeless, culturally independent and often equally applicable to both natural and social phenomena. The aim of the philosophy is to discover and describe these structures and laws. This puts a focus on analysing and searching for how the world is and how the world ought to be, in order to be able to understand and describe reality.

The view of social reality implied by Soft Systems Methodology, on the other hand, is that “it is the ever changing outcome of a social process in which human beings continually negotiate and renegotiate, and so construct with others their perceptions and interpretations of the world outside themselves and the rules for coping with it. These rules are never fixed
once and for all” (Checkland 1988, p. 246). Further, SSM does not assume
the world to be ordered; rather, it takes reality to be both complex and
confusing. It also states that social phenomena, through human meaning
and intentionality, are fundamentally different from natural phenomena.
The focus for Soft Systems Methodology lies in understanding and
describing people’s perceptions of reality and the taken-as-given values
that govern these perceptions. Practically, this implies reflecting on how
the world could be and designing the world according to how one wants it
to be.

Due to this difference, the concepts and ideas from the philosophy of
Dooyeweerd have, metaphorically speaking, been lifted out of the
Dooyeweerdian philosophy and into the sphere of Soft Systems
Methodology. To make the concepts fit within this new context I have
modified and used the concepts in accordance with the underlying
philosophy of Soft Systems Methodology, and my own view on reality. I
am, however, aware of the link that always exists between a philosophy or
a theory, and a related concept. This link is not always easy to recognise or
eliminate, which means that one always needs to reflect on it. This is my
reason for discussing the issue of paradigm incommensurability (Burrell
and Morgan 1979) and methodological pluralism (Mingers and Gill 1997).

The issue of methodological pluralism is a both interesting and challenging
issue around which there seems to be a lot of disagreement (Mingers and
Gill 1997). One stream in this discussion is concerned with whether or not
it is possible to mix paradigms and methodologies. The other focuses on
whether or not it is possible and/or advisable to mix concepts, theories and
methods from methodologies that have different theoretical foundations.

Burrell and Morgan (1979) were among the first to recognise the big
difference that existed between the metatheoretical assumptions about the
nature of social science and the nature of society within different social
theories. They identified four so called paradigms which all had their own
view on social reality and because of that had their own theories,
explanations and concepts. Because the different paradigms rest on
different assumptions about the nature of social reality, theories,
explanations and concepts belonging to one paradigm cannot easily be
understood or interpreted in terms of another paradigm. Instead, they need
to be explored and understood from within the paradigm they belong to.
Based on this, the authors concluded that a synthesis between paradigms
cannot be achieved.

This view is also defended by Jackson and Carter (1991), who argue that
“attempts to abandon paradigm incommensurability lead, apparently
inexorably, towards epistemological authoritarianism” (p.123). Other
authors (Donaldson 1985; Reed 1985) argue against paradigm incommensurability with the argument that it is the epistemology of science that determines what is valid data, and this epistemology can, and should, be determined by scientists within the discipline.

There are also authors like Mingers (1997) who favour multi-paradigm research based on the argument that each paradigm reveals certain aspects, but ignores other. By limiting oneself to only one paradigm one gains a limited view of the particular intervention or research situation. Exploring different paradigms, on the other hand, are said to be a good way to handle the complexity and multidimensionality of today’s real-world problem situations as well as the diversity of tasks that different phases of an intervention pose. Mingers also discusses problems usually related to multi-paradigm research, such as: philosophical feasibility, which focuses on the issue of paradigm incommensurability; cultural feasibility, which focuses on organisational and academic resistance towards multi-paradigm work; and psychological feasibility, which focuses on problems that an individual can experience when moving from one paradigm to another. However, he sees these problems as important issues that need to be further investigated rather than as insurmountable problems.

Brocklesby and Cummings (1995) are more sceptical and argue that paradigm and methodological complementarism demand more than what at present seems possible to demand from systems thinkers and practitioners. “True methodological complementarism is analogous to a situation in medicine where a brain surgeon is required to conduct heart by-pass operations, amputate limbs, and remove haemorrhoids, combine ‘traditional’ with ‘nontraditional’ medicine, and retain the broad-spectrum diagnostic capabilities of the GP” (p. 243).

When it comes to the question of mixing methods, models and techniques from different methodologies most authors argue that this is possible and also point to different benefits of doing so (Bennett, Ackermann et al. 1997; Ormerod 1997). Bentham (1997, p. 103), for example, argues that often, it is necessary to introduce different techniques even when addressing superficially similar issues. In relation to behavioural changes “it is unlikely that any single approach will have the flexibility to be both culturally acceptable in the early phases of the change process and yet sufficiently stretching to promote a significant shift in perspective”. Schwaninger (1997), on the other hand, while being positive to multimethodology argues that: "There are also conflicts, deficits of communication and maybe even incommensurability between certain 'schools' of the systems movement. Generally, a deep gap still yawns between 'quantitative' and 'qualitative' approaches" (p. 148).
One problem with the literature dealing with the benefits of mixing methods, models and techniques is that the authors do not clearly state whether they refer to models and techniques lifted out of their methodological and theoretical context, or whether they are actually talking about mixing whole methodologies. Here, Mingers (1997) presents a categorisation framework including different ways and degrees of combining methodologies; ranging from methodological isolationism, which means using one single methodology throughout the whole intervention, to multi-paradigm multimethodology, which means combining parts of different methodologies based in different paradigms in the same intervention. This framework illustrates the big variety in meaning that exists in relation to the concept multimethodology, and can be a good tool for clarifying the position of different authors.

In connection to this discussion, it can also be of interest to point to the fact that even within one particular methodology there can be contradictions. In relation to Soft Systems Methodology, for example, Mirijamdotter (1998) argues that while SSM’s epistemological assumptions are based within the interpretative and hermeneutic tradition, some of its techniques, such as the measures of performance, still seem to have their base in the founding methodologies of systems engineering and systems analysis.

Jayaratna (1994) points to statements in the literature which indicate that using SSM techniques from the perspective of hard systems thinking can be considered as a variant of SSM. However, while this can be true in earlier versions of SSM, I argue that, based on the new constitutive rules (Checkland 1999), this is no longer the case. On a more detailed level, Jayaratna argues that the two types of relevant systems, “primary-task” and “issue-based” (Checkland and Wilson 1980) represent different types of systems thinking; “hard” and “soft” respectively, and that primary task systems are taken-as-given descriptions of systems that exist in the real world. As such their relevance have already been established. Based on this, he states that “the incorporation of ‘primary-task’ systems is in direct contradiction to the epistemological notions advocated by the methodology” (p. 190). On this issue, I do not, however, agree with him. I argue that even primary-task systems can be modelled in accordance with the interpretative tradition. It is true that the relevance of a primary-task system is harder to question compared to an issue-based system. However, choosing a primary-task system will only be judged as relevant if there are some problematic issues related to it, such as people questioning its relevance today or in the future, problems with its performance, introduction of new techniques that demand that the process is modified, etc. Also, modelling a primary-task system provides an opportunity to question both its relevance and the assumptions behind it. This way, it will
be possible for someone to model a completely different view of what the system stands for and what it results in. If we do not model these kinds of systems then what are our possibilities to question them?

To further illustrate contradictions within SSM, I point to Holwell’s (1997) argument that, within the literature on SSM as a problem solving approach to information systems, two distinct bodies of work can be identified. These two bodies are, according to her, based on different philosophical foundations, a functional and an interpretative.

Besides this, there are often contradictions within people’s belief systems. People are seldom purely following a hermeneutic, positivistic, functional, or structural approach. More often, people are influenced by many different research approaches and theories that not always are easily combined. However, even though people do not strictly adhere to any of the above named philosophies or social theories they tend to identify themselves with one or another. This is because one cannot believe in an objective and externally existing reality and at the same time believe that reality is socially constructed. Because of this, I agree with Burrell and Morgan and argue that methodologies cannot be mixed.

It is, however, possible to combine concepts, tools and methods from different methodologies, because I argue that each designer, consciously or unconsciously, moulds the theories she uses to fit her assumptions of the world. This does not mean that all concepts and methods can be mixed with each other, or that this is an unproblematic task. Rather, careful consideration and reflection are needed to make sure that the methods do fit and sometimes some modifications in a theory might also be needed.

Reflecting on my use of the modal framework in analysis and evaluation, I would say that the modalities, as representing possible knowledge areas, fit well within Soft Systems Methodology. The main argument for this is that many, but not all, of the dimensions already are present in SSM, especially in the finding out phase. Further, since most of the modalities are related to internationally agreed-upon scientific disciplines, my experience is that most people have a pre-understanding of what they stand for which has been very helpful when I have introduced the modal framework. This is also in accordance with the findings of Winfield (1995). Differences in peoples pre-understanding of one or several modalities can, however, lead to very interesting discussions. When it comes to my use of the concept qualifying function I see this as a type of metaphor-technique and metaphors have been suggested by Atkinson and Checkland (1988) as a good way to help people break away from their traditional way of viewing a situation.
5.2 The Constitutive Rules of SSM

Soft Systems Methodology is a methodology, a way of thinking, that gives advice on what and how to handle change processes without being too precise in this advice and this way impede situation-specific adaptations. Because of this, the use of SSM will always be user-dependent. SSM is also a methodology that has been adopted and used within a variety of settings, from planning everyday activities, to planning, designing or implementing organisational and societal changes. Literature on how different people have made use of SSM as their guiding methodology also indicates interesting differences (Checkland 1981). For this reason, it is understandable that a number of authors have raised the question of what a user must do if he or she wishes to claim to be using SSM. This is an important question for my research as well. Is my work truly a multi-modal extension of SSM, i.e., is it a version of SSM, or has it become something else?

To address the question of what SSM is, the "constitutive rules" (Checkland 1981) were developed. Over time, these rules have been modified and in the 30-year retrospective (Checkland 1999), they are stated in three main points, addressing three different levels: "the taken-as-given assumptions; the process of inquiry; and the elements used within that process" (p. A35). The following three rules or statements of principle originate from Holwell (1997), but are accepted by Checkland as the new constitutive rules. They are: "(1) you must accept and act according to the assumption that social reality is socially constructed, continuously; (2) you must use explicit intellectual devices consciously to explore, understand and act in the situation in question; and (3) you must include in the intellectual devices ‘holons’ in the form of systems models of purposeful activity built on the basis of declared worldviews." (p. A35).

Based on these constitutive rules, I argue that the work presented in this thesis constitutes a version of Soft Systems Methodology. Firstly, I position myself within the interpretative or hermeneutic research tradition and view social reality as socially constructed. This is one of the main reasons for why I chose the soft tradition as my starting point. It is also one reason for why I later focused on Soft Systems Methodology, since SSM is a methodology that has taken particular interest in peoples perceptions of reality and how these perceptions affect the different phases of the design process. In my studies, I have also tried to understand different people’s shared, as well as personal social reality. Finally, I appreciate the hermeneutic spiral inherent in Soft Systems Methodology on all different levels, from the relation between the different phases to the relation between root definition, CATWOE, and conceptual model.
Secondly, I have used explicit intellectual devices consciously to explore, understand and act in the situations in question. In my different studies, I have focused on different devices. The new concepts introduced and applied in this thesis have been modified in accordance with the philosophy and assumptions of the methodology. The modalities are suggested as a pragmatic framework that can help designers to identify important issues in analysis, design and evaluation, not as a culturally independent and timeless structure. Further, the concept qualifying function is seen as a kind of metaphor used to challenge or develop our understanding of a particular system or problem situation, not as a representation of a pre-existent function that is constant over time and regardless of culture. These concepts are also suggested as additional tools or devices and are not meant to replace the already exiting ones.

Finally, I have included the intellectual device of 'holons', or human activity systems, in the form of conceptual systems models of purposeful activity built on the basis of declared worldviews in all but one study. This study focused on the finding out phase and on new ways to structure and draw a rich picture. In the work related to the qualifying function, on the other hand, the main focus was to draw out and model different perspectives of a problem situation.

5.3 REFLECTING ON MY RESEARCH PROCESS

In this subsection, I will reflect on my research process and point to issues where I, in hindsight, can see that the study might have been improved by a different approach.

One such issue concerns the relation between my three cycles through the conceptual model of my research methodology, depicted in Figure 4. In this work, I have addressed one perceived problem at a time and in isolation. Hence, I started by analysing the evaluation measures used to assess conceptual models and, based on the outcome of this analysis, I suggested the modal framework as an additional tool for evaluation. This work lead me to conclude that for the performance indicators to be meaningful from a learning perspective, they must be considered already when analysing the problem situation, i.e., when drawing the rich picture. This initiated the second cycle through my research model where I focused my attention on how the modalities could be used to structure and cluster already gathered data. Here, no attempt was made at continuing the study by including the modelling phase in order to assess how the inclusion of the modalities already in the finding out phase would affect the modelling and evaluation activities.
The third cycle through the research model focused on how the concept qualifying function could be used to draw out different perceptions of a problem situation and this way help people break away from traditional ways of thinking about this situation. The study did not either, to a full extent, bring in the suggestions from the earlier cycles. This was a conscious choice based on the argument that I wanted to focus my attention on the concept qualifying function to see what effects this would have. However, I do think that I could have learned even more by gathering all my previous insights and tested these in the practical study.

The second issue also concerns the third and last cycle, but is related to my role, and my contribution to the study. My role, or task, in the study was to clarify how different project members viewed the projects and this way increase their understanding of the projects and their role in them. To assess if I had reached this objective, I asked the people involved in the study whether the interview discussions, as well as the presentation and discussion of the different conceptual models, had in fact increased their understanding of the projects and their role in them. Their answers were that it had, and I accepted this as a sufficient confirmation. In hindsight, I can see potential benefits by exploring this issue further. It would have been very interesting to have a second interview discussion with the people involved in the project in order to get knowledge of what parts in the process that had been particularly meaningful and insightful for them, and why. It might also have been of value to let an independent person carry out such an interview discussion since this can help people to be honest about both positive and negative factors.

The last issue for reflection in relation to my research process concerns the extent to which I have considered the relation between different modalities. Reflecting on my use of the modalities I can see that I have used them a lot as individual aspects, rather than as interrelated ones. It would have been interesting to see if, or how, my understanding of different situations had been different if I had spent more time investigating how the different modalities affected each other in the studies.

5.4 Reflecting on My Own Development

Reflecting on a process that one has just ended, or that is just about to end is often a difficult task. This is because reflection indicates that one takes a step back and tries to understand one’s own actions. Because of this, it is usually easier to reflect on a process, activity or event after some time has passed and a mental distance has been reached. I will, however, try to reflect on my own development and learning during the time it has taken me to write this thesis.
Concerning the modal framework, I used the modalities as they were described by de Raadt (de Raadt 1989b; de Raadt 1991; de Raadt 1995a) in the first two articles that I wrote (Bergvall-Kåreborn and Grahn 1996a; 1996b). After that, I started to study Dooyeweerd’s (1997) work. The main reason for this was to learn more about the theory behind the modalities in order to better understand the modalities themselves. As my understanding of the modalities grew, I was also able to better assess the modal changes made by de Raadt (1996; 1997a; 1997b; 2001) in his later writing. Since I did not agree with these changes and since I found that Dooyeweerd offered a richer description of the modalities, I chose Dooyeweerd’s original framework over de Raadt’s modified one for my further studies.

Another issue, related to the modal framework, where I have changed my standpoint over time, is whether the modal framework should be seen as a system or unity or whether it is possible and beneficiary to focus on only a few modalities in a study. Here, I started with the assumption that all modalities were equally important and needed equal attention, regardless of context. Very soon I realised, however, that each study seemed to focus on only a handful of modalities, and that these usually were among the normative kind. Now, instead, I argue that all the modalities are important to consider, but that each problem situation will give special attention to a handful of modalities. What determines this attention is not clear to me yet, but I assume that it is a combination of personal interest and focus, social roles, system type, context, etc.

Finally, this work has forced me to reflect on my ontological and epistemological standpoints, and identify where I stand, as well as, the consequences of this in relation to my work. I cannot see that I have changed my position to any noticeable degree during this time, but reflecting on these issues have, gradually, but slowly, made me more aware and sure of my own position. Despite this, I have a long way ahead before I reach full clarity, if I ever will. There is a statement made by Vickers that beautifully expresses my own view on these issues.

“I have no doubt that adaptability, as commonly understood, is not enough, as a goal or even as an explanation of our striving. We must assume also a ‘nature’ which men and societies are striving to realize and which gives force and direction to their adaptation and sets limits to their adaptability. I believe that this nature is limited but not given by the genetic constitution of mankind; it is something which we may be said both to ‘make’ and to ‘discover’. At any given moment of history, it consists not so much in the mass of partly inconsistent relations which we are set to seek or shun... as in that idea of ourselves which guides our valuations and hence our compromises. It is an active force in
our evolution, none the less so for being its chief product. It will always be tentative, never final, never sacrosanct; yet it will slowly come to hold more of what history has to tell us about what it is worthwhile to try to be” (Vickers 1959, p. 113).

As Vickers points out we both adapt to and shape the context and conditions that we are a part of. Hence, it would be wrong to argue that these conditions were static, because they do change. It would be equally wrong to argue that we as individuals can create or shape social reality as best we choose, because some social constructions have inertia within them, which make them quite stable. Despite this inertia men and women, as well as societies, are striving to realize a reality that conforms to their values and standards. These values give force and direction to their adaptation but also sets limits to their adaptability.
"If A equals success, then the formula is: A=X+Y+Z. X is work. Y is play. Z is keep your mouth shut".

(Albert Einstein)

6. CONCLUSIONS AND FURTHER RESEARCH

In this section, I will summarise the lessons I have learned and relate them to the aim of my thesis. I focus on what I consider to be the main conclusions of my work. This means that there might be minor lessons stated in the separate articles that are not included and discussed in this section.

To help the reader, I start by restating my aim before I present my lessons. As was said in the introduction, this thesis focuses on systems design and aims to explore ways of enriching Soft Systems Methodology by developing intellectual tools that can help designers to conceptualise, create and evaluate different design alternatives. Using Soft Systems Methodology as a methodology for systems design means focusing on designing and implementing both mental changes and real-world systems and this places new requirements on the methodology.

In order to realise the above objective, the study proposes the following supplements:

- Firstly, a framework of 15 modalities (knowledge areas) is suggested as a supplement to existing analysis techniques, with the aim of helping the analyst identify important aspects that need to be understood in order to identify relevant issues for modelling.

- Secondly, a concept called qualifying function is proposed as an additional modelling tool for drawing out different perspectives of a particular problem situation, discussing desirable purposes for the design, and for exploring the underlying rationale behind a suggested transformation or a stated Weltanschauung.

- Thirdly, an expansion of the measures of performance used in SSM modelling, for evaluating conceptual models, is suggested. This expansion also builds on the modal framework.
The first set of conclusions is related to my use of the modal framework as a supplement to existing SSM techniques for finding out about a given problem situation and facilitating the identification of relevant issues for further inquiries. Here, I used the modalities in order to structure interview questions and answers from secondary data. Each question and answer was related to one, or a few, modalities that I interpreted as best representing their meaning. This provided the following lessons:

- By structuring the data according to the modalities it became clear to me, which dimensions the respondents seemed most preoccupied with and eager to discuss. Hence, the modal framework proved to be a good device for highlighting dimensions that are perceived to be important by people in a particular problem situation, as well as dimensions that are lost or ignored.

- Besides using the framework to cluster and analyse data, it could also be used in the data gathering process. In this study the modalities were used to illuminate which dimensions the interview had focused on, but the framework could also be used to elicit interview questions.

The second set of conclusions is related to my use of the concept qualifying function as an additional tool for helping people break away from traditional ways of viewing a problem situation. Here, the potentials of the concept were first illustrated through theoretical arguments followed by a real-world application in order to test the practical applicability of the concept. This provided the following lessons:

- The concept qualifying function proved to be a good tool for drawing out different perspectives of a problem situation and for identifying self-imposed constraints. As such, it can constitute a complement to already existing techniques (root definition, CATWOE or PQR, and conceptual model). In the study, the concept, together with the modal framework, was used as a stimulus for exploring possible views on what qualifies, or makes the activity of creating new work opportunities meaningful. This generated a number of interesting perspectives on why a municipality might view this activity as important.

- The work indicates that the qualifying function has a tendency to focus on perceptions related to the problem situation and to beliefs and assumptions about the social reality in which the problem situation is embedded, rather than to the Weltanschauung of a particular transformation. Broadening the perspective on Weltanschauung used in the modelling phase also broadened the understanding of the relevant system under study, the primary-task system for creating new work opportunities. This proved to have very positive consequences for the
study as a whole since it was on this level that the more fundamental
differences between the participants appeared.

- The concept qualifying function helped to clarify the meaning of a
  stated Weltanschauung (W) or Transformation (T) and to show that
  many different interpretations can be made of a certain statement. In this
  study, this clarification was done by relating different modalities to
  statements about T and/or W in order to explicate these before writing
  the root definition. Most of the time, a statement got quite different
  meanings depending on which modality it was related to. Hence, the
  qualifying function is a good tool for clarifying and enriching PQR and
  CATWOE statements.

- Clarifying T and/or W influenced the model building in that it added
  knowledge to the root definition, which, in turn, helped to find relevant
  activities that enriched the conceptual models. This facilitated the
  transition from root definition to conceptual model. The concept
  qualifying function also relates the root definition and the conceptual
  model closer together and this way provides an alternative technique for
  model validation.

Besides these lessons, some additional lessons were also learned through
the study.

- The study revealed that CATWOE provides a rich base for the root
  definition and, therefore, still has a lot to contribute to the modelling. It
  is, therefore, important not to let the shorter and more condensed PQR
  statement take over.

- The case study strengthened the presumption that in a study all
  modalities are not experienced as equally important and, thus, are not
  given equal attention. On the contrary, only a handful of modalities are
  treated as especially important in a particular study.

- The study showed that the systems-model with benefit could be applied
  as a tool within Analysis One, analysis of the intervention. It was
  helpful in providing a structure of the organisation and placed different
  roles within this structure.
The third set of conclusions is related to my use of the more normative modalities\textsuperscript{10} as a supplement to existing evaluation measures for judging the in-principle-performance of conceptual models, and for initiating debate. This provided the following lessons.

- The modal framework provides a complement to SSM's original 3 evaluation measures. While the original measures focus on logical and economic aspects, the framework provides additional aspects to reflect on when evaluating conceptual models. This reduces the risk that important issues are ignored or lost from neglect.

- The modal framework, used in conceptual models, also points to issues that can be of importance in the comparison phase when possible changes are discussed and future actions are planned. This can include questions, such as, how the need for information and communication are to be planned, or how the historical aspect of the situation might complicate the change process at hand.

- The modal framework can also support the process of finding new ways in the design. By considering additional dimensions new and relevant issues can come to the fore.

- This study also indicated that some aspects might be considered as more important to attend to than others. There is nothing wrong in consciously choosing to focus on only a limited number of aspects for the evaluation. The difference in choice of aspects will depend on what the people involved in a study judge to be relevant.

Finally, there have been some common lessons learned throughout the different studies.

- As illustrated in the above, applying the modal framework to different situations has revealed that all modalities rarely are treated as equally important. Instead, each study has focused on only a handful of modalities, and these have usually been of a more normative kind.

- Most people seem to have a pre-understanding of what most of the modalities stand for. This can be due to the relation between the framework and existing sciences. Linking the modalities to the knowledge within their related sciences has also proven to be a good way to stimulate discussion.

Thus, the above lessons indicate that the inclusion of the modal framework, and its related concept qualifying function, into the different phases of Soft

\textsuperscript{10} These include the pistic, ethical, juridical, aesthetic, economic, social, lingual, historical and logical modalities.
Systems Methodology can enrich and support the designer in the design process. The supplements provide new conceptual tools for analysing, creating and evaluating new and different design proposals.

Based on the above, I conclude that using the modalities as a general framework in analysis, modelling and evaluation, as well as using the concept qualifying function to tease out and clarify relevant transformations and underlying value systems, as I have done in my work, has practical benefits and, therefore, can be said to enrich Soft Systems Methodology.

Finally, I argue that the concept qualifying function strengthens SSM’s ability to help people break away from their traditional ways to view a problem situation. It also strengthens their ability to appreciate the quality and consequences of different design alternatives. Additionally, the modal framework strengthens SSM in evaluating conceptual models and this way its ability to assess possible design paths. These are important and critical issues discussed in subsection 2.2 which I have addressed in this work. Here, I have focused on developing tools that can help individual designers, tackle these tasks and left the political side of these issues for further research.

6.1 FURTHER RESEARCH

While the work related to my thesis has helped to clarify many questions, it has also brought forth many new questions and issues that need to be dealt with in the future.

Some of these issues are related to the limited practical experience of using the modal framework within the context of Soft Systems Methodology. Thus, the modal framework, when used in all the different SSM phases, needs to be elaborated on in greater depth, both in its nature and in its role as a conceptual tool for analysis and design. Another question, more theoretical in nature, concerns the difference between the ontological and epistemological base of Soft Systems Methodology and Dooyeweerdian philosophy. The consequences of this paradigmatic or methodological difference also need to be studied in practical applications to assess how this mix affects the design process, and its outcome.

From a Dooyeweerdian perspective, the relation between the modalities needs to be further explored, both in their anticipating and retrospective nature. Additionally, the concept qualifying function needs to be studied further. Of particular interest, here, is to study what types and/or degree of change that affect a system’s identity and this way affects its qualifying function.
Applying the modal framework to different situations has revealed that all modalities rarely are treated as equally important. Instead, each study has focused on only a handful of modalities, and these have normally been of a more normative kind. How personal interest, context, problem situation, etc., influence this choice would be very interesting to study.

It would also be interesting to explore how the work of Ulrich, particularly his concepts “boundary judgements” and “boundary questions”, could be applied in a SSM study. These concepts have the potential to help unfold underlying rationalities related to problem definitions and suggested solutions, which represent important issues within the soft approach.

Finally, there are important concerns raised by the critical school, such as participation, democracy, and emancipation. How these concerns can be incorporated and dealt with within the soft tradition are also important questions for further research.
7. SUMMARY OF THE ARTICLES

The five articles are listed and briefly summarised below.


The main aim of this paper is to expand the criteria used for evaluating conceptual models within Soft Systems Methodology. These evaluation measures are usually called the 5 Es, and refer to: Efficacy (does the means work; are these activities accomplishing the transformation); Efficiency (are minimum resources used; could the transformation be accomplished better with a different technique); and Effectiveness (is this the right thing to do; are we accomplishing our longer-term goals that are linked to our Weltanschauung); Ethics (is the transformation morally correct); and Elegance (is the transformation aesthetically pleasing). While the first three are considered the main ones, and answer the question “How could the system fail?”, they could, and should, be supplemented with other considerations of a broader nature if it seems appropriate in a particular field. Thus, ethics and elegance seem to be examples of such supplements, and if so, they could be neglected, replaced or complemented by others of free choice. In order to expand SSM’s present measures of performance, part of a framework of 15 dimensions or modalities (numerical, spatial, kinematic, physical, biotic, sensitive, logical, historical, informatory, social, economic, aesthetic, juridical, ethical and credal) originating in a philosophy developed by Herman Dooyeweerd, were introduced\textsuperscript{12}. The reason for only including the nine latter modalities on the list is because we have chosen to focus on the more normative aspects of systems design in this paper.

Although most of the chosen nine modalities (shown in italics above) are not new to SSM and can be recognised in different parts of the SSM process, for instance in modelling relevant systems and in selecting systemically desirable and culturally feasible changes, they are not clear and visible in the evaluation. Our model distinguishes between them and

\textsuperscript{11} Now Mirrijamdotter

\textsuperscript{12} In the first and second paper, a modal framework, slightly modified by de Raadt (1991; 1995a) was used. However, as de Raadt, in later writings (1996; 1997b; 1997c), started to diverge more and more from the original framework of Dooyeweerd, the author decided to return to the latter one. Hence, in the third, fourth, and fifth article, it is the framework as described by Dooyeweerd that is used.
structures them in order to make them apparent and to assure that none of them is ignored or lost from neglect. To clarify the contribution of the modal framework to SSM's monitor and control activities, it was related to a real world situation, the Estonia catastrophe in 1994. The conclusions of this work is that it is not only hard logic and technical aspects that need to be considered when designing systems. By concentrating on logical and technical aspects, we argue that other important dimensions are lost. Under these circumstances, it is not surprising if impacts other than the predicted ones accrue. By considering additional dimensions, as is done in our model, we conclude that unpredictable disadvantages, as well as unpredictable advantages, can come to light and, thereby, be anticipated. Furthermore, our model is based on a well-founded theory, is comprehensive and easy to apply. This makes it possible for the designers of a system to conceive the aspects of the model and take them into account when developing systems for real-world use.


The aim of this paper is to explore if, or how, a framework consisting of 15 interrelated dimensions (numerical, spatial, kinematic, physical, biotic, sensitive, logical, historical, informatory, social, economic, aesthetic, juridical, ethical and pistic) can enrich the appreciation and analysis of a problem situation by helping the analyst identify important aspects that need to be looked at. The framework originates in the philosophy of Herman Dooyeweerd and is incorporated into the finding out phase of Soft Systems Methodology (SSM) and applied to a case study. The reasons for incorporating the framework into the finding out phase of SSM is firstly, to make sure that the aspects against which the conceptual models are to be evaluated also are included in the inquiry of the problem situation. Secondly, to supplement the already existing techniques within SSM for finding out about a problem situation, and, hence, expand the rich picture. The case study is based on a survey conducted in order to establish the conditions for young people in a municipality in the north inland of Sweden. Here, the modal framework, as a whole, was used as a tool to structure and cluster the gathered data. The framework was also used in order to analyse, differentiate and relate different issues to each other. Finally, it was used as a control device for highlighting dimensions that were perceived as important, as well as dimensions that were lost or ignored.

\textsuperscript{13} Now Mirijamdotter
Besides using the framework to cluster and analyse data, it could also be used in the data gathering process by indicating important dimensions around which interview questions should be elicited. Accordingly, a broad approach in the information gathering should also enable a rich analysis of the problem situation. Due to the relationship between the framework and existing sciences, different issues can be appropriately categorised and analysed with the help of individual sciences.


In this paper, I explore potential benefits of using the concept qualifying function as a tool for systems design. The concept originates in the philosophy of Herman Dooyeweerd and refers to the function or character that guides and directs the internal structure of an entity or activity. This means that if the qualifying function for an entity or activity changes, its structure as a whole will change as well. Due to this, the concept and its related theory can help people to view situations from new and different perspectives and to explore the consequences of different views. It can provide a common base for the design around which accommodation more easily can be reached and from where further discussions can be continued. Finally, it has the potential to point to fundamental differences of opinion between participants and stakeholders.


This paper addresses the critique regarding Soft Systems Methodology’s tendency to result in regulatory, rather than radical, agendas for change. It also discusses the argument that the difference between different Weltanschauungs in the modelling phase is taken at face value and not related to the structure of society. The aim of the paper is to address these critical comments made towards SSM by incorporating a concept called qualifying function as a conceptual tool for modelling and design. The concept is a modally defined concept and originates in the philosophy of Herman Dooyeweerd. It refers to the function that characterises a particular object or activity and guides its internal structure. That it is a modally defined concept means that it is related to the modal framework developed by Herman Dooyeweerd and consisting of 15 irreducible dimensions of human experience and thought (numerical, spatial, kinematic, physical, biotic, sensitive, logical, historical, lingual, social, economic, aesthetic, aesthetic,
juridical, ethical and pistic). Hence, the qualifying function of a particular thing or activity is related to one particular modality.

Incorporating the concept qualifying function into the modelling phase of Soft Systems Methodology has the following benefits. It helps people in a particular problem situation to view a situation from new and different perspectives. It also has the potential to enrich the transformation process and its underlying rationality by giving them a direction. This way, the conceptual models are also enriched. Finally, it provides an alternative technique for model validation by relating the root definition and the conceptual model closer together.


The aim of this paper is to build on the arguments in the previous paper (4) where the author introduced a concept named qualifying function as a conceptual tool for modelling and design. The concept was incorporated into the modelling phase of Soft Systems Methodology (SSM) with the purpose of addressing some of the critique directed towards the methodology, such as its tendency to result in regulatory, rather than radical, agendas for change. It was argued that the concept had the potential to help people in a particular problem situation to view the situation from new and different perspectives and that it could enrich the conceptual models by giving the transformation process (T) a direction. The aim of this paper is to apply the concept embedded into SSM to a case study involving two projects focused on creating new work opportunities.

The main findings from this article are as follows. Firstly, the concept qualifying function can constitute a complement to already existing SSM techniques for teasing out different perspectives of a problem situation and identify self-imposed constraints in order to reduce the tendency for regulatory changes. This can be done by relating the concept to the transformation and the Weltanschauung of a particular conceptual model.

Secondly, enriching the root definition by enriching T and W has the potential to strengthen the bond between a conceptual model and a root definition and this way strengthen the defensibility of the conceptual model. It also has the potential to enrich the conceptual models by helping the model builder find relevant activities. As such, it could be one way to help inexperienced model builders to make the transition from root definition to conceptual model.

Thirdly, in the comparison phase, the qualifying function can be used to compare different design alternatives, as well as their consequences. The concept can be used to point to differences between design alternatives,
such as the difference between designing a system for creating work opportunities from an ethical or a historical point of view. Using different modalities as the qualifying function for the relevant systems selected in the case study showed how this would affect the holons and that the holons would be different if different qualifying functions were used.
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Expanding the Framework for Monitor and Control in Soft Systems Methodology

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Expanding the Framework for Monitor and Control in Soft Systems Methodology

Birgitta Bergvall-Kåreborn and Anita Grahn

Soft Systems Methodology (SSM) has been criticized for its interpretivistic stance by, among others, Critical systems thinkers. By locating problems inherent in the techniques of SSM, this paper proposes an expanded theoretical framework, concerning measure of performance in the conceptual models. The expansion is based on the theories behind Multi-Modal Methodology and has resulted in a new model of performance indicators for the design.

KEY WORDS: Soft Systems Methodology (SSM); Critical Systems Thinking (CST); Multi-Modal Methodology (MMM); evaluation criteria for design.

1. INTRODUCTION

The underlying purpose of this paper is to build upon the Lancaster developments of Soft Systems Methodology (SSM) (Checkland, 1972, 1981; Checkland and Griffin, 1970; Checkland and Jenkins, 1974; Checkland and Scholes, 1990b; Wilson, 1990), with a focus on systems design. However, SSM is stated to be, not a methodology for systems design, but a methodology for conceptualisation and design of changes. "Any design and implementation is, in general terms, the design and implementation of an agreed change rather than of a system. Design of a system emerges as a special case, appropriate when the problem definition is sufficiently sharp to enable objectives and measures of performance to be defined and hence to allow the thinking to be in terms of model building, simulating performance and optimising" (Checkland, 1972). We disagree with the above narrow definition of systems design. Also, we interpret this definition as inconsistent with Checkland's earlier typology of systems where he maps the universe into five possible systems classes: natural, designed physical, designed

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1This article is a revised version of a paper (Grahn and Bergvall, 1994) presented at the 17th Information Systems Research Seminar in Scandinavia, IRIS 17.

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abstract, human activity, and transcendental systems (1971). The authors agree with the latter, that the whole of the Universe, including the process of enquiring about it, can be perceived as a system. Therefore, when interpreting the concept of systems in this broad sense, systems design does not emerge as a special case. Thus, we believe that, while Soft Systems Methodology is appropriate for systems design it has some weaknesses.

Guided by the critique offered by Critical Systems Thinking (CST) (Flood and Jackson, 1991a, b; Flood and Ulrich, 1990), this paper argues for the need of an “objective” criteria for reflecting on the systems design. By objective criteria is meant, not the positivistic view, but something similar to Bhaskar’s “critical realism” (1978). That is, a standard which stands “outside” ourselves and is based in theory which gives it meaning in a particular context.

Resolving this issue by using Multi-Modal Methodology (MMM) (de Raadt, 1989, 1991, 1995; Strijbos, 1995) as the theoretical framework is the main purpose for this paper. MMM rests on some well-founded theories based on two streams of thinking, the Philosophy of the Cosmonomic Idea (Dooyeweerd, 1953), and Cybernetics (Shannon and Weaver, 1949; Wiener, 1948; Ashby, 1976; Beer, 1981). MMM was developed as a reaction toward the hard systems approaches, which are seen as being too narrow because of their common base in technological determinism and because of their way of dealing with human problems only as they affect productivity, profit or other economic variables. That there is more to life than just hard logic is realized by other authors as well (Ackoff, 1981; Banathy, 1989; Checkland & Scholes, 1990b), but instead of incorporating “loosely defined dimensions” (de Raadt, 1991), MMM is founded upon rigorously specified aspects of human life.

In the following, an overview of each approach is given. We begin by discussing SSM from the systems design point of view, with a focus on the evaluation criteria. Then CST is briefly described, with attention to its critique of interpretivism. In the philosophy concerning MMM, and the philosophies behind it, the choice has been to focus on the structure of distinct dimensions in reality, while its operational aspects are not regarded. MMM has then been used in order to expand SSM’s theoretical framework concerning performance indicators and has resulted in the development of a model. Finally, the model is discussed, and conclusions and implications for further research are provided.

2. SOFT SYSTEMS METHODOLOGY FOR DESIGN OF CHANGES

Soft Systems Methodology grew out of the failures of traditional management science and has raised a lot of interest among people within our field. Its basic shape can best be illustrated by Fig. 1.

The SSM process usually starts because someone perceives a real-world
situation as problematic and wants to do something about it. In order to get a better understanding of the situation of concern, relevant issues are illustrated in models of purposeful activity. These methods illustrate different interpretations of the real-world situation under study and represent activities that logically need to be performed in order to reach a certain purpose. The models are then used in a comparison process, by being set against perceptions of the real-world situation, depicted in "rich pictures" (Checkland and Scholes, 1990b, p. 45). The comparison will initiate a debate leading to a decision, which is enriched by knowledge from the cultural analysis, and to take actions, in order to improve the situation. In modeling purposeful activity the concept of systems thinking is used to interpret the "real" world. In guiding the cultural analysis support is given by Analysis One, analysis of the intervention; Analysis Two, social aspects; and Analysis Three, political aspects (Checkland and Scholes, 1990b, p. 44ff).

In the systems thinking part some "precise" techniques have been developed, which consist of root definition, CATWOE, and conceptual models of activity systems. Root definition means naming, in a short statement, a system of purposeful activity. The formal rules for a well-formulated root definition is that it should contain the elements of the mnemonic word CATWOE (Smyth and Checkland, 1976):

\[
\begin{align*}
\text{Customers:} & \quad \text{The persons that would be beneficiaries or} \\
\text{victims of the system} &
\end{align*}
\]
Actors: The persons who perform the transformation process
Transformation: An input–output process by which some entity is changed to some new form of that same entity
Weltanschauung: A worldview which makes the transformation meaningful
Owners: The persons who can stop the transformation
Environmental constraints: Elements which affect the system but which cannot be controlled

The conceptual model consists of a set of logically contingent activities, which express the transformation. It is of vital importance that the formulation of these three techniques are consistent with each other, "since credibility (and the participants’ confidence in the process) can be diminished if some smart person in the situation points out a basic logical flaw in the model" (Checkland and Scholes, 1990a).

In coherence with the systems idea of communication and control, a monitor and control system of the conceptual model is a necessity. The monitor and control system evaluates the activity system’s performance against three, or if wider consideration seems relevant, five, measures of performance. They are normally referred to as the three (or five) E’s (Checkland et al., 1990):

E1—Efficacy: Does the means work? Are these activities accomplishing the transformation?
E2—Efficiency: Are minimum resources used? Could the transformation be accomplished better with a different technique, e.g., is it efficient to brush the pavement with a toothbrush?
E3—Effectiveness: Is this the right thing to do? Are we accomplishing our longer-term goals that are linked to our Weltanschauung?
E4—Ethics: Is the transformation a morally correct thing to do?
E5—Elegance: Is the transformation aesthetically pleasing?

These measures of performance are defined as “indicator[s]” (Checkland, 1981, p. 315) which signal progress or regress in pursuing purposes or trying to achieve objectives. The measures are not explicitly stated, neither in root definition nor in CATWOE, and some of them have no clear correspondence to the situation. It is not mentioned why these particular E’s were chosen, except that the first three originate from the question “How could the system fail?” (Checkland, 1989). Effectiveness answers the question, “Are we doing the right thing?” and relates to weltanschauung. Efficacy asks if the means work and
relates to the transformation process. Both are judgments based on one interpretation in the systems thinking phase. Efficiency, on the other hand, relates to economy of resource use. This consideration together with the remaining two, ethics and aesthetics, seems to be related to something “outside” the system thinking phase.

The first three E’s, that is, efficacy, efficiency, and effectiveness, “cover only the most basic idea of transformation. They can be supplemented with other considerations of a broader nature if it seems appropriate in a particular field” (Checkland and Scholes, 1990b, p. 42). Thus, ethics and aesthetics seem to be “picked out of the air” and could be neglected, replaced, or complemented by others of free choice. Subsequently, the use of the concept efficiency is not consistent with the systems approach (Churchman, 1968). “Efficiency thinkers” are colored by Taylor’s theories on Scientific Management where there is one single way to perform a work efficiently. Costs are seen as equivalent to resource use, which is measured in dollars and cents, and the objective is to minimize costs. Efficiency is a concept which is always viewed in relation to a small portion of the organization and therefore unsuitable for an holistic approach. As Churchman points out, if one is interested only in cost reductions, as such the result can be quite the opposite of that which was intended. A decrease in costs of one part of a system can often lead to an increase in costs of the whole system.

One of the optional E’s is, however, addressed as an issue of an ethical dimension in SSM. Atkinson (1989) points to the importance of identifying where moral judgments are implicit in systems design in general, and in SSM in particular, and uses Seedhouse’s “Ethical Grid” (1988) to structure moral judgments. However, Atkinson’s research on ethics in SSM does not cover ethics as a measure of performance for the transformation in conceptual models. He focuses on the question from a position where moral judgments are involved in the process of doing a systems study using SSM.

The problem we perceive, because of SSM’s interpretivist stance, is that the methodology gives no vision for the learning and the design. The systems design is evaluated in the light of the measures of performance, but these need to be looked at more closely and related to some theoretical framework.

3. CRITICAL SYSTEMS THINKING AS INITIAL GUIDES FOR “OBJECTIVE” CRITERIA

Critical Systems Thinking (CST) as defined mainly by scholars at Hull University in the United Kingdom, evolved out of a critique of traditional management science as well as out of a critique of SSM. Traditional management science was criticized for being positivistic and because of that, inadequate in practical applicability, whereas SSM was criticised for its interpretivist stance.
CST’s critique toward SSM points to the lack of “objective” standards for the interpretations. If we live in a “perfect” world where everyone is concerned with improving the organization as a whole, then the debate in SSM will be impartial to particular persons’ or interest groups’ own objectives. This is, however, not the case. Real-world situations are very much characterized by power and politics where persons and groups, regardless of the benefits for the organization, aim at furthering their own ends. The characteristics of Soft Systems Methodology implies the intention not to “diminish the freedom” or “to force it [real life] into a more rational form” (Checkland, 1981, pp. 173, 181). Instead it wishes to portray itself as being open and participatory. But, “the kind of open, participative debate which is essential for the success of the Soft systems approach, and is the only justification for the results obtained, is impossible to obtain in problem situations where there is fundamental conflict between interest groups which have access to unequal power resources” (Jackson, 1991).

In order to manage situations characterized by conflicting interest groups and get a more democratic approach, Critical Systems Thinking suggests a philosophy which rests on three “commitments.” These are commitments “to critique, to emancipation and to pluralism” (Schecter, 1991).

The second “commitment,” emancipation, is of interest as an “objective” criteria for systems design. Emancipation is considered by seeking to develop emancipatory systems approaches and methodologies to deal with problem situations in coercive contexts. Additionally, there is also a reference to Habermas’ theory of human interests and his social theory. For all individuals critical systems thinkers aim at achieving maximum development of their potential. In the theory of human interests, Habermas (1972) argues that there exist three kinds of knowledge interests, namely, a desire for technological control, a desire for understanding, and a desire for emancipation. The desire for technological control is linked to hard systems methodologies, which aim at assisting material well-being by improving production and steering capacities. The desire to understand is connected to interpretive methodologies, which look at promoting and expanding mutual understanding among individuals and groups. Finally, to serve emancipatory interests means to protect one domain of interest from being dominated by the other “by denouncing situations where the exercise of power, or other causes of distorted communication, are preventing the open and free discussion necessary for the success of interaction” (Jackson, 1991).

CST’s choice for “measuring” the performance of a system is found in emancipation. Though we agree that we need a standard “outside” ourselves for guiding the design, we do not agree with CST’s measure of performance, “emancipation,” as the solution since it is too narrow in scope. To measure a system only in terms of whether it sets its members free “especially from legal, political or moral restraint” (Hornby, 1986, p. 281) cannot be a sufficient solu-
tion. If a bus driver decides to set himself free from the legal restraint of having to obey the traffic rules and decides not to respect the traffic light, the consequences can be fatal. The only emancipation that is likely to occur is liberation from life, something that may have not been requested by the victim(s). So, emancipation for one person may cause oppression for others. This leads to an important aspect which, to the authors' knowledge, has never been discussed among critical systems thinkers; that is, freedom always implies responsibility. Hence, the performance of a system needs to be measured in more than the emancipatory aspect.

4. WHAT IS MULTI-MODAL THINKING?

Multi-Modal Methodology (MMM) is rather new to the field of systems thinking, but rests on some well founded theories, the Philosophy of the Cosmonomic Idea, and Cybernetics. The Philosophy of the Cosmonomic Idea has its origin in the Netherlands and was founded by two Dutch professors at the Free University of Amsterdam, D. H. T. Vollenhover and Herman Dooyeweerd. It is the work of Dooyeweerd (1953) that, among the philosophers of the Cosmonomic Idea, has had the greatest influence on multi-modal thinking.

The second stream of influence comes from cybernetic thinking, which has its origin in Shannon and Weaver’s “Information Theory” (1949) and Wiener’s work (1948). Their ideas, further developed by Ashby (1976) and Beer (1981), are applied by de Raadt in MMM.

MMM criticizes the narrowly focused, technological determinism used by the hard systems approaches in dealing with human problems, as well as the soft approaches where the assumption about reality is based on chaos and complexity. Instead, MMM, influenced by Dooyeweerd, suggests that there is order within complexity. We believe that the philosophy of multi-modal thinking, focused on Dooyeweerd’s dimensions of reality, offers a great contribution for guiding systems design.

Dooyeweerd began his task of developing the Philosophy of the Cosmonomic Idea through his position as an advisor of legal and politicoeconomic issues at the Kuyper Institute. He felt that to carry out this task properly, systematic theoretical work was required. Therefore he began to tackle the problem of politics, both historically and systematically, both theoretically and practically, and studied its application in the social, economic, political, and legal spheres of life. This work convinced him that all questions in science are consciously or unconsciously answered in terms of underlying philosophical systems, i.e., the answers are formulated on the basis of a certain belief of about reality. As a result, Dooyeweerd sought for the structure of temporal reality through reflecting on human experience and thought. Gradually distinct dimensions were identified, analyzed, and discussed. Dooyeweerd’s work resulted in
15 irreducible aspects, but he constantly emphasized that his analysis is open to correction and elaboration.

The aspects, or modalities, Dooyeweerd identified are numeric, spatial, kinematic, physical, biotic, sensitive, logical, historic, informatory, social, economic, aesthetic, juridical, ethical, and credal; see Fig. 2.

The distinctions between these modalities are made for purely analytical reasons with the purpose of disentangling the concepts and thereby obtaining a clearer picture of the situation. In human experience and thought, however, they are bonded together as a whole. The modalities are best illustrated by an example, and we have chosen to apply them to an industrial plant. The numerical aspect can immediately be discovered by counting the members of the work force, the number of machines, the units produced per day, etc. The spatial dimension refers to, for example, the amount of space that the plant, machinery, workers, products for storage, etc., occupy. Within the plant building there is a constant movement of people, material, goods, etc., which point to the kinematic dimension. Both living creatures and machinery need energy in order to function (the physical modality).

The organic phenomena of life represented by the biotic modality can be
viewed in the workers’ need for food, water, and air to breathe. The sensitive aspect is illustrated in the display of emotions between the members of the work force and the managers when, for example, negotiating about wages. The logical dimension is present in production plans and work schedules, which are formulated on the basis of past experience, the historical dimension. Orders and instructions are then mediated to those concerned either through direct communication or in writing, both of them operating in the informatory modality.

The plant is in itself a social system, and is also part of a social community. For most people their employment is a major part of their social life; for some it may even be their only possibility to socialize. This is something worth remembering when designing our systems. The economic modality dominates today’s business world, usually at the expense of the other modalities. The aesthetic dimension is hardly visible in an industrial plant at all. Perhaps this lack of aesthetic dimensions, together with the general picture of industrial plants as places of loud noise and dirt, is one reason why people of today are not interested in this kind of employment. This is a problem that has been addressed by, among others, big industrial corporations like ABB, Sweden.

The juridical dimension is noticeable for instance, in the laws that regulate relations in the labor market, and in acts of parliament, for example, the Companies act. The ethical dimension is visible in discussions on topics like environmental pollution caused by the plant versus employment opportunities. Finally, the credal modality can be traced to the strong belief in industry as the engine of society. Furthermore, trust in the company by customers, share holders, finance institutions, etc., is another example of the importance of this modality.

Each modality is given its meaning through its kernel, or nucleus; see Fig. 3. Each has its own order, or set of laws, by which it is governed. Thus, the numeric modality is guided by its kernel, discrete quantity, which is different from symbolic representation, the kernel of the informatory modality. In the hard modalities, such as the numerical and spatial, and their equivalents in scientific disciplines, mathematics and geometry, the orders, or set of laws, that govern these modalities are more determinative, the laws of which ‘always exerts its own fulfilment’ (de Raadt 1991). But in the soft modalities, such as the ethical and juridical, the laws are more normative. Their fulfillment is contingent on people’s inclination to follow these laws. That does not mean that the softer modalities are indefinite or “fuzzy.” They have their own set of laws, although they cannot be described through the harder modalities’ determinative rules.

The ordering of the modalities are not haphazard; on the contrary, their arrangements are in accordance with Dooyeweerd’s perception of the order of creation or the development of the earth. This order also shows the interrelationships between the modalities. Thus, each lower modality (see Fig. 3) forms
the foundation for the one immediately above, e.g., organic life, the biotic modality, rests upon processes within the physical, which rests upon processes within the kinematic, which rests upon the spatial, and so on. These foundational aspects constitute basic conditions for all organic life.

Further, one modality cannot be defined by concepts from within, e.g., the social modality does not get explained by the words "being social" or "having social intercourse." Instead the informatory modality is inherent to the understanding of the social modality; and the historical is inherent in the understanding of the informatory modality.

de Raadt (1989) suggests that when designing systems for humans, especially information systems, there is a need to incorporate all aspects of life, and keep a balance between them, so that "human life may be defined as one that displays a modal ecology very similar to the biological ecology found in the rain forest." Kant, Weber and Habermas also recognize the need to incorporate several dimensions of knowledge, such as ethics and aesthetics, and not just pure logics (Stolterman, 1991). In designing systems, hard systems methodologies have already devoted attention to the more determinative aspects of systems design. The normative dimensions have been left unconsidered; in the following we therefore give our attention to them. We argue that by analyzing the system in different modalities and in several layers, new insights are discovered. We also expand our knowledge of the more normative aspects, often called soft and fuzzy, in real life, and develop a vocabulary that makes it easier to form and express our thoughts about these dimensions.
5. MULTI-MODAL THINKING AS A COMPLEMENTARY FRAMEWORK FOR SSM

Soft systems thinking as a methodology aims at learning and motivating for changes, and is, according to Checkland, not to be seen as a methodology for systems design. But, as argued above, this separation is not possible since they are each other’s presuppositions. However, in a design situation, regardless of the design of changes or of the systems, we need, as stated before, some kind of guidance. If the guidance is based on different individuals’ interpretations, as in SSM, one interpretation is as good as another. In a situation, with conflicting interpretations, there is no point in discussing because no argument will be seen as more valid. The debate becomes meaningless. To navigate around the problem, SSM suggests the systems thinking phase. There, different interpretations are illustrated in root definitions, CATWOE, and conceptual models which are validated through the measures of performance, i.e., the five E’s—efficacy, efficiency, effectiveness, ethics, and elegance.

However, when examining these measures—the five E’s—more closely, they become more and more nebulous in several aspects. It is not mentioned, or clearly stated, why these particular E’s were chosen, how they should be used, what they exactly mean, what they should relate to, and how one knows if they are achieved. While two of them, efficacy and effectiveness, are interpretivistic, the remaining three look “outside” for reference. Efficacy and effectiveness are related to transformation and weltanschauung respectively, i.e., they are internal judgments based on one interpretation. Efficiency, on the other hand, is related to minimizing costs, which has nothing to do with the root definition or CATWOE. Ethics and elegance (also referred to as aesthetics in the following) as measures of performance have not been clearly stated. However, we interpret that SSM’s intention in using these measures is to look beyond mere interpretation. If this is not the case, if ethics and aesthetics are subjectively interpreted, we see no meaning in explicating them, since they then could be found as a part of the weltanschauung and, thus, related to effectiveness. This is a clear indication that SSM’s measures of performance would benefit from an expansion of its theoretical framework to address these sorts of problems.

Multi-Modal Methodology captures a wide variety of human thought, perhaps not the complete variety, but the best we have found so far to elucidate us. The framework relies on extensive research where the dimensions have been uncovered and arranged in their specific order. There is an interrelation between the modalities so that one builds on another and therefore no dimension can be ignored. A further benefit with the structure is that most people, if not all, recognize the dimensions as natural aspects of their own life. Systems we design should therefore reflect these dimensions. Further, since these modalities are drawn out of the sciences, knowledge about each can be found by inquiring into the different disciplines.
Because our aim is to concentrate on the normative aspects of systems design, we find some relationship between SSM’s evaluation of the models’ performance, E1–E5, and the normative aspects of the multi-modal framework. Dooyeweerd’s structure is also discernible in the SSM process. See Table I.

As a result of the relationship between SSM and MMM seen in Table I, we can see the following. The credal modality is linked to E3—effectiveness through the chosen weltanschauung for the system (“W” of CATWOE). Effectiveness relates to the system’s outcome, in relation to W, not to the effectiveness of the weltanschauung. The ethical modality is related to the measure of performance, E4. The aesthetic modality corresponds to SSM’s measure E5. The economic modality refers to resource use and corresponds to SSM’s measure E2. The social modality’s nucleus, social intercourse, is represented by SSM’s intrinsic dialogue guided by respect, consideration, observance of conventions, etc. This dimension is also explicitly considered through SSM’s cultural analysis of social aspects, termed Analysis Two. The informatory modality permeates the whole process. In SSM specifics the formulation of the root definition is an example of symbolic representation being clearly visible. The historical modality predominates the design through its formative power, “today’s problems come from yesterday’s ‘solutions’” (Senge, 1990, p. 57), and is also a prerequisite for future changes. Finally, the logical modality coincides with measure E1—efficacy. The concept of logic and the concept of efficacy is, in everyday language, usually perceived as each other’s presupposition. If one is logical, one is also considered to be efficacious, and if one acts efficaciously, the actions are presumed to follow a logical flow. As a consequence, if one wants to make a task more efficacious, this is usually done by looking at the present flow of activities which make up this task, and then this flow is evaluated, in terms of logics, to find the best solution.

As shown in Table I, the modality framework is in coherence with SSM and hence implies its potential as an analytical framework for measuring the performance of the system. Since most of the dimensions are recognizable in

<table>
<thead>
<tr>
<th>MMD modality</th>
<th>MMM nucleus</th>
<th>SSM measure and concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credal</td>
<td>Faith</td>
<td>E3—effectiveness</td>
</tr>
<tr>
<td>Ethical</td>
<td>Love</td>
<td>E4—ethics</td>
</tr>
<tr>
<td>Aesthetic</td>
<td>Harmony</td>
<td>E5—elegance</td>
</tr>
<tr>
<td>Economic</td>
<td>Frugality</td>
<td>E2—efficiency</td>
</tr>
<tr>
<td>Social</td>
<td>Social intercourse</td>
<td>Analysis of social aspects (Analysis Two)</td>
</tr>
<tr>
<td>Informatory</td>
<td>Symbolic representation</td>
<td>Root definition</td>
</tr>
<tr>
<td>Historical</td>
<td>Formative power</td>
<td>The problem situation itself</td>
</tr>
<tr>
<td>Logical</td>
<td>Distinction</td>
<td>E1—efficacy</td>
</tr>
</tbody>
</table>
some way or another, we believe that Dooyeweerd’s theory is a suitable framework of analysis for SSM. By expanding SSM’s theoretical framework with the normative aspects of multi-modal thinking, we improve the design guidance. Our belief is that by designing systems according to the modalities and their guiding nucleus, the system regulates itself in each dimension. Further, our hypothesis is that by adhering to the interrelation between the modalities, the system will be balanced in a harmonious manner. Taken together, this results in the design of systems with a focus on human needs where also emancipation can be achieved when needed. Therefore we suggest that SSM’s measures of performance can be complemented by MMM’s framework.

The notion “measures of performance” is normally linked to something measurable, in digits. However, the present authors believe that the criteria which measure the performance of a system should not be limited to quantifiable indicators. We believe that it is also important to include judgmental standards, i.e., qualitative aspects. Additionally, some elements are not meaningful to measure but should, instead, be seen as instruments for guiding the design.

Because of the inherent, quantifiable aspect of the expression “measure of performance,” we suggest that the word “measure” should be replaced by “indicator.” This term is already used in the glossary (Checkland, 1981, p. 115) and covers both the qualitative as well as the quantitative aspects in a more comprehensive way. Therefore in Table II, when referring to the model of SSM’s expanded measure of performance, the synonym “performance indicators” (PI) is used.

The performance indicators judge the design of the system in coherence with SSM’s techniques in the systems thinking phase. The core of the systems thinking phase is the transformation (“T” of CATWOE), in the light of its

<table>
<thead>
<tr>
<th>Performance indicator</th>
<th>Nucleus</th>
<th>Clarifying question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credal</td>
<td>Faith</td>
<td>“Is the right thing being done?”</td>
</tr>
<tr>
<td>Ethical</td>
<td>Love</td>
<td>“Is the transformation morally correct?”</td>
</tr>
<tr>
<td>Juridical</td>
<td>Justice</td>
<td>Is the transformation just?</td>
</tr>
<tr>
<td>Aesthetic</td>
<td>Harmony</td>
<td>“Is it aesthetically satisfying?”</td>
</tr>
<tr>
<td>Economic</td>
<td>Frugality</td>
<td>“Is resource use minimum?”</td>
</tr>
<tr>
<td>Social</td>
<td>Social intercourse</td>
<td>Is the social need accounted for?</td>
</tr>
<tr>
<td>Informatory</td>
<td>Symbolic representaion</td>
<td>Is the communicative aspect considered?</td>
</tr>
<tr>
<td>Historical</td>
<td>Formative power</td>
<td>Can we derive lessons from history about similar transformations?</td>
</tr>
<tr>
<td>Logical</td>
<td>Distinction</td>
<td>“Does the means work?”</td>
</tr>
</tbody>
</table>

*Source: Checkland et al. (1990).
weltanschauung. The transformation process should not be judged solely in itself, but in a wider perspective where considerations of what makes the transformation possible are included.

In Table II, a presentation of each performance indicator is given. It starts with the credal and proceeds toward the logical. The left-hand column lists each performance indicator; the center column links each indicator to its nucleus, the purpose of which is to guide and give meaning to the indicator. Finally, the right-hand column states a question which aims to seek information and knowledge about the indicator in a particular situation.

The *credal* indicator is linked to the chosen weltanschauung for the system. Checkland and Davies (1986) clarifies the use of the term weltanschauung by distinguishing three categories, W1, W2, and W3. W1 is a taken-as-given set of assumptions which makes a particular root definition meaningful and is there only to help in model building. W2 is related to a version of the problem situation and, thus, related to the taken-as-given assumptions in W1 in the sense that W2 makes W1 relevant. Finally, W3 is of wider concerns and related to the social reality in which the problem situation is embedded. W3 is linked to our beliefs and assumptions about reality and makes us understand social situations. The techniques developed for SSM do not include evaluation of W3 or W2, but concentrate on the evaluation of W1. By asking, “Is the right thing being done?” the effectiveness of the transformation, in the light of the W, i.e., W1, is checked. We agree that it is important to evaluate the system from this perspective, but argue that this is not enough. Evaluation of a broader notion of Weltanschauung is needed, which is found in the credal modality. This modality equals W3, which W2 is a part of, and which, in turn, W1 reflects. Subsequently, this performance indicator evaluates if W1 is reached by the transformation but also discusses the soundness of W3. W2 is not explicitly considered in the evaluation process.

The *ethical* modality is represented through SSM’s ethical measure or E4. When judging the ethical performance of the system, SSM reviews whether the transformation is morally correct. Ethics is normally seen as the study of right and wrong, and because of the close connection between right and just, the distinction between ethics and juridics becomes a bit blurred. However, in Dooyeweerd’s conceptualisation the ethical dimension is based in charity, i.e., in the willingness to judge other persons with kindness, and its core is “humanitarian love for one’s neighbour” (Kalsbeek, 1975, p. 102). This is also our definition of the ethical performance indicator.

The *juridical* modality is neither explicitly nor implicitly represented in SSM; therefore to follow Dooyeweerd’s structure, it needs to be added. The aspect concerns the justice of the system and how it is affected by juridical laws. These laws should be balancing different interests, and their function should be twofold, conducting actions, and guiding sanctions in order to maintain and
restore the respect for law. It is, however, important to remember that this aspect should reflect the justice of the system and thus should not be limited to the juridical laws.

The *aesthetical* modality is represented through SSM’s measures E5, elegance, and checks the beauty of the system by asking if the transformation is aesthetically satisfying. This aspect needs to be expanded further, in understanding both its nature and its role as a SSM measure of performance.

When considering the *economic* performance of the model, SSM asks if the use of its resources is minimum through its measure E2—efficiency. Because of the fact that we do have limited resources, which should be used sparingly, this is an important question. But, due to the word “efficiency,” the question can easily be associated with minimizing costs in order to maximize profit. To minimize costs is nothing wrong in itself. The problems occurs when short-term reasoning is taken too far and costs are minimized in order to maximize profit with disastrous long-term consequences. A decrease in costs viewed only from a short-term basis can often lead to an increase in costs of the whole system, especially seen in a wider perspective. The economic modality’s nucleus, frugality, suggests a different approach to efficiency. The word economy has its origin in the Greek word *oikonomous*, which means household, and to keep a household means to manage within given resources. Frugality proposes the sparing use of scarce resources “whereby our needs are fulfilled while at the same time sufficient is kept for other people and also for nature” (de Raadt, 1991, p. 27). In order to stress minimum resource use, it would be of benefit to change the name of this measure from *efficiency* to *economic* and thereby emphasise the nucleus frugality.

In the cultural enquiry of SSM the *social* aspect is discussed in the analysis of roles, norms and values. The analysis concentrates on a present situation which has been formed by its history. Thus, even though SSM recognizes the importance of analysing the social dimension from a historical perspective, it does not evaluate it in the design. Hence, this dimension, which was so important in understanding the situation, is likely to be neglected or overlooked. The social aspect also needs to be stressed from a future perspective since SSM’s conceptual model is a basis for future changes, which will affect people in their social situation. In the question “Are social needs accounted for?” lies considerations such as, Does the model improve or worsen the possibility for social interchange? To what extent is social competence needed? How does the change affect established roles, norms, and values? etc.

Symbolic representation is present in all human activity systems and is considered in SSM particularly in terms of the consistency between root definition, CATWOE, and conceptual model. This consistency, that is, that the model be technically defensible, is most important for the credibility of the model which will affect the participants’ confidence in SSM. However, this
discussion is kept on a meta-level and concerns mainly the semantic of language, i.e., it checks that SSM is done "properly." It does not evaluate the informatory aspect in relation to the modeled activity system.

When considering the informatory aspect as a measure in itself, we concentrate on the idea of a feedback loop between the meta-system and the operational system (Beer, 1985). The meta-system feeds information to the operational system, which through its operations, transforms input to output. The output that is generated is then compared to standards, and deviations are reported back to the meta-system. Based on this feedback information the meta-system decides on the course of action, which then is fed back to the operational system, and so the loop continues. In this context questions arise, such as: Which data are relevant to collect? Which information is relevant to feed into the operational system? What information is relevant to feed back to the meta-system and what should be filtered out? With what frequency should the status of the measures be checked? Which are the appropriate channels for the information? etc. This indicator has the potential to become the bridge between SSM and information systems design.

The historical aspect is not explicitly considered in SSM's measures of performance, but can be seen implicitly as a part of the cultural analysis. Consequently, the historical aspect is not considered when evaluating the models, only in a later stage when the models are being compared with perceptions of the real world. The outcome of this phase should lead to suggestions for culturally feasible changes. We argue that it is a benefit to consider the historical aspect already in the design process, and not leave it to the debate about what is culturally feasible to implement. By considering history already in the design stage, previous experiences will be discussed explicitly and put in relation to relevant models. In this way the importance of history is evaluated one step earlier in the process, which should lead to refined models and thereby an improved tool for the debate. Finally, and most important, "It will always be essential to learn and reflect upon . . . history if we are to learn from the relative failure of [e.g.] classical management sciences, since that is surely due to its attempt to be ahistorical" (Checkland and Scholes, 1990b, p. 28). Considering the historical aspect with its formative power, already in the design of conceptual models, our attention is drawn to the learning that yields from history.

The concept of logic and the concept of efficacy, SSM's measure E1, are, in everyday language, usually perceived as each other's presupposition. However, the nucleus of Logic is distinction, and this implies that to model the system, one has to be able to distinguish between the different activities that together make up the system as a whole. The logical indicator checks whether the distinctions are made properly and whether the distinguished activities make it possible to achieve the intended transformation. Instead of naming the measure
efficacy, it would be more appropriate in this context to name it logical, since it is the logic of the system that is evaluated. Further, though the meaning of the term efficacy is different from effectiveness in Checkland’s definition (1989, p. 90, 1990, p. 39), the words are synonymous in everyday language (Hornby, 1986). Therefore, by changing the name of the measure from efficacy to logical, one will gain in clarity.

When applying the above performance indicators, each needs to be analyzed through its nucleus and, when taken together, kept in balance in such a way that no modality is allowed to dominate. Our belief is that if one follows the guidance of the nucleus and keeps the modalities in balance with each other, the chance of achieving “good” systems is improved. This hypothesis will be tested in further studies.

The main contributions of our model in Table II is that we expand the measure of performance according to a well-researched framework. Although most indicators are noticeable in different parts of the SSM process, for instance, in modeling relevant systems and in selecting systematically desirable and culturally feasible changes, they are not clear and visible. Our model distinguishes between them and structures them in order to make them apparent and assure that none of them is ignored or lost from neglect.

The spirit of the model is harmony. Therefore no performance indicator is allowed to be ignored, but depending on the situation some aspects are more important than others. However, if one allows an indicator to dominate over the others, this must be a conscious choice, which is consistent, and not in conflict, with all of the nuclei. What is, for example, morally correct and aesthetically satisfying, is a judgment based upon the nucleus and the laws and orders which govern each modality. Our firm belief is that by considering all the different performance indicators together in a harmonious way, the soundness of the transformation is improved.

6. ILLUSTRATION OF THE PERFORMANCE INDICATORS

To clarify our contribution to SSM’s monitor and control activities, let us consider a real world situation, the Estonia catastrophe. On the night of 28 September 1994, the ferry Estonia sank into the Baltic Sea on its way from Tallinn to Stockholm, carrying over 1000 people. Only 137 people survived; about 900 died in what is considered to be the worst shipping catastrophe in Europe since the Second World War. This calamity has left no one unaffected and the recurrent question is how something like this could happen. In the following, touched by the Estonia accident, we develop a conceptual model of an activity system for obtaining safe ferry transportation and discuss our suggested model for performance indicators. In Fig. 4, we present one version of
Root Definition:

A system, shipping company owned and staff operated, that runs on existing ferries and in existing weather, in order to obtain safe ferry transportation and thus, reduce emergency situations.

CATWOE

C - passenger; staff
A - staff
T - need for safe ferry transportation → that need met
W - reduce emergency situations
O - shipping company
E - existing ferries; weather

Fig. 4. A SSM representation of a system to obtain safe ferry transportation.

how the system could be conceptualised. The top of the figure shows the root definition and continues with the CATWOE test. The bottom shows the activity system of the stated transformation, with its monitor and control activities.

Figure 4 represents a transformation, with the aim of obtaining safe ferry transportation in order to reduce emergency situations in contemporary shipping business. The activities in Fig. 4 are the minimum necessary to meet the requirements of the root definition and CATWOE. The model shows the operational system, activities 1–6, and the monitor and control system (or meta-system), activities 7–9. In accordance with the purpose of our paper, we concentrate on
the measures used in the monitor and control activities. To clarify the contribution of our model we discuss each performance indicator in relation to Fig. 4. We start by looking more closely at the logical performance indicator and proceed upward in accordance with our model, Table II. The examples and illustrations that we give are based on information by the press and may include mere speculations and flaws. Since our aim is to illustrate the performance indicators, and not to investigate the Estonia accident, we do not consider this as affecting the quality of our example.

In evaluating the logic of the above system, the question “Does the means work?” (Table II) checks whether the activities distinguished in the system produce the desired output. In order to reflect on the above question we have to analyze our notational system by distinguishing between the different activities and their order and, finally, check that the activities taken together can be counted as safe ferry transportation. It is also important to distinguish between different levels of safety, because checking that the chairs are not damaged and that stairs and floors are not slippery does not alone vouch for safe ferry transportation. In the Estonia example, early in their investigations experts were quite sure that the accident happened because huge amounts of water entered the car deck. Before Estonia left the harbor in Tallinn the ferry was checked by two Swedish Maritime inspectors who were in Tallinn for in-service training. They had made a minor remark about the inadequacy of the inner door seals but also said, when interviewed, that this alone could not have caused the disaster. Other experts thought that the hydraulic system that regulated the locking of the bow doors had not been in order; something the inspectors did not check.

When regarding the historical impact in the model in Fig. 4 the question that should be asked is, “Can we derive lessons from history about similar transformations?” By studying events that have occurred in the past and that have been repeated, lessons can be learned. More specifically, the impact of the historical dimension can be seen in ferry construction, i.e., the design of safer ferries, and not more profitable ferries. The use today of ro-ro ferries (roll-on roll-off) is a case in point. Previously the construction was U-shaped, with both entrance and exit in the stem. This has been replaced by the more efficient ro-ro design, where the cars enter the stem and then exit through the stem. The design necessary for this type of economy means that they are vulnerable for easy filling up and capsizing. Besides the Estonia, the British ferry Herald of Free Enterprise, which capsized outside Zeebrugge in 1987, is another example of this problem. History, in the form of statistics, will also tell us that ro-ro ferries are more vulnerable than their precursors, so vulnerable that the Royal Institute of Naval Architects states that they are “unacceptably sensitive” to damages. Also, according to Lloyd’s Register of Shipping, statistically there will be one severe accident involving ro-ro ferries every fifth to seventh year.
The informatory aspect concerns mainly feedback information, understood in its full context, as well as data collection and generation. With regard to the informatory aspect in our example, questions could be raised, such as Which are the appropriate information systems? What information is needed? How should that information be channeled and fed back? Are key concepts, criteria, and decisions clearly stated and clearly communicated? etc. With reference to Estonia, Were decisions taken about safety routines clearly communicated to the staff? Were incidents reported and fed back to decision takers? Were monitor and control systems in order, appropriate, and active? etc. There are speculations that the information systems, monitoring the vehicle deck, were turned off for the night so they would not disturb the staff. If this is the case, the consequence would be a delay in discovering that water was entering the car deck and, thereby, a delay in taking appropriate actions as well as in alarming staff, passengers, and emergency centers.

With regard to the social indicator, our conceptual model requires the possibility for social interchange, the necessity for social competence, and the consideration of established roles. More specifically, when designing the actions which comprise activity 6, strategies like the following need to be discussed: Should operations be performed manually or computerized? Should they involve several people or be carried out by individual persons? Should the emphasis be on diversity or specialization? Should the tasks be attached to a bigger whole or carried out in isolation? etc. The choice of strategy will most certainly affect the social aspect in the design of work.

The economical performance indicator, with reference to our model, concerns the use of resources in relation to the outcome and can lead to discussions such as which constraining elements should be considered, how many current ferry transformation systems should be evaluated, which are the key concepts that need to be framed, how many levels of monitor and control systems are needed, etc. There is a point when it is no longer economic to “frame” yet another “concept,” to “evaluate” one more “ferry transportation system,” and so on. This situation occurs when the costs are higher than the value it generates. In relation to Estonia, the owners cut costs by hiring cheap staff that did not have sufficient education, and by this they also decreased the value of the outcome. Because of this, there has been speculations that the shipping company traded security for economical reasons. At hindsight, if this is a fact, it might have been more economic for the company to hire more qualified staff and, by that, perhaps avoid the catastrophe from happening or at least reduce the severance of it.

With regard to the aesthetic dimension SSM checks the elegance of the system by asking if the transformation is aesthetically satisfying. To illustrate the importance of the aesthetic dimension, consider a helmet, or any other safety
equipment, that would make the staff look ridiculous. Since the staff are not different from other people, they will most certainly not enjoy being laughed at. Therefore it is imperative that we design a helmet that staff are not ashamed to wear and is therefore aesthetically pleasing and, at the same time, has the safety of its crew upper most.

When evaluating the juridical aspect in our example, the focus is on how the process and the output are affected by the laws of justice. Sea traffic is regulated in national laws and orders which are based on international agreements, for instance, the International Safety Management Code initiated by the United Nation’s International Maritime Organisation. In theory most nations have homogeneous rules for sea traffic. What differs between them is the degree to which these rules are observed. Different shipping companies give different attention to these regulations, and different countries have different sanctions for ensuring that the laws are obeyed. In activity 5 in our example, when deciding appropriate activities for obtaining safe ferry transportation, these regulations must be taken into consideration.

The juridical situation can be very complicated, as in the case of the Estonia, where three countries, Sweden, Estonia, and Cyprus, are involved. The ferry traffic between Estonia and Sweden is run by Estline Ltd., which is registered in Sweden. At the time of the accident Estline Ltd. was owned both by Estonian Shipping, an Estonian state company, and the Swedish shipping company Nordström & Tuhlin. Estonian Shipping and Nordström & Tuhlin also own the company Estline Marine Ltd., which is registered in Cyprus. This company owned the Estonia and leased the ferry, without crew, to Estonian Shipping. Estonian Shipping, in turn, leased the ferry, now with crew, to Estline Ltd. To open the shipping route between Tallinn and Stockholm, Estline had to buy a ferry and therefore needed a bank loan. However, Estline wanted an Estonian crew and therefore planned to register the ferry in Estonia, but the bank involved required that the future owner of the ferry was registered in a western country. Therefore Estline Marine Ltd. was created and registered in Cyprus. This company applied for the loan and bought the ferry, and the ferry was registered in both Cyprus and Estonia. The advantage for the company to register in Cyprus was that, besides being a Western country, Cyprus did not, contrary to most Western countries, object to the ferry being registered in several nations. Nor did they demand, also contrary to most Western nations, to staff the ferry with a crew from its own country. Consequently, in the case of the Estonia, laws and interpretations from three nations, concerning sea traffic, were needed to be considered.

The ethical dimension raises a lot of interesting issues for discussion and the Estonia catastrophe has given us many examples of the consideration of man for his brother, even to the point of self-sacrificing action. When one of the
shipwrecked was lifted by a winch from the raft to a rescue helicopter, he was so tired out that he fell through the harness. One man from the rescue crew then jumped from the helicopter into the water and managed to get hold of the man despite the huge waves. He swam back to the raft with the man and managed to save both the man and himself. One would think that those who were saved, especially in such dramatic circumstances, felt lucky, but many of the shipwrecked people that survived felt mainly guilt. They asked themselves how they could be happy in such a tragic situation, if they had survived at the expense of others, and if they could have done more to save their friends and fellow passengers. In our activity system, when deciding criteria and acceptable values for safe ferry transportation, ethical considerations play a big role.

Finally, to evaluate the credal aspect in our example the following needs to be considered. First, by asking whether or not our longer-term goals are reached, the T (transformation) is checked in relation to W1 (weltanschauung). More specifically the question asks if meeting the need for obtaining safe ferry transportation will lead to reduced emergency situations. Second, by asking whether or not our longer-term goals ought to be strived for, our beliefs and assumptions about reality, that is, W3, are critically examined. These reflections will then generate new questions which will further inquire our beliefs and assumptions. Reducing emergency situations may be important for the shipping company since emergencies cost money and create chaos. Another reason that reducing emergency situations is important to strive for is the belief that life has an intrinsic value of its own that needs to be respected.

As the above indicates, when inquiring into the W of the model, different underlying assumptions and beliefs on higher recursive levels can be found, which makes that particular W meaningful. The effects of the Estonia catastrophe have shown us what an important part faith plays in our lives and in our decisions. After this calamity people lost their faith in ferries as a means of transportation and were afraid to travel by sea. Consequently, the shipping companies in and around Sweden lost 30% of their passengers. Shipping companies did almost anything to restore people’s faith in them. They welded the bow doors on the ferry while claiming that this was not really necessary, since the construction of bow doors were safe. They even gave free tickets away to increase the number of passengers and thereby increase their business. The underlying assumption about people’s behavior was, in agreement with positive feedback, that when more and more people started to travel by sea again, this would restore faith among both travelers and in society in general.

In Fig. 5, based on Fig. 4, we state short questions to consider for evaluating the performance of the system, and summarize our model of a safe ferry transportation system.

The clarifying questions for each performance indicator are adjusted to our
example of a system to obtain safe ferry transportation and are ranged in accordance with our model presented in Section 5. Benefits achieved by complementing SSM with further evaluation aspects are illustrated and argued in the above. As our example has shown, important aspects, such as lessons from history, social implications, and juridical connotations, were easily lost when the concentration was focused on the logical dimension of conceptual models, and the related three measures of performance of how the system could fail. By considering additional dimensions such as history, sociology, and law, greater insight into the future notional situation was achieved.

7. SUMMARY AND IMPLICATIONS FOR FURTHER RESEARCH

The main aim of this paper was to build upon the Lancaster developments of Soft Systems Methodology, the base of which is in guiding interventions in situations where change and improvement are needed. SSM claims to be a methodology for learning, not primarily a methodology of systems design in the
traditional sense. However, as discussed earlier, we believe that learning and the design of concepts cannot be separated since one implies the other. The problem we perceive is that, because of its interpretivistic stance, SSM gives no vision for the learning and the design.

Hence, we argued that Critical Systems Thinking fairly criticizes SSM regarding the “danger” of interpretivism. We agree that we need a measure of performance, grounded in theory, which “stands outside” ourselves, for guiding the design. However, we do not agree with CST’s measure of performance, emancipation, as the solution since it is too narrow in scope and cannot hold for all dimensions of life.

Multi-Modal Methodology suggests that there is a distinct order in reality displayed in fifteen different dimensions. This new and challenging way of thinking is explicated in a model of the dimensions, their nuclei, and their interrelationships. In this paper the MMM model was used as a theoretical framework for expounding and justifying the measures of performance of the systems design. In order to differentiate between “original” measures of performance and our suggested expansion, we introduced the term “performance indicators.” This was also done because of the inherent interpretation in everyday language of the word measure, meaning something quantifiable.

Our developed framework is in itself fairly general and is to be used as an instrument for structuring and guiding the discussion about the design. We consider that it is not only hard logic and technical aspects that need to be considered when designing systems, even though these tend to predominate during the actual development phase. By concentrating on logical and technical aspects, we argued that other important dimensions were lost. In these circumstances it is not surprising if impacts other than the predicted accrue. By considering additional dimensions, as was done in our model, we conclude that unpredictable disadvantages, as well as unpredictable advantages, can come to light and thereby be anticipated. Furthermore, our model is based on a well-founded ontology, comprehensive, and easy to apply. This makes it possible for the designers of a system to conceive the aspects of the model and take them into account when developing systems for real world use. Most performance indicators in our model are not new to SSM and can be recognized in different parts of the process. Our contribution in this paper was to make them explicit and to link them to a theoretical body of knowledge. The performance indicators are credal, ethical, juridical, aesthetical, economical, social, informatory, historical, and logical. They are interrelated and build on each other. By considering all the above performance indicators in a harmonious way, guided by their different nuclei, systems design will be enhanced.

As the development of our model of performance indicators has emerged, new insights for further research have evolved. Each performance indicator
needs to be elaborated in greater depth, both in its nature and in its role as a performance indicator for the design. The model also needs to be studied in a practical application.

Additionally, in the paper we have argued that the concept of learning and the concept of design presuppose each other. For the performance indicators to be meaningful from a learning perspective, they must be considered when analyzing the problem situation, i.e., the rich picture. Previous knowledge of the situation is visualized in SSM’s rich picture, the only guidance of which is the analysis of the intervention, the analysis of the “social system,” and the analysis of the “political system.” From a learning perspective it is a weakness that the rich picture is not consistent with the conceptual model. For instance, the ethical and aesthetical criteria for measuring the performance of the conceptual models are nowhere to be found in the rich picture. Hence, two new aspects of evaluation, which have not been considered in analyzing the problem situation, are “suddenly” introduced to the conceptual model. Therefore the framework that we have developed will, in future research, supplement SSM’s concept of rich pictures, and the performance indicators will be subsequently expanded.

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REFERENCES


Multi-Modal Thinking in Soft Systems Methodology’s Rich Pictures

Birgitta Bergvall-Kåreborn and Anita Grahn
Methodologies in systems analysis and design are traditionally dominated by technological determinism and economic reductionism. This paper proposes a framework for incorporating additional dimensions. The framework is based on theories behind multi-modal thinking and is incorporated in Soft Systems Methodology. In order to test its applicability the framework is used in an empirical study.

KEYWORDS: systems analysis, soft systems methodology, rich picture, multi-modal thinking, determinative aspects, normative aspects.

INTRODUCTION

There is a lot of attention in the field of systems analysis and design given to developing methodology. However, this attention has normally had its base in technological determinism and economic reductionism, which, although dominating our modern lives, does not seem to be able to ‘solve’ the problems of today. Ironically, some of these problems, like those caused by unemployment, have their base in technological development and economic failures. Because of these failures we see a need to broaden the scope of our thinking and to include more normative aspects in systems analysis and design, in addition to technological and economic concerns.

The aim of this paper is to explore how a framework consisting of interrelated dimensions in thinking can enrich the appreciation of the problem situation in the systems analysis phase. We base our research on Soft Systems Methodology, SSM, as mainly developed by Checkland and his research team (Checkland, 1981; Checkland and Scholes, 1990; Checkland, and Holwell, 1993; Checkland and Haynes, 1994; Wilson, 1990) and incorporate a framework based on Multi-modal thinking (de Raadt, 1989; de Raadt, 1991; de Raadt, 1994; Strijbos, 1994). This framework is developed by a Dutch philosopher, Herman Dooyeweerd (Dooyeweerd, 1953; Kalsbeek, 1975), and captures a wide variety of human thought, perhaps not the complete variety, but the best we have found so far.
Soft Systems Methodology has raised a lot of interest. There is a vast amount of literature about the use of Soft Systems Methodology. There is also extensive literature on theoretical developments based on its use. Other work aims at incorporating SSM or parts of it to complement other methodologies. Further, there is also research on practitioners’ experience of using SSM (Kreher, 1994; Mingers and Taylor 1992) and research with the aim of strengthening, supporting and developing the techniques of SSM, e.g. (Avison, Golder and Shah, 1992). Our work aims at this last point; to further develop the techniques of SSM. In previous work (Bergvall and Grahn 1996; Grahn and Bergvall, 1994) we have developed a theoretical framework for evaluating normative aspects in systems design. This framework has been incorporated into SSM’s system thinking phase in order to expand the measures of performance of conceptual models. Next, to study the practical implications, an empirical work has been outlined (Bergvall and Grahn, 1995) and this paper will report on the findings made so far.

In the following we will give a brief introduction to the theories we base our research upon, i.e. Soft Systems Methodology and Multi-modal thinking, with a focus on appreciating the problem situation, and the framework of dimensions in human thought. Then we will present our empirical work, conclude with the findings we have done so far and finish with the issues for further research.

**SOFT SYSTEMS METHODOLOGY AND RICH PICTURE BUILDING**

Soft Systems Methodology, SSM, is by now well established within our field. Its basic shape can best be illustrated with the figure below, Figure 1.

![Figure 1. The basic shape of SSM (after Checkland and Scholes, 1990; Checkland and Holwell, 1993).](image-url)
MULTI-MODAL THINKING IN SOFT SYSTEMS

The SSM process usually starts because someone perceives a real-world situation as problematic. In order to get a better understanding of the situation, relevant issues are illustrated in activity models, which are based on system concepts. These models illustrate different interpretations of the real-world situation under study and represent activities that logically need to be performed in order to reach a certain purpose. The models are then compared with what is perceived, i.e. the actual perception of the situation. Through the comparison, new insights are revealed which will lead to actions to improve the situation.

In the process of identifying relevant issues, the SSM practitioner gathers information about the problem situation itself and represents that information. This representation is termed "Rich Pictures" (Checkland, 1981: p. 317; Checkland and Scholes, 1990: p. 45). However, it is important to note that the term "Rich Picture" does not only include the pictorial representation itself but the whole process of appreciating the situation (Lewis, 1992). There is no formal technique for representing the problem situation except the recommendation to look for "elements of slow-to-change structure" and "elements of continuously-changing process" and how these elements relate to each other within the situation climate (Checkland, 1981; p. 164). The notion of climate has, in later versions of SSM, been further developed and is now guided by exploring the situation through analysis of the intervention, social system analysis, and political system analysis, i.e. SSM's Analysis One, Two, and Three (Checkland and Scholes, 1990: p. 47ff). However, as is typical in systems work, the emphasis is on representing relationships and connections and therefore a diagrammatic representation has proved more powerful in expressing these relationship than expressing it in linear text. Therefore the Rich Picture has come to be associated with this diagram, but as discussed in the above, the diagram is rather "a by-product of the process of investigation of the problem situation" (Lewis, 1992).

In a study of the use of SSM among non-academics (Mingers and Taylor, 1992) the findings were that the majority of the people chose SSM to develop an understanding of the situation and not to bring about change. This was surprising since traditionally SSM is viewed as a problem solving methodology with the aim of intervening in situations to facilitate change. However, the learning process of SSM is also emphasised. One skilful definition is presented by von Bulow: "SSM is a methodology that aims to bring about improvements in areas of social concern by activating in the people involved in the situation a learning cycle which is ideally never-ending" (Checkland and Scholes, 1990: p. 28). Consequently, in Mingers' and Taylor's study (1992), and in coherence with developing an understanding of the situation, the techniques of SSM that were almost always used were the rich picture and the central modelling activities—relevant systems, root definition and conceptual model—while the comparison activities—the base for debating about changes—were less used. Concerning modifications to the methodology the authors found that they were mainly centred around the rich
picture stage. Some were replacements, e.g. personal constructs, while others were complements of SSM's original technique.

In another study on the teaching of SSM (Woodburn, 1991) the learning that is involved in a systems study is analysed and nine internal learning processes together with their external stimuli are presented. The learning processes involved are: reception—attending to new information; expectancy—appreciating the link between improved performance and new information; retrieval to Working Memory—retrieving past information from Long Term Memory to Working Memory; selective perception—prioritising new information; semantic encoding—coding new information for Long Term Memory storage and retrieval; responding—demonstrating awareness of new information; reinforcement—appreciating the value of new information; retrieval and reinforcement—demonstrating the impact of new information; and retrieval and generalisation—broadening the impact of new information. The corresponding external stimuli to trigger learning are then: gaining attention; communicating learning goals; stimulating recall of past information; presenting information; providing meaningful frameworks; eliciting performance; providing feedback; assessing performance; and enhancing retention. These learning processes take part in five domains: motor skills, i.e. use of muscles; intellectual skills, i.e. use of symbols; verbal information, i.e. use of ideas, or combining symbols; cognitive strategies, i.e. use of learning strategies, or combining ideas; and attitudes, i.e. personal choices. Woodburn relates the above mentioned processes and stimuli to instructional events and gives suggestions for teaching SSM so that most of the domains of learning will be stimulated. However, one of the most important conditions for learning according to Jean Piaget's theories on intelligence, namely the ability to assimilate or accommodate new information with past information (Hård at Segerstad, 1982) is not argued. This aspect can be found in several of the nine internal learning processes, e.g. retrieval to working memory, semantic encoding, reinforcement etc. but is not explicitly discussed.

The characteristics for rich pictures is in expressing the problem situation by representing relationships in structures, processes and climate. Its main aim has, in surveys, shown to be in getting an understanding of the situation. To achieve this understanding the authors have pointed at the importance of consistency in learning, and the predicament of being able to assimilate or accommodate new knowledge with existing and past experience. To facilitate this learning we present a framework to be incorporated in SSM's systemic concept which, for the purpose of this paper, is in the rich picture building.

MULTI-MODAL THINKING AND ITS FRAMEWORK OF DIMENSIONS

There are scholars who have taken an interest in introducing additional aspects into systems analysis and design, besides logics and economics, e.g. (Ehn, 1994;
However, none of them that we have found so far has based their studies on such a complete and holistic work as Dooyeweerd’s (1953), see Figure 2.

Dooyeweerd identified 15 dimensions, or modalities, related to human experience and thought and ranged them from more determinative, e.g. numerical, spatial and kinematic, to more normative, e.g. aesthetical, juridical, ethical and credal according to the figure. The modalities are best illustrated by an example, and, for that purpose we illustrate their application to an industrial plant. The numerical aspect can immediately be discovered by counting the members of the work force, the number of machines, the units produced per day, etc. The spatial dimension refers to, for example, the amount of space that the plant, machinery, workers, products for storage, etc. occupy. Within the plant building there is a constant movement of people, material, goods etc. which point to the kinematic dimension. Both living creatures and machinery need energy in order to function (the physical modality).

The organic phenomena of life represented by the biotic modality can be viewed in the workers’ need for food, water, and air to breathe. The sensitive aspect is illustrated in the display of emotions between the members of the work force and the managers when, for example, negotiating about wages. The logical dimension is present in production plans and work schedules, which are formulated on the basis of past experience, the historical dimension. Orders and
instructions are then mediated to those concerned either through
direct communication or in writing, both of them operating in the informatory
modality.

The plant is in itself a social system, and is also part of a social community. For
most people their employment is a major part of their social life; for some it may
even be their only possibility to socialise. This is something worth remembering
when designing our systems. The economic modality dominates today’s business
world, usually at the expense of the other modalities. The aesthetic dimension is
hardly visible in an industrial plant at all. Perhaps this lack of aesthetic dimension,
together with the general picture of industrial plants as places of loud noise and
dirt, is one reason why people of today are not interested in this kind of
employment. This is a problem that has been addressed by, among others, big
industrial corporations like ABB, Sweden.

The juridical dimension is noticeable for instance, in the laws that regulate
relations in the labour market, and in acts of parliament; for example the
Companies Act. The ethical dimension is visible in discussions on topics like
environmental pollution caused by the plant versus employment opportunities.
Finally, the credal modality can be traced to the strong belief in industry as the
engine of society. Furthermore, trust in the company by customers, share holders,
finance institutions etc. is another example of the importance of this modality.

It is important to note that the distinctions between the modalities are made for
purely analytical reasons. In human life and experience they are bounded
together as a whole and one dimension cannot replace another. Further, the
ordering of the modalities are not haphazard; on the contrary there are
interrelationships between the modalities which define their position. Thus, the
aesthetic modality is dependent on the economic, the economic on the social, the
social on the informatory and so on, and no one can be reduced or replaced by
any of the others. Further, one modality cannot be defined by concepts from
within, e.g. the social modality does not get explained by the words 'being social'
or 'having social intercourse'. Instead the informatory modality is inherent to the
understanding of the social modality; and the historical is inherent in the
understanding of the informatory modality.

Each modality is given its meaning through its kernel, or nucleus, and has its
own order, or set of laws, by which it is governed. Thus, the numeric modality is
guided by its kernel, discrete quantity, which is different from symbolic
representation, the kernel of the informatory modality. However, although the
modalities have their own, specific set of laws, these laws are homomorphic so that
the order of one modality can be transduced to the order of another (de
Raadt, 1991). For instance, in the example of the industrial plant, the
numerical modality, governed by mathematical laws, is used to represent aspects
in the economical modality, the informatory modality, which is guided by
the laws of symbolic representation, is used to communicate laws, agreements, etc.
and so on.
Just as each modality has a nucleus which guides and gives meaning to it, every system should be defined by a core modality which guides and gives meaning to the system’s purpose. This modality, including its laws and nucleus, defines the core purpose of the system and is termed the system’s “sphere of sovereignty” (de Raadt, 1991: p. 110). While a certain nucleus is linked to a certain modality a system’s sphere of sovereignty has to be chosen. The modality that is chosen as the sphere of sovereignty will affect the activities and the decisions of the whole system. For example, if a hospital’s sphere of sovereignty is stated in the biotic modality, the purpose is focused on preserving biological life. If instead the ethical modality is chosen as the sphere of sovereignty, the hospital’s purpose shifts to provide love and care in a respectful and dignified way. To keep the biological functions in the human body alive with the help of machines while the actual person is ‘dead’ is sometimes neither caring nor showing respect for the patient or her family. Thus, one modality might violate one or more of the others and in this light choosing one of the modalities as the system’s sphere of sovereignty is very important for the nature of the whole system, because the characteristics of this modality has the final ‘say’ in determining how the system should act. However, it is not a straight forward task to determine the systems’s sphere of sovereignty. Therefore, exploring different alternatives and revealing the consequences that follow is often a necessary approach in order to choose the modalities most suitable to guide the system. The modality that is finally chosen as the sphere of sovereignty from this group is something that the people involved in the situation must decide upon.

Dooyeweerd’s dimensions can also be found in our sciences, e.g. the numerical dimension is researched in Mathematics, the spatial in Geometry, the kinematic in Chemistry, while the aesthetical dimension is researched in Arts, the juridical in Law, the ethical in Ethics and the credal in Theology. This scientific distinction promotes the possibility to further our understanding of each dimension as well as, when acting as systems scientists, to identify their homomorphism and their relations.

Since the dimensions are present in human experience they are also present in organisations and should therefore be represented in the systems we design for organisations. Consequently, these dimensions should also be looked for in the process of appreciating the situation. Further, from a learning point of view, since the dimensions in themselves are not new knowledge, but rather provide a framework for incorporating both past and new knowledge, this framework supports the process of assimilation and accommodation which, as pointed out in the above, are the prerequisites for understanding the situation. Next we will illustrate with a case from a real world situation how Multi-modal thinking can support the collection of information for appreciating the situation, and thereby enrich SSM’s rich picture.
EMPIRICAL STUDY OF THE YOUTH SITUATION IN ARVIDSJAUER

Our case is based on data concerning the situation among youth in a small municipality in the north of Sweden called Arvidsjaur. Arvidsjaur is situated inland and is surrounded by forests, mountains and about 4000 lakes and rivers. The number of lakes can be compared with the number of inhabitants which is around 8000. The big employers are the state and the municipality, especially the army, medical centres and the forestry industry. Due to cuts in governmental expenses Arvidsjaur has experienced a growing rate of unemployment. In these respects Arvidsjaur’s situation is no different from many other inland municipalities in the north of Sweden, i.e., they are sparsely inhabited, have a higher unemployment rate than usual and are very dependent upon the government for employment. What makes Arvidsjaur interesting is its strategy to develop work opportunities based in information technology. In order to manage this in the long term an important issue arises, namely how to keep the young people from leaving the municipality for a bigger city, and how to influence the people who leave Arvidsjaur for higher education, to come back.

Because of this a survey was conducted in order to establish the conditions for young people in Arvidsjaur. The survey include 2 questionnaires with open ended questions and it is the data from the first one that forms the basis of our empirical work. This questionnaire was given to and answered by 46 people of which the majority were between the ages of 15 to 25. It covers 7 topics, starting with a general question about what is perceived as good and bad about being a youth in Arvidsjaur. It then continues with more specific questions concerning living conditions, cultural activities and leisure time, education, work opportunities, power perceptions, and finally, visions for the future concerning themselves and the municipality. Most of these questions were stated in the form ‘what would you like to change concerning...’ followed by questions on how these changes ought to be brought about. Consequently most answers focus on matters that are perceived as problematic in some way.

When organising the data, and thus beginning to diagramatically illustrate the rich picture, we chose to structure it according to the framework of multi-modal thinking presented earlier. Although we do not analyse or design ‘systems’, we use the concept of the sphere of sovereignty in order to achieve a focus for each issue. For each question we have, in most cases, picked a sphere of sovereignty which is consistent with the topic of the question or, for the general questions, the answers. In some cases we have, however, chosen to explore different alternatives instead, to illustrate that for certain topics a group of modalities are seen as equally important and therefore equally suitable to guide the topic. In these latter cases the decision about which sphere of sovereignty to choose is left for later work.

In order to see what aspects and issues the respondents have given priority to, we start our rich picture (Figure 3) by clustering the answers from question one and labelling them with the modality/modalities we found most appropriate. In
the picture we also include the above mentioned pre-conditions of Arvidsjaur since we believe they are of interest when analysing the answers and also because they make the picture richer.

The preconditions are represented in the form of square boxes in the figure above. The municipality’s size and the number of inhabitants are linked to the numerical modality; the fact that Arvidsjaur occupies space in the north inland of Sweden is related to the spatial dimension and the contract of employment between the inhabitants and the state is foremost a juridical matter.

The circles in the figure (which should be seen as suns) represent the answers on what is good about Arvidsjaur while the clouds illustrate what is perceived as bad. The arrows represent relations between different issues. Starting with the former, the circle in the lower left-hand corner communicates the most normative aspect mentioned, namely the juridical, in the form of little violence and drugs. (In the word drugs, alcohol is not included). The circle at the top of the figure shows that there is a good community spirit and fellowship in the municipality. Some people related this to the fact that Arvidsjaur was small, and because of that everybody knew everybody. There is also a possible relation between this and the fact that there is little violence in Arvidsjaur. The third positive thing about Arvidsjaur is that there are excellent conditions for sport activities and outdoor life. For some people sports are a way to meet new people and to socialise while for others the main attraction is sensitive; it clears the mind and is both stimulating and relaxing. The same goes for most outdoor activities. Of course, for most of us it is not either or; sometimes the social aspect is more important while
at other times it is the sensitive that takes over. This is also the reason why we have chosen to relate this issue to both the social and the sensitive dimension. As can be seen in the figure, there is a relation between this issue, especially concerning outdoor life, and the spatial modality. Because Arvidsjaur is situated in a place surrounded by fresh air and clean nature in the form of forests, mountains, rivers and lakes the conditions for outdoor activities are good. The last circle depicts the perception of good elementary schools in the municipality.

The two main clouds that appeared in the answers regarding negative conditions for youth in Arvidsjaur was the limited entertainment possibilities and high unemployment. The former is a cluster of opinions regarding not enough dances, discos, pubs, cinemas, theatre, concerts, cafés, etc. This can be related to both the numerical and the spatial aspects mentioned, i.e. it is not very common that a small municipality in the Nordic inland of Sweden can offer broad and big entertainment possibilities. This by no means indicates that one cannot or should not try to enhance the supply. The second cloud, unemployment, is foremost an economical and a social problem. The problems experienced at first with being unemployed is perhaps economical, but work also has an important social aspect. One can, of course, also say that work has a sensitive purpose, we need to fulfil ourselves and one way to do this is through our work. However in this context we chose to focus on the economical and social.

We then complement the first rich picture, Figure 3, with the answers related to the other topics; see Figure 4 below. The rich picture below illustrates the answers from the 7 topics in the questionnaire and is focused on matters which were perceived as problematic. Beginning in the lower right-hand corner the kinematic aspect was visible in answers relating to several questions. It was perceived that communication services were insufficient and needed to be developed. Continuing in the Figure anti-clockwise, from more determinative to more normative dimensions, we come to the informatory modality. This dimension relates to questions about education, and the answers mainly addressed the issue of limited possibilities for higher studies. The fact that the elementary school is perceived as good while there is a dissatisfaction concerning higher education can be explained by a prime difference between the two educational levels; elementary school is quite standardised while higher education is more specialised. Relating to the numerical and spatial dimensions again, it can be hard for a small municipality to offer a wide variety of education.

When asked specifically about culture and leisure time it was consistently mentioned that the entertainment possibilities were too narrow and too few. The answers also showed that the cultural activities, which we relate to the aesthetic dimension, were perceived as inadequate. The question about work opportunities revealed similar answers as the ones related to the first topic concerning good and bad conditions for young people in Arvidsjaur. The labour market was perceived to be too narrow and the unemployment rate too high. The question regarding living conditions yielded answers which all pointed in the same direction, namely
to the economical modality and to the fact that Arvidsjaur's living conditions are too expensive.

The next topic relates to power perceptions, which we link to the juridical dimension. What was apparent when analysing these answers was that young people felt left out; they felt that no one listened to them or took them seriously; they felt they had no influence on the decisions taken concerning their own and the municipality's future. The last question deals with the respondents' visions for themselves as well as for the municipality, and relates to the credal dimension. One thing that the answers make plain is that there is a big difference between the respondents' visions for the municipality and for themselves. The visions of the municipality tend to be almost unrealistic dreams; e.g. Arvidsjaur is seen as a conglomerate to which big companies are drawn and where culture is flourishing and entertainment possibilities are endless. Compared to this, the respondents' visions for themselves is much more modest and mundane; they hope to have a job; a family; a house, a car etc. The reasons for this difference can be left for future studies.

A common theme which mirror a segregation between adults and youth was noticed in all answers. This segregation is visible in the different perspectives on authority and responsibility. Adults usually perceive these concepts as two sides on the same coin, while the young people tend to ask for authority without recognising its companion, responsibility. For instance, when asked how to improve the different problem situations the common answer was 'fix it for us';
B. BERGVALL-KÅREBORN AND A. GRAHN

‘build cheaper apartments’; ‘give us subsidies’; ‘create work opportunities by arranging theatres, musicals etc.’; and so on. Nowhere in the answers could suggestions be found that mirrored youth responsibility for bringing about improvements of the problem situations. For example, to cope with the expensive living conditions young people could advertise for a room mate instead of asking the state to build smaller apartments; in order to expand the cultural activities in the municipality and perhaps create work opportunities they could organise a theatre association and give performances instead of asking the municipality to do this for them. To summarise, young people wanted authority but did not seem willing to take on the responsibility that goes with it.

By structuring the rich picture according to the framework of multi-modal thinking, we notice which dimensions seem to be especially important and which dominate the situation in this specific context. Consequently, the aspects given less attention, or no attention at all, becomes visible. This structure for organising real-world situations is highly suitable for analytical purposes, while it also keeps a holistic view. As shown in the above, different issues can be analysed, differentiated and related to each other as the modalities are tied to human experience making the framework easy to understand and natural to most people. This facilitates an enriched understanding of the situation. The significance of this finding is perhaps best illustrated by the reaction of one of the youth social workers involved in the study. He could see things in our rich picture that had escaped not only him but the rest of the research team. The thing that astonished him most was that youth seemed to want authority but not the responsibility and social integration that usually follows. This episode supports Avison, Shah and Golder’s statement that “rich picture diagrams are an excellent communication tool” (Avison, Shah and Golder, 1993).

CONCLUSION

We have presented the Multi-Modal framework which is related to a variety of dimensions in human thought, and which aims to support the systems analysis phase. In this specific research the framework has been incorporated in the rich picture building in Soft Systems Methodology and applied in an empirical study.

The core of rich picture building is mainly to gain an understanding of the situation and to facilitate the identification of relevant issues for further inquiries. Understanding is sought by illustrating different perceptions and relationships, something that our framework supports. The strength of the framework has been demonstrated in analysing, differentiating and relating different issues to each other. Further, the elements which are indicated in SSM’s recommendations for Rich Pictures, e.g. structures and processes within the culture of the situation, becomes a richer analysis by incorporating the Multi-Modal framework. In addition, dimensions that are perceived as important are highlighted as well as
dimensions that are lost or ignored. A further benefit is the relationship between our framework and existing sciences. Due to this relation different issues can be appropriately categorised and analysed with the help of individual sciences.

It is hoped that further studies will concentrate on continuing to incorporate the framework of multi-modal thinking to the different phases of SSM as well as continuing empirical work by completing the SSM cycle. Another issue to attend to is the order within the modalities, their homomorphism and their relationships. Finally studies will be directed towards understanding the role that different dimensions play in information systems and their development.

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The Role of the Qualifying Function Concept in Systems Design

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The Role of the Qualifying Function Concept in Systems Design

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In this paper I explore potential benefits with using the concept qualifying function as a tool for systems design. The concept originates from the philosophy of Herman Dooyeweerd and refers to the function or character that guides and directs the internal structure of an entity or activity. This means that if the qualifying function for an entity or activity changes, its structure as a whole will change as well. Due to this, the concept and its related theory can help people to view situations from new and different perspectives and to explore the consequences of different views. It can provide a common base for the design around which accommodation more easily can be reached and from where further discussions can be continued. Finally, it has the potential to point at fundamental differences of opinion between participants and stakeholders.

KEY WORDS: systems design; multimodal systems thinking; qualifying function; philosophy of Herman Dooyeweerd.

1. INTRODUCTION

The world we live in is becoming increasingly artificial in the sense that almost everything surrounding us shows signs of human intervention and design. I am not just talking about the houses we live in, the clothes we wear, and the food we eat; no, many times the fields, forests, and even lakes that we have around us are equally artificial in that they are designed by man. The same is true for the languages we speak, the concepts we use, and the theories and philosophies we live by.

Together these abstract and concrete designs affect the way we think and act; they influence how we view ourselves and others as well as how we carry out our tasks and what tasks we consider to be important. Due to this formative character of the design process, and the results it produces, design can be seen to

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have a strong ethical dimension. This means that designers should strive toward creating good designs; designs that affect people's lives and future freedom of action in a positive way. However, deciding criteria for what constitutes good design is a very complex task that is influenced by many dimensions, and so are the tasks of conceptualizing, creating, and assessing different design alternatives.

In these processes many aspects such as ideology, aesthetics, sociology, and history come into play. All these dimensions will affect the designers' visions for the end product, the way they carry out the design process, and their view on what constitutes good design. Hence, there is a mutual interrelationship between our designs and our worldviews.

This means that in the design process intellectual tools such as ideals, thought figures, and mental models are as important as technical artefacts for designers to be able to conceptualize and create their designs. Some scholars even argue that it is the conceptual activity that constitutes the heart of the design process (Le Moigne, 1989). With this in mind I argue that we should give at least as much attention to developing mental tools as we do to developing technical artifacts for helping designers in their work.

Consequently, there is a need for conceptual frameworks that can express, explicate, and manage the complexity within systems design. One such framework can be found in the philosophy of Herman Dooyeweerd (1997). Within this philosophy a framework of 15 dimensions ranging from arithmetical, physical, and sensitive to historical, social, ethical, and pistic constitutes the base. Related to the modal framework is a concept called the "qualifying function" which aims to identify the leading or qualifying function of a certain thing or activity. This paper introduces and explores this concept together with its underlying modal framework as new conceptual tools for systems design. More specifically, the paper explores the potential benefits of using the concept as a way to conceptualize different design alternatives, as well as to capture the essence and characteristics of these alternatives and, finally, to perceive different consequences with them.

The paper should also be seen as a continuation of the work done within the so-called Multimodal Systems Thinking approach. This is an umbrella term for a variety of attempts to bring the ideas of Herman Dooyeweerd to bear on systems thinking (Bergvall-Kåreborn and Grahn, 1996a, b; de Raadt, 1991, 1995, 1997; Eriksson, 1998; Mirijamdotter, 1998), with the aim of finding a balance between the given and the constructed aspects of reality.

The structure of the paper is as follows. First, an account of the philosophy of Herman Dooyeweerd with a focus on the concept qualifying function and other related concepts are given. After that a number of potential benefits of incorporating the concept in systems design are discussed. Finally, some conclusions and implications for further research are provided.
2. THE PHILOSOPHY OF HERMAN DOOYEWERD

Herman Dooyeweerd (1894–1977) was a lawyer by profession but it is through his philosophical work that he is best known. His first major contribution, *The Philosophy of the Law Idea*, was made in 1936 and approaches the concepts of ontology and epistemology from a Judeo-Christian point of view. As such, the philosophy assumes an ordered reality where structures and laws, to a large extent, already exist. However, these structures and laws are not seen as constraints but, rather, as guidelines helping the individual to understand the world around her and directing her when intervening in this reality through the process of human formation.

The philosophy was later developed into five fundamental and coherent theories: (1) the theory of religious ground motives, (2) the modal theory, (3) the theory of time, (4) the entity theory or the theory of individuality structures, and (5) the social theory. In the following, I will focus on the parts of the philosophy that relate directly to the concept qualifying function. This means that only part of the modal theory and part of the entity theory will be covered. While both theories deal mainly with the law side of reality, represented by ontologically given structures and dimensions, there is a difference in focus between them. The modal theory describes modal functions and structures and offers a way of doing justice to both the diversity and the coherence in reality. It focuses on the general, is related to theoretical thought, and tries to answer the question “How does something function?” Entity theory, on the other hand, focuses on classes of things and activities found in reality, is related to concrete experience rather than to theoretical thought, and asks “What is something?” This focus on the law side, rather than on the subject side, is visible in most of Dooyeweerd’s work and is commented on by Glas (1995, p. 77) in the following way: “Dooyeweerd has said a lot about the structural side; however, he has never given a satisfactory account of the individual side.” However, despite this focus, Dooyeweerd both recognizes and strongly argues that everything that we experience in the world around us has both a law side and a subject side.

Hence, it is within entity theory that the concept qualifying function belongs, but since this concept is a modally defined concept in the sense that it draws on the modal theory for its meaning, modal theory needs to be understood before the concept qualifying function can be fully understood. Because of this I will start with a condensed description of the most central parts of modal theory before I continue to entity theory and the concept qualifying function.

2.1. Modal Theory

Modal theory was the first part of the philosophy to be developed and it came about as a result of Dooyeweerd’s quest for a reformed epistemology and
ontology. In this search it was the notion of “Sphere Sovereignty” (Bratt, 1998; Dooyeweerd, 1997; Henderson, 1994; Kalsbeek, 1975), introduced by Abraham Kuyper (Bratt, 1998) in order to protect each type of institution in society from being dominated by any of the other types, that eventually inspired and guided Dooyeweerd in his development of the theory (Dooyeweerd, 1973, 1997; Henderson, 1994; Kalsbeek, 1975, p. 141).

In trying to answer what constituted or distinguished separate life-spheres such as the state, church, school, and family, and by what right these spheres should be sovereign and free to operate without being trespassed on by any other, Dooyeweerd gradually identified distinct modal aspects related to human experience and thought. Or, as Dooyeweerd says in an interview,

> During one of these walks in the dunes I received an insight (ingeving) that the diverse modes of experience, which were dependent upon the various aspects of reality, had a modal character and that there had to be a structure of the modal aspects in which their coherence is reflected. The discovery of what I called “the modal aspects of our experience horizon” was the point of connection. (Henderson, 1994, p. 38)

At the end of his life Dooyeweerd had identified 15 irreducible aspects or spheres of human experience which formed the base of the modal theory: the arithmetical, spatial, kinematic, physical, biotic, sensitive (psychic), logical, historical (cultural), lingual, social, economic, aesthetic, juridical, ethical, and pistic (credal). Besides providing a methodological criterion for what was meant by Kuyper’s concept sphere sovereignty, and hence providing a theoretical base for the concept, the modal framework also helped distinguish between different areas of knowledge and science.

Although we can distinguish all of the aspects in temporal reality, they never appear in isolation, but always in an inseparable and mutual coherence. It is only in order to understand more fully the different modalities and their individual natures, that is, the element that distinguishes each aspect from the others and makes it irreducible, that we need to isolate them. The element distinguishing each aspect from all the others is called the nuclei or kernel, and it is the nuclei that “characterizes or qualifies” (Kalsbeek, 1975, p. 84) a modality.

In Fig. 1, all the modalities together with their nuclei are listed. Hence, the arithmetic modality is characterized by its kernel, discrete quantity, which is different from symbolic representation, the kernel of the lingual modality. As with the modalities, the kernels always indicate a how, a manner of being, never a concrete something. Hence, continuous extension may never be identified with the space we see around us. Space is always related to a concrete something in which all the aspects are found, not just the spatial (Kalsbeek, 1975).

Since the modalities are based on human experience and thought, I will illustrate their meaning by relating them to a situation with which I think most readers will feel familiar. Imagine the social system that we call a hospital.
The Qualifying Function Concept in Systems Design

Fig. 1. The different modalities related to their nuclei (Bergvall-Kåreborn and Grahn, 1996a).

the arithmetical aspect is visible in the number of doctors, nurses, and patients occupying the building. The spatial modality becomes apparent during epidemic periods when there are more patients than the hospital can handle. Standing in the middle of a corridor, the presence of the kinematic dimension can be viewed in the movement of people walking from one room to another. It is also represented in the molecular movement present in our bodies. The people as well as the equipment within the hospital need energy in order to function which point to the physical aspect. The biotic or organic modality is perhaps especially apparent in a social system like a hospital where the main activities are centered around curing diseases, saving lives, and bringing new life into the world. It is, however, also visible in both the slow and the sudden deaths of some of the patients.

Watching different people as they receive good or bad news as to the condition of their loved ones, the joy as well as the pain they radiate is evidence of the sensitive modality of feeling and sensory perception. The logical aspect is represented by the work schedules and operation plans, which are developed from past experience (the historical dimension). Orders and instructions are mediated to those concerned either through direct communication or in writing, pointing to the lingual aspect and the significance of symbolic representation and interpretation. As I mentioned earlier the hospital is in itself a social system with its own norms of decency, deference, politeness, and fashion. Besides this, the social modality is also present in the close relationships that develop between people who work together under stress and pressure and in the fact that for many people, work constitutes a major part of their social life.

The economic aspect has become especially visible, at least in Sweden, due to the decline in the country’s economy and due to general rationalization efforts
that have resulted in massive cutbacks. The aesthetic modality is present in the beautiful gardens that hopefully surround the hospital, in the paintings or other kinds of decorations found inside, and in the colors of the wallpaper, curtains, and floors: all carefully chosen to create a harmonious atmosphere. The activities of the hospital need to follow many legal rules and regulations, and if they do not, the people responsible for these activities are usually brought to court to defend their actions (the juridical modality). The ethical modality goes beyond the juridical and is guided by the kernel of love and care rather than justice. This can result in actions such as doctors letting patients call them at home if something special happens and the much-debated situations where medical staff have given patients help in dying, with the argument that the patients had begged them for this and that they could no longer watch them suffer. Finally, the pistic modality reflects people’s trust and religious faith in what they regard as sacred.

The purpose of the modalities is not to describe exhaustively all of reality including human nature, nor do the modalities, or their sum, represent the whole of the universe. Instead the modalities reflect the rich variety in human life, and their intent is to remind us that both reality and humanity comprise a variety of discrete dimensions that cannot be reduced into one single dimension. The modalities also indicate that there is an interrelationship between the different dimensions that need to be considered.

Further, the list of modalities is not a final one. On the contrary, Dooyeweerd constantly emphasized that the modalities as well as their number should be open for correction and elaboration. In his later development he also showed this by including an additional aspect, the kinematic. This was originally part of the physical modality but Dooyeweerd argued that, while the physical modality was governed by energy, the kinematic was characterized by movement and hence distinguished from the physical modality. However, not all members of the school associated with Dooyeweerd agree with this distinction. Though it often is impossible, scientifically, to prove who is right and who is wrong in these arguments, the main principle stated by Dooyeweerd is that each modality should be fundamentally different from all the others. If this is not the case—if one modality is considered to be a variant of another modality and thus reducible to it—it should not be considered a separate modality.

2.2. Entity Theory

While modal theory focuses on what is common and general for all types of things and activities, entity theory focuses on what is specific to different classes of entities and activities. It strives to explicate the specific structure in which things and events, also called individuality structures, present themselves to us so that we can recognize them as one thing or another. Hence, it is within the latter theory that the concept qualifying function belongs.
An individuality structure is "a concrete, whole entity or event which has special qualities distinguishing it from all other individuality structures" (Kalsbeek, 1975, p. 42). However, the concept individuality structure refers to the structure of a class of entities or activities, not individual entities and activities. Hence, all dogs have the same individuality structure, which is different from that of cars or that of schools, and all individuality structures have a qualifying function.

While all individuality structures function in all 15 modalities, it is only human beings and individuality structures related to human beings, such as families, schools, and businesses, that function as a subject in all of the modalities. A biological plant functions as a subject only up to the biotic modality, while animals function as a subject up to the sensitive. This means that while a cat functions as a subject in the numerical, spatial, kinematic, physical, and sensitive, it functions only as an object in the other 10 modalities. A cat does not analyze situations, master a language based on symbolic representation, or live by any particular belief system. The cat does, however, as an object, function in all the above 10 modalities. As an object, the cat can be fought for in a court of law, its aesthetic qualities can be appreciated, and it can be described with the help of language.

In the same way that all individuality structures have subject and/or object functions, they also have founding and qualifying functions. The founding function of an individuality structure is related to the aspect that has created the specific individuality structure under study or made it possible for it to come into being. The qualifying function, on the other hand, refers to the function or modality that characterizes a particular individuality structure and "indicates the intrinsic destination of a thing" (Dooyeweerd, 1997, Vol. III, p. 60). Hence, it can be seen as the manager, foreman, or pilot of the internal structure of the certain individuality structure. Due to this, the concept is also referred to as the guiding or leading function. Finally, all four concepts have an ontological character by trying to establish what something is, not merely how we interpret something.

To illustrate better the meaning of the concepts founding and qualifying function, I will use a flower for my first example. Arguing that it is the biological modality that constitutes the founding function for flowers whereby they increase through, for example, pollution is probably not considered a radical statement. This is also their modal qualification, for, according to Dooyeweerd, the qualifying function of a flower is to be found within the biological modality. While the physical and chemical processes within a flower are of vital importance, it is the biological function that qualifies the flower as a structural whole. It is this modality that characterizes it more than any other modality, and hence it is within this modality that the inner structure of a flower is shaped which characterizes it as a biological plant, a flower, and, finally, as a bluebell, an oxeye daisy, or a tulip. However, the qualifying function should not be confused with
external teleological relations such as what end or purpose a flower can serve with reference to other beings. The facts that a flower provides food for bumblebees and other insects and that it is appreciated by people for its aesthetic form and nice scent lie outside of the internal structure of a flower. Hence, the inner structure, or destination, of a flower, or any other thing or activity, is implicitly distinguished from its external teleological relations according to Dooyeweerd.

While natural systems, such as a wildflower, have their origin in the origin of the universe, designed systems are the result of conscious human activity. This difference does not, however, affect the concept qualifying function, according to Dooyeweerd. If we take a book as an example, a book is qualified by the lingual modality through its kernel symbolic representation, and this is true for all kinds and types of books. Fiction, nonfiction, and children’s or picture books are all characterized by the aim or function to communicate something to the reader using symbols of different kinds.

Yet there are times when the context in which a thing or an activity belongs plays a key role in determining the qualifying function. Glas (1995) uses a chair to illustrate this. The main function of a chair is to provide a place where people can sit. But by which modality is this function qualified? To answer this question Glas suggests that it is this function combined with the context in which the chair is used that determines its modal qualification, and for a chair this is to be found within the social modality. “People use chairs to sit on, in order to work or to spend their leisure time. Assuming that these functions can be qualified as social, chairs can be said to possess a social object-function as qualifying function” (p. 69). Object function, here, means that the chair functions as an object, rather than as a subject in the social modality since the chair can be said to possess a social function as an object only in relation to human beings. Further, the qualifying function of a chair is said to be “expressed in and by means of the physical structure of the chair” (p. 69).

Following this argument, but taking a wineglass as the example, one can argue that while the main function of the glass is to be used as something people can drink from, it is the context in which the drinking is done that determines its qualifying function. Hence, a regular wineglass might be qualified by the social modality, while the wineglass, or chalice, used in Holy Communion would be qualified by the pistic modality. To highlight the difference in context and function, the wineglass used for Holy Communion is even given a special name. However, even for designed individuality structures there is still a fundamental difference between the qualifying function and subjective or external teleological ends, according to Dooyeweerd. While there is nothing to prevent us from using a book as a hammer or a wineglass as a coffee cup, we are usually conscious that, according to its entire inner structure, it has not been designed with this purpose in mind. Further, even when we use a thing apart from its original purpose, this does not change its inner structure; rather, “in empirical
reality the objective structure of a thing is constant so long as the latter exists” (Dooyeweerd, 1997, p. 147).

But, due to the relation that exists between designers' visions and the qualifying function of designed things or activities, three modes related to the qualifying function need to be defined. The first mode is called “intentional representational relation” or “objective qualifying function” and is defined as the “objectification, in the structure of a real object, of the intentional object, as the latter is conceived in the design of a thing.” This means that when one designs something the qualifying function of the designed thing or activity affects its structure, and through this, the qualifying function is objectified into the thing or activity. The second mode is called “unfolding relation” or “opening relation” and is said to be the “subjective unfolding or opening in human experience of the closed objective thing-structure.” By this is meant the experience or knowledge of the objective qualifying function of a certain individuality structure from a historical period. Finally, the last mode, called “actualization relation,” is defined as the “actualization of the objective thing-structure by human activity, which uses the thing according to its objective and open qualifying function” (Dooyeweerd, 1997, Vol. III, p. 148). This means that a certain individuality structure is used in accordance with its objectified qualifying function.

To illustrate the three modes let us consider the clothing of knights. In the medieval feudal society, knighthood had an actual military function. At the end of the Middle Ages, Knighthood lost its military significance but retained its position as a rank endowed with political power. The French Revolution destroyed this position, whereby knighthood disappeared as a particular privileged social rank. However, later generations can still unfold and experience knightly attire as objective socially qualified things of a bygone historical period. “Their objective qualifying function is the objectification, in the real clothing material, of an intentional conception of the designer of these costumes. This state of affairs remains unchanged by the transitions of cultural development” (Dooyeweerd, 1997, Vol. III, p. 147). However, the socially qualified objective function of knightly costumes can no longer be actualized in today’s society because the feudal class system has disappeared.

3. BENEFITS OF INCORPORATING THE CONCEPT QUALIFYING FUNCTION INTO SYSTEMS DESIGN

Before discussing how modal theory and the concept qualifying function can enrich systems design, there are two comments that I wish to make in relation to Dooyeweerd's view on the concept qualifying function. First, Dooyeweerd (1997, Vol. III, p. 147) argues that “in empirical reality the objective structure of a thing is constant so long as the latter exists.” I would say that this is a rule to which there are exceptions. Imagine a wineglass from ancient Greece. It might
have been designed as part of a fine service to be used at specific holidays, rituals, or other social or religious events. As such, it would be the social or the pistic modality that would guide its inner structure. However, by the time we discover the wineglass in modern times it might be impossible to use the glass in accordance with its original intent because we might not have full knowledge about the rituals or special occasions surrounding the use of the glass. While this might change the way we view the glass, it would not change the objective structure of the glass itself. If, on the other hand, the glass had been broken and had to be glued together or if it had been lying in a place where dangerous material had blended into its original material, this would both make it impossible to use the glass in accordance with its qualifying function and also, I argue, change the objective structure of the glass as such.

While the above illustration or argument might be more of an exception than a rule, when it comes to natural or designed things, it is much more common when it comes to social systems. These systems, contrary to natural and designed ones, can more easily change their structure with the passing of time and in relation to people's perception of them.

In a discussion about how it is possible to justify why a social system pursues one objective over another, Vickers (1959) says that, when faced with such questions, the system can only answer, or stop a regression of similar questions by answering "Because that is the sort of system I am" or by saying "Because that is the value I place upon it," which, according to Vickers (p. 100) is only another way of saying the same thing. These statements can help to clarify my view on the concept qualifying function in relation to social systems. While the former may seem more in agreement with Dooyeweerd's thoughts than the latter, I agree with Vickers when he says that they are really saying the same thing. Because the norms of a system, to a large extent, determine the character of that system. And it is my argument that the qualifying function chosen for a social system reflects these norms as well as influences them.

Besides this there is also a difference between the main aim of the philosophy of Herman Dooyeweerd and that of design methodologies, especially within the interpretative tradition, and this difference and its implications need to be discussed. The main purpose of Dooyeweerdian philosophy is to say something about reality: to describe or depict reality in order for us to understand it better. Hence, the concept qualifying function in its originality is thought to represent an actually present function within an individuality structure. Design, on the other hand, focuses on the new and not yet created, on reality as it can become, or be made to be. Or as Checkland (1981) puts it, designed systems have their origin in man; they are consciously designed as a result of some human purpose and they exist to serve a purpose. This implies that in systems design the task is to decide which function(s) best relates to the design vision of the designer(s) rather then to try and identify a specific and objective function present in already exist-
The Qualifying Function Concept in Systems Design

ing entities and activities. It also means that, even in the analysis of an existing situation, it is important to be able to view this situation from many different perspectives because, as argued earlier, our perceptions on reality affect our design visions for the future.

Hence, in the discussion below, concerning how the concept qualifying function can enrich systems design, I will use the concept in a more exploratory and interpretative way than it was intended in its original context. Here, three application areas for the concept will be discussed, all related primarily to the objective qualifying function mode of the concept.

The first uses the concept qualifying function and its related modal framework as an inspiration or stimulus, to help people in a particular problem situation to view that situation from new and different perspectives. The importance of being able to perceive situations from different perspectives has been argued by many authors (Ackoff, 1993; Checkland, 1981; Flood and Jackson, 1991) and cannot be overemphasized in a design situation. Ackoff (1993), for example, argues that the identification and removal of self-imposed constraints provide two out of three steps in creative behavior. The third is an exploration of the consequences of having done so. This, however, often requires that we can change, break away from, or at least question our present frame of mind or worldview, something that has proven to be a very difficult task, which also often appears very threatening to people. As an example of how hard it can be to question previously unquestioned worldviews, consider the well-known example of the shift from the Aristotelian to the Copernican worldview related to the structure of the Universe.

In Total Systems Intervention, Flood and Jackson (1991) do something similar by relating different systemic metaphors, similar to those of Morgan’s (1986) eight metaphors of an organization, to different systems methodologies. They argue that these metaphors can highlight aspects of a particular problem situation and hence guide the choice of appropriate systemic problem-solving methods. Or as Midgley (1997, p. 259), puts it, “[P]articipants can use them to think in different ways about the issue with which they are concerned.” In addition, they argue that consciously looking at problem situations through different metaphors should help a manager in creative thinking.

To illustrate better how the concept qualifying function can help us to tease out different perceptions of a certain situation and break away from ingrained notions and frames of mind, I shall use the earlier example of a hospital as an intellectual experiment. Prehistorically sickness was considered to be a punishment from the Gods or the result of evil persons’ witchcraft, and the symptoms were usually seen as evidence that the body had been taken over by an evil spirit. Hence, the remedy was sorcery and magic. With this view of sickness and health I would argue that it was the pistic modality that constituted the qualifying function of the healing activity. However, even as early as 1600 BC, evidence
suggested that there also existed a more empirical and earthly view of the cause of sickness, at least in Egypt. In Greece, the father of health ethics, Hippocrates (460–377 BC), defined a doctor’s principal task as to serve and be of use to, or at least not hurt, the patients.

In Sweden, in modern times, hospitals have, by tradition, been viewed as governmental organizations with missions focusing on biological curing and healing, rather than on economic profit. It is the biological modality that, to the largest extent, has guided the discipline in both its practical and its theoretical endeavours. In recent times, however, other factors, such as the ethical, social, and aesthetic, are also starting to be emphasized as important for the healing process. Some people even argue that the focus should be shifted from the biological to the ethical and that the leading function for hospitals should be to give love and care rather than to save lives. However, considering the large cutbacks in the budgets for hospitals leading to policies saying that old people will be allowed to shower and get some fresh air only once a week, it could also be argued that it is the economic modality, rather than the biological or ethical, that influences hospitals more and more. Cutbacks have even forced some hospitals to shut down wards, refuse admission to people in need of their services, and issue public statements saying that they can no longer guarantee the safety of their patients. Even if these three perceptions might not be all too radical, they still function as an illustration of how the modalities help us to view a situation or a system from different perspectives.

It could of course also be argued that the concept qualifying function, while being based on the 15 modalities, can create a boundary for our thoughts and hence constrain rather than free our minds. While I have to agree that this is a possibility, my defense is that all concepts, tools, methods, or methodologies have this weakness. While they help us and guide us in how to think, what to do, and how to do it, they also automatically have the possibility to constrain us. As soon as you say do this, it can also be interpreted as saying do not do that. However, I argue that the help they offer far exceeds the constraint they represent. Further, this weakness or constraint inherent in methods and methodologies can be limited by being aware of its existence and by working with many different and diverse methods.

Second, besides being used as an inspiration or stimulus to help people view situations from different perspectives, the concept can also, together with the theory it builds on, be used to help a designer assess different design alternatives as well as their consequences. This can be achieved by choosing different qualifying functions for the system to be designed and then analyzing how these choices would affect the characteristics and inner structure of the system. If we take a hospital as an illustration once again, and limit ourselves to only two possible modal qualifications, the biotic and the ethical, this would have the following effects. Taking the biological modality as the guiding one, represented by the function saving
lives, would, for example, most likely result in hospitals where providing help in
dying was seen as a real “sin.” It would go against the very purpose of their activi­
ties. It would probably also result in hospitals where very sick and weak patients
might not be allowed visits from their relatives and where patients would be forced
to stay in the hospital as long as this was considered to be the safest alternative. If,
instead, the ethical modality was chosen as the qualifying function, help in dying
might in some circumstances be considered more human and caring. It is also pos­
sible that these hospitals would give a higher priority to the social needs of patients,
even at the expense of the biological. This could mean less rigid rules regarding vis­
itors and perhaps the possibility for patients to be cared for in their homes rather
than in the hospital. Besides this, one can also simulate discussions as to where
the hospital should be located, close to family and friends or where the air, tem­
perature, and humidity are especially favorable, and how the hospital should be
designed—how important it is to have playgrounds and playrooms and to have
family rooms enabling close relatives to stay overnight or even live with the patient
for short or long periods of time. Besides the biological and ethical modality, other
modalities can also be considered, such as the economical, for example. When
discussing different design alternatives, Dooyeweerdian philosophy also indicates
that good design is characterized by a vision and strives for an alternative where all
of the modalities are allowed space and where there exists a balance and harmony
between the different modalities.

Third, Ackoff (1993, p. 406) argues that, in general, people tend to disagree
less about ideals then about shorter-range goals and ways of pursuing them and
that “the more ultimate the values, the more agreement they generate.” He con­
tinues by saying that once agreement has been reached on ultimate values, dif­
ferences over means and short-range goals can often be resolved. Following this
argument, I argue that the concept qualifying function can be used in order to
find accommodation, and hence has the potential of providing a common base
for design, from which many different types of systems still can be perceived.
Besides being used to find common ground between participants, the modalities
can also point to fundamental differences of opinion as to what should guide
and give meaning to the system in question.

4. SUMMARY AND CONCLUSIONS

The main aim of this paper was to explore potential benefits that the concept
qualifying function can have for systems design. It was argued that since the
artifacts that we design have such an immense impact on our lives as well as
on our future freedom of action, it is of crucial importance to reflect on how we
want this future to look. For this, conceptual tools such as ideals, thought figures,
and mental models are of vital importance. The concept qualifying function can
be one such conceptual tool.
The concept originates from the philosophy of Herman Dooyeweerd and refers to that which guides and directs the internal structure of a certain class of entities or activities. This means that changing the qualifying function for an entity or activity will change the structure as a whole for that entity or activity. Hence, in the example of the hospital, we can see that choosing the biotic or ethical modality as the base for the qualifying function not only will change how we perceive the hospital but also will affect how it will look, where it might be placed, and the norms and routines that will guide the work of nurses, doctors, and the administrative staff.

With this in mind, I pointed out the following benefits that the concept qualifying modality can have in design situations. First, it can help people in a particular problem situation to view the situation from new and different perspectives, hence to identify and remove self-imposed constraints. This has proven to be a very difficult task, but one that is of utmost importance for creative design and good insight into problem situations. Second, it can be used to explore and analyze the consequence of different design alternatives. Third, it can provide a common though general base for the design around which accommodation can be reached more easily, and from which further discussions can be continued. Finally, it has the potential also to point at fundamental differences of opinion between the participants and the stakeholders.

Since this paper constitutes only a first exploration of how the notion of qualifying function can enhance and enrich systems design, further work needs to be done on the subject. The concept needs to be applied in empirical studies so we can learn more about its strengths and weaknesses. It also needs to be related to a design methodology that can give it a proper context. Further, its ontological and epistemological character needs to be analyzed and its relation to concepts such as worldview, missions, and goals needs to be explored further.

REFERENCES


Enriching the Model Building Phase of Soft Systems Methodology
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Enriching the Model-Building Phase of Soft Systems Methodology

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Soft Systems Methodology (SSM) has been criticized for its tendency to result in regulatory, rather than radical, agendas for change. It has also been argued that when stressing the difference between different Weltanschauungs SSM takes them at face value and does not investigate the similarities between them or seek an explanation for this in terms of the structure of society. The aim of the paper is to address these critical comments made towards SSM by incorporating a concept called qualifying function as a conceptual tool for modelling and design. The concept has the potential to help people in a particular problem situation to view the situation from new and different perspectives. It also has the potential to enrich the conceptual models by directing the transformation process. Finally, it provides an alternative technique for model validation by relating the root definition and the conceptual model closer together. Copyright © 2001 John Wiley & Sons, Ltd.

Keywords systems design; soft systems methodology; qualifying function; dooyeweerdian philosophy.

INTRODUCTION

The importance of worldviews, perceptions and conceptual tools in design situations is becoming increasingly acknowledged as the view on design as a mental activity is recognized and emphasized (Dahlbom, 1992; Fairtlough, 1982; Mirijamdotter, 1998; Stolterman, 1991). While the soft systems thinking approaches, in general, are characterized by a subjectivist approach to social science, there is one approach in particular, Soft Systems Methodology (SSM), that has paid special attention to people's perceptions of reality, their worldviews, and how these perceptions and worldviews affect design situations. SSM aims at extending the area in which systems ideas can be used to find a structure, and hence help improve or solve real world problems in the realm of social systems; SSM has, as such, been argued to be 'the most self-conscious (and certainly the most rigorous) attempt at an interpretive systems methodology' (Jackson, 1982 p. 22). This is done by taking seriously the subjectivity which is the crucial characteristic of human affairs and to 'treat this subjectivity, if not exactly scientifically, at least in a way
characterized by intellectual rigour' (Checkland, 1981, p. 30). This attempt is visible throughout the methodology and based on the assumption that individuals interpret situations differently and in accordance with what they find meaningful. Further, what is perceived as meaningful is based on our particular "image" (Boulding, 1956b) of the world, or Weltanschauung (Checkland and Davies, 1986), which in turn is formed by individual preferences, background, knowledge and experience, and which, in general, we tend to take for granted. SSM teases out such world-images and examines their implications. Because of this, the concept of Weltanschauung is argued to be the most important in the methodology (Checkland, 1981, p. 18).

However, in order to handle the complexity that a person's Weltanschauung implies, the content of the term has been reduced quite drastically in the model-building part of SSM. Instead of including the whole Weltanschauung of a person, Checkland suggests that it is enough to try and draw out the underlying rationale of why a person finds it meaningful to carry out a certain activity or transformation. Even if this is most helpful, it has been argued by Bergvall-Kåreborn and Grahn (1996a) that the concept has been too narrowly restricted to do full justice to the diversity found in different perceptions. Mingers points to another weakness related to the concept Weltanschauung by arguing that when stressing the difference between different Weltanschauungs, SSM takes them at face value and does not analyse the similarities between them or seek an explanation for this in terms of the structure of society: 'It therefore lacks an explanation of why these particular W's have developed and thereby how they might be changed' (Mingers, 1980, p. 48).

It has also been argued by many authors (Jackson, 1982; Mingers, 1980, 1984; Naughton, 1979; Prévost, 1976; Schregenberger, 1982) that the methodology has a tendency to result in conventional and regulatory, rather than radical, agendas for change. Some authors (Jackson, 1982; Mingers, 1984; Prévost, 1976) argue that this is an inherent characteristic of the methodology due to its functionalistic and/or subjective character. Jackson (1991), for example, argues that there is no attempt within SSM to make sure that conditions for genuine debate can be provided. Because of this '[t]he kind of open, participative debate which is essential for the success of the soft systems approach, and is the only justification for the results obtained, is impossible to obtain in problem situations where there is fundamental conflict between interest groups which have access to unequal power resources' (Jackson, 1991, p. 133).

A contrary view (Checkland, 1982; Mingers, 1980; Naughton, 1979). is that this remains unproven and that it is equally likely that the regular tendency stems from the context within which these studies have been carried out, people's inherent resistance to change, or lack of insight and originality on the part of those using the methodology, rather than from an intrinsic defect in the approach itself. As an example of the last reason Naughton points to his own experience and says that when making the transition from root definition to conceptual models 'inexperienced analysts invariably plump for bureaucratic-type models' (Naughton, 1979, p. 70).

I agree with Checkland and Naughton and argue that there is nothing in the methodology per se which forbids or makes radical changes impossible. Further, while Jackson (1982) is quite right when he says that there is no real attempt within SSM to make sure that conditions for genuine debate can be provided, and that debates characterized by constrained discussion can prevent radical changes from being expressed, I cannot find any methodology that has succeeded in eliminating differences between stakeholders related to power, resources and intellectual capacities. Jackson is also partly right when he says that in social systems 'political or economic factors often act as the main catalyst of change' (Jackson, 1983, p. 113). However, I argue that these changes, even when they have their source in political and economic changes, reflect changes in Weltanschauung among people and groups, and that many times it is changes in values and attitudes that drive the political and economical changes, rather than the other way around. Just think of the abolition of slavery in North America, women's right to vote, and the more recent opinion against circumcision, or
maiming, of young girls in Africa. These are all, I would argue, radical changes which have come about due to changes in people’s Weltanschauung, and in settings characterized by constrained discussion.

Hence, I sympathize with Jackson in his endeavour to achieve an open and participatory debate characterized by ‘unconstrained discussion’ (Jackson, 1982). However, I think this endeavour should be viewed as a vision rather than something all methods and methodologies need to achieve or fulfil before we can use them, otherwise we will find that we have very few methodologies at our disposal. I also argue that, while a constrained discussion can prevent radical changes from being expressed, unconstrained discussions in themselves are no guarantee for radical change.

Nevertheless, since many people perceive the methodology as regulative and argue that in practice radical changes often do not occur as a result of using the methodology, it is important to see how this can be changed. In this paper, I will do this by concentrating on the second reason for SSM’s tendency towards conservative and regulative changes by exploring one way of helping the users of SSM to break away from traditional ways of viewing an issue or problem situation. I will also explore if it is possible to enrich the concept of Weltanschauung, used in the modelling phase, without making it too complex to deal with in a real-world situation. This is done by introducing a concept termed ‘qualifying function’ (Dooyeweerd, 1997). The concept, which aims at identifying or defining the leading or guiding function for a thing or activity, originates from a Dutch philosophy developed by Herman Dooyeweerd, here referred to as the Dooyeweerdian philosophy.

Thus, the aim of the paper is to address some of the critical comments made regarding SSM by incorporating selected theories and ideas from the Dooyeweerdian philosophy with the aim of strengthening SSM, not to try and combine Dooyeweerdian philosophy with SSM. The paper should also be seen as a continuation of the multimodal developments of SSM, as set forth by Bergvall-Kåreborn and Grahn (1996a, 1996b) and Mirijamdotter (1998), and has the following structure. It starts with a description of SSM, followed by a presentation of the philosophy of Herman Dooyeweerd, with a focus on the theories related to the concept of qualifying function. After that, the benefits of incorporating the concept of qualifying function will be discussed. Finally, the paper ends with a summary and conclusions.

SOFT SYSTEMS THINKING

SSM is a cyclic learning system which uses models of human activity systems to explore with the actors in a real-world problem situation their perceptions of that situation and their readiness to decide upon purposeful action which accommodates different actors’ perceptions, judgements and values’ (Checkland, 1984, p. 98).

The methodology evolved through an action research programme at Lancaster University (Checkland, 1979b; Checkland and Jenkins, 1974), starting at the end of the 1960s, as a reaction against the inability of contemporary management science in handling complex real-world problems (Checkland, 1970, 1972, 1978, 1981, 1984, 1994; Checkland and Griffin, 1970; Checkland and Haynes, 1994).

According to Checkland (1970), Management Science was at that time characterized by extreme confusion, and there were two main sources of this. Firstly, there was considerable confusion among the practitioners of the many different varieties of Management Science. Secondly, there was confusion due to its lack of impact on the day-to-day reality of management. There was an enormous gap between what was theoretically possible, using all the techniques of Management Science, and what was actually put into practice.

While Checkland believed that the systems approach, in general, could help resolve the first confusion by revealing the pattern of the whole of Management Science and provide a way of structuring it, the general systems approach could not, at least not at that time, bring possibilities and actualities closer together. Systems Engineering, on the other hand, being the
practical manifestation of the systems view, could. Systems Engineering, in the Lancaster sense, was 'an attempt to use the insights of systems thinking to solve real problems, and to develop the subject by means of this close involvement in actual management problems rather than by pursuing the mathematics of General Systems Theory' (Checkland, 1970, p. 9).

Besides the above problems related to Management Science, Checkland also argued against the goal-seeking model of human action found in these theories as well as in traditional organization theories. Here, the manager is viewed as a purely rational decision-maker, pursuing organizational goals that often provide the standards against which progress will be judged.

Thus, in order to find a complement to contemporary management theories, Checkland began to investigate whether systems thinking approaches of that time, like Systems Analysis and Systems Engineering, could be used. This was done by studying what happened when these methodologies were applied to 'soft' problems, such as those of policy-makers, administrators and managers. It was especially the methodology described by Jenkins (1969) that constituted the starting point for SSM in this work. However, these approaches were also found to be inadequate for managerial real-world situations due to their emphases on structured problems, and hence on finding efficient means of achieving known and defined ends. This was an inappropriate focus for managerial problems, characterized by Checkland as ill structured, fuzzy and 'soft' and where the real difficulty lies in defining the problem itself (Checkland, 1979a).

Besides this, these approaches, later referred to as 'hard systems approaches', also shared management science's view of reality as objective, neutral and value-free as well as the goal-seeking model of human behaviour. Checkland reacted against this and instead pointed out that people interpret situations differently, depending on what they find meaningful. What is perceived as meaningful is dependent on an individual's background, previous knowledge, experience and so on. Therefore, a situation perceived as problematic by one person need not be interpreted accordingly by another. Further, depending on the way we interpret a situation, we form intentions; i.e., in the light of our interpretation we decide to do one thing rather than another. To explain human behaviour it is necessary to know the underlying concepts of intentions that were acted upon; we need to know the underlying purpose. By bringing these things into the open, we can also better understand and learn from each other. This also points to the fact that learning is personal and needs to be adjusted to the knowledge and experience of each individual if it is to be really helpful. Furthermore, real-world managerial problems are multifaceted and cannot be pressed into predefined form; they are characterized by the fact that their objectives are hard to define, the decision-making process is uncertain, and suitable measures of performance are at best qualitative.

Based on the experience gained by applying the hard systems thinking approaches to soft and unstructured problems, the Lancaster group started to redefine Systems Engineering until it was clear to them that a new methodology had evolved: Soft Systems Methodology. This methodology still depended largely on the hard systems approaches, but tried to place these theories within the arena of human affairs by relating it to the work of Sir Geoffrey Vickers (1970, 1983a, 1983b) on 'appreciative systems' and to Churchman (1971, 1984) and his writings on Inquiring Systems.

Besides these theories the interpretative tradition is also represented in SSM by both hermeneutics and phenomenology. However, among the above-mentioned theories, it seems that it is Churchman who has made the greatest impression on Checkland when it comes to the notion of Weltanschauung (Checkland, 1981). It is also in relation to this concept that one main difference between SSM on one hand, and Systems Analysis and Systems Engineering, on the other, or more generally, between soft and hard systems thinking, can be found. The difference is that while the hard approaches believes in, and aims to describe, an objective world, and hence, according to the language of the soft approach only takes one Weltanschauung into consideration, the soft approach acknowledges
and considers many different perceptions and Weltanschauungs.

In striving to develop a new methodology that could extend the area in which systems ideas could be used in the realm of social systems, the guiding principle for the Lancaster group was that 'only concepts used in actual problems would be incorporated into the findings, and that the outcome should be a methodology for using systems ideas to find a structure in, and hence solve, real-world problems of a 'soft' or ill-structured kind' (Checkland, 1975, p. 278). According to Checkland, the unquestioned prime value embodied in 'a systems approach, and the implicit value system of SSM is that continuous, 'never-ending learning is a good thing' (Checkland, 1981, p. 285). Besides this, a number of other underlying assumptions can also be found, like the assumptions that people in general want to solve their problems or improve problematic situations and that in order to do this some kind of consensus or accommodation between stakeholders needs to be achieved. Further, it is assumed that many problems and conflicting situations involve disagreements related to needs, objectives, measures of performance, etc., and have their base in either misunderstandings and/or differences in interests or culture. These misunderstandings and differences are usually due to lack of understanding or information or to different and incompatible Weltanschauungs. Either way, by understanding each other and these differences better we can solve, or at least improve, many problematic situations.

Other SSM characteristics arising from this are that SSM views the design process as a learning process and points at the importance of making plain many different perceptions of the problem situation, as well as the underlying rationale or 'hidden rationality' (Stolterman, 1992) of these perceptions. It stresses the importance of trying to break away from self-imposed constraints and frames of mind, and, finally, it tries to reach accommodation through discussion. To summarize, the purpose of SSM can be stated as follows: to improve real-world situations by orchestrating changes of appreciation through a cyclic learning process.

The SSM process, which according to Checkland 'is, in fact, a method for the more formal articulation of the workings of what Vickers terms the process of appreciation' (Checkland, 1979a, p. 325), consists of four main phases: finding out; systems modelling; comparison; and, taking action, illustrated in Figure 1. It is not the phases in themselves that makes SSM particular because as Checkland himself points out, they are all 'everyday mental acts' (Checkland, 1981, p. 214), and can be found in most methods and methodologies aimed at change. Rather, its particularity is the way in which these phases are perceived, due to the epistemological and methodological Weltanschauung of the originators of SSM.

Even though it is possible to start the process at any phase (it is the relation between the phases rather then their order that is important), it usually starts in the first phase by an exploration of a real-world situation of concern (the left centre of the figure), initiated because someone perceives that situation as problematic and wants to do something about it. The purpose of the exploration is to provide a better understanding of the situation in question and it is

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1These phases are called 'perceiving', 'predicating', 'comparing' and 'deciding' by Checkland (Checkland 1981, p. 214).
usually summarized in a so-called ‘rich picture’ (Checkland and Scholes, 1990).

From the rich picture, issues, judged by the analyst or someone else to be relevant for improving the problem situation, are selected and modelled using systems concepts (the upper right-hand corner of the figure). These models, depicted as square boxes, illustrate different perceptions or interpretations of the real-world situation under study and represent activities that logically need to be performed in order to reach a certain purpose. Because of this, they are referred to as conceptual models of ‘human activity systems’ (HAS) (Checkland, 1971, 1981; Checkland and Scholes, 1990), and the class human activity systems comprises all activities that are carried out by human beings. In order to form a ‘whole’ or a system, these activities are linked to each other by some principle of coherence or some underlying purpose or mission. Further, these models should be neither accounts of the real world, nor Utopian designs, but rather epistemological devices which help to structure a debate.

In the third phase, the models of human activity systems are set against actual perceptions of the situation, based on individuals’ appreciative settings and, to some extent, depicted in the rich picture (the right centre of the figure). Through the comparison, and the debate it creates, new insights are revealed and appreciative settings may be changed, hopefully in such a way that accommodations between different interests and views can be reached – accommodations that emerge as both feasible and desirable and can lead the way towards actions to improve the situation. This represents the fourth phase and is depicted at the bottom of the figure. The implementation of agreed-upon changes, or actions to improve the situation, then becomes the new problem situation and this way the methodology comes full circle. However, if changes cannot be agreed upon, a more extended examination of relevant systems will be necessary.

The purpose of the modelling phase is to tease out different perspectives of the problem situation and to structure the thinking of the same. In order to do this, some ‘precise’ techniques have been developed, which consist of root definition (RD); PQR\(^2\); CATWOE and conceptual models (CM) of human activity systems. Root definition means naming, in a short statement, a system of purposeful activity. The formal rules for a well-formulated root definition are that it should contain the elements of the mnemonic word CATWOE (Smyth and Checkland, 1976) and/or include the elements of PQR (Checkland, 1999). PQR refers to the statement ‘Do P by Q in order to contribute to achieving R’ and answers the three questions: What to do (P); How to do it (Q); and Why do it (R)? (Checkland, 1999, p. A23f.), while CATWOE stands for:

- Customers: the persons that would be beneficiaries or victims of the system;
- Actors: the persons who perform the transformation process;
- Transformation: an input–output process by which some entity is changed to some new form of that same entity;
- Weltanschauung: a worldview which makes the transformation meaningful\(^3\);
- Owners: the persons who can stop the transformation;
- Environmental constraints: elements which affect the system but which cannot be controlled.

The aim of the conceptual model is to represent the minimum number of logically contingent activities that need to be carried out in order to accomplish what has been defined in the root definition, and which the actors could, in principle, carry out right away. These models are not models of parts of the real world, as was pointed out above, but rather ‘ideal types’ in Weber’s sense. This means that each model is formed by the one-sided accentuation of a certain perception of the world, that is, by a worldview or Weltanschauung. Since the Weltanschauung is different for different people and since a

\(^2\)In earlier writings PQR has always been referred to as XYZ, but in Checkland (1999) it is changed, with the argument that Y might be confused with why represented in the question ‘why carry out the transformation’?

\(^3\)In Checkland (1981, p. 225) Weltanschauung is said to make the root definitions meaningful to the actors in the situation.
particular Weltanschauung of a particular person changes through time, Checkland argues that there is no such thing as the real human activity system. Hence, in a sense, 'human activity systems do not exist; only perceptions of them exist, perceptions which are associated with specific Ws' (Checkland, 1981, p. 219). This means that both the concepts human activity systems and conceptual models cannot exist without the concept Weltanschauung.

Further, every concept in the root definition should find expression in the conceptual model, and the conceptual model should reflect all aspects of the root definition, but no others. The aim is to achieve a pairing of root definition (what the system is) and conceptual model (what the system must do in order to be the system named in the root definition) which are mutually consistent (Checkland, 1981). Until recently, it was argued that conceptual models ought to represent what rather than how since they originate from root definitions and these latter usually define a what (Checkland, 1981; Wilson, 1992). It was also argued that, in order for the comparison phase to result in an outcome that is as effective as possible, the what of the conceptual model should be compared with the how of the real world.

Schregenberger, however argues that 'we cannot expect a CM to be ‘deduced’, or in a deterministic sense, ‘derived’ from a RD, since the modelled original (the human activity system) cannot be considered to behave deterministically. CM’s derived from RD’s cannot be more than ‘systematic associations’: representations of abstract stored knowledge about analogous originals. Two different persons will derive different CM’s from a given RD; since they will have different abstract concepts about the real world, being as they are to a large extent the result of formal education and training' (Schregenberger, 1982, p. 97).

This is also in line with Mingers’ argument that from each root definition a number of different conceptual models can always be conceptualized; ‘there can never be a completely specified expansion of an RD into one and only one CM, unless the RD explicitly includes all the main activity verbs, in which case it could be argued that it is specifying a how anyway’ (Mingers, 1990, p. 23). Because of this, Mingers suggests that conceptual models should not be seen as what but rather as fairly general hows, detailing the way in which the what, expressed in the root definition, is to be carried out. Due to this, but also in accordance with their own practical experience, Checkland and Tsouvalis argue that ‘CMs should, therefore, better be seen as ‘hows’ rather than ‘whats’ (Checkland, and Tsouvalis, 1997, p. 168).

Further, Checkland and Scholes argue that it is important that the formulation of these three, or four, techniques (RD, CATWOE, PQR and CM) are consistent with each other, ‘since credibility (and the participants’ confidence in the process) can be diminished if some smart person in the situation points out a basic logical flaw in the model’ (Checkland, and Scholes, 1990, p. 41). In this effort, the concepts of transformation process and Weltanschauung can be seen as a kind of glue which helps to keep the techniques in coherence with each other. These two concepts also form the base for the whole of the modelling phase; together they constitute the foundation for both the root definition and the conceptual models.

The importance of the concept of Weltanschauung and its central position within SSM have also been argued by other authors (Checkland and Davies, 1986; Fairtlough, 1982; Jackson, 1982). Within SSM, the concept is defined as a set of assumptions taken as given in communication between people which can help an observer understand social situations. Hence, it helps explain a situation, rather than the actors in that situation. This can be illustrated by an example given by Checkland (1981), where he says that when we observe people voting we do not see marks being made on pieces of paper but rather human beings taking part in the democratic process. Hence, whether we realize it or not, we view ‘raw’ data via a particular mental framework, worldview or Weltanschauung and we attribute meaning to the observed activity by relating it to this larger framework that we supply from our minds. Even more, the observed activity is only meaningful to us in terms of a particular Weltanschauung, which in general we take for granted.
However, as a response to Fairtlough’s (1982) article, pointing at eight different meanings associated with how the term Weltanschauung was used in SSM, Checkland and Davies (1986) distinguish three categories of the term: W1, W2 and W3. W1 is a taken-as-given set of assumptions which makes a particular root definition meaningful and is there only to help in model building. It has nothing to do with the dynamic flux of events which represents social reality and should be stated as pure and as simply as possible. W2 is related to a version of the problem situation and, thus, related to the taken-as-given assumptions in W1 in the sense that W2 makes W1 relevant. Finally, W3 is of wider concern and related to the social reality in which the problem situation is embedded. W3 is linked to our beliefs and assumptions about reality and makes us understand social situations. This means that while W1 is related to the modelling phase, W2 and W3 are not; they are both related to the problem situation existing in the real world. Because of this, neither W2 nor W3 is included in the techniques developed for SSM (Checkland and Davies, 1986; Fairtlough, 1982). Checkland and Davies also say that the concept Weltanschauung should be reserved for W2 and W3, while W1 can be referred to as simply W.

While I can understand the distinction made by Checkland and Davies, I feel that this distinction tends to drain the methodology of the richness that the concept Weltanschauung stands for. Since it is only W1 that is used in the modelling phase, and this concept is quite limited and restricted, much of the richness and therefore also understanding is lost. Evaluation of a broader notion of Weltanschauung, which could be found in W2 and W3, is also needed. The weakness of limiting the modelling phase to only W1 has also been mentioned by Bergvall-Kåreborn and Grahn (1996a).

To illustrate my point I will give two examples from randomly chosen case studies of SSM. The first example is from a case study carried out in the East Berkshire District Health Authority, where the purpose was to investigate and recommend ways of measuring the performance of community medicine in this district (Checkland and Scholes, 1990, p. 100).

**Root Definition:**

A DHA-owned [District Health Authority] system, staffed by professional officers accountable to the DHA which, in the light of existing provision of health care (NHS [National Health Service] and non-NHS), plans and organizes the delivery of health care to defined populations using current health technology. The system manages the delivery via both ongoing services and specific projects, operates according to principles laid down by DHSS and Region and within the budget allocated. The system responds also to ad hoc issues arising outside the framework described. Its reporting meets the requirements of the ‘NHS planning system.’

**CATWOE**

T: population in given health state → population in improved health as a result of this system’s contribution

W: organized provision of health care is feasible and desirable, it can be planned and organized

What do the T and the W really mean in the above statements? Why is it meaningful to plan and organize for improved health of people and why is it meaningful to improve the health of people at all? The W does not answer these questions; it does not address the issue of why improved health, or planning for it, is desirable and meaningful to achieve. Rather, it focuses on how to achieve improved health (through organized provision of health care). Besides this, the W also seems a bit too general because, in order to understand the given statement, we also need to understand the underlying rationale behind the assumption that organized provision of health care will, in fact, improve the health of people.

The second example is from Checkland and Tsouvalis (1997, p. 5) and looks as follows:

**Root Definition:**

A professionally-manned system in a manufacturing company which, in the light of
market forecasts and raw material availability, makes detailed production plans for a defined period.

CATWOE

T: need for production plan → need met
W: rational planning of production is desirable and is a possibility

Similar questions can be asked in relation to this second T and W. Why is there a need for a production plan and what makes rational planning desirable and possible? The fact that someone wants to do T and think it is possible still does not tell us why that person would like to do T. Hence, in both of these cases the W in CATWOE does not really make plain what makes the transformation meaningful. Further, while it is important to state both what is to be done and how it is to be done, it is equally important to state why it should be done, and in these two examples the why seems to be lost, both in relation to the what and how. Finally, the Ws also seem too general and, as Boulding says, ‘we always pay for generality by sacrificing content’ (Boulding, 1956a, p. 197). One result of this is that the more general a W is stated, the larger the number of possible interpretations that can be generated and, according to Checkland (1981), it is very difficult to make conceptual models out of root definitions including multiple transformations and Ws. Because of this, it is important to find some way to make the T more specific.

THE PHILOSOPHY OF HERMAN DOOYEWERD

The philosophy of the Cosmonomic Idea, as it was called originally, was mainly developed by Herman Dooyeweerd (1894–1977), but is also related to the work of people such as Groen van Prinsterer (1801–1876) and Abraham Kuyper (1837–1920). Currently, however, the philosophy is usually referred to simply as Dooyeweerdian philosophy. It builds on the worldview coming from the Judeo-Christian tradition and assumes an ordered reality where structures and laws, to a large extent, already exist. These structures and laws are seen, not as constraints, but rather as guidelines helping the individual to understand the world around him and directing him when intervening in this reality through the process of human formation.

Hence, the philosophy aims at describing reality in order for us to understand it better. It consists of five fundamental and coherent theories: (1) the theory of religious ground motives; (2) the modal theory; (3) the theory of time; (4) the entity theory or the theory of individuality structures; and (5) the social theory.

In the following, I will focus on the parts of the philosophy that directly relate to the concept qualifying function. This means that only parts of the modal theory and parts of the entity theory will be covered. While both theories mainly deal with the law side of reality, there is a difference in focus between them. The modal theory describes modal functions and structures and offers a way of doing justice to both the diversity and the coherence in reality. It focuses on the general, is related to theoretical thought and asks ‘What is something?’ This focus on the law side, rather than on the subject side, is visible in most of Dooyeweerd’s work, and is commented on by Glas in the following way: ‘Dooyeweerd has said a lot about the structural side; however, he has never given a satisfactory account of the individual side’ (Glas, 1995, p. 77). However, despite this focus Dooyeweerd both recognizes and strongly argues that everything that we experience in the world around us has both a law side and a subject side.

The Modal Theory

The modal theory was the first part of the philosophy to be developed and it came about as a result of Dooyeweerd’s (and Vollenhoven’s) quest for a reformed epistemology and ontology.
In this search, it was the notion of ‘sphere sovereignty’ (Bratt, 1998; Dooyeweerd, 1997; Henderson, 1994; Kalsbeek, 1975), introduced by Kuyper in order to protect different types of institutions in society from being dominated by the state, that eventually inspired and guided Dooyeweerd in his development of the theory (Dooyeweerd, 1973, 1997; Henderson, 1994; Kalsbeek, 1975). However, even though Kuyper saw the state as the strongest source of domination in society and therefore focused his interest on the relation between the state and other types of institutions, the idea behind the concept is more general and seeks to protect each type of institution in society from being dominated by any of the other types.

In trying to answer what constituted or distinguished separate life-spheres such as the state, church, school and family, and by what right these spheres should be sovereign and free to operate without being trespassed by any other, Dooyeweerd gradually identified distinct modal aspects related to human experience and thought. Or as Dooyeweerd says in an interview:

During one of these walks in the dunes I received an insight (ingeving) that the diverse modes of experience, which were dependent upon the various aspects of reality, had a modal character and that there had to be a structure of the modal aspects in which their coherence is reflected. The discovery of what I called ‘the modal aspects of our experience horizon’ was the point of connection. (In Henderson 1994, p. 38)

However, besides providing a methodological criterion for what was meant by Kuyper’s concept of sphere sovereignty and, hence, providing a theoretical base for the concept, the modal framework also helped distinguish between different areas of knowledge and science. At the end of his life, Dooyeweerd had identified 15 irreducible aspects of human experience which formed the base of the modal theory (see Figure 2). These were the arithmetic (numerical), spatial, kinematic, physical, biotic, sensitive (psychic), logical, historical (cultural), lingual, social, economic, aesthetic, juridical (political), ethical and pistic (credal). These different aspects are referred to by a number of collective names, but I will try to limit myself to the labels dimensions, modalities or spheres in the following.

Since the modalities are based on human experience and thought, I will illustrate their meaning by relating them to a situation that I hope most readers will feel familiar with. Imagine a big and old spruce tree. The tree will have a certain number of branches and needles, representing the arithmetical aspect. It will also occupy a certain amount of space—a space not so easily defined and demarcated if one considers the tree with all its root systems. This refers to the spatial modality. The kinematic aspect is visible in the molecular movement present in the tree, while the physical modality is noticeable through the feeding and breathing of the tree where it consumes water, sunlight and carbon dioxide and produces oxygen through the process of photosynthesis. The biotic modality can be illustrated both in the splendour of the tree but also by its eventual death.

Standing close to the tree we can touch the spruce and feel its sharp needles, observe the colour and form of the tree and smell the scent of it, all of which point to the sensitive aspect. Looking at the tree we can distinguish the branches from the stem, and the stem from the roots. This distinction, or analysis, illustrates the logical modality. The tree also has a historical aspect that makes it possible to investigate when it first came to a country and how it has spread during the years. Not only can we feel, observe and smell the tree, we can also talk and write.

Figure 2. The different modalities
about it, pointing at the lingual aspect. The social aspect related to a spruce tree is perhaps most noticeable, at least in most Christian countries, during Christmas. At this time, many people either go to the woods and cut themselves a tree, or they buy one, which they later bring inside the house and decorate, all in accordance with both social and historical traditions. The tree constitutes a gathering point for many social activities, especially for the younger ones.

During this time, the economic aspect of the tree also becomes visible, at least for those people standing in the street selling or buying Christmas trees. Here, the aesthetic modality is also present and will influence the price of the tree. The juridical aspect is also present in the buying and selling of the tree, since the owner of the tree is the one who can decide its destiny and call for legal protection against people who would steal or damage the tree. The ethical aspect is visible through the people who own forests and spruce trees and who allow relatives, friends and neighbours to cut themselves a tree for free. Finally, the pistic modality can be illustrated in our different beliefs on how the tree has come into being; e.g., through a slow process of evolution made possible by the Big Bang or by the creation of a God.

The purpose with the modalities is not to exhaustively describe all of reality including human nature, nor do the modalities, or their sum, represent the whole of the universe. Instead, the modalities reflect the rich variety in human life and their intent is to remind us that both reality and humanity comprise a variety of discrete dimensions which cannot be reduced into one single dimension. The modalities also indicate that there is an interrelationship between the different dimensions that needs to be considered.

Further, the list of modalities is not a final one; on the contrary, Dooyeweerd constantly emphasized that the modalities, as well as their number, should be open for corrections and elaboration. In his later development he also showed this by including an additional aspect: the kinematic. This was originally part of the physical modality, but Dooyeweerd argued that while the physical modality was governed by energy, the kinematic was characterized by movement and, hence, distinguished from the physical modality. However, not all members of the school associated with Dooyeweerd agree with this distinction. A further example of differences in the interpretation of the modal order of reality is that some scholars (though not part of the Dooyeweerdian circle) assert that the pistic aspect represents nothing more than a sign of sensitive expression. If this is true, something that Dooyeweerd strongly rejects, the pistic modality could be reduced to the sensitive and should therefore not be a modality of its own (Kalsbeek, 1975).

While many times it is impossible, scientifically, to prove who is right and who is wrong in these arguments, the main principle stated by Dooyeweerd is that each modality should be fundamentally different from all the others. If this is not the case and if one modality is considered to be a variant of another modality and thus reducible to it, it should not be considered as a separate modality.

Although we can distinguish all of the aspects in temporal reality, they never appear in isolation, but always in an inseparable and mutual coherence. It is only in order to more fully understand the different modalities and their individual nature, that is, the element that distinguishes each aspect from the others and makes it irreducible, that we need to isolate them. The element distinguishing each aspect from all the others is called the nucleus or kernel and it is the nucleus that ‘characterizes or qualifies’ (Kalsbeek, 1975, p. 84) a modality.

In Figure 3 all the modalities, together with their kernel, are listed. Hence, the numeric modality is characterized by its kernel discrete quantity, which is different from symbolic representation, the kernel of the lingual modality. As with the modalities, the kernels always indicate a how, a manner of being, never a concrete something. Hence, continuous extension may never be identified with the space we see around us. Space is always related to a concrete something in which all the aspects are found, not just the spatial (Kalsbeek, 1975). Besides having their own kernel, each modal sphere is also ruled by its own types of laws. These laws can be of two different types:
determinative and normative. While the determinative laws always exert their own fulfilment, the fulfilment of the normative laws is contingent on people's inclination to follow them. However, Dooyeweerd argues that, as with the determinative laws, the normative laws 'cannot be accounted for as a relation between or within people but must have an external origin or ground in order to have authority over us' (in Henderson 1994, p. 42). Finally, one very important thing to recognize with the normative modalities is that in a way they embody both their kernel and its negation. This means that both love and hate resides in the ethical modality. Being ethical or not being ethical are both ethical issues.

The Entity Theory

While the modal theory focuses on the general, the entity theory focuses on what is specific with different classes of entities and activities in reality, and it is within this latter theory that the concept of qualifying function belongs. The theory aims at gaining theoretical access to the structure in which things and events, also called individuality structures, present themselves to us.

An individuality structure is 'a concrete, whole entity or event which has special qualities distinguishing it from all other individuality structures' (Kalsbeek, 1975, p. 42). However, the concept of individuality structure refers to the structure of a class of entities or activities, not individual entities and activities. Hence, all dogs have the same individuality structure, which is different from that of cars or that of schools, and all individuality structures have a qualifying function.

While all individuality structures function in all 15 modalities, it is only human beings and individuality structures related to human beings, like families, schools and businesses, that function as a subject in all of the modalities. A tree only functions as a subject up to the biotic modality, while a dog functions as a subject up to the sensitive modality. Hence, a dog functions as a subject in the arithmetical, spatial, kinematic, physical, biotic and sensitive modality, but it only functions as an object in the other 10 modalities. A dog does not analyse situations,
master a language based on symbolic representation, or live by any particular belief system. The dog does, however, as an object, function in all of the 10 modalities above the sensitive. As an object, the dog can be fought for in a court of law, its aesthetic qualities can be appreciated and it can be described with the help of language.

In the same way as all individuality structures have subject and/or object functions they also have founding and qualifying functions. The founding function of an individuality structure is related to the aspect that has created the specific individuality structure under study, or made it possible for it to come into being. The qualifying function, on the other hand, refers to the function or modality that characterizes a particular individuality structure and gives it a certain identity. Further, the qualifying function also determines the inner structure and ‘indicates the intrinsic destination of a thing’ (Dooyeweerd, 1997, vol. III, p. 60). Hence, it is the qualifying function that determines the form that all of the 15 modalities need to take in order to become a specific individuality structure. Because of this, the concept can be seen as the manager, foreman or pilot of the internal structure of the certain individuality structure and the concept is therefore also referred to as the guiding or leading function. Finally, all four concepts have an ontological character by trying to establish what something is, not merely how we interpret something.

To better illustrate the meaning and significance of the concept of qualifying function I will continue with the example of the tree. According to Dooyeweerd, the qualifying function of a tree is to be found within the biological modality, for while the physical and chemical processes within a tree are of vital importance, it is the biological function that qualifies the tree as a structural whole. It is this modality that characterizes it more than any other. However, the qualifying function should not be confused with external teleological relations such as what end or purpose a tree can serve in reference to other beings. The fact that a tree can give shade for humans and animals and that birds can build their nests in it lies outside of the internal structure of a tree in so far that, while the internal structure of a tree favours and enables it to be used for certain purposes, such as the ones mentioned above, using a tree for these purposes does not change the internal structure of the tree. Hence, the inner structure, or destination, of a tree, or any other individuality structure, is implicitly distinguished from its external teleological relations according to Dooyeweerd.

While natural individuality structures, or systems, like a tree, have their origin in the origin of the universe, designed individuality structures, or systems, are the result of conscious human activity. Because of this the qualifying function of designed individuality structures, like that of clothes, becomes closely related to the intentions and visions of the designer. This difference affects the concept of qualifying function, even though Dooyeweerd argues that it does not, in any fundamental way, change it. Even for designed objects there still exists a most fundamental difference between their qualifying functions and subjective or teleological ends. While there is nothing to prevent us from using a wineglass as a coffee cup or a soup bowl or a table as a seat, we are usually conscious that, according to its entire inner structure, they are not designed with these purposes in mind. And, regardless of how it is used, its internal structure will not change. 'No, in empirical reality the objective structure of a thing is constant so long as the latter exists' (Dooyeweerd, 1997, p. 147).

A focus on designed individuality structures does, however, reveal a ‘problem’ related to the concept of qualifying function, namely that in the course of time the objective, or original, function of a thing seems to change. Old armours and weapons originally intended for war or hunting may now be used as decorations or as symbols communicating historical conditions. There are also some individuality structures that are so narrowly bound to a certain office, social status, family or person that apart from such they cannot be used in accordance with their individual qualifying function. This points to the subject–object relation mentioned above and can be exemplified by items such as a throne, an admiral’s uniform or a wedding ring. Everyone, provided they have access to the item, can sit on a throne, wear an admiral’s uniform or a wedding ring, but this would still not cause the
things to function according to their objective, or original, function.

Thus, in relation to designed systems three different modes related to the qualifying function need to be defined. The first mode is called "intentional representational relation" or "objective qualifying function" and is defined as the "objectification, in the structure of a real object, of the intentional object, as the latter is conceived in the design of a thing". This means that when one designs something the qualifying function of the designed object affects its structure and through this the qualifying function is objectified into the object. The second mode is called "unfolding relation" or "opening relation" and is said to be the "subjective unfolding or opening in human experience of the closed objective thing-structure". By this is meant the experience or knowledge of the objective qualifying function of a certain individuality structure from a historical period. Finally, the last mode, called "actualization relation" is defined as the "actualization of the objective thing-structure by human activity, which uses the thing according to its objective and open qualifying function" (Dooyeweerd, 1997, Vol. III, p. 148). This means that a certain individuality structure is used in accordance with its objectified qualifying function.

To illustrate the three modes let us consider the clothing of knights. In medieval feudal society knighthood had an actual military function. At the end of the Middle Ages, knighthood lost its military significance, but retained its position as a rank endowed with political power. The French Revolution destroyed this position, whereby knighthood disappeared as a particular privileged social rank. However, later generations can still experience knightly attire as objective socially qualified things of a by-gone historical period. Their objective qualifying function is the objectification, in the real clothing material, of an intentional conception of the designer of these costumes. This state of affairs remains unchanged by the transitions of cultural development" (Dooyeweerd, 1997, Vol. III, p. 147). However, the socially qualified objective function of knightly costumes can no longer be actualized in today's society because the feudal class system has disappeared.

INCORPORATING THE CONCEPT OF QUALIFYING FUNCTION INTO SSM'S MODEL-BUILDING PHASE

Since there is a difference in purpose between Dooyeweerdian philosophy and the underlying philosophy of SSM, and hence between the concept of qualifying function and the modelling phase of SSM, I want to make this difference clear. I also want to explain why I consider it possible and fruitful to bring some theories and ideas from the Dooyeweerdian philosophy into SSM. This will be done by arguing that this can have positive effects on SSM.

In the above it has been argued that the Dooyeweerdian philosophy strives to say something about reality; to describe or depict it in order for us to better understand it, and that the concept qualifying function, in its originality, is thought to represent an actually present function within an object or activity. The underlying philosophy of SSM, especially noticeable in its modelling and comparison phase, is characterized by its focus on people's perceptions of reality, rather than on reality as such. The aim with the modelling phase, for example, is to tease out different perceptions of a certain problem situation and to depict these in so-called root definitions and conceptual models. These root definitions and conceptual models are not supposed to be models of the real world, but rather models relevant for debating about the real world. Hence, while the focus for the Dooyeweerdian philosophy is on reality as such, the focus for SSM is on people's perceptions of reality.

Further, while Dooyeweerd argues that given laws and structures exist both within the natural and the social world, Checkland only acknowledges given laws and structures within the natural world. This can be seen in many of his statements and also in his 'Systems Map of the Universe' (Checkland, 1971, 1981). In the latter, he places social systems in between natural and human activity systems, with the argument that it would be wrong to place social and cultural systems solely within the boundary of human activity systems because even though they are the context of virtually all human activity they are also, at the same time, natural systems. The
relation to natural systems is through human beings and 'due to the fact that man is a gregarious animal who has a basic need for the supports provided by his fellow human beings in community life' Checkland (1971, p. 110). Hence, Checkland only acknowledges laws and structures within social reality arising from the human being as a natural system.

Personally, I believe that some type of structure exists even within social reality, and the great similarities that exist between countries and nations when it comes to basic values strengthen my belief. I also believe that, even though the world is not divided into physics and biology or psychology and sociology, there is a relation between reality and our perception of it. Hence, even though it is people who have decided that some things should be called linguistics, while other things are named ethics and aesthetics, and even though it would be possible both to rename and redefine these notions, I believe that the notions have come about because, somehow, there are aspects reflecting these notions in the world around us. But whether these notions have their origin in man or should be sought outside the realm of man, I cannot answer.

Further, even though I believe in the existence of certain aspects this does not in any way mean that I see the whole of reality as given. Rather, it indicates a number of aspects where we, as individuals and groups, have the possibility to intervene and form reality through the process of human formation. Hence, even though language and social norms, of some kind, exist in most, if not all, cultures they can take quite different forms. And even though I believe in ontologically present aspects I do not believe that it is epistemologically possible to ever find a method or methodology that can give us full and true knowledge about the world around us. This means that besides analysing 'how the world is' and debating about 'how the world ought to be' we should also ask ourselves 'how the world could be' and 'how we want it to be'. Addressing the two latter questions we enter into the area of design, because design focuses on reality as it can become or be made to be, rather than on reality as it is. Design is not a predictable or determinable activity, and it does not lead to insights into reality as it must be of necessity; rather it focuses on creating the not yet existing (Löwgren and Stolterman, 1998; Strijbos, 1998).

Before discussing how the modal theory and the concept of qualifying function can enrich the model-building phase of SSM there are two comments that I wish to make in relation to Dooyeweerd's view on the notion of qualifying function. Firstly, Dooyeweerd argues that 'in empirical reality the objective structure of a thing is constant so long as the latter exists'. I would say that this is a rule to which there are exceptions. Imagine a wineglass from ancient Greece. It might have been designed as part of a fine service to be used at specific holidays, rituals or other social or religious events. As such, it would be the social or the pistic modality that would represent the objective qualifying function, also called intentional representational relation of the glass, and guide its inner structure. However, by the time we discover the wineglass in modern times it might be impossible to use the glass in accordance with its original intent because we might not have full knowledge about the rituals or special conditions surrounding the use of the glass. Using the terminology of Dooyeweerdian philosophy, we might not be able to unfold or actualize the objective qualifying function of the wineglass. While this might change the way we viewed the glass it would not change the structure of the glass itself. If, on the other hand, the glass were to be broken and would have to be glued together or if it had been lying in a place where dangerous material had blended into its original material this would both make it impossible to use the glass in accordance with its qualifying function but, it would also, I argue, change the objective structure of the glass as such.

While the above illustration or argument might be more of an exception than a rule when it comes to natural or designed physical things, it is much more common when it comes to social systems. These systems, contrary to natural and designed physical ones, can much more easily change their structure with the passing of time and in relation to people's perception of them.

The following statement, made by Checkland when discussing designed systems, can help to
illustrate how I view the concept of qualifying function. He says that: ‘We could if we wished use a piece of rock, a natural system, to knock nails into pieces of wood to make a hen coop. But we would perform the task better if we used a hammer, a physical system designed with fitness for purpose in mind’ (Checkland, 1981, p. 119). The idea that when we design something the vision and intentions of the designer are objectified into the designed object and through that gives the object a certain form and function is very appealing to me. It also feels closely related to the concept of qualifying function. To illustrate my point I will take the thought experiment given by Tsouvalis and Checkland (1996) where an unconventional householder chooses to view a bicycle as a kind of fencing, and therefore makes a fence from a line of bicycles buried up to the axles. While the authors are right when they say that no one can stop the householder from viewing, or using, bicycles as a type of fence, in the same way as we can use a book or a piece of rock as a hammer if we want to, one can hardly, at least not in my mind, argue that bicycles have been designed to fit that purpose. However, even though most designed objects are designed with a certain purpose or function in mind, this function or purpose is not always easily recognized by other people.

Since the aim of this paper is to address some critical comments made towards SSM, not to try and combine SSM with Dooyeweerdian philosophy as such, and since design is focused on the new and not yet created, I will use the concept of qualifying function in a more exploring and interpretative way than was intended in its originality. I will use it as a tool to discuss which function and modality best relate to the design vision of the designer(s) rather than to identify a specific function present in already existing entities and activities. While SSM is already strong on teasing out different perceptions, the concept of qualifying function has the potential to further strengthen this process. Using it this way has the following benefits.

Incorporating the concept of qualifying function into the modelling phase of SSM can help people in a particular problem situation to view the situation from new and different perspectives. The importance of the latter has been argued by many authors (Ackoff 1993; Checkland, 1981; Flood and Jackson, 1991; Morgan, 1986) and cannot be overemphasized in a design situation. Ackoff (1993), for example, argues that the identification and removal of self-imposed constraints provide two out of three steps in creative behaviour. The third is an exploration of the consequences of having done so. This, however, often requires that we can change, break away from, or at least question our present Weltanschauung — something that has proven to be a very difficult task, which also often appears very threatening to people. As an example of how hard it can be to question previously unquestioned worldviews, consider the well-known example of the shift from the Aristotelian to the Copernican Weltanschauung or Weltbild⁴ related to the structure of the Universe.

In Total Systems Intervention, Flood and Jackson (1991) do something similar by relating different systemic metaphors, similar to those of Morgan’s (1986) eight metaphors of an organization, to different systems methodologies. They argue that these metaphors can highlight aspects of a particular problem situation and hence guide the choice of appropriate systems problem-solving methods. Or as Midgley puts it, ‘[p]articipants can use them to think in different ways about the issue with which they are concerned’ (Midgley, 1997, p. 259). In addition, they argue that consciously looking at problem situations through different metaphors should help a manager in creative thinking. However, the benefit with the modal framework is that it is based on a theoretical framework that gives each modal aspect a defined meaning and establishes coherence between the different spheres.

SSM is both aware of the importance of being able of put on different kinds of thinking caps and has also developed techniques (the formulation of root definitions, CATWOE and conceptual models) for how this can be done. Hence, the concept of qualifying function is not meant to replace these techniques. Rather it is meant to complement the already existing techniques in the

⁴Weltbild is a more limited concept and is related to our understanding of the physical universe.
identification, and hopefully removal of self-imposed constraints. The concept is also useful when exploring alternative design possibilities.

To better illustrate how the concept of qualifying function can be used to complement the modelling techniques in SSM, the concept is incorporated into an SSM study carried out in the East Berkshire District Health Authority by, among others, Peter Checkland. The purpose of this study was to help the East Berkshire Community Medicine Department (CMD) with the problem of measuring its performance, which mainly consisted of providing epidemiological data and actively being involved in helping to manage the delivery of health care programmes in the district. To manage this Checkland felt that they needed to understand 'not only the ideas (and controversy) underlying the different conceptions of community medicine but also the basic mechanisms operating at district level in the NHS in the provision of health care' (Checkland and Scholes, 1999, p. 97).

Incorporating the concept of qualifying function into this study would include selecting and discussing possible functions that can qualify the National Health Care Service, the East Berkshire District Health Authority and/or the East Berkshire CMD. This can be seen as a way of introducing W2 and W3 into the modelling phase and let them set the stage for further modelling.

If we select the National Health Care Service it is probably the biotic modality that feels like the most logical choices for representing the inner structure of the system. Taking this modality as the qualifying function one would argue that it is this modality that characterizes the kernel of the activity carried out at our hospitals and health care systems. It is the biological modality, with a focus on curing diseases and saving lives, that represents the scientific discipline to which doctors and nurses belong and it is within this modality that they have their knowledge, responsibility and sovereignty. This view can be noticed in the argument made by the authors when they say: 'If, as is often the case, there is more than one way of carrying out a surgical operation, a DGM [District General Manager] cannot instruct a surgeon to adopt the cheapest way, that must be left to the surgeon's professional judgement' (Checkland and Scholes, 1999, p. 94). This argument is based on the underlying assumption that the biological modality constitutes the main responsibility or function of the medical staff, and that this is where they have sovereignty. If this was not the case the statement would not make sense.

However, it is always important to consider a number of possible functions or modalities to qualify a specific system or holon since the main purpose of the activity is to provide insights into our underlying assumptions regarding the problem situation at large and to try to find new ways to view the situation. In the case described above, modalities such as the social, economic, juridical, ethical or pistic can all provide interesting insights into our assumptions on health care.

Taking the ethical modality, for example, as the qualifying function, one could argue that curing biological diseases is only one element of the healing process and therefore not a broad enough focus for the health care system. Instead of focusing on individual parts or diseases health care should focus on caring for the whole person with a special emphasis on caring rather than curing. Hence, by letting the ethical modality guide and characterize the health service one might take a broader perspective on health and argue that in order for people to improve their health we need to see them, and care for them, as whole human beings, not as broken parts like a bad knee, an aching back or a high blood pressure.

This change in the qualifying function from the biological modality, focused on curing diseases and saving lives, to the ethical modality, focused on human compassion and care, would also most probably affect both the activities and the structure of the hospital. Discussing and deciding whether it is right or wrong for hospitals to provide help in dying for patients that are in great pain and where there is no hope for recovery would, for example, be seen very differently. From a biological standpoint this would be seen as a real 'sin' since it would go against the very purpose of the system. From an ethical viewpoint, on the other hand, helping

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3This study was also used as an example in the section above on 'Soft Systems Thinking' in order to illustrate the limitation of only considering W1 in the modelling phase.
patients take control of their situation instead of letting them die in pain and fear could instead be seen as a human and caring action. As to the structure of the hospital differences regarding where the hospital should be located (where the air, temperature and humidity are especially favourable or close to family and friends), how the rooms should be designed and the importance of having playgrounds, family rooms and social gathering spaces might also differ depending on what qualifying function is chosen.

Further, the concept of qualifying function can also be used to facilitate the process of generating different possible views on what makes a particular T meaningful, i.e., generating different W's. To exemplify this in relation to the above study I have chosen to focus on a model described by the authors as 'a rather detailed model of a general (primary task) system to plan and organize (but not deliver) health care to a defined population' (Checkland and Scholes, 1999 p. 97ff.). Following the authors, the system has the subsequent root definition and CATWOE.

Root Definition:

A DHA [District Health Authority]-owned system, staffed by professional officers accountable to the DHA which, in the light of existing provision of health care (NHS [National Health Service] and non-NHS), plans and organizes the delivery of health care to defined population using current health technology. The system manages the delivery via both ongoing services and specific projects, operates according to principles laid down by DHSS and Region and within the budget allocated. The system responds also to ad hoc issues arising outside the framework described. Its reporting meets the requirements of the ‘NHS planning system’.

CATWOE

C: defined population
A: professional officers
T: population in a given health state → population in improved health as a result of this system’s contribution
W: organized provision of health is feasible and desirable; it can be planned and organized
O: DHA
E: Structure DHSS/Regional District; ‘NHS planning system’ as a reporting mechanism; budget

Using the qualifying function to elicit different possible W’s by generating different views on what makes a particular T meaningful would in this case mean that we focus on why it is seen as meaningful to plan and organize for improvement of people’s health. Searching for possible functions that could qualify the above activity or transformation does this.

Seen from an ethical point of view one might desire to improve the health of people because one wanted to limit the suffering that sickness can cause, both to the sick and to their relatives and friends. It is also possible to strive towards improved health as an issue of equality or justice: trying to balance the seeming injustice of nature in allowing some persons to be born strong and healthy while others are born weak and sick. Or one might want to improve the health of people for economic reasons, arguing that it is more economic, in the long run, to invest money in health care, since this most probably will result in a healthy population that can work and contribute to the production of products and services.

Besides facilitating the process of generating different possible views on what makes a particular T meaningful, the concept of qualifying function can also help to clarify an already stated T or W. In relation to the above statements it becomes clear that there can be many different views on why it is seen as desirable to improve the health of a given population. By clarifying these different views new root definitions with more specific W’s can be created. This is important considering Checkland’s (1981) statement that it is very difficult to make conceptual models out of root definitions including multiple transformations and W’s.

Using the qualifying function in the two ways described above can improve our understanding and help question our underlying assumptions related to established systems such as the health
care system. It can also help us with the process of generating different possible views (W’s) on what makes a particular T meaningful as well as help to clarify an already stated T or W. However, besides these three benefits the concept also has the potential to address some of the critiques directed towards SSM.

Firstly, including the concept of qualifying function in the modelling phase, as was done above, could be one way of addressing the critique given by Mingers (1980) that SSM does not notice similarities between different W’s or seek an explanation for this in terms of the structure of society. As in the illustration related to the British coal-mining industry after the Second World War, Checkland (1981) points to the difference in Weltanschauung between Lord Robens, Chairman of the National Coal Board, and one of the working miners, but does not consider the fact that most people in Lord Robens’ position will have similar appreciations, and these will be very different from those of most working miners. Hence, SSM is said to lack an explanation of why these particular W’s have developed and thereby how they might be changed. While neither the concept of qualifying function nor the modal framework constitutes a critical sociology, as is suggested by Mingers, they have the possibility to at least point to similarities and differences in focus between and/or within different groups of people.

In the study discussed above related to the NHS it could be argued that while doctors and nurses, due to their education, interests and responsibilities, might be more apt to view situations from biotic and ethical perspectives, administrators and economists might instead focus on economical and juridical issues and give prominence to these aspect in their discussions.

Secondly, expanding the T and/or the W also has the potential to enrich the conceptual models. As early as 1979 Naughton argued that ‘inexperienced analysts invariably plump for bureaucratic-type models’ (Naughton, 1979, p. 70) when making the transition from root definition to conceptual models. In a more recent study Mirjanddotter (1998) argues that when the model builder lacks personal experience of the subject or transformation being modelled the conceptual models tend to become impersonal, general, poor on normative issues and sometimes not very informative. These statements are also in agreement with the findings of Mingers (1992), Schregenberger (1982), Vickers (1983a), Woodburn (1985) and even Checkland (Checkland, 1999; Checkland and Tsouvalis, 1997). However, teasing out the qualifying function for the transformation (T) has the potential to enrich the conceptual models in that it adds knowledge to the T and by that helps the model builder find relevant activities.

Thirdly, incorporating the concept of qualifying function into the root definition can also strengthen ‘the fragility of the “bond” between a conceptual model and a root definition’ (Checkland and Tsouvalis 1997, p. 162) and by that strengthen the defensibility of the conceptual model. Defensibility here refers to the second of the two validity questions posed by Checkland in order to answer how well one can tell a ‘good’ design from a ‘bad’ one: the first being ‘whether a model is actually “relevant” or not’, and the second, ‘whether a given model is competently built’ (Checkland, 1995, p. 52f.).

In the early stage of the methodology the ‘Formal Systems Model’ (Checkland, 1981) was developed for this purpose, i.e., to check ‘whether a given model is competently built’. Later on the formal systems model was, however, discarded on the grounds that it blurred the distinction between the language of the real-world problem situation and the systems thinking language of the same (Checkland and Scholes, 1990; Checkland and Tsouvalis, 1997). Instead, another technique for the same purpose has been introduced. This technique aims at modelling the transformation process of the root definition in such a way that it fulfils the criteria of effectiveness, efficiency and efficacy (Checkland and Scholes, 1990). Later, the criteria ethics and elegance were also added (Checkland et al., 1990). These criteria are usually referred to as the 3 or 5 E’s, and function as the measures of performance by which the conceptual model is judged.

Recently, a third technique has been proposed, which suggests that all the main verbs of a conceptual model should be incorporated into the root definition (Checkland and Tsouvalis,
While this technique helps to bind the root definition and the conceptual model closer together, by showing that each activity in the conceptual model stems from the words used in the root definition, it also has as a consequence the loss of ‘the richness gained by the pairing of being and doing which the root definition—conceptual model relationship provides’ (Checkland, 1981, p. 292; Checkland and Tsouvalis, 1997, p. 160).

While the first technique uses general system thinking concepts as a means to evaluate the technical defensibility or validity of a conceptual model, the second uses more logical and economic concepts. The third technique, on the other hand, focuses on the internal consistency between the modelling tools (root definition, CATWOE and conceptual model). However, as was argued above, this validation technique binds the modelling tools so close together as to almost make them alike. Hence, the concept of qualifying function could constitute an alternative technique for checking the technical defensibility of a conceptual model.

It could of course also be argued that the concept of qualifying function, while being based on the 15 modalities, can create a boundary for our thought and hence constrain rather than free our minds. While I have to agree that this is a possibility, my defence is that all concepts, tools, methods or methodologies have this weakness. While they help and guide us in how to think, what to do and how to do it, they also automatically have the possibility to constrain us. As soon as you highlight one direction the others easily get pushed into the background. However, I argue that the help they offer far exceeds the constraint they represent. Further, this weakness or constraint inherent in methods and methodologies can be limited by being aware of its existence and by working with many different and diverse methods.

**SUMMARY AND CONCLUSION**

In this paper I have pointed to the central role of the concept of Weltanschauung or worldview within SSM. While the concept plays a central role within the whole of the methodology its presence is most noticeable within the model-building phase. Here, the aim is to tease out different perceptions of the problem situation and to structure the thinking of the same. In order to do this some precise techniques have been developed (root definition, CATWOE and conceptual model). Hence, the techniques do not aim to describe part of the real world but rather to accentuate certain perceptions of the world.

However, in order to handle the complexity that a person’s Weltanschauung implies, the content of the term has been reduced quite drastically in the model-building part of SSM. Instead of including the whole Weltanschauung of a person, Checkland suggests that it is enough to try and tease out the underlying rationale of why a person sees it meaningful to carry out a certain activity or transformation. Even if this is most helpful it was argued that the concept becomes too narrowly bounded to do full justice to the diversity found in different perceptions. In order to further enrich and stimulate the process of teasing out different perceptions I introduced a concept called qualifying function.

The concept originates from the philosophy of the Cosmonomic Idea, presently termed the Dooyeweerdian philosophy, and refers to the function that characterizes a particular thing or activity. Hence, it can be seen as the manager, foreman or pilot of the internal structure of a particular individuality structure, and is therefore sometimes also referred to as the guiding or leading function. Finally, this function or characteristic is also related to the modal framework developed by Dooyeweerd that comprises the following 15 irreducible aspects: the numerical (arithmetic), spatial, kinetic, physical, biotic, sensitive (psychic), logical, historical (cultural), lingual, social, economic, aesthetic, juridical, ethical and credal (pistic). This means that the qualifying function of a particular individuality structure is related to one particular modality.

Incorporating the concept of qualifying function into the modelling phase of SSM has the following benefits. Firstly, it helps people in a particular problem situation to view systems, situations and activities from new and different perspectives by complementing already existing methods and techniques. Secondly, it can be used to clarify a stated Transformation (T) and/or
Weltanschauung (W) as well as to point at other possible ways of interpreting these. This is important considering that Checkland argues that it is difficult to make conceptual models out of root definitions including multiple T’s and W’s. Thirdly, the concept can be used to related different W’s to roles and structures in society and by that increase our understanding of a stated W. This also, to some extent, addresses the critique given by Mingers that SSM lacks an explanation of why particular W’s have developed. While neither the concept of qualifying function nor the modal framework constitutes a critical sociology, which is what Mingers calls for, they have the possibility to at least point to similarities and differences in focus between and/or within different groups of people. Fourthly, the concept provides an alternative technique for model validation by relating the root definition and the conceptual model closer together. Finally, it has the potential to enrich the conceptual models by directing the transformation process (T) and by that hopefully make the models less conservative.

I would like to end the paper by pointing out that this paper constitutes only a first step in the exploration of how the concept of qualifying function can be related to a specific design methodology, in this case SSM, and the benefits this can have. However, in further studies the concept and its discussed benefits need to be tested in real-world situations and, hence, applied in empirical studies.

REFERENCES


Article 5

Qualifying Function in SSM modelling – A Case Study
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Qualifying Function in SSM Modeling—A Case Study

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In a previous paper the author introduced a concept called qualifying function as a conceptual tool for modeling and design. The concept was incorporated into the modeling phase of soft systems methodology (SSM), with the purpose of addressing some of the criticism directed toward the methodology, such as its tendency to result in regulatory, rather than radical, agendas for change. It was argued that the concept had the potential to help people in a particular problem situation to view the situation from new and different perspectives and that it could enrich the conceptual models by giving the transformation process a direction. The aim of this paper is to apply the concept, embedded in SSM, to a case study involving two projects, focused on creating new work opportunities, to explore the practical applicability and usefulness of the concept, both in general and as a part of the modeling phase of SSM.

KEY WORDS: systems design; soft systems methodology; modeling; Dooyeweerdian philosophy; qualifying function.

1. INTRODUCTION

Soft systems methodology (SSM) (Checkland, 1981; Checkland and Scholes, 1999) is a well-known methodology that aims at tackling real-world problems of management. As such, it has been used both for information systems design (Checkland, 1984, 1988; Checkland and Griffin, 1970; Checkland and Holwell, 1997; Wilson, 1992; Winter et al., 1995) and for systems design and learning in general (Callo and Packham, 1999; Checkland and Scholes, 1990a; Kartowisastro and Kijima, 1994; Mirijamdotter, 1998; Reid et al., 1999; Rose, 1997). It focuses on models of perceptions, not models of complex reality (Checkland, 1981) and is especially suited for problem situations labeled as complex and pluralistic (Flood and Jackson, 1991a,b). Hence, the focus of attention for SSM is on people's perceptions of reality, their worldview, rather than on external reality as such. This focus on perceptions and worldviews has its rationale in the belief that, without
changes in people's worldview or weltanschauung, significant changes in social systems will not prevail.

Even though the interpretivistic nature of SSM is its main strength, it is in relation to this characteristic that the methodology has received the most criticism (Flood and Jackson, 1991; Flood and Ulrich, 1990; Ivanov, 1991; Jackson, 1982; Mingers, 1984). In this paper I focus on the critique related to SSM’s tendency to result in regulatory, rather than radical, agendas for change. Some authors claim that this is an inherent characteristic of the methodology due to its functionalistic and/or subjective character (Flood and Jackson, 1991; Jackson, 1982; Mingers, 1984). Other authors argue that this regular tendency stems from the context within which these studies have been carried out, peoples’ inherent resistance to change, or lack of insight and originality on the part of those using the methodology (Checkland, 1982; Naughton, 1979). For a more extensive discussion of these two views see Bergvall-Kåreborn (2002).

However, both of these views point to important criteria that should be fulfilled before a transformation of the real world is carried out. We need both the ability to see old systems from new perspectives and a climate that allows for an open and free participation and debate regarding what are considered feasible and desirable changes. By focusing on the above critique I am not arguing that radical changes, as a rule, are better than regulatory changes but, rather, that a methodology should have the ability to enable both radical and regulatory changes depending on what the situation under study requires.

A number of recent papers (Attwater, 1999; Callo and Packham, 1999; Kartowisastro and Kijima, 1994) have focused on the aspect of participation or emancipation in relation to the critique mentioned above. This article takes a different approach and focus. First, it focuses on stimulating radical changes by developing tools that help the model builders in their creative work. This puts the focus on the modeling or systems thinking phase of SSM since the purpose of this phase is to draw out different perspectives of the problem situation and to structure the thinking of the same. Hence, this is the phase where radical, rather than regulatory, ideas need to be born. Second, the paper approaches this problem by incorporating concepts and theories from the philosophy of Herman Dooyeweerd (1997).

In a previous paper (Bergvall-Kåreborn, 2002) these concepts and theories were tentatively incorporated into the modeling phase of SSM. The way forward is therefore to seek insight into these ideas by using them in practice. Hence, the aim of this paper is to use a case study to research the practical applicability of the theories and to explore to what extent they can assist the users of SSM to name and model relevant systems that stimulate new perceptions of the problem situation and, thus, address the critique mentioned above. Examples of earlier papers with a similar focus, to stimulate new perceptions of the problem situation, are Atkinson and Checkland (1988) and Davies and Ledington (1987).
The structure of this paper is as follows. In Section 2 a description of selected parts of the philosophy of Herman Dooyeweerd is given, followed by a short presentation of the case study in Section 3. In Section 4 the framework, methodology, and area of application for my study are outlined before the case study is discussed in more detail in Section 5. The paper ends with a discussion of what the case study revealed in Section 6, followed by a summary and conclusion in Section 7.

2. THE PHILOSOPHY OF HERMAN DOOYEWEERD

The philosophy of Herman Dooyeweerd (1973, 1997) can be divided into five parts: (1) the theory of religious ground motives, (2) the modal theory, (3) the theory of time, (4) the entity theory, and (5) the social theory. Of these, the modal theory holds a special place both because it was the first to be developed, but also because it provides an ontological and epistemological foundation for the philosophy as a whole. Thus, many of the other theories are related to and, to some extent, build on the modal theory. Because of this, I start by presenting some central ideas within this theory before I move to the entity theory where the concept qualifying function belongs. For a more extensive description of the modalities and the concept qualifying function, see Bergvall-Kåreborn (2001, 2002).

2.1. Modal Theory

Within the modal theory, Dooyeweerd identifies 15 irreducible aspects based on human experience and thought: the arithmetic, spatial, kinematic, physical, biotic, sensitive (psychic), logical, historical (cultural), lingual, social, economic, aesthetic, juridical (political), ethical, and pistic.

Besides being related to human experience and thought, the aspects concern "a manner of being, a mode;" therefore, they are also called modal aspects or modalities (Kalsbeek, 1975, p. 42). They answer the question how, which means that they indicate a how, never a concrete something. To clarify the difference between a concrete thing or activity and a modality, Kalsbeek refers to the distinction between what we experience and how we experience something. Imagine that you walk across a meadow. What do you see, experience, there? Flowers, trees, and, grass: all very concrete things. How do you perceive, experience, this meadow? You find it harmonious and beautiful (the aesthetic aspect of the object) or perhaps you view it as a waste of valuable resources that could have been used for some better purpose (the economic aspect).

However, the list of modalities should not be seen as final; on the contrary, Dooyeweerd emphasized that the interpretation of the modalities, as well as their number, should always be open for corrections and elaboration. Hence, the modalities do not purport to describe all of reality exhaustively. Rather, they are meant to reflect the rich variety in human life, and their intent is to remind us that both
reality and humanity comprise a variety of discrete dimensions that cannot be reduced into one single dimension. The element distinguishing each aspect from the others and making it irreducible is called the nucleus or kernel, and in Fig. 1, all the modalities together with their nuclei are listed. Thus, the lingual modality is characterized by its kernel symbolic representation, while the social aspect is characterized by social intercourse. As with the modalities, the kernels indicate a how, never a concrete something. Although we can distinguish and analyze separate aspects in temporal reality, they never appear in isolation, but always in an inseparable and mutual coherence. Hence, the modal framework “offers a way of doing justice to both the diversity and the coherence in reality in an extremely subtle manner” (Geertsema, 1995).

2.2. Entity Theory

While the modal theory focuses on what is general for different entities and activities, the entity theory focuses on what is specific and strives to explicate the specific structure in which entities present themselves to us. One central concept within this theory is the concept of the qualifying function, which aims to explain what qualifies, or characterizes, an entity. Further, and as the name implies, the concept focuses on identifying the function that qualifies an entity, and function in this context refers to an aspceutal function such as a biotic function, an economic function, an aesthetic function, etc. Hence, the qualifying function of an entity is
related to a particular modality. In this sense a plant is said to be qualified by the biotic modality, while a state is qualified by the juridical (Kalsbeek, 1975). Finally, it is argued that the qualifying function guides the internal structure of a thing; it "indicates the intrinsic destination of a thing" (Dooyeweerd, 1997). However, according to Dooyeweerd it is usually only in naive experience that we can fully grasp the identity of something. Here, we continue to experience the identity of a thing while observing it to be susceptible to change.

Following this argument the concept qualifying function is a modally defined concept that refers to the function that characterizes an entity, determines its inner structure, and makes us experience a specific identity in relation to this entity despite all the changes that may occur to it over the years. As such, it can be seen as the manager or foreman of the internal structure of a particular thing and is, therefore, sometimes also referred to as the guiding or leading function.

3. THE BACKGROUND OF THE CASE STUDY

In Sweden, as in other countries both within and outside the European Union (EU), economic decline, together with general rationalization efforts, has led to big structural changes within the public sector, resulting in huge reductions in the number of people working within schools, day care centers, hospitals, defense, etc. Because of this the EU has developed special programs for the development of models for how new work opportunities can be created. Two such programs, located in a small municipality in the north inland of Sweden, are Women in Progress (WIP) and AdAstra. The aim of these projects was to create new work opportunities by helping people with business ideas to develop and operationalize them. Hence, self-employment in some form was a key concept.

To help people develop and operationalize their ideas they where offered a 30-week education divided into two main parts. The first part was a more or less common 10-week education, covering topics such as IT, accounting, human communication, and techniques for presentation, as well as how one develops a business idea, and what it means to have your own business. During these 10 weeks, the students were also supposed to develop their own ideas into applicable business ideas and to develop an activity and time schedule for how to proceed. These first 10 weeks were followed by a period of up to 20 weeks of individual work where the business ideas were to be operationalized. The students were selected on the basis of personal interviews, and in total three succeeding groups, including 30 persons each, participated in the projects.

Even though WIP and AdAstra formally constituted two separate projects, with separate owners, target groups, goals, and financial arrangements, it was decided to run them as one, with the same project leader and reference group. Some reasons for this were that the projects had common purposes and common methods for accomplishment. Besides this, or perhaps influencing this, was the
fact that both projects had been initiated and developed by the Office for Trade and Industry within the municipality. The main difference between the projects was that they focused on different target groups. The target group for WIP was unemployed women with little education and a long previous employment within the public sector. AdAstra, on the other hand, was directed toward people employed within the public sector but who ran the risk of losing their jobs. This difference also constituted the reason that the Office for Trade and Industry could not represent both projects, because unemployed people lie outside their commission.

Using the powerful statement of SSM's PQR (Checkland and Scholes, 1999) to summarize my first understanding of the projects from a formal perspective results in the following representation.

- **What to do (P)?** Develop models for how to create new work opportunities
- **How to do it (Q)?** Through projects such as WIP/AdAstra
- **Why do it (R)?** To reduce the intermediate stage between unemployment and work (WIP) and help companies and organizations to prepare better for structural changes in society (AdAstra)

4. RESEARCH METHODOLOGY

Before continuing with the case study I place the study in a context by describing the research methodology that has guided my research. My research follows the tradition of the interpretative and action-oriented approach, where the researcher enters a real-world situation with the aim of both improving it and acquiring knowledge (Baskerville and Wood-Harper, 1998, 1996; Checkland and Holwell, 1998; Hult and Lennung, 1980; Susman, 1983). Action research approaches are becoming more and more accepted and adopted within the research tradition of systems theory and information systems as the benefits of this approach are disclosed (Baskerville and Wood-Harper, 1996; Checkland and Holwell, 1998; Galliers and Land, 1987). When it comes to research regarding systems development methodologies Baskerville and Wood-Harper (1996) even argue that “action research is one of the few valid research approaches that researchers can legitimately employ to study the effects of specific alterations in systems development methodologies. It is both rigorous and relevant” (p. 240). However, despite this, there is still some confusion as to what should count as action research (Baskerville and Wood-Harper, 1998; Seashore, 1976; Warmington, 1980). My work is best described by the action research type developed by Peter Checkland in his SSM (Checkland and Holwell, 1997, 1998).

My role or involvement in the study has been of a facilitative nature, which means that while the responsibility of solving the problem was on the study subjects, my task was to clarify how different project members viewed the projects
and, thereby, increase their understanding of the projects as well as their role in them. This was of particular interest since the two projects were to be run as one and because the project leader felt that different key members had different views on the projects. The project leader was also the person initiating the study.

The reason for choosing this role was that the project leader made clear from the beginning that most of the key persons would not be able to allocate much time to the study. Because of this it was decided that I would be the person carrying out the study (draw the rich picture, develop the conceptual models, etc.) but that the project members would contribute information about their perspectives of the projects. The study would end with a workshop where I would present a rich picture of the situation as well as some selected models of relevant systems to be discussed by the different project members.

Further, following this type of action research it is particularly important to discuss the concepts of framework of ideas, methodology, and area of application, although Checkland (1985, 1991; Checkland and Holwell, 1997) argues that these three elements need to be defined, discussed, and related to each other, no matter which research method one uses.

My framework includes systems thinking, as viewed by the soft approach together with Dooyeweerdian philosophy. The soft approach characterizes design as a personal process very much influenced by the worldviews, visions, and mental models of the people involved in the design process. There is a continually changing interaction among people’s Weltanschauung, their conceptual models, and any real-world changes. The Weltanschauung of the model builders affects the content of the conceptual models, while the conceptual models affect the real world, which in turn influences our perceptions of the problem situation, because, in reality, conceptual models are a part of, and, therefore, affect, the whole problem-solving practice (Tsouvalis and Checkland, 1996).

Dooyeweerdian philosophy points to the existence of both a given and a constructed side of reality and argues that these two need to be integrated. While the given side refers to things such as the law of gravity or the structure of wood, the constructed side refers to all those things or activities that are the result of human intervention. These two poles also reflect the shades and diversity that exist between the unchanging, fixed, or established, on one side, and the changing, adaptable, and new, on the other side. In design situations we usually take some features as given, constraints that we need to adapt to, while we actively try to change other features. However, as advocates of the critical school (Flood and Jackson, 1991a,b) have pointed out there are some real dangers in accepting the present, or established, without a thorough and critical analysis.

There exist some ontological and epistemological differences between the interpretivistic base of SSM and the philosophy of Dooyeweerd. However, since these differences have been addressed elsewhere (Bergvall-Kåreborn, 2000, 2002) and since they are not crucial for this paper, I do not discuss them here.
As my methodology (M) I use SSM supplemented with the modal theory and the concept qualifying function from the philosophy of Herman Dooyeweerd to facilitate the process of generating different perspectives and conceptual models of two EU projects focused on creating new work opportunities (A). Both A and M are explained further below.

5. GOING THROUGH THE PHASES OF SSM

Soft systems methodology “is a methodology that aims to bring about improvements in areas of social concern by activating in the people involved in the situation a learning cycle which is ideally never-ending” (von Bülow, 1989). This learning takes place through an iterative process consisting of four main phases: finding out, model building, comparison and discussion, and taking action (Checkland and Scholes, 1999). Below, the first three phases are discussed in relation to the case study, while the fourth is included in the last section (5.3) concerning comparison and discussion of changes. The focus of attention is, however, on the model-building phase since this constitutes the central point of the paper.

5.1. Finding Out About the Projects

To gain an understanding of the situation in question the author used interviews as the main source. These interviews were conducted as a mix of semistructural interviews and open discussions. In total 13 persons were interviewed: 6 students, 1 tutor, the project leader, the 2 project owners, and 3 persons from the steering committee and reference group.

These interviews/discussions revealed two accounts as to how the second part of the projects was to be run, each represented by a project owner. The owner of WIP, a private organization, Institut Ungdom och Framtid (IUF; Institute Youth and Future), saw the projects as a 30-week-long project consisting of three phases in which all students needed to participate. The first phase should deal with self-development, group work, and communication. In this phase, the students should also make an inventory of present and future needs in their local community and analyze the present supply. Based on this, the students should try to find their own business idea and form for realizing it. Phase 2 would focus on how to take responsibility for a business, and here the students would have an opportunity to try and start a business. In phase 3, the students should have their business up and running but would still have guidance and supervision from the tutors and project leaders, as well as from the group as a whole. The only reason for a student not to follow the 30-week program would be if the person after the first phase did not have any clear ideas of what to do and how to do it.

The owner of AdAstra, the office for Trade and Industry within the municipality, viewed the projects as an individual journey consisting of two phases. The
first phase was a 10-week general educational period that was quite similar for most students but that could be adapted to fit particular needs as well. After this phase, an individual program should be worked out for each student, stating what the student wanted to achieve and how this was to be achieved, as well as important stages and dates along the way. No student should be involved in the projects longer than what was needed for the student to realize his or her goals. I call these views the process and the product view.

Though both project owners formally had the same power over their own project, the owner of AdAstra had a very strong position, due to the role his organization plays in the world of trade and industry. This position was further strengthened by the fact that both projects had been developed, and initiated, by the office for Trade and Industry.

The finding-out phase also highlighted a strong feeling of insecurity among the students as to the relation between creating new work opportunities and self-development. Some felt that they got different signals, as to the purpose of the projects, at the selection interviews and after the projects had started. At the selection interviews, the purpose of the projects felt more floating, and both self-development and creation of new work opportunities were mentioned as important. However, once the projects had started, the emphasis on creating new work opportunities increased. Some of the interviewed students also felt that the focus on development of business ideas to create new work opportunities had grown stronger with time and from the first to the second and third student intake. The latter statement was also confirmed by some of the other members, with the argument that the main aim of the projects was to create new work opportunities and that, therefore, the money should be used primarily to help people with business ideas to realize these.

Further, during this phase it became clear that, despite homogeneous views on the selection criteria between the projects (motivated people with productive business ideas who were unemployed or ran the risk of losing their jobs and who could make a contribution to the student group as a whole), practical circumstances, such as fewer applicants for WIP than for AdAstra, resulted in differences between the students in the two projects.

At the end of the study, it was decided by the project owners, in consultancy with the project leader, that the student group should be split into two groups after the basic 10-week education: one for people who needed more personal development and where the guidance was of a more social character and one for people who had a fairly clear business idea and needed help on how to develop and operationalize the idea. Even though it was mostly WIP students in the first group and AdAstra students in the second group, the split was not made according to project but, rather, according to the estimated needs of the different students. One stated reason for this split was the increased difference between the students involved in the two projects.
5.2. Model Building

From the finding-out phase many interesting ideas for relevant human activity systems emerged, such as the following.

1. A system to create new work opportunities
2. A system to develop and test models for how new work opportunities can be created
3. A system to help people take responsibility for their development and future
4. A system to take advantage of peoples’ resources
5. A system to help people develop themselves
6. A system to make visible different self-imposed constraints that complicate the process of creating new work opportunities
7. A system to change and remodel the structure for trade and industry
8. A system to illustrate the difference between a product and a process view on the projects
9. A system to elucidate the relation between self-fulfillment and self-employment
10. A system to attract students to the projects, especially to WIP

The finding-out phase also confirmed the project leader’s feeling that different key persons had different views on the projects, the more important being a difference in perspective related to the aim of the projects as well as to how the projects were to be run.

5.2.1. Broadening the View of the Modeling Phase by Including W2 and W3

In line with earlier arguments (Bergvall-Kåreborn, 2002) that the modeling would benefit from incorporating a broader perspective on weltanschauung (W), the author started to model a holon that could widen the scope of attention to include both “W2” and “W3” (Checkland and Davies, 1986). W2 is related to a version of the problem situation as such, while W3 is related to beliefs and assumptions about the social reality in which the problem situation is embedded. Here I have chosen to cast the root definition (RD) (Checkland and Wilson, 1980) in the form of PQR, to give a short statement that expresses the core purpose of my chosen holon.

P: Create new work opportunities
Q: Through self-employment
R: Because it is good for the municipality

To test how the concept qualifying function together with the modal framework could be used to elicit different viewpoints relating to W2 and/or W3, I used the modalities to understand further what could lie behind a statement such as R.
Why is creating work opportunities seen as good for a municipality? To explore possible views on this I used statements from the participants, related to their view on the purpose of the projects, together with the modalities as stimulus. While some of the statements (utilize the resources available in people) felt closely related to a certain modality (economic), other statements (help people find their place in society) could easily be related to many modalities (ethical, social, economic) and shifted their meaning depending on which modality that was chosen. Interpreting the statement—help people find their place in society—from an ethical aspect, the students came in focus as the main customers, and it was their needs, interests, and well-being that guided the creation of work opportunities. Viewing the statement from the social modality, the main customer became the society (municipality or state), and the focus for creating work became directed toward the social structure and where in this structure the different students would fit best. As a last illustration, relating the statement to the economic modality, the society was still the prime customer but the focus for the projects became geared much more toward resource use rather than social structure.

In the following a number of possible views are given on what qualifies or makes the activity of creating new work opportunities meaningful. These views are either based solely on a modality or constitute a mixture of a participant’s statement and a modality. In the latter case this is indicated by including the statement in parentheses at the end of the paragraph.

Starting with the ethical modality as the qualifying function, one could argue that there are tasks, such as taking care of the sick and the old, that need to be done, and human kindness and consideration demand that we identify and carry out these tasks. These tasks also need to be carried out if we want our societies to be humane and caring societies. Hence, the main function of creating work is to be able to provide for those that are not able to care for themselves, at least not fully. (Turn needs into work opportunities.)

Viewing create new work opportunities as a juridical function rather than an ethical one puts the focus on human rights, rather than human kindness and consideration. From this perspective it could be argued that for justice to be served, everybody needs to work to contribute to, and help retain or increase, the level of welfare in a society. Hence, working or not working is not a personal choice but the duty of every man and women. Related to this line of argument, but seen from another angle, is the view that the purpose with work is to distribute the wealth (resources), as well as the responsibilities, of a society. Hence, since it is through work that a society’s resources are distributed, it is the right of every man and woman, rather then the duty, to have the possibility to work.

Seen from an economic perspective, and given that different people have different gifts and potentials, the prime function of work would be to take advantage of and utilize these potentials (competence, experience, knowledge, ideas,
enthusiasm, etc.) in a satisfactory way. Not doing so would be a waste of resources. This would also be the reason behind work specialization and other related concepts and can be illustrated by the very simple example of two neighbors trading work assignments with each other. One, trained as a bricklayer, might help her neighbor to install a tiled stove, while the neighbor helps her to design her garden in return. From a bigger perspective work would be seen as a way for people to divide the work tasks in society to improve the quality of work and/or reduce the time needed to carry out the tasks. (Utilize people’s resources and ideas.) Another perspective on work, still seen from the economic aspect, is that the main function of work is to create revenues, as well as increase the buying power of people. Hence, from an economic perspective, the focus is on demand (needs) and supply and on how demands can be satisfied with as little resource use as possible. (Turn needs into work opportunities.)

It is also possible to view work as primarily a socializing activity, by which the young people in a society are fostered in current norms, values, and practices—an activity that gives people their role and place in society. (Help people find their place in society.) Finally, we can view work from an historical perspective, guided by the kernel of formative power and, thereby, representing the past as well as the future. Seen this way, how and where work is carried out have a far-reaching effect when it comes to shaping a society as a whole, such an effect that one could argue that this is its main function. Viewing work according to this, or any other, perspective puts the activity of creating work opportunities in new contexts. (Change and remodel the structure for trade and industry.)

5.2.2. Presenting Two Conceptual Models Based on Different Qualifying Functions

Below, a minimum number of logically contingent activities that need to be carried out to accomplish what has been defined in the root definition above are presented in two conceptual models (CMs) (Checkland, 1979; Checkland and Scholes, 1990b). The models are based on the same PQR statement but related to different qualifying functions. The first CM is based on the ethical modality and represents the view that new work opportunities are good for a municipality because they help the municipality address inherent needs and because they give people the possibility to create jobs that feel meaningful to them. The second CM is based on the historical modality and represents the view that new work opportunities are good for a municipality because they can help change and remodel the structure for trade and industry. In this case a structural change which aims at reducing the municipality’s dependency on the public sector as a main employer for its inhabitants would increase the number of work opportunities within the private sector. The reason for my choice is that these two functions represent, to some extent, the views of key persons within each project.
Fig. 2. Conceptual model for how work opportunities that benefit a municipality can be created, seen from an ethical perspective.

While both holons aim to create new work opportunities, the underlying rationale for doing so is different and this shows in the activities of the conceptual models. In Fig. 2, which has the ethical modality as the qualifying function, the focus for the model is to create work opportunities to provide for people who are not able to care for themselves and, at the same time, help people develop jobs that feel meaningful to them. Here, it is the perceived needs of both the receivers and the providers that guide what kind of work should be created. In Fig. 3, where the conceptual model is drawn from an historical perspective, the focus is on creating work opportunities that have the possibility to change and remodel the structure for trade and industry. Hence, the different qualifying functions highlight different types of customers (C in CATWOE) (Smyth and Checkland, 1976). The ethical function focuses on customers on an individual level, while the historical centers on customers on a societal level.

This is in line with Mingers’ (1990) argument concerning the what/how distinction related to conceptual models, where he argues that there can be situations in which the how is more important than the what. “There may be agreement about what is to be done but disagreement about how to do it. This can be modelled either by having one RD and a series of CMs, or in preference, a number of RDs which only differ in respect of the how which is specified in them” (p. 24). In the case of WIP/AdAstra there was a general agreement as to what should be done (create work opportunities), but the reasons for this and hence how this would be accomplished turned out to be more problematic. The way forward in this study
was to develop a number of RDs which differed only with respect to the *why* which was specified with the help of the concept qualifying function and affected the question of *how*.

5.2.3. Focusing on W1

After taking a broad view on the issue at hand the concept qualifying function was also used to facilitate the process of generating different possible views on what makes it meaningful to develop models and methods for how new work opportunities can be created. Based on the following P and Q, different views on R or W1 were elicited with the help of the modal framework.

What to do (P)? Develop models or methods for how new work opportunities can be created

How to do it (Q)? Through projects such as WIP and AdAstra

Why do it (R)?

- It is good resource management, and hence economic, to develop models that other people can use and reuse (economic).
- We can and should learn from each others’ past experiences (historical).
- The Swedish society is similar enough to other societies within the EU for the knowledge from the projects (WIP and AdAstra) to be transferred to, acceptable in, and usable in other countries within the EU (social)
- It is possible to communicate the knowledge gained through the projects, in the form of models and methods, to people not involved (lingual).
According to the literature, W is said to represent a worldview which makes the transformation meaningful (Smyth and Checkland, 1976). Looking through case studies (Checkland and Scholes, 1999), however, reveals that W (or R) often is used in two ways: (1) to illustrate different perspectives on why it is meaningful (desirable) to carry out the transformation and (2) why it is seen as possible (feasible) to carry out the transformation. This difference is illustrated in the four perspectives listed above. While the first two reasons are related to desirability, the latter two are related to feasibility. Both ways of using W contribute to the modeling process by pointing at underlying assumption of different types. To make the most of this difference it is, however, important to make clear how W is used in a particular root RD.

5.3. Comparison and Discussion of Changes

The comparison and discussion phase was carried out in a seminar attended by the project leader, the two project owners, a tutor, and people from the steering committee and reference group. The original purpose of the seminar, and, to some extent, of the study as a whole, was to present different perspectives of the projects and discuss these to make them apparent and understandable to the project members. Hence, the purpose of the study was to result in a change of outlook or attitude. Because of this the study was not meant to include any genuine taking-action phase but rather to end with a discussion where different perceptions were debated to widen the participants' understanding of the projects and their role in them. This new understanding might then trigger structural or process changes to occur. However, as it turned out the process took a different turn. The taking-action phase was carried out and the changes implemented (the split of the student group) at the end of the study and the seminar became a way of making sense of this change.

The seminar started with a presentation of the results from the finding-out phase, after which different views on work, and why it can be seen as meaningful to create new work opportunities, were presented. These different perceptions were then discussed with the group as a whole and related to the two projects in the form of a mixture of “informal discussion” and “model overlay” (Checkland and Scholes, 1999) to open up the debate.

The main topics for discussion were the difference between the students in the two projects, the difference between a process and a product approach, and different qualifying functions in relation to the projects' purposes. Due to the split of the students into two groups, the seminar ended with a discussion about how the above issues were related to each other and how they had affected the decision to split the student group. While the difference between the students in the two projects formed the basis for the split and was known by some project members, the other two differences and their relation to key members within the
different projects had not been clear. Pointing out these differences increased their understanding and helped them to understand one possible reason for the many misunderstandings surrounding the information given to the students as to how the projects were to be run, what was expected of the students, and how long they were to be involved in the projects. It also shed light on additional reasons for why the projects had been divided into two groups. One group following a process-oriented approach and focusing on students with low self-esteem and unclear visions for what they wanted to do. Here, the projects were seen as learning processes where the process was considered to be as important as the end result and where aspects such as group dynamics became especially important. In the other group, following a product-oriented approach and focusing on students with a clear business idea, the end result, the product, was stressed rather than the process. Besides this, the individual project members, rather than the group as such, were also emphasized. This was seen in the argued importance of allowing for the freedom of each student to develop her ideas within the time schedule needed for her.

Finally, the interrelation among these three issues can also be related to Checkland’s (1999) argument that most organized changes can be seen to entail three subchanges—“structural change, process change, and changes of outlook or attitude”—and that the relation and interaction among these three changes need careful thought. In this study we have seen how the difference in students together with the difference in attitudes among the project owners affected both the structure (the division of students) and the process (how the projects were run) of the projects.

6. LEARNING

The aim of this paper was to address some of the criticism directed toward SSM by applying a new conceptual tool to stimulate radical changes by helping model builders view situations from new perspectives. In the following I discuss the practical applicability and usefulness of the tool, both as a part of the modeling phase of SSM and more generally related to my framework.

6.1. Facilitating New Perceptions

Based on the experience gained by the case study, I argue that the concept qualifying function can constitute a complement to already existing techniques (root definition, CATWOE or PQR and conceptual model) for drawing out different perspectives of a problem situation, i.e., helping to elicit different kinds of Ws on different levels. In the study this was first done by using the concept, together with the modal framework, as a stimulus for exploring possible views on what qualifies or makes the activity of creating new work opportunities meaningful. This focused attention on perspectives related to the problem situation as such (W2), as well as
beliefs and assumptions about the social reality in which the problem situation was embedded (W3). Hence, it broadened the perspective on weltanschauung used in the modeling phase. Including W2 and W3 in the modeling proved to have very positive consequences for the study as a whole since it was on this level that the more fundamental differences between the participants appeared. One such difference was the difference between creating work to provide for those who are not able to care for themselves, contrary to creating work to shape and remodel society as a whole.

The qualifying function was also used as a stimulus to elicit different W1s related to why it is seen as both desirable and feasible to develop models for how work can be created. However, even with this purpose in mind, the concept had a tendency to lift the thought of weltanschauung to the level of W2 and W3 rather than W1, resulting in reasons such as the following: it is good resource management, and hence economic, to develop models that other people can use and reuse (desirable); and it is possible to communicate the knowledge gained through the projects in the form of models and methods to people not involved (feasible).

The concept also helped to clarify the meaning of a stated weltanschauung (W) or transformation (T) and to show that many interpretations can be made of a certain statement. In this study this clarification was done by relating different modalities to statements about T and/or W to explicate these before writing the RD. Most of the time a statement got quite different meanings depending on which modality it was related to. When exploring possible views on why creating work opportunities can be seen as good for a municipality, the statement—help people find their place in society—clearly illustrated this. Here the meaning of the statement shifted depending on whether it was interpreted from an ethical, a social, or an economic perspective. However, there were also times when a statement felt so closely related to a certain modality that only one modal interpretation felt relevant. Though the clarification in this study was done in the modeling phase, it should also be possible to do the clarification in the discussion phase and, thus, get a broader range of views represented. Here, interesting groupings of people might also develop, and if so it would be interesting to analyze what made these groups develop.

Further, incorporating the concept qualifying function into the RD by clarifying the T and/or W also introduces a new way to strengthen “the [fragile] . . . ‘bond’ between a conceptual model and a root definition” (Checkland and Tsouvalis, 1997) and, thus, strengthen the defensibility of the conceptual model. Defensibility, here, refers to the second of the two validity questions posed by Checkland (1995) to answer how well one can tell a “good” design from a “bad” one and focus on “whether a given model is competently built” (p. 52f.). It does not, however, mean that only one CM is possible to draw from any given RD [see Checkland and Tsouvalis (1997), Mingers (1990), and Schregenberger (1982) for a discussion
of this], just that the concept provides an additional bond between the RD and the CM that might provide an alternative to the technique for checking the technical defensibility of a CM. It can, for example, constitute a complement to the techniques of using the “formal systems model” (Checkland, 1981), modeling the transformation process of the RD in such a way that it fulfills the criteria of effectiveness, efficiency, and efficacy (Checkland and Scholes, 1990b), or including all the main activities of the holon in the root definition (Checkland and Tsouvalis, 1997).

Finally, clarifying T and/or W influenced the model building in that it added knowledge to the RD, which in turn helped to find relevant activities that enriched the CMs. This helped to make the transition from the RD to the CM. Enriching the CMs also addresses the repeated problem concerning the tendency of the CMs to be impersonal and general and, thus, not always very informative (Checkland and Scholes, 1999; Checkland and Tsouvalis, 1997; Mingers, 1992; Mirijamdotter, 1998; Naughton, 1979; Schregenberger, 1982). To develop models that are personal and relevant is of outmost importance since the “models in SSM have an impact on and effects in the real world, affecting perceptions of the problem situation” (Tsouvalis and Checkland, 1996).

6.2. Reflecting on my Framework

Regarding the framework, I identify the following lessons. Using the concept qualifying function to visualize the function or structure of a holon is a new way to apply the concept that seems to fit well with the underlying philosophy of SSM. Instead of gathering data to build an argument for why a thing or activity has a certain function and structure and why this structure and function is related to a certain modal aspect, one goes the other way around and discusses what structure and function a holon would have if it was qualified by a certain modality. Whether or not it is appropriate to use the same name for this application or whether the concept should be renamed when applied to purely conceptual systems and activities needs to be discussed.

In the traditional way of using the concept qualifying function there is a relation between the weltanschauung of the analyst and the qualifying function identified for a certain system. In addition, when using the concept as a way of picturing a holon from different perspectives, the relation between the weltanschauung of the modelers and the qualifying function of the holon modeled becomes even stronger. This issue can be broadened to include discussions about the consequences, and application areas, when using the concept to represent some kind of existing structure, an is; an aspired norm, an ought to; a possible structure, a could be; or an desired structure, a wish to.

Hence, even though Dooyeweerd very strongly argues that the internal structure of a thing or activity, and, hence, its qualifying function, is constant and not
determined or affected by external teleological ends, my experience in this study has proven the opposite. Time after time, I tried to find qualifying functions for the two projects WIP and AdAstra, as well as for other systems, such as schools, hospitals, or unions, that are not affected by the way we view the systems. This has, however, failed every time. By this, I am not saying that social systems or activities change their structure and their qualifying function as soon as we start to view them from a different perspective, or as soon as just one person views them from another perspective. But, when enough people have changed their view as to what constitutes a system, the structure of that system also starts to change. If enough people start to view hospitals as a cheap kind of hotel, or as a place that will hurt rather than save you, the structure of hospitals will also change. In the case study this was evident when I tried at first to discuss different qualifying functions in relation to the projects, without involving the concept weltanschauung. However, for each qualifying function that I discussed, I found that it matched very well to what can be seen as part of a weltanschauung, and it was this weltanschauung that determined what kind of system was to be modeled.

Finally, during this study only about half of the modalities played an active role in stimulating the modeling and only about a handful recurred on a regular bases. Common for the more actively used modalities are their relation to the social sciences (ethics, economics, history), while modalities related to the natural sciences very seldom were used. The reasons for why and when different modalities are used can most certainly be explained by a mixture of issues such as the context, the problem situation, the particular phase in the change process, and the background and interest of the user. However, for a pattern to emerge many diverse studies need to be carried out. Besides this, most of the stated Ws relate to the pistic modality in that they are all beliefs. This is also in agreement with earlier findings by Bergvall-Kåreborn and Grahn (1996) in their discussion regarding the relation between the pistic modality and the concept of weltanschauung. However, while the statements can be related to the pistic modality, the author was not able to find what felt like a relevant W1 specifically based on the pistic modality.

7. SUMMARY AND CONCLUSION

In this paper, it has been argued that even though the subjective and pluralistic nature of SSM is its main strength, it is also the characteristic that has been most criticized. The aim of this paper was to address the arguments that the methodology has a tendency to result in regulatory, rather than radical, agendas for change. This was done by incorporating a concept called qualifying function into the model-building phase of SSM and using a case study to research the practical applicability of the concept.

The study resulted in the following main findings. First, the concept qualifying function can constitute a complement to already existing SSM techniques for
drawing out different perspectives of a problem situation, and identifying self-imposed constraints, to reduce the tendency for regulatory changes. In this process the concept showed a tendency to focus attention on perspectives related to the problem situation as such, as well as on beliefs and assumptions about the social reality in which the problem situation was embedded. Second, enriching the RD by enriching T and W has the potential to strengthen the relation between a CM and a RD and, thus, strengthen the defensibility of the CM. Third, it also has the potential to enrich the CMs by helping the model builder find relevant activities. As such, it could be one way to help inexperienced model builders to make the transition from RD to CM.

Finally, the study conveyed a difference between using the concept qualifying function as a tool for analysis and using it as a tool for design. While our weltanschauung always has an impact on how we perceive the world around us, this became very noticeable when using the concept for design. Here, the perceptions of the people involved very much influence the holon to be modeled, its structure and function, and, hence, also its qualifying function.

To summarize, I argue that in this study the concept qualifying function, together with the modal framework, helped the participants to view their situation from new and different perspectives. Through this, the study resulted in a change in attitude or outlook for the project members by increasing their understanding of both the projects as such and their role in them. Hence, the concept proved to have the capability of stimulating radical changes through its potential as a tool for drawing our different perspectives on the problem situation and helping the models builders find relevant activities.

REFERENCES
Qualifying Function in SSM Modeling


Sammanfattning
The main aim of my research is to explore ways of enriching Soft Systems Methodology by developing intellectual tools that can help designers to conceptualise, create and evaluate different design alternatives. This directs the focus on the methodology's modelling phase even though some ideas related to analysis also will be presented.

In order to realize this objective the study proposes the following supplements. Firstly, a framework of 15 modalities (knowledge areas) is suggested as a supplement to existing analysis techniques, with the aim of helping the analyst identify important aspects that need to be understood in order to identify relevant issues for modelling. Secondly, a concept called qualifying function is proposed as an additional modelling tool for drawing out different perspectives of a particular problem situation, discussing desirable purposes for the design, and for exploring the underlying rationale behind a suggested transformation or a stated Weltanschauung. Thirdly, an expansion of the measures of performance used in SSM modelling, for evaluating conceptual models of possible design alternatives, is suggested. This expansion also builds on the modal framework.

Based on both the theoretical and the practical work I have done I conclude that using the modalities as a general framework in analysis, modelling and evaluation, as well as using the concept qualifying function to tease out and clarify relevant transformations and underlying value systems has .....

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