Analysis of the Dutch approach of integral organizational renewal (IOR) : an innovation in sociotechnical concepts, or just a local manifestation of global Socio-Technical Systems Design?

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Analysis of the Dutch Approach of Integral Organizational Renewal (IOR)

An Innovation in Sociotechnical Concepts, or Just
A Local Manifestation of Global Socio-Technical Systems Design?

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Abstract

First, this paper elaborates upon some concepts of the Dutch Socio-Technical Systems Design (STSD) approach of 'Integral Organizational Renewal (IOR)', and contrasts them with relevant Australian, Scandinavian or American counterparts. For instance, the main concepts of 'sub-system' and 'aspect-system' are discriminated and discussed as they will continue to influence differentially the theoretical economy (efficiency and effectivity) of our present and future STSD models. Also the IOR concept of 'interference' is considered for its fruitfulness for integral thinking.

Next, based on Van Eijnatten (1993), functional similarities and shared ideals are presented. It is strongly advocated that this congeniality of concepts is indicative of a single sociotechnical tradition, that is firmly based on the normative world view of 'Participative Democracy'.

As an appendix, some rather intemperate statements will be put forward in order to stimulate discussions, that should facilitate a better understanding of both the discrepancies and similarities of distinct holons of sociotechnical concepts at a high level of abstraction.

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1 Introduction

The history of the Socio-Technical Systems Design (STSD) paradigm covers almost half a century. During that time STSD unfolded its potential in the direction of all points of the compass. Several individual STSD approaches developed in that course of time. In my survey of STSD literature (Van Eijnatten, 1993), I suggested a division into three development trajectories: A) Pioneering STSD (1949-1959); B) Classical STSD (1959-1971) and C) Modern STSD (1971-present). The modern phase was further discriminated into four parallel tracks: 1) Australian STSD or 'Participative Design' (PD); 2) Dutch STSD or 'Integral Organizational Renewal' (IOR); 3) Scandinavian STSD or 'Democratic Dialogue' (DD); and 4) North-American Consultancy. For a graphic illustration of distinguished phases and episodes see appendix 1.

Although the afore-mentioned survey evolved into a rather personal reconstruction of the history of STSD, the careful inclusion of several critical commentaries by key-opinion leaders added to its validity. A superficial comparison of these distinct approaches, makes them seem rather incompatible, showing all sorts of regional as well as cultural particularities. But more systematic observations also reveal similarities. In this paper I will amplify, that apart from obvious discrepancies in methodologies, theories of concepts and practical design solutions, apparent similarities with respect to 'world view' can be observed on a more abstract level.

As a point of departure I start with elaborating on some central concepts of Dutch STSD, and try to match them with counterparts in other contemporary sociotechnical approaches (both Australian, Scandinavian and American STSD), and with some principal conceptions of Classical STSD. Based on this analysis I suggest functional similarities

1 See also appendix two for relevant discussion items
and shared ideals that could be viewed as mere indicators of a single STSD tradition. This paper by no means holds a plea for a single/universal STSD approach. On the contrary, it strongly supports pluralism, on the practical level. However, on a more abstract level it tries to interpret local STSD measures as sorts of functionally equivalent steps towards the superordinate goal of simultaneously improving the qualities of work, organization and society.

By doing so, I will give my answers to two of the most attractive 1995 Melbourne Colloquium questions: “How relevant are the core conceptual breakthroughs made in the 1960s, and to what extent do they need to be modified or adapted in the light of subsequent upheavals in the intellectual fields of cybernetics, the physics of ‘order out of chaos’, and current advances in complexity theory and ‘artificial life’?” And: “To what extent is it feasible to talk of a single ‘sociotechnical tradition’, given the co-existence of several strands of theory and practice?”

Although the author conscientiously tries to avoid chauvinism, the reader should bear in mind, that because he is operating in a Dutch context, the author might be unable to fully escape the natural human mischief to rank his own views above those of others.

2 Dutch Sociotechnical Concepts

Focusing on the scientific base of the Dutch STSD approach of ‘Integral Organizational Renewal’ (IOR), the following concepts will be discussed:

a. The concepts of ‘production and control structure’.
b. The concept of ‘interference’.
c. The concept of ‘control capacity’ and ‘room to manoeuvre’, ‘elbow-room’ or ‘latitude’.

To further delineate these concepts, the following English-language documents have been referred to: Van Eijnatten (1993); Van Eijnatten & De Sitter (1989); De Sitter et al. (1990). Also some Dutch-language documents will be mentioned (De Sitter 1978/1994/1995).

A. The IOR concepts of ‘production and control structure’

The Dutch approach of ‘Integral Organizational Renewal’ has deliberately broken with the conventional definition of a ‘sociotechnical system’, which consists of both social and technical ‘systems’, viewed as sub-systems, as is done in Classical STSD and North-American Consultancy (c.f. Emery, 1959; Trist, 1981; Taylor & Asadorian, 1985). Even the name of the paradigm was based on this primary distinction. The reason to give up this central concept certainly calls for a fuller explana-
In general it has to do with the systemic potencies to build an integral model. According to De Sitter et al. (1990) "the conventional sociotechnical definition of the social and technical 'systems' as sub-systems contradicts the notion of a production system as an integral functional system. The relations which constitute a real production system are functional relationships in which matter, energy and time are involved. The separation of social and technical system elements into sub-systems transforms these functional relationships into nominal ones" (p.6). An integral approach should focus on the system's total structure. In order to construct a parsimonious integral model, Van Eijnatten & De Sitter (1989) have proposed to define a sociotechnical system as a holon including human system elements only, and to consider 'technology' as part of their attribute structure, just as their attitudes, values and norms are:

"In the past few years we have learned that defining technology as a 'thing' interferes with building a parsimonious design theory. Therefore, we explicitly state that technology is just a phase in the human decision-making process, namely the syntactical one. Let's elaborate on this rather formal argument although it goes against reason and it seems of minor importance to practitioners. The main questions are: "How do we see technology as a scientific construct?" And: "What do sociotechnical practitioners mean when they say they changed the system but not the technology?"

Let's start our plea by simply stating technology is everything that is not flesh and blood. So my papers and pencil, your chair, this furniture, all of this we will call technology. Back at the office we have all sorts of machines to produce our texts, print the booklets and answer calls. That's our first working definition of technology: Technology as system elements. But what about coherence, about the relations between the elements? We pick up all our chairs, furniture, documentation, personal computers, printers and communication facilities and put them outside the building in the beautiful North-Holland countryside. We pile our technology on one side of a large green field. We ourselves stand on the other side of the field, calling ourselves the social system. On the other side of the field we have the technical or technological system. It is a nominal system because the only relation between its elements is the characteristic of 'being invented by man'. Everybody will understand that all relevant connections have been lost. What there is on the grass is a jumbled mess of things without any functional coherence at all. We come to our first conclusion: Formally speaking, technology itself, without the presence of man, cannot be a sub-system. Technology should not be defined as 'things', as system elements, because this results in a nominal system without any functional relation between its elements.

Let's continue this argument by stating technology is the existence of technical relationships between the human elements in the system. This is our second working definition of technology: Technology is technical relations. So, we have a system, a car factory for instance, with all sorts of outcomes. One output arrow is what we call a technical function. So in our example the product is a car and the technical aspect is its construction. We are afraid that's not what we are looking for in defining technology. Defining technology as an aspect-system undoubtedly is a theoretical possibility, but such a definition is not a very useful one for building design models. It is better to start all over again.
Let's consider technology in a more process-oriented way. Our third working definition of technology is 'an act of organizing in a one-sided way'. We started this discussion by stating technology is just a phase in the human decision-making process, namely the syntactic one. Now we will make our point in more detail. Technology, not being a sub-system, nor an aspect-system, can be a characteristic of the human control process. In each control loop four basic steps can be distinguished: signalling, comparing with norms, selecting the right action, and intervening. Applied to the human act of organizing as a decision-making process, those four steps can be operationalized as: perception, judgment, design and implementation.

- The first step, perception, we define as the semantic phase in organizing as a human decision-making process. Inputs have to be signalled. We need a window, a filter and a coding system;
- The second step, judgment, we call the pragmatic phase in organizing as a human decision-making process. A value function is attached to the perceptions. For a long time this field has been the prerogative of the social sciences;
- For the next two steps, selection of actions and intervention, we need solid insights in reality. We call these two steps the syntactic phase in organizing as a human decision-making process. At this point technology comes into the picture as the knowledge base of unfalsified statements about reality. But you never can say that a human act is purely a technical one. There is always a perception in advance, with a value function attached to it. In the decision-making process semantic, pragmatic and syntactic phases have been integrated. There is no 'technical action' possible which is not penetrated by social concepts. Let's look again at our chair. It's not a product of technology as we defined it, it's a coagulated idea, a materialization of our own thoughts. A chair is just a human.

We come to our final conclusion. What do we mean with 'technological design'? From the above discussion we deduce: Technological design is a form of organization which is not directed at all relevant functions in the environment. For instance, an organization design which is out of tune with the labour market, the quality of work, health, environment and so on. Technology is not an isolated entity in the organization, it's part of the attribute structure of the elements, it's the syntactical phase in the design process. Technology is applied science. Applying our knowledge is technology!

Technological design is a system that chose a partial organizational solution which is only useful to its direct inventors. In such a situation, we use our knowledge in a one-sided way. In order to solve organizational problems, we need an integral design.”

Van Eijnatten & De Sitter (1989), pp. 4-6

Because it resulted in nominal systems, the original Classical-STSD distinction in social and technical sub-systems is - theoretically speaking - likely to prevent rather than stimulate the development of an integral approach to design. In Classical STSD the concept of 'joint optimization' was developed to stimulate the act of integration. According to Emery (1993) that concept “(...) only becomes meaningful if one is studying the coupling of different kinds of systems. The coupling of unlike systems is inherently nonlinear but, as Sommerhoff has illustrated, their study need not be less scientific, just different.” (p. 136). We don’t criticize this, but we think it will not result in a parsimonious
integral model. The analysis of time and goal-oriented relations between man and machines is easily camouflaged using such a framework. "The choice for an integral approach implies that the focus should be on studying the manner in which a system's structure determines its capacity to select, develop, coordinate, reconcile and balance a multitude of input-output functions with respect to a multitude of interaction partners within and between systems in each of which cognitive as well as evaluative and technical dimensions are implied" (De Sitter et al., 1990, p. 7, italics added). So redesign should be aimed at facilitating both quality of work, quality of organization, and quality of industrial relations at the same time.

An integral model should not be deterministic by nature. The design criterion should be phrased in terms of goal directability, not in terms of goal directedness (De Sitter, 1995, p. 15): "Which structural conditions guarantee that an organization is able to maintain a balance between changeable functions (both at present and in the future as well)."

To better enable the building of such an integral model of a production system, the IOR approach defines the following pair of aspect-systems (De Sitter, 1994):

a. Production Structure (P aspect-system): The architecture of the grouping and coupling of performance functions with respect to the order/work flow (transformations);
b. Control Structure (C aspect-system): The architecture of the grouping and coupling of control functions (regulations).

These two aspect-systems were based on two main functions: control (the selection of relations in a labour process) and performance (realizing relations in a labour process). Some structural parameters of the P aspect-system are: Functional concentration, performance differentiation, and performance specialization. Some structural parameters of the C aspect-system are: Control specialization, control differentiation, and division of control functions in the control loop. The Information Structure (I aspect system) can be added to the P and C as the content and form of information to be registered, and the way in which it is stored, processed and transmitted (Van Eijnatten & Loeffen, 1990; De Sitter, 1994). Being aspect-systems, in a real-life system P, C and I are not separable; they actually relate the system elements (people) to each other.

B. The IOR concept of 'interference'
The concept of 'interference' is described by De Sitter as "(...) the chance that two or more interaction processes meet each other in the labour process, and as a result of their normative and/or material incompatibility, cause a disturbance which tends to affect the interaction possibilities which come into being through the labor process" (De Sitter,

1978, p. 15). The more different system functions should be controlled in a variety of circumstances, the greater the probability of interference between the processes/interaction cycles in question.

Incontestably the concept of 'interference' echoes Ashby's cybernetic 'Law of Requisite Variety' (ALRV). In its original conception (Ashby, 1956) it states that the external variability of the environment as an input should be compensated for or cancelled by a proportional variety of the open system itself.

In both Classical and Australian STSD, this ALRV was further developed into the central sociotechnical principle of 'redundancy of functions' (Emery, 1967; Emery, F. & Emery, M., 1974). In order to account for enduring environmental variety, Fred Emery's prior concern was to establish an overcapacity of functions on a micro level, in each person in the organization. In Dutch-STSD terms, Emery is increasing 'control potencies' by making the workers 'multi-skilled' to prepare them to perform different tasks, whenever necessary.

Ashby's Law of Requisite Variety (ALRV)

![Diagram of Ashby's Law of Requisite Variety](image)

Figure 1 A graphic presentation of the working of the IOR balance model. Hoevenaars (1991), p.20
In Modern Dutch STSD (IOR approach) De Sitter also built his 'Balance Model' on ALRV. But his elaboration was quite different. De Sitter (1978) defined the variability of the open systems inputs as 'control needs', and the potential open systems variability as 'control potencies'. As was mentioned above, three aspect-systems were defined: 1) the production structure (P): The grouping and coupling of executive functions; 2) the control structure (B): The grouping and coupling of regulative functions; and 3) the information structure (I): The technical elaboration of P and C. By starting to redesign the production structure aspect-system on a macro level, his primary interest is to reduce the systems control needs by parallelization of order/work flows. In terms of Classical STSD this is redesigning the 'technical system'. Notwithstanding which STSD variant will be used - Classical STSD, Participative Design, or Integral Organizational Renewal - the very act of redesigning will result in an acceptable ALRV equilibrium state. But the absolute levels of their balances differ. Because Emery apparently accepts the environmental variety as given or unchangeable, his boosting operation to increase the 'internal systems variety' necessarily results in a more heavy-weighted balance (so less efficient equilibrium) than De Sitter's. IOR's recommendation to make order/work flows parallel will decrease the input variability of each production sub-system dramatically, at each particular level of environmental turbulence. Applying ALRV to this redesigned situation, will result in a more light-weighted balance (so more effective equilibrium). For a graphic illustration of this argument, see figure 1.

I would like to stress here that De Sitter did not reduce environmental turbulence as such - of course this is neither a real option nor a desirable one - but he actually is downsizing the inputs range/scope of the open system by creating parallel subflows. After parallelization, each sub-system will account for only a part of the original environmental variety. Just partitioning the original work flow into two parallel subflows already causes a dramatic drop (up to 83 %) in the internal variety needed (control potencies). This action has a major impact on the overall complexity of the structure (see figure 2).

This 'streamlining' of the production system does not mean one should do away with self-managing groups (SMG's). Obviously there is still enough external variety to account for in each sub-system! But because of the reduced control needs - theoretically speaking - De Sitter's SMG's certainly can control a larger part of the paralleled production flow. While managing rather large segments of a specific order/work flow, the groups will become real 'whole task groups'.

This innovative idea of parallelization of work flows in order to enable successful team design is also firmly expressed in Mathews (1994, p. 56) under the title 'segmentation by product or process', while its working is transparently demonstrated in the case of the pad moulding plant of Bendix Mintex (Mathews, 1994, p.118; Mathews et al., 1993).
According to De Sitter (1993) the idea of 'joint optimization' in Classical STSD also have been based on some notion of potential interference between types of systems functions (p.165). In fact this design concept tries to accomplish 'a best match' of 'social' and 'technical' subsystems alternatives.

C. The IOR Concepts of Control Capacity and Elbow-Room or Latitude

Control capacity can be described as the potential of a (sub)system to reduce interference (De Sitter, 1994). So control capacity may be used by a person (worker or manager) or a group. Two pairs of this interference reduction capability can be distinguished: the potency to regulate the labour process in question, using routine or nonroutine procedures; and the potency to coordinate your own work with that of fellow workers up or downstream in the process, using routine or nonroutine procedures. Especially the nonroutine regulation variants of control capacity can be powerful instruments in the hands of workers or teams. By constantly managing their own work, they also start re-discovering unutilized control potencies, and learn to change regulation procedures.

Figure 2 Parallelization: Reduction of 'external' variety by streamlining the production structure. De Sitter et al. (1990), p. 14
whenever necessary. One of the central features of the control capacity concept is the emphasis on discretion: The freedom to act according to one's own judgment. Controllability instead of control is the aim of IOR: the generic capacity to adapt and innovate in a balanced, multi-functional manner.

**Figure 3** A further analysis of Karasek's data. De Sitter (1994), p. 28

Control capacity bears a resemblance to the concept of 'responsible) autonomy', that is used in other STSD approaches. But in IOR its meaning is broadened, liberating it from the restrictions of purely psychological connotations. One of the effects of control capacity can be illustrated using the data of Karasek (1979). Further analysis of his data showed that autonomy (control capacity) and workload (as perceived by the workers) could be successful predictors of absenteeism. Absenteeism is highest in cases where workers experience high workloads but are offered low control capacity (De Sitter, 1994; see also figure 3).

The IOR model discriminates internal and external elbow-room, scope or latitude. It concerns different action alternatives that should be functionally equivalent with respect to one interaction cycle, but functionally different with respect to other interaction cycles. According to De Sitter (1995) elbow-room is a special case of ALRV: More complex relations require more latitude. This concept corresponds to, but does not duplicate the 'equifinality' concept in Classical STSD.

What Emery did for Classical (and Australian) STSD, De Sitter did for Dutch STSD. The results are two quite different sets of concepts (see table 1).
3.3 Functional Similarities and Shared Ideals in STSD

Most discussions about conceptual developments in STSD usually do not rise above the local level. This is understandable because working in a national context makes this kind of communications the major concern. But it keeps away from getting a wider scope. Because one is easily predisposed to present one’s own variant as being absolutely unique, scientists and practitioners are hardly ready to accept the relevance of alternative approaches. As a result, personal knowledge of
additional contemporary modern STSD variants is rather limited.

In order to discover any similarities among approaches, one has to become familiar with these STSD variants in the first place! As the concepts and measures seem quite incompatible, one should predominantly look for congruity on a more abstract level, seeking for functional equivalences.

One of the most characteristic features of 'global STSD' is the use of action research as a typical way of working among sociotechnologists. The actual practice of action research is most clearly observed in the Scandinavian variant of (Modern) STSD (Naschold et al., 1993). But it is fair to say that in the evolution of Dutch, Australian and American approaches action research also played a cardinal role. The ideal is to develop local sociotechnical outcomes that accommodate the 'tacit knowledge' of the company workers involved as much as possible. Actually, the real secret lies in specifically combining a minor set of innovative design principles with the most valuable local experiences. In Australian and Dutch STSD the communication about concepts starts with sorts of 'briefing sessions'. PD involves giving some training in the use of its basic conceptual framework in both Participative Design Workshops and Search Conferences (Emery, M., 1993). IOR organizes 'knowledge transfer' courses for both management and workers of the companies in which a sociotechnical project is starting (De Sitter, 1993). Using the conveyed concepts, the actual redesign in both variants is done by the people whose work is under revision. Most of the time the resulting sociotechnical solutions are tailor-made and highly context-specific endeavours, successively urging researchers to tap and study these local variants.

Another common feature of the various STSD approaches is the use of an open systems model. Although the degree of sophistication may differ considerably, such a model is exploited as a basis for all contemporary STSD variants. In (Modern) Dutch STSD the open systems model is most elaborated from a design-technical point of view; in Modern Australian STSD the model is left quite simple and by implication, it is very communicable. In mainstream American STSD the model is closest to the Classical STSD prototype, while in more recent attempts people have used 'chaos theory' models as well (cf. Purser & Pasmore, 1991). In original Scandinavian STSD the use of the classical open systems model is evident, but in the current approach it goes unobserved.

A third striking similarity between distinct STSD approaches is the creation of a 'learning organization'. In Scandinavian STSD theoretical emphasis is put on the restructuring of language/communication, facilitating inter-organizational learning by applying the dialogue conference method (Engelstad & Gustavsen, 1993). Australian STSD is explicitly based on an educational approach towards learning, culminating in a whole array of STSD 'do-it-yourself' participative analysis and
design methods (Emery, M. (Ed.), 1993). Dutch STSD actually contributes to organizational learning by specifying/determining its structural conditions (De Sitter, 1994). Currently also more dialogue/learning-oriented process extensions of IOR are being developed (Fruytier, 1994; Hoogerwerf, 1995). In American STSD organizational learning was just one of the themes, because of its original emphasis on expert consultancy. In more recent years it definitely has become a core issue (Purser & Pasmore, 1991).

A shared ideal in all STSD approaches is ‘Participative Democracy’ which is aimed at “locating responsibility for coordination clearly and firmly with those whose efforts require coordination” (Emery, F. & Emery, M., 1989, p.100). Acknowledged as a dominant world view, this ideal has the power to join all sociotechnologists across the globe: Each local action could be a step towards the superordinate goal of simultaneously improving both the qualities of work, organization and society.

4 Arguments and Indications for a Single STSD Paradigm

Of course, it would be poor judgement to suggest all local conceptions should fit one STSD approach only. Because of regional differences in political and cultural systems, the actual form of measures will remain dissimilar.

In the previous paragraph I have stated that on a more abstract level these distinct approaches could be regarded as related endeavours of a single master STSD paradigm. What was advocated there, was that on a higher level of abstraction the distinct approaches share a common goal: To reach the ideal of ‘Participative Democracy’. It is only at the strategic level that STSD variants distinguished are compatible.

Van Beinum (1993b) expressed a comparable view. With respect to PD, IOR and DD he noticed: “It is clear that there are some fundamental differences between the three schools, both with regard to the assumptions underlying their theoretical orientation and in their methodologies for effecting change. (...) The evidence indicates that, in spite of their very distinctive characteristics, the three approaches share some fundamental orientations and assumptions which seem to suggest that, from a practical development point of view, the pluralistic features of STSD are basically not of a conflictuous kind. All three schools include in their theoretical position the notion that the effective organization should have a developmental orientation and have the characteristics of a learning environment. Furthermore, they recognize, albeit in different ways, the essential correlation between participative democracy and their various strategies for organizational change. Also, they include in their understanding the democratizing significance of the STSD paradigm in a wider societal context.”(pp.xxii-xxiii).

Additional evidence for a single STSD tradition is that sociotechni-
cal scientists from all over the world continue to meet each other to discuss common topics (c.f. this Melbourne colloquium). They share the same attitudes and goals, although their particular concepts differ considerably and their approaches resulted from different epistemological/ontological backgrounds and world contexts.

More than any other theoretical argument actual practice should provide the norm to declare different STSD approaches to be related. Sociotechnologists from all points of the compass share that typical emancipation/action-research attitude to change. In the context of an increasingly changing world, the unambiguous drive to create a desirable future discretely identifies different STSD approaches as clear representatives of a single sociotechnical paradigm.

Note

The author wishes to express his sincere thanks and to pay special tribute to Prof. dr. Ulbo de Sitter, the architect of the Dutch Socio-Technical Variant, for his innovative scientific oeuvre. On 31 March 1995 he retired from Nijmegen University, the Netherlands. His valedictory address, about the development of the IOR approach, is entitled: "De onzichtbare hand (The Invisible Hand)". His Dutch colleagues have honoured him by publishing a "liber amicorum", called: "Als het maar stroomt! Ulbo de Sitter: Laveren tussen simpel en complex (Keep it flowing! Ulbo de Sitter: Keeping a happy medium between simple and complex)".

References


Review, 69 (6), 69-79.


Figure 2.2 The phases and milestones in the development of STSD
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Appendix 2

Paper (to be) presented at the "International Colloquium on Organizational Innovation and

Some Statements to Encourage Discussion

This appendix contains some points of disputation in order to stimulate discussions. Most issues have previously been raised in Eijnatten, F.M. van (1993). The paradigm that changed the work place. Stockholm/Assen: The Swedish Center for Working Life/Van Gorcum. This Melbourne colloquium is a first-rate opportunity to continue the debate. The following topics could be discussed:

1. The fruitfulness of identifying sub-systems versus aspect-systems concepts in defining STSD.
2. The question of administering democratic versus undemocratic approaches in order to change work structures.
3. Drafting an inventory of 'strong and weak points' of distinguished STSD variants.
4. The desirability to continue to support a distinct STSD paradigm in the future.

The author wishes to thank Fred Emery, Hans van Beinum and Ulbo de Sitter for their critical statements.
The first point of discussion could be of course the fruitfulness of sub-systems/aspect-systems distinctions in defining STSD.

The following statement is by Fred Emery (taken from Van Eijnatten, 1993):

"The social 'elements' (people!) are organized in social systems and the technical elements into technical systems. 'The social elements' behave, the technical elements only act or interact. The laws governing technical elements 'are functional relationships in which matter, energy and time are involved': They are rate-dependent laws; the variables are epistemically dependent and they lead us to the integral, closed systems models for which we can thank Descartes, Newton and Laplace. The laws or 'rules' governing biological, psychological and sociological behaviors are time independent and hence epistemically independent of the variables of matter, energy and time (Pattee, 1977; Sommerhoff, 1950). (...) De Sitter's IOR theory is a reversion to General Systems Theory and I think, I made clear, what I think of that, in the introductions to my Penguin collections, Systems Thinking (1969/1981). It is not related to STSD and its development, except for representing what STSD rejected and sought to replace. It would certainly be misleading to label it 'Modern STSD' as it has nothing to do with STSD, it is just straight industrial engineering systems theory."

Fred Emery (1993), p. 136
This is Ulbo de Sitter's reply (taken from Van Eijnatten, 1993):

"Emery does not seem to understand our argument (...). The question is not whether 'social' elements (people) behave just as 'technical' elements according to 'rate-dependent' laws. Of course they do not and neither do 'technical' elements. Rather, the question is whether it is useful to use the concepts of the 'socio' and 'technical' sub-systems as cornerstones in a theory of sociotechnical design. More simply speaking, things in the world around us become 'technical' only in the minds and at the hands of man. A fallen branch may be picked up and used as a stick for some purpose. In doing so, the branch becomes the actor's bearer of 'technical' meaning. The creation of meaning however, can only be understood in the interactive context of man's existence. By using it, the branch becomes the bearer of social meaning. This same branch can represent very different meanings and it is, therefore, not the 'thingness' of something, nor its subjectedness to 'rate dependent' laws, that makes it 'technical' but the type of meaning attached to it. Thus, technical elements can be material as well as immaterial. Software elements are just as technical as machines of machine components. How one assembles a sentence out of words to be used as an effective and efficient vehicle of communication or 'meaning transfer', is a 'syntactical' or technical problem, and, as such, a social problem. In short, technical problems are human problems and technical elements are the product of man's creative thinking as a social being. Technological change is social change and is therefore not a function of rate-dependent laws, etc. This is the way the term 'technical' is applied to everyday living, and I do not see any reason why scientists should take a different stand."

Ulbo de Sitter (1993), p. 165

This is my own suggestion:

For the best practice of STSD, I think it hardly makes any difference whether one is using the traditional twin-concept of 'social and technical sub-systems', or the IOR 'production and control aspect-systems'. It is at the theoretical level that specific advantages/disadvantages come to the fore. The two strands have led to different sets of concepts, and different scientific groups in different nations/continents, who are defending them.

Emery's original conception of 'social and technical sub-systems' was for a long time the best available alternative. It is still very attractive because it is easy to communicate. The approved explanatory power seems to originate from this 'intuitive credibility', as is the case with the whole 'Participative Design' approach. In Classical STSD the idea caused rather complex design concepts (such as 'joint optimiz-
ation', and 'directive correlation').

De Sitter’s conception of ‘production and control structure’ is rather arduous to communicate. First of all people have to understand the quite abstract ‘aspect-systems’ concept. But once mastered, the idea of inseparable (in practice), but analytically decomposable ‘relationships’ proved very economical in advocating integral design.

In summary then, if one is interested in systematically developing a STSD knowledge base, one should judge the systemic sophistication of both distinctions, and choose accordingly. If one is just interested in achieving the best practice possible, acting is far more important than abstract thinking, and one should choose models that are most easily obtainable or most convenient in actually motivating people in a local situation of change.

One question remains. What counts more: Clear communication and motivation, or scientific sophistication in model building? Or can we do both: using a more popular language to initiate change, while at the same time developing a formal system’s language to explain redesign principles in a parsimonious way?

To me this discussion should not lead to clashes between different ‘schools of thought’, nor to reproaches for treating ‘participative democracy’ as identical to ‘social engineering’. Both approaches, PD and IOR, proved real representatives of STSD!

The second point of discussion could be the question of democratic versus undemocratic approaches to change. Should people have complete freedom in designing new workplaces for themselves, or do we have to coach them by presenting a frame of reference? Or should we install democracy by using undemocratic procedures?

*This is Ulbo de Sitter’s point of view (taken from Van Eijatten, 1993):*

In the traditional sociotechnical paradigm it is largely and implicitly taken for granted that there is a logical and complementary relationship between democratic decision making on the level of a system as a whole and individual needs and values at the level of individual members. The sociotechnologist as *agent of change* is confronted here with a complex ‘double’ problem. Can democratic decision making produce undemocratic decisions? Is it possible that undemocratic decision making could produce democratic decisions? Is Schumpeter right when he concedes that democracy should be defined as an ‘arrangement’ for decision making independent of the content of decisions (Schumpeter, 1943)? How is democracy on the level of the national community and democracy on the level of organizations related? Which type of participative decision making is democratic and which type is not? And last
but not least: Is democracy an indispensable concept in applied sociotechnical design? The double character of these questions appears when a sociotechnologist fulfills the role of agent of change. If only change on the basis of democratic decision making is regarded as acceptable, how then could a system that by its centralistic authoritarian structure, have fostered alienation and disinterest among its members ever change democratically? How could a sociotechnologist as servant of power render his services to a management that simply imposes a sociotechnical redesign? In short: How could a fundamental undemocratic structure ‘democratically’ be changed into a democratic one? The question is, according to Van Eijnatten’s overview, an actual one and a short comment from a modern sociotechnical point of view might be of interest.

In the national policy of industrial nations, labor relations play an increasingly important role. Since redesign of the division of labor is always implied in the sociotechnical approach, the mutual interdependence between members of work organizations with respect to production control, will change from asymmetrical to (more) symmetrical. Consequently, labor relations on the level of the individual firm will change as a function of the redesign of work structures. If sociotechnical restructuring could be accomplished on a nation-wide scale, this would induce fundamental changes in the labor relations on a national level. It would, however, be entirely wrong to foster a sociotechnical ambition to exert influence on the political orientation of such a change. Sociotechnical structures enlarge options and opportunities for decision making on the basis of organizational learning, not with respect to specific problem definitions but with respect to problem solving as such. In this sense the position of Sociotechnology should be kept modest. It should rest on the notion that democracy at the macro (national) level is bounded by structural conditions on the meso and micro levels of the social system. The idea that democracy on the national level requires participative structures within the institutions that constitute a national community is still not an altogether shared view in political science. However, an impressive amount of research in this field sustains theory in this regard. People who participate in decision making at work tend to be less alienated and see themselves as more committed. They are more often active members of associations, labor unions or political parties while a pluriform institutional differentiation in its turn sustains political pluralism and the open ‘individualizing’ character of society. As a sociotechnical redesign of the division of labor always implies that more members perform more tasks in production control on the operational as well as the tactical (design) and strategic levels, the degree of participation and the opportunities for learning will be substantially enlarged. In this sense sociotechnical redesign undoubtedly enforces the micro-structural foundation of a democracy within the realm of work. This view, which also in political science has its strong sup-
porters (Pateman, 1970; Naschold, 1971/1972) deserves more attention and interest because emancipator movements and institutions often underestimate the fundamental social (as opposed to individual) function of the quality of work. In Labour Unions, for example, the idea that emancipation stands for increased wages and social security benefits are still dominant and Unions tend to treat their members as consumers rather than as producers.

Besides the democratic structural potential implied in Sociotechnology, there is the much discussed problem of its implementation in work organizations. There are, in my view, two basic questions: First, is it possible to change an undemocratic structure in a democratic manner? Second, is the content of a democratically chosen change as it where legitimated by itself, and is the content of an undemocratically imposed change automatically wrong because the choice rests on an undemocratic decision?

The answer to the first question is simple. Of course, it is by logical necessity impossible to transform an undemocratic structure in a democratic manner. If, as a function of the prevailing division of labor, the relationships between people in an organization are outspoken asymmetrical in terms of power and interdependence, the structure is by definition undemocratic. Just as in the political theory of the nation as a whole, a distinction is made between the form of decision making and its structural prerequisites, democracy at work is more than a decision making arrangement. The positions members hold in an organizational network impede or foster their opportunities to develop insight, knowledge and skill with respect to the process to be designed and controlled and determine their opportunities on the labor market. Such conditions limit the options for effective participation, even if participation was freely be granted. Members of an organization could come to the agreement only to design and implement structural change on the basis of consensus and they could wish to make decisions in a 'free' debate or 'Diskurs' in the sense of Habermas. But they could only wish to do so. Such arrangements have no effect whatsoever on the current structure and its eventually uneven distributed opportunities for effective participation. Production systems are no debating clubs. They are complex systems producing goods and services in a competitive market. One can deplore or enjoy this fact of life, but you cannot ignore it.

This conclusion brings us to the second question: the legitimacy of the content of a decision with respect to redesign. Again the answer is, in principle, a simple one. The core of the question is, whether it is possible to base a judgment of a given organizational design on scientific arguments. Suppose the criterion for such a judgment would be based on the potential capacity of a system to contribute to the development of an optimally balanced society. The term 'balanced' refers here to multifunctionality: Not only a competitive product, but also a non-polluting product. Not only healthy and save work, but also inspiring
work with reduced risks for stress and alienation and more opportunities for developing one’s own resources. Not only a structure ensuring optimal control of the current process, but also a structure that fosters innovation by learning. Not only optimal QWL, but also optimal product quality. Not only profitability in the short run, but also employment in the future, etc. This amounts to a practical time-bound summary of a balanced production function. On the theoretical level, multi-functional balance could, without becoming more concrete, be defined as ‘functional complementarity’. As the future is unknown, the specific functions to be kept in balance are also unknown. The sociotechnical problem refers to the question that structural conditions constitute the generic capacity for balanced control. If one believes, as I do, that such a sociotechnical science is possible, as a result of a consequence, you must accept the possibility that an organization decides democratically to implement a structure that could, from a sociotechnical point of view, be judged as unsatisfactory.

Of course, the probability of the effective implementation of a resolved redesign increases with the degree of consensus reached. The opportunities given to members where they have actual influence on organizational change can reduce resistance to change and foster consensus and commitment. In an asymmetrical situation of a strong management and a large volume of unskilled repetitive labor, such opportunities are unevenly distributed. And even where this is not the case, there is no guarantee for successful redesign. There was once a Dutch case where weavers were given a free hand in the redesign of their department. They designed new nice tasks for themselves and proposed a transfer of all original repetitive task elements to a new group of unskilled men. In Dutch Sociotechnology we have, therefore, been working on the development of design methodology that prescribes the best sequence in which questions of a redesign should be discussed and what kind of knowledge and set of design techniques is connected to each step. With the help of such knowledge the members of an organization can make their own redesign.”

Ulbo de Sitter (1993), pp. 171-174

This is Hans van Beinum’s statement (taken from Naschold et al., 1993):

“It will probably not be disputed that democracy is in need of renewal, revitalization and further development. Also, it is quite evident that the democratization of work and the nature of our democracy in general are closely linked, both positively and negatively. Furthermore, looking at the various examples given of the kind of conditions affecting the development of new forms of work organization on different social system levels, it is clear that the situation is very complex. (...) This kind
of reasoning suggests that the democratization of work requires an
orientation which is pragmatic and in accordance with Ashby's law of
requisite variety. There should be an appropriate fit between approach
and reality, between the characteristics of the strategy and the features
of the field. This means among other things a multi-level methodology
which can accommodate the different contexts and different types of
relationships (Gustavsen, 1992, p. 105). Although there is no conceptual
scheme that will integrate the features of the different social system
levels, there is nevertheless a 'universal' in the 'particulars' of the prag­
matic approach, which is in fact the glue of the human condition, and
that is language and communication. This fact, combined with the
notion that one can only democratize by means of democracy, form, in
my opinion, the fundamental logic of the democratic dialogue of the
LOM programme. It is only through dialogue that the linguistic re­
sources will be developed that will make it possible for the different
levels to discover and build the kind of language and the necessary
concepts that will enable them to connect and create a common ground
which is required for the democratization of work in a wider societal
context. This is what Gustavsen would call linguistically oriented prag­
matism, the hallmark of the LOM programme."

Hans van Beinum (1993a), pp. 188-190

This is Fred Emery's statement (taken from Emery, M. (Ed.), 1993):

"(...) We cannot think in terms of anything but representative demo­
cratic systems. Furthermore, I have suggested that those systems have a
powerful and compelling logic of their own. Locked into that logic we
finish up with Churchill in deploring 'democracy' but deploring the
known alternatives even more. It has been my contention that, behind
the backs of political scientists and others concerned with political
democracy, practical democratic alternatives to the representative sys­
tems have already emerged. These are alternatives that enable us to
move closer to the ideal of democracy; i.e., toward participative democ­
rapy in the conditions of the modern industrial society.

I have not been discussing participative democracy just as a theo­
etical possibility - there was quite enough of such empty speculation in
the late sixties. I have been discussing implications of enduring practi­
cal experiments in the harshly practical world of work. In the world of
work those ideas of participation have gone from being interesting
possibilities to serious probabilities that have to be considered in the
design of any work organization. (...) If we fail to recognize that real
democratic alternatives to representative systems are possible, then we
remain condemned to continue on the flight path of the fabled ooloo
bird who flew in ever decreasing circles.
(...) One can expect that when people experience the freedom that comes with participation in markets (as propertied persons, not slaves) there will emerge social pressures to exercise similar choice of preferences in their governance. If it is accepted that they are competent to do the one, they will not readily accept arguments that they are incompetent to do the other.

(...) After analysing the interlocking roles of modern markets and modern politics, Lindblom observed that we have still failed to appreciate adequately the probability that "more than class, the major specific institutional barrier to fuller democracy may, therefore, be the autonomy of the private corporation" (p. 356). It is this failure that appears to lead to his conclusion that without boldly conceived mayor new democratic alternatives, "it may follow, then, that it is impossible for democracy to develop significantly beyond what is found in crippled form in existing polyarchy" (p. 353). Without apparently knowing what had been emerging in the world of work since 1951, Lindblom felt that "the most fertile field for a more participatory democracy appears to be in industry (...) an arena in which authoritarianism has been for so long universally practised and little questioned" (p. 334).

(...) I hope that I have established that Lindblom's expectations about the most fruitful starting point for finding a bold new alternative have been justified.

Fred Emery (1993), pp. 182-184

A third point of discussion could be (the utility of) drafting an inventory of 'strong points' of STSD variants distinguished, so that we can learn from each other and improve the design of more comprehensive approaches towards integral organizational renewal.

This is my own view:

I think it is good practice to discuss similarities and differences in terms of value. Indicating strong and weak points can be very informative. Of course the local situations should remain the main point of departure. Although the aim certainly is not to end up with a universal approach, we could try to use this occasion to discover and communicate probable deficiencies in our own approaches.

In order to facilitate discussions, I would like to start with a preliminary listing of some strong and weak points of Modern STSD variants:

- Scandinavian STSD ('Democratic Dialogue'), Strongest points: Special emphasis on the wider scale by creating inter-organizational networks (quality of industrial relations), proper development of demo-
cratic communication strategies, good scientific documentation of cases. **Weakest points:** Few operational changes at the workplace level, no measurable contribution to the strategic goals of firms.

- **Australian STSD ("Participative Design").** **Strongest points:** Excellent elaboration of a 'Do-it-yourself' analysis and design approach (quality of work) based on participative democracy, very successful diffusion strategy. **Weakest points:** Low degree of elaboration of structural design theory, poor scientific documentation of cases.

- **Dutch STSD ("Integral Organizational Renewal").** **Strongest points:** High degree of elaboration of structural design theory, measurable contribution (benchmarking/quality of organization) to the strategic goals of the firm, the active role of logistics and control theory in creating an integral approach. **Weakest points:** Low degree of elaboration of the implementation process, poor scientific documentation of cases (c.f. Haak, 1994).

- **American STSD ("American Consultancy").** **Strongest points:** Proper development of expert methods and change techniques, good scientific documentation of cases. **Weakest points:** Low degree of elaboration of structural design theory, low direct participation of workers in analysis and redesign efforts.

Of course this list is subject to careful validation by the respective representatives of the distinct STSD approaches.

The *fourth point of discussion* could be the desirability to continue supporting a distinct STSD paradigm in the future. Do contemporary upheavals in management literature urge the end of the Socio-Technical Systems Design paradigm? Or do we have to fight these new fads because they threaten the ideal of participative democracy?

*This is my own position:*

In recent years basic ideas about structural organizational renewal alternatives seem to have been converging. In this paper four alternative Modern STSD variants were discussed, as they developed during the seventies and eighties. In the nineties these variants have been found to be merging (Roobeek, 1993; Van der Zwaan, 1994; Mathews, 1994). I believe this is not only the case in Modern STSD, but also applies to other approaches in the realm of organization theory and management science. Many authors are currently proclaiming a remarkably similar ‘new’ production concept (c.f. Mohrman & Cummings, 1989; Hammer, 1990; Davenport & Short, 1990; Prahalad & Hamel, 1990; Harmon & Peterson, 1990; Drucker, 1990/1991/1993; Quinn Mills, 1991; Davenport, 1993; Hammer & Champy, 1993; Mohrman, 1993; Suzaki, 1987/1993; Galbraith, 1994; Schumacher, 1994).
More than once original pathfinding STSD ideas appear to be echoed in highly commercialized approaches such as Business Process Re-engineering, Total Quality Management and Total Productive Maintenance.

At the same time, different ‘world class’ practices show deceptive similarities in actual work organization: Parallel work flows, all sorts of teams as instances of whole-task/self-managing work groups, integration of staff with production activities, and the development of networks. Soon the new production concept will become common property as a new world standard with numerous local variants. In that case there would be no further need for a separate STSD paradigm any more; the signalling role of STSD would become obsolete. Right?

I don’t think so! First, behind the facade of fashionable management hypes there could be a hidden variant of old-world Taylorism, as is the case in Lean Production. Second, in most bestsellers prophesy predominates, while the actual redesign methods and techniques remain relatively unspecified. Because of the absence of a straightforward approach to change, it is easy for organizations to use these new buzz words just to re-label their traditional work processes, while actually changing nothing! Third, STSD should continue to adapt to new developments, such as the invalidation of the ‘unity of time, place and action’, caused by modern Information Technologies (Electronic Highway), creating completely new opportunities for the sociotechnical work organization, because people can process/(re)work different stages of the same document at distinct locations at the same time, etc.

It is my conviction that STSD should continue to defend the ideal of ‘participative democracy’, and try to get this vital function incorporated in each emerging integrated approach to organizational renewal.