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An Holistic Approach to the Management of Information Systems Development—A View Using a Soft Systems Approach and Multiple Viewpoints

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This paper argues that only a systems-based approach to information systems development is likely to cover all the recognized problem issues reported in the literature. It is then shown that software development can be characterized by the structure of the Soft Systems Methodology, so that this methodology acts as a metaphor for the process of information systems development. The structure of this methodology can be seen at lower levels of the development process, and so the model generated here is seen as recursive. Further, information systems development is seen as an unstructured business problem that can be characterized by the Multiple Viewpoint approach. The connections between this approach and the methodology are identified. Finally, the unifying link between these approaches and all forms of action research is identified.

KEY WORDS: information systems development; soft systems methodology; multiple viewpoints.

1. INTRODUCTION

The overall aim of this paper is to argue that only a systems-based approach to information systems development (ISD) is likely to cover all the recognized problem issues reported in the literature. The characteristics of these problems are identified. It is noted that these problems have been known for many years. The responses to the problems fall into two broad areas, which are characterized

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as paradigms. On the one hand, there is a belief that systems development should be considered to be a form of applied science or engineering (Dijkstra, 1976; Floyd, 1992; Hoare, 1982). However, there are weaknesses with this approach, which are identified herein. These weaknesses are addressed by approaches from within the second or systems paradigm (Checkland, 1981; Checkland and Scholes, 1990). The systems paradigm is regarded as an extension of the science paradigm. Consequently, it is argued that fewer problems will be found if methodologies based on the systems paradigm are used. The foundations and nature of this approach are described. Further, it is shown that the Soft Systems Methodology (SSM), which is based on this paradigm, can be used as a metaphor or model of ISD. In this form, it is recursive; and so this model is characterized as Recursive SSM. The change of paradigm reflects a change in attitude by the developer, which is characterized through Linstone's (1984) concept of Multiple Viewpoints. These viewpoints are identified and characterized. Their impact on SSM is described.

This paper will therefore address the following major activities:

- An examination of the possible causes of and responses to the problem area recognized as the "software crisis."
- Recognizing that these problems are not addressed by the science paradigm *per se*. The science paradigm needs to be extended to address the outstanding issues. This extension is termed the systems paradigm.
- Identifying the support for the Soft Systems Methodology from the systems approach.
- Developing an understanding of the form of Recursive SSM.
- Recognizing the use of SSM for ISD.
- Identifying and characterizing the multiple viewpoints present in ISD.
- Identifying the presence of these viewpoints in SSM.

2. SYSTEM FAILURES—REASONS AND RESPONSES

Software and its associated technologies and business processes are now transforming the opportunities for business organizations. Unfortunately, the promise of computer usage does not always bear fruit. In 1968, a Study Group on Computer Science, established by the NATO Science Committee, responding to the perception of a "software crisis," recommended the holding of a working conference on software engineering (Naur et al., 1976). The term "software engineering" was coined to be deliberately provocative, implying, as it does, the need for software development to be based on the principles and practices seen in engineering (Naur et al., 1976).

Although the introduction of an engineering approach had an effect on the way software is developed, we note that some years after the initial concept of software engineering Pressman (1987) still commented that for "the past decade managers and many technical practitioners have asked the following questions:

- Why does it take so long to get programs finished?
- Why are costs so high?
- Why can't we find all the errors before we give the software to our customers?
- Why do we have difficulty in measuring progress as software is being developed?"

Despite the problem represented by these questions being well-known (in that these issues have been prominent in the literature for nearly thirty years), disasters are still happening.

Although a common response to the software crisis has been to suggest that training should be improved (Canan, 1986; Hoare, 1982), practitioners and managers do not always do what they know they should. For example, Gibbs (1994) reports Larry E. Druffel, Director of Carnegie Mellon University's Software Engineering Institute, as saying that, unfortunately, "the industry does not uniformly apply that which is well-known best practice". Even if "best practice" is enshrined in a methodology, this does not guarantee success. For example, a discussant (Eddie Moores) at the 1995 Information Systems Methodologies Conference, referring to some currently unpublished research of his, said that the most used methodology was "JDI" (just do it). It was also made clear in subsequent discussion that even when managers said a methodology was being used, this was no guarantee that this was so. Another example of managers not doing what is expected by the literature is when they implement systems on time, but with known errors. As Pirsig (1984) notes, a quality product will only be produced if people care about quality.

The NATO Study Group's belief that the use of applied science would be an appropriate solution to the software crisis was echoed by Hoare (1982) when he said that "professional practice ... [should be] ... based on a sound understanding of the underlying mathematical theories and ... should follow closely the traditions of engineers in better established disciplines." Similarly, Dijkstra (1976) was interested in the mathematical basis of programming, and considers the development of programs to be a scientific discipline. Gibbs (1994) supports this view when he concludes that a disaster "will become an increasingly common and disruptive part of software development unless programming takes on more of the characteristics of an engineering discipline rooted firmly in science and mathematics." This is the same recipe as reported by Naur et al. (1976) nearly 20 years earlier.

From this description, we can characterize the software engineering perspective as deterministic and one that assumes that there is some definable, true, and real set of requirements that can be elicited and formally specified. It concentrates on the production of a piece of software that conforms to a specification as efficiently as possible (Vidgen et al., 1993). However, this optimistic approach lacks the insight shown by Bronowski (1973) when he says "there is no absolute knowledge. And those who claim it, whether they are scientists or dogmatists, open the door to tragedy. All information is imperfect. ... That is the human condition." Although it might be overstating the issue to say an unnecessary business problem is a tragedy, this paper will demonstrate that this insight does apply to ISD. The problem of unsuccessful information system developments is seen as unnecessary, as the problems and solutions are well known. However, it is clear that systems do still fail, both during development and use. Little (1993), for example, finds estimates of system failure in the literature running between 25% and 90%.

In a major survey of the literature on why information systems fail, Lyytinen and Hirschheim (1987) identify four generic issues that give rise to such failures:

- Correspondence failure—the system, as implemented, does not correspond to what was required.
- Process failure—a system is not forthcoming within time or resource constraints.
- Interaction failure—systems, as implemented, which fail to satisfy the users.
- Expectation failure—systems that are unable to meet stakeholders' expectations.

The Process failure can be seen as representing a functionalist approach. However, whereas the other three kinds of failures may be addressed by a functionalist approach, they all reflect the social and organizational issues identified earlier. To ensure that these are addressed requires a different approach, introduced herein.

Recently, it has been recognized that it is important to identify the way analysts are seen by the organization and how they see themselves (Bell and Wood-Harper, 1992; Hirschheim and Klein, 1989). This can be identified by the use of metaphor. The software engineer is usually seen as a technocrat who tries to deliver what is thought of as the user's requirements, but with minimal reference to the user. The failure types that reflect social and organizational problems, rather than purely rational problems, are more likely to be addressed when the analyst acts as a facilitator. This change of emphasis from technocrat to facilitator is actually quite radical, as it reflects a major change in the background philosophy of the analyst. The facilitative approach is characterized as interpretative and contextual in outlook; it views models as a means of talking *about* reality rather than models *of* reality. This new philosophy cannot be supported entirely from within the current scientific framework. A way of encapsulating this form of framework is the concept of a paradigm. A paradigm describes a way of looking at the world. There are certain limitations to the science paradigm when considering individual members of staff and managers, which are addressed by a related paradigm, which is developed through the systems approach or from systems theory (Checkland, 1981; Lyytinen and Hirschheim, 1987). A systems approach will reflect a concern to look at potential systems as a whole (holistically). This is in contrast to the scientific or engineering approach, which tends to solve problems by breaking them down into smaller, more manageable fragments (reductionism). Further, and in particular, a systems approach will be expected to address the human and organizational issues that tend to be ignored in the traditional approaches.

Newman (1989) puts it quite strongly when he suggests that it is a myth that organizational issues are not the concern of its information systems professionals. The incorporation of social issues needs to be based on a systems approach (Checkland, 1981; Hitchman and Bennetts, 1994, 1995; Mitroff and Linstone, 1993). The systems approach is needed, as it can incorporate these issues, whereas a science of engineering-based approach cannot. Similarly, Bignell and Fortune (1984), in examining failures in undertakings such as the building of the Humber bridge, also recommend a systems approach, and recognize the need to take human factors into account.

Today, even workers in Safety Critical Systems, in which very great technical demands are made on systems, recognize the need to include "human" aspects (Griffyth, 1995; Newmann, 1995). Software creation is recognized as a social activity (Price, 1995); similarly, Rogers (1995) identifies communication as crucial. Further, Prince (1993) reminds information system managers that "quality assurance (QA) and related programs are first and foremost human resources programs. IS managers who attend to the human details succeed in a way that QA theorists never do." This has been recognized for some time. For example, Bostrom and Heinen (1977) in a comment that they recognize can be applied to any computer-based information systems effort, say "The major reason why Management Information Systems (MIS) have had so many failures and problems is the way systems designers view organizations, their members and the function of an MIS within them." They argue for a "more realistic view of organization," as in "Socio-Technical System design." Similarly, Earl and Hopwood (1980) recognize that "lack of management support and involvement are [frequently] cited as causes of inadequate MIS." They urge "a broader organizational perspective" for systems development. We therefore argue that an approach that is more than purely functionalist is required.

Others have recognized that software development is not just a purely rational process; for example Lucas (1975) and Symons (1990) recognize how political the development of an information system can be. There are instances in which a perceived benefit for one group is not necessarily a benefit for another group, as increased access to information in one place may imply an eroded power base elsewhere (Symons, 1990). Lucas (1975) makes it quite explicit when he says "information systems do not exist in isolation: they have the potential for creating major changes in power relationships and stimulating conflict." Similarly, "no one knows how many computer-based applications ... are abandoned or expensively overhauled because they were unenthusiastically received by their intended users" (Markus, 1983). Further, Markus (1983) argues that to "design systems that will not be resisted or to devise ways to modify resisted systems ... technical system analysis must be augmented with a social or political analysis." It is clear that one key issue in ISD is organizational politics. Even so, Symons (1990) considers that despite often playing a key part in ISD, politics "are generally ignored by researchers." Consequently, there is a possibility that a developer, creating a system through the use of a methodology that does not itself recognize the need for a political analysis, will avoid such an analysis.

This section has shown that the software crisis, first recognized well before 1976, is still an issue in 1999. Other problems of ISD have also been characterized. The issues giving rise to all these problems have been identified and seen to imply that human, social or organizational issues share much of the blame. It has been noted that these issues have been addressed by responses from within the applied science or engienering paradigm. However, these attempts have not resolved the problem.

This paper has recognized that there are difficulties in the development of software. It is not clear from the literature how pervasive these difficulties are. For political reasons, organizations would prefer to be able to say that they have no problems. Although well-structured, clearly defined problems may well have no difficulties in their development, ill-structured or contentious problems are likely to have difficulties in their development. Some of these difficulties are intrinsic, and some are brought in by the behavior of the developers or their managers or their clients. Software Engineering has been offered as a way of resolving the intrinsic, technical problems. However, the other problems need different methods. Both classes of problems need to be resolved to develop quality software. This is supported by Blackburn (1973) when he says "by relying lopsidedly on abstract quantification as a method of knowing, scientists have been looking at the world with one eye closed." It is also supported by Hesse (1976) when she says that the "empiricist account of science as objective, cumulative, success-oriented, and value-free, is no longer adequate ... for the social sciences." This reference to the social sciences is particularly relevant now that ISD is recognized as a social system (Ledington and Heales, 1993).

3. SSM AND INFORMATION SYSTEMS DEVELOPMENT

It has been argued that the business process of ISD is subject to politics and other aspects of human interaction issues that cannot be dealt with from within the scientific tradition alone. Instead, an approach based on the systems paradigm has been recommended. The methodology chosen to support this approach is Checkland's Soft Systems Methodology (Checkland, 1981; Checkland and Scholes, 1990). This methodology assumes that those involved in an activity agree to come to an accommodation (Checkland, 1998). It also operates as a learning process. Consequently, the methodology expects no final, fixed outcome, although this is possible. For SSM, a particular problem situation (in this case, ISD) is examined through an analysis of the perceived corresponding Human Activity System (HAS). Consequently, both product and process issues can be examined.

The rationale for choosing SSM can be summarized as follows:

- Systemic thinking is supported, recognizing emergent properties, together with monitoring and control activities. (In the context of ISD, this embeds the Software Quality Assurance (SQA) process and other associated processes, such as project management, within the monitoring and control activities of the methodology.)
- The social and organizational aspects of ISD are recognized in the form of a Cultural Stream of Analysis, which is continually being examined and updated. (Hence, politics and human factors are explicitly recognized.)
- The technical processes required to develop the system can be represented by the Logic Stream of Analysis, although not by the original processes. To reflect this, Checkland's image of the stream is replaced by a framework attributed to Wood-Harper (1994), described herein.
- An in-built learning process is offered.
- Participation by all stakeholders is assumed. (This is potentially very difficult to achieve in its ideal form. However, it does aid involvement and acceptance.)
- Historical information is expected. (How did the organization get to its current state?)
- It does not assume that all answers are already known, but acts as a means of structuring a debate to identify the appropriate and feasible solutions in a particular organization at a particular time. (Aids communication among stakeholders.)
- The context for development is determined by the stakeholders. (This allows ISD to reflect an organization's business objectives, rather than an idealized set of objectives imposed from outside.)

Avison and Wood-Harper (Avison and Wood-Harper, 1990; Avison et al., 1998) characterize the processes of ISD using the dimensions of technical issues, information technology issues, organizational issues, and social issues. These dimensions are taken in four pairs—organizational and technical issues; technical and information technology issues; information technology and social issues, together with social and organizational issues. Using this framework, the logic-based analysis of ISD can be encapsulated in the following four stages:

- Identify the information processing needs of the organization.
- Develop an information model or models of the organization.
- Design corresponding information systems.
- Identify the impact of these information systems on the organization.

It should be noted that all these stages are ongoing. The information needs of any organization are not fixed, but liable to change on an unpredictable basis. It has proved difficult, in practice, to achieve a usable information model of an organization (Batra and Marakas, 1995; Reingruber and Gregory, 1994). The designs developed will be contingent on the resources, expertise, and technology available. There may be external economic and political factors that affect which systems are implemented and how. This image of SSM in the context of ISD is summarized in Fig. 1.

4. RECURSIVE SOFT SYSTEMS METHODOLOGY

It was argued in the previous section that SSM can be seen as an appropriate metaphor for ISD. Following a similar argument, Bennetts and Wood-Harper (1997) and Lewis (1994) recognize that SSM can be seen as a metaphor for the process of data analysis. This is because the elements of the process of data analysis are covered either by the Logic Stream or by the Cultural Stream. Consequently, it is argued that any process that can be divided into elements that are dealt with these two streams combined can use SSM as a metaphor for its structure. It has already been noted that the process of ISD can be seen as a Human Activity System (HAS), and that many traditional developments fail precisely because they omitted to take note of organizational issues or political issues, preferring to respond only to the logical issues. This therefore establishes that a Social or Cultural Stream should be present in any methodology or combination of methodologies that address the whole process of ISD. It is already recognized that a Logic Stream is present. This Logic Stream, as represented by most methodologies, will concern itself with specific fragments of specific models of the systems life cycle. For example, SSADM defines its activities as covering the Requirements, Analysis, Design, and Implementation phases of the Waterfall Systems Life Cycle. We are not concerned here with which methodologies might be considered, only with recognizing that there are many ways of achieving the requirements of the ISD process' Logic Stream.

Checkland and Scholes (1990) develop SSM in the context of problem identification right at the start of any systems life cycle. Further, Vidgen et al. (1993) show that SSM is an appropriate model for SQA, a monitoring and control process of ISD. Finally, Bennetts and Wood-Harper (1997) and Lewis (1994) show

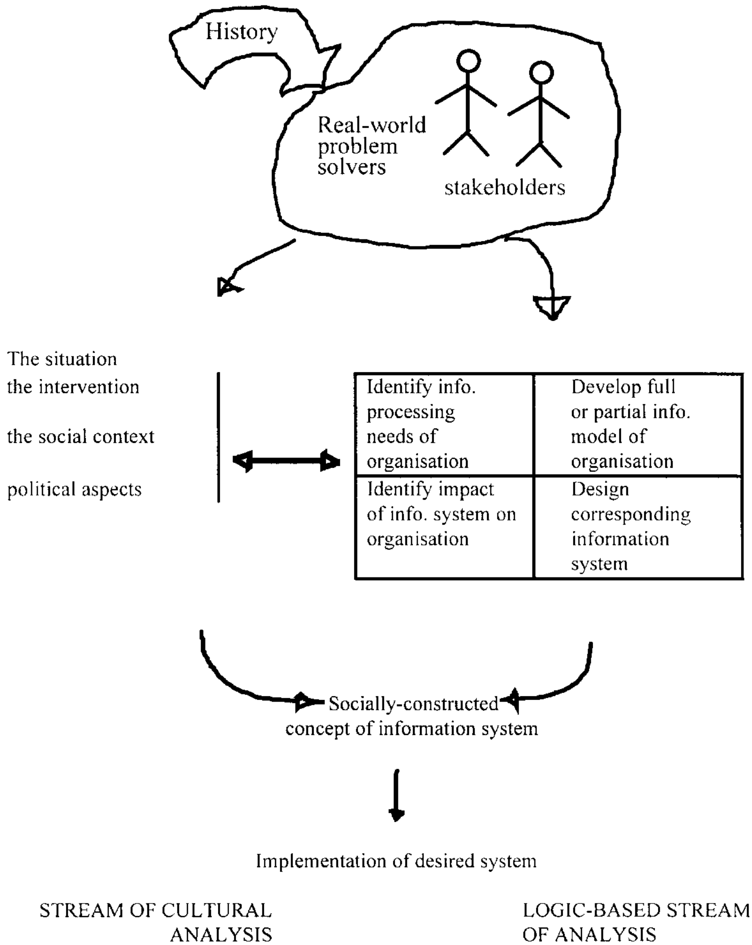

Fig. 1. A framework for the ISD process (adapted from Bennetts and Wood-Harper, 1997 after Vidgen, Wood-Harper and Wood, 1993).

that SSM is an appropriate model for the process of data analysis. However, these are all sub-processes within the process of ISD, which is itself modeled as an SSM process. Consequently, the process of ISD can be modeled as a recursive SSM process. This model is therefore called Recursive SSM.

Care is required here in interpreting the word "recursive." Two forms of recursion can be identified. The first one, found in mathematics and some programming languages, operates as a defined calculation together with a "stopping value." One common example of this form of recursion is the factorial function, in which factorial (n) is defined by the calculation $n * \text{factorial} (n - 1)$, and 0 acts as the value at which the recursion stops, with factorial (0) defined as 1. We therefore call this form of recursion mathematical recursion. The second form of recursion—schematic recursion—is structural rather than algorithmic, and has no stopper. Instead, it is recognized that within a given model, parts of that model, which model specific substructures, have the same overall structure in relation to that substructure as the overall model has to the overall structure. Another example of this form of recursion may be found in Beer's concept of a Viable System (Beer, 1985). Recursive SSM has schematic recursion.

5. MULTIPLE VIEWPOINTS

This section describes the work of Linstone and colleagues (Linstone, 1984; 1985; 1989; Mitroff and Linstone, 1993). It shows how this work relates to the model of ISD described earlier. The principal idea at issue is that any complex, unstructured business problem needs three generic viewpoints to be considered in order to arrive at a comprehensive, pertinent, and acceptable solution. Given the scenario depicted in the Introduction, ISD is seen as an unstructured business problem. The viewpoints identified are the Technical (T), the Organizational (O), and the Personal (P). Linstone follows Checkland in suggesting that the source of the technical perspective may be seen in disciplines such as systems engineering, systems analysis, and operations analysis (Linstone, 1984). The organizational and personal perspectives he traces from Machiavelli (*The Prince* and *The Discourse*), as well as Lindblom's Incrementalism, Kant's Noumena, and Churchman's Singerian inquiring systems.

Linstone particularly defends the introduction of the personal viewpoint when he says: "From Adam Smith to West Churchman, concern has been expressed over the danger of ignoring the individual and losing him in the aggregate view" (Linstone, 1984). Linstone's three viewpoints are recognized by him as generating a framework that is equivalent to Churchman's Singerian inquiring system (Linstone, 1984). These inquiring systems of Churchman (1971) are recognized by Courtney, Croasdell, and Paradice (1998) as providing philosophical support for learning organizations, and by Checkland (1981) for SSM. This is useful as the same philosophical framework supports both the generic approach to successful ISD and the organization's attempts to improve its processes. The three viewpoints are described in detail later. Mitroff and Linstone (1993) argue that the T perspective will cope with most events that are likely to happen. However, O and P perspectives are needed when considering low likelihood events with severe consequences.

This last comment needs further examination. Checkland (1981), in the context of SSM and therefore, in the context of ISD, would argue that all three viewpoints are required in order to adequately analyze any ill-structured problem situation, regardless of the risk. It is recognized that clearly defined goals can be addressed through the technical viewpoint alone. However, the O and P perspectives are always required if attitudes and assumptions need to be identified. This has been confirmed by pilot work reported by Bennetts and Wood-Harper (1996), which showed the implicit presence of these viewpoints in decision making about software quality by practitioners. In the introduction, it was argued that the probability that a large, complex information system will fail, in some sense, in its development or use, is high rather than low. However, the results of such a failure are often severe. If it difficult to reconcile this with Mitroff and Linstone's definition of when O and P perspectives are needed, as their definition refers to low-probability events.

Linstone (1984; 1985; 1989) describes the use of these viewpoints and their characterization in very similar ways. The technical perspective is recognized as being dominant. The rational, analytical approach of this perspective focuses on things such as data, models, optimization, and alternatives. Much effort is expended on classifying and categorizing, developing lists, tables, charts, and graphs.

On the other hand, the organizational perspective is concerned with policies, power and procedures, i.e., the politics of the organization, both internal and external. Ideally, an organization would hope, during any change process (such as the development and implementation of an information system), to progress in a controlled way from one state to the next. The organizational viewpoint will need to respond to external pressures from competitors, regulatory bodies, special interest groups, customers, etc. It will also be reacting to internal pressures in the context of the organization's culture and myths that help the organization develop its own image and bind its personnel together. The issues and characteristics of the organizational perspective in a particular instance may not be immediately obvious. Indeed, SSM sees the discernment of this perspective as an ongoing activity.

Finally, the personal perspective is difficult to define, as it includes any personal issue not covered by the other two perspectives. These are issues such as intuition, charisma, leadership, and self-interest. Clearly, some people will have more impact in a given environment than others. Consequently, this perspective would endeavor to elucidate the explicit and implicit power structure in an organization.

Linstone identifies four roles for the personal perspective (Linstone, 1984):

- Understanding of the total decision process is enhanced through the participating actors. Linstone gives examples from national politics—e.g., selected in-depth interviews may give better understanding of voter attitudes than polls; loyal subordinates may put a particular "spin" on reality that will fit the boss' views.

Table I. Characteristics of the Generic Viewpoints (after Linstone, 1985; 1989).

	Technical (T)	Organizational (O)	Personal (P)
Goal	Problem solving, product	Action, stability, process	Power, influence, prestige
Mode of inquiry	Modeling, data analysis	Consensual and adversary	Intuition, learning, experience
Ethical basis	Rationality	Justice, fairness	Morality
Planning horizon	Far	Intermediate	Short, with important exceptions
Other characteristics	Cause and effect	Agenda of the moment	Challenge and response
	Problem simplified, idealized	Problem delegated and factored	Hierarchy of individual needs
	Claim of objectivity	Reasonableness	Need for beliefs
	Optimization	Satisficing (first acceptable solution)	Cope only with a few alternatives
	Quantification	Incremental change	Fear of change
	Trade-offs	Standard operating procedures	Leaders and followers
	Use of averages, probabilities	Compromise and bargaining	Creativity and vision by the few
	Uncertainties noted	Avoid uncertainties	Need for certainty
Communication	Technical report, briefing	Language differs for insiders, public	Personality important

- It is a way of gaining better understanding of the organization's viewpoint. The thought here is that it may be easier to synthesize attitudes from talking to key individuals, rather than trying to analyze a group as a whole.
- Individuals may matter, and this is one approach that will identify their characteristics and behavior.
- Communication of complex problems and issues may be facilitated through this perspective.

This description and characterization are summarized in Table 1. Notice that the organizational and personal perspectives can be seen as the end-points of a "quasi-continuous range of perspectives between individuals and organizations" (Linstone, 1984). Linstone (1989) shows how Checkland's (1981) SSM reflects this multiple viewpoint approach. In order to describe this reflection, a figure based on the stage diagram of SSM (Checkland and Scholes, 1990) is displayed as Fig. 2. The stage numbers are used for ease of reference. Current prac-

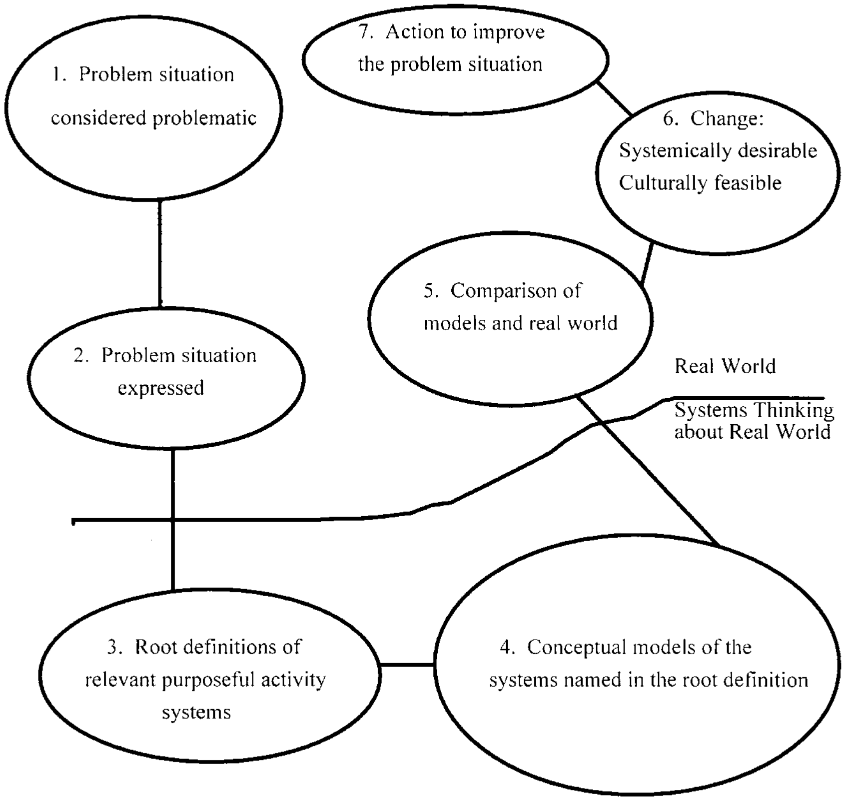

Fig. 2. The conventional structure of SSM (after Checkland and Scholes, 1990).

tice, as described in Checkland and Scholes (1990), indicates that the stages are not necessarily performed in numerical sequence. Hence, Linstone sees stages 1 and 2 of SSM as giving the systems practitioner the opportunity to build up the "richest possible" (i.e. multiple perspective) picture of the "problem situation" in the real-world setting in which it is anchored. Only then, in stages 3 and 4, is the practitioner expected to formulate his conceptual models or T model. Subsequent stages revert to the real world (stages 5, 6, and 7). Recognizing that SSM is also used by nontechnical staff, he allows that nonsystems people will have considered other, more O- and P-oriented means to move from stage 1 to stage 5. For all those involved, stages 5 and 6 then involve cross-cueing, integration and political bargaining among the stakeholders and their perspectives, which leads to stage 7—action to improve the problem situation. Similarly, the process diagram of SSM (Checkland and Scholes, 1990) or the adaptation of it shown in Fig. 1 can also be mapped on to Linstone's Multiple Viewpoints. Thus, the Technical Viewpoint is covered by the Logic Stream, whereas the O and P perspectives are reflected in the Social Stream of Analysis.

6. CONCLUSIONS

The Soft Systems Methodology was specifically designed to assist in the resolution of ill-structured problems. It was also designed as an interpretative approach, allowing insights to be gained about this form of problem situation. The early sections of this paper clearly show that ISD is not well-structured. If it were, it would be much easier to control. Further, it was shown that politics and human factor issues are critical. Approaches based purely on the science paradigm have difficulty coping with these issues. SSM, however, is formulated specifically to include these issues. Further, it was shown that science paradigm is represented by SSM's Logic Stream, whereas the systems paradigm needs both the Logic and the Cultural Streams. Consequently, SSM is offered as a metaphor for the management of ISD. Finally, it was shown how Linstone's Multiple Viewpoint framework addressed business problems such as ISD, and was reflected in the model developed from the metaphor.

It has been argued that if an ISD project should fail, it is usually through a failure to consider organizational and personal viewpoints sufficiently, and that SSM could be used as a metaphor to describe the necessary management of ISD. However, this implies that the organization is willing to change or learn. Further, it must be willing to move to an undefined (as yet) mode of operation. In order to gain insight into how this might be achieved requires the use of qualitative research methods. For example, Baskerville and Wood-Harper (1998) argue that "The discipline of IS seems to be a very appropriate field for the use of action research methods." Further (citing Van Eynde and Bledsoe, 1990). Baskerville and Wood-Harper comment that "It should not be surprising that action research is the touchstone of most good organizational practice ... [It] merges research and praxis thus producing exceedingly relevant research findings." It is therefore suggested that appropriate approaches may be determined through the use of action research.

It is noted that both Linstone (1984) and Checkland (1981) describe approaches to problems in organizations that are forms of action research. Further, both authors recognize the philosophical support they receive from Singerian inquiring systems (Churchman, 1971). Checkland develops SSM through a merger of action research with systems science (Baskerville and Wood-Harper, 1998) and Linstone's approach can be characterized as management consulting. Baskerville and Wood-Harper (1998) offer a genealogy of IS action research, that divides the field into five streams—social and organizational science; organizational learning; process consultation; systems science; and IS action research.

Linstone's and Checkland's approaches come from different streams, but both have the same philosophical framework as a basis. This paper therefore argues that Churchman's Singerian inquiring system can be used to support all forms of IS action research.

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