A COMPARISON OF FIVE ALTERNATIVE APPROACHES TO INFORMATION SYSTEMS DEVELOPMENT

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INTRODUCTION

The field of information systems (IS) has grown dramatically over the past three decades. Recent trends have transformed the IS landscape. These trends include: the evolution of implementation technology from centralized mainframe environments towards distributed client-server architectures, embracing the internet and intranets; changes in user interface technology from character-based to graphical user interfaces, multimedia, and the World Wide Web; changes in applications from transaction processing systems towards systems supporting collaborative work; and the use of information technology as an enabler of business process reengineering and redesign. These technology changes coupled with changes in organizations and their operating environment, such as the growth of the network and virtual organization, internationalization and globalization of many organizations, intensified global competition, changes in values such as customer orientation (service quality) and Quality of Working Life, have imposed new demands on the development of information systems.

These changes have led to an increasing discussion about information systems development (ISD), and in particular, the various methods, tools, methodologies, and approaches for ISD. We believe such discussion has opened the door for new, alternative IS development approaches and methodologies.

Our paper takes up this theme by describing five *alternative* ISD approaches, namely the Interactionist approach, the Speech Act-based approach, Soft Systems Methodology, the Trade Unionist approach, and the Professional Work Practices approach. Despite the fact that most of these approaches have a history of over 15 years, their relevance to IS development is not well recognized in the mainstream of IS practice and research, nor is their institutional status comparable to traditional approaches such as structured analysis and design methods. Therefore we characterize the five approaches as 'alternative' in the sense of alternative to the orthodoxy.

The selection of the five approaches is essentially based on the finding that research on ISD approaches and methodologies has been dominated by a single set of philosophical assumptions regarding the nature of the phenomena studied and what constitutes valid knowledge about those phenomena (Hirschheim and Klein,1989; Orlikowski and Baroudi, 1991; and Iivari, 1991). The idea behind the selection of the five ISD approaches has been to include approaches which challenge the dominant assumptions. These alternative approaches typically build upon radically different conceptions of the goals, meaning, function and processes of ISD. Part of the rationale for our paper is to meet the need of a concise yet penetrating way of introducing alternative ways of system development to a wider audience. The way in which the approaches are introduced, highlights their underlying principles and features. This naturally leads to a critical examination of their strengths and weaknesses. From this angle the paper adds more detail to the earlier work on mapping the terrain of the complex literature on IS development (*cf.* Episkopou and Wood-Harper, 1986; Hirschheim and Klein, 1989; Iivari, 1991; Orlikowski and Baroudi, 1991; Baskerville, *et al.* 1992; Avison *et al.* 1992; Avgerou and Cornford, 1993; Fitzgerald, 1994; Hirschheim, Klein and Lyytinen 1995; Avison and Fitzgerald,1995; Jayartna and Fitzgerald, 1996; Wynekoop and Russo, 1997; Iivari, Hirschheim and Klein 1997).

The paper can be expected to be of interest to the IS community in three respects. Firstly, the five alternative approaches are likely not to be as widely known as they deserve to be. The following meets the need of a concise introduction to them. Secondly, the paper continues our earlier work on mapping the terrain of the complex literature on IS development (Hirschheim and Klein, 1989; Iivari, 1991; Hirschheim and Klein, 1992; Hirschheim, Klein and Lyytinen 1995, 1996; Iivari, Hirschheim and Klein, 1997). Thirdly, it is our contention that the five alternative approaches point the direction which some important IS research will likely take in the future to strengthen the interpretive and critical traditions (Orlikowski and Baroudi, 1991; Hirschheim and Klein, 1994) within the field.

REVIEW OF THE RELEVANT LITERATURE

The Interest in ISD Approaches

In the current discussion about ISD it is possible to detect two countervailing trends and this paper can be

viewed as a contribution to both. The first trend reflects the belief by some that the interest in methodologies has been waning for reasons of their supposed deficient practicality. Even though there is little empirical research on the actual use of ISD methodologies, existing evidence (e.g. Hardy *et al.* 1995, Chatzoglou and Macaulay, 1996) suggests that their use is limited in practice, and as far as they are used, they are not literally applied (*cf.* Westrup 1993). Chatzoglue and Maculay (1996), for example, report that nearly half of the projects (47%) did not use a methodology in their survey of 72 projects within the UK, while another British survey, Hardy *et al.* (1995), suggest an encouraging figure (18%) for the non-use of methodologies. Hardy *et al.* (1995) report that 38% of methodologies used were in-house developed and were customized in 88% of cases. Wynekoop and Russo (1993), report the findings of a survey of over 100 organizations which indicated that 65% of organizations had developed their own methodology in-house and 89% of the respondents believed that formal methodologies should be adapted on a project-by-project basis. Mathiassen (1988) went so far as to question the practicality of methodologies in guiding the work of seasoned practitioners, suggesting that methodologies are primarily intended for beginners as the primary vehicle by which they are initiated into the field (*cf.* Andersen, *et al.* 1990). More moderately, Unhelkar and Mamdapur (1995) propose a metaphor of a "road map" for ISD methodologies, suggesting that a methodology may not be able to recognize all situational factors (e.g. road-blocks) and is more useful for a "foreigner" (beginner) than for a "seasoned" practitioner (Henderson-Sellers, 1995).

At the same time, there is a second trend of resurgence in methodology interest for several reasons. Firstly, the recent interest in object-orientation has created a new wave of ISD methodologies. Since the late 1980's dozens of object-oriented methodologies has been published leading to an increasingly complex methodology landscape (Monarchi and Puhr, 1991; Hong, *et al.* 1993; Iivari, 1994). Secondly, Computer Aided Systems/Software Environments/Engineering (CASE) with their companion methodologies (Vessey, *et al.* 1992) have also brought ISD methodologies to the forefront. Most current CASE tools support a specific, standard methodology, such as Modern Structured Analysis or some object-oriented methodology. The tight coupling between methodologies and CASE tools is suspected to stifle the evolution of IS methodologies (Bubenko, 1988). The latest CASE research has focused on more flexible CASE environments leading to the idea of method engineering as an engineering discipline to design, construct and adapt ISD methodologies and methods (Kumar and Welke, 1992; Harmsen, *et al.* 1994). Thirdly, software quality (e.g. ISO 9000-3) has been brought to the forefront in Software Engineering (*Computer*, 1996), the common view being that the quality must be built in the software right from the beginning. This obviously requires some sort of methodology. Finally, there has been considerable research and industry interest in software process maturity and improvement since the publication of the Capability Maturity Model (CMM) by the Software Engineering Institute sponsored by the DoD (Humphrey, 1989). CMM identifies five maturity levels which are based on an increasingly disciplined, standardized and predictable software process (Paulk, *et al.* 1995).

Untangling the Methodology Jungle

Avison and Fitzgerald (1988) coined the phrase "methodology jungle" to describe the status of ISD methodologies as a whole, as an unorganized collection of numerous methodologies which are more or less similar to each other. Bubenko (1986) estimated a decade ago that there existed hundreds of ISD methodologies, and more recently Jayaratna (1994) estimated the number to be of order of 1000. In such a state, it is clear that the highest priority should not lie in developing new methodologies but in better understanding the existing stock and the collective methodology knowledge embedded in them. And as far as new methodologies are concerned, one should be careful that a new methodology differs in some significant way from existing ones.

Iivari, Hirschheim, and Klein (1997) suggest that categorizing ISD methodologies into classes of similar methodologies, begins to address the problem of the methodology jungle. They define an ISD *approach* as a set of fundamental goals, guiding principles, concepts, and principles for the ISD process for IS development, which drive interpretations and actions in information systems development. The *goal* specifies the general purpose of the approach. *Guiding principles* form the common "philosophy" (*cf.* Avison and Fitzgerald, 1995) of the approach which ensures that its methodology instances form coherent wholes (*cf.* Hirschheim, Klein and Lyyti-nen, 1995). *Fundamental concepts* define the nature of an IS implicit in the approach as well as the focus and unit of analysis in ISD. *Principles of the ISD process* express essential aspects of the ISD process in the approach. The methodology instances of an ISD approach are stipulated to share these fundamentals. An ISD *methodology*, on the other hand, can be interpreted as "an organized collection of concepts, methods[1], beliefs, values and normative principles supported by material resources" (Hirschheim, Klein and Lyytinen, 1995). More

[1]Because the word "method" has two other meanings - the meaning of methodology which is increasingly adopted in Europe, and the meaning of operation or service in the object-oriented vocabulary - the term "technique" is preferred in the following.

specifically, an ISD methodology is codified into a set of goal-oriented procedures which guide the work and cooperation of the various parties (stakeholders) involved in the building of an information systems application. These procedures are usually supported by a set of preferred techniques and tools and activities (*cf.* Hirschheim, Klein and Lyytinen, 1996). A technique, in this context, consists of a well-defined sequence of elementary operations which more or less guarantee achievement of certain outcomes if executed correctly.

Emerging from the concept of ISD approach, is the need for methodology customization (or more formally "method engineering", *cf.* Kumar and Welke, 1992). One should note, however, that customization is neither easy nor necessarily being successfully performed (Hardy, *et al.* 1995). Iivari, Hirschheim and Klein (1997) suggest the concept of an ISD approach as a class template of its specific ISD methodologies would be a useful intellectual tool in the customization process, allowing customization as an instantiation of a specific approach. The concept of approach leads to focusing on the fundamental goals, guiding principles, concepts, and principles for the ISD process in the customization process.

To conclude, this paper takes the position that ISD methodologies are still important. At the same time one should recognize additional roles of ISD methodologies which are complementary to the traditional idea that methodologies are rules systems to be applied literally. These roles include to serve as convenient knowledge representation forms, ideals of a "rational" design process (Parnas and Clements, 1986), vehicles of learning (Checkland, 1981), and to provide concepts and metaphors for expert communications (Madsen, 1989). Hence methodologies deserve continued attention even though the focus of this attention may be shifting to new aspects. However, the paper goes beyond specific methodologies to consider ISD approaches, and in particular, the paper goes beyond the prevailing "functionalist" approaches when introducing and discussing five alternative ISD approaches.

SELECTION OF APPROACHES

There has been considerable interest in the underlying assumptions of IS research covering both their broad philosophical (paradigmatic) assumptions (e.g. Klein and Welke,1982; Mumford, *et al.* 1985; Banville and Landry, 1989; Hirschheim and Klein, 1989; Iivari, 1991; Orlikowski and Baroudi, 1991; Nissen, *et al.* 1991; Hirschheim and Klein, 1992; Hirschhein, Klein and Lyytinen 1995, 1996; Iivari and Hirschheim, 1996) as well as more specific aspects of IS development, such as the values held by IS designers, and the views of IS users (e.g. Hedberg and Mumford, 1975; Bostrom and Heinen, 1977; Dagwell and Weber, 1983; Kumar and Welke, 1984; Kumar and Bjorn-Andersen, 1990). Hirschheim and Klein (1989) applied the paradigmatic framework of Burrell and Morgan (1979) to categorize IS development approaches. Their literature analysis suggested that there exists an identifiable "orthodoxy" which ignores those based on fundamentally different assumptions. Orlikowski and Baroudi's (1991) analysis of 155 empirical research articles published from 1983 to 1988 provides confirmatory evidence. They report that existing IS research exhibits a single set of philosophical assumptions regarding the nature of the phenomena studied and what constitutes valid knowledge about those phenomena. They also introduced two additional research philosophies for consideration - the interpretive and the critical - illustrating each through an example. Iivari's (1991) paper based on the analysis of fourteen books representing seven contemporary traditions or "schools of thought" of IS development - Software Engineering, Database Management, Management Information Systems, Decision Support Systems, Implementation Research, the Sociotechnical approach and the Scandinavian Infological approach - also confirms the existence of an "orthodoxy".[2]

If we accept the notion of a prevailing "orthodoxy" to ISD, it is natural to seek out its counterparts and this has provided the motivation and criterion for selecting "alternative" approaches for analysis. It is our preconception that the following five approaches represent philosophical assumptions which make them significantly different from the dominant textbook "orthodoxy":

1.   the Interactionist approach,
2.   the Speech Act (SA)-based approach,

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[2] Iivari (1991) found that all the seven traditions have quite similar assumptions. In his words, they were dominated by the view of information/data as descriptive facts and an information system as a technical artifact with social implications with the exception of the Sociotechnical and Infological approaches which perceive an information system to be a social system as well. Technology is seen as a matter of human choice, and organizations as stable structures. The preferred epistemology is positivist with a means-end-oriented view of IS Science. The values of IS research mostly reflect organizational and economic goals, but most of the seven traditions also pay some attention to user-oriented criteria. In the case of human nature and research methods the analysis did not identify clear dominant views. These assumptions are largely consistent with each other and could be characterized as a functionalist "orthodoxy" in the sense of Hirschheim and Klein (1989) or Orlikowski and Baroudi (1991).

3. the Soft Systems Methodology (SSM),
4. the Scandinavian Trade Unionist approach, and
5. the Professional Work Practice (PWP) approach.

The selection of the five approach as a contrast to the prevailing "orthodoxy" is argued in more detail in Iivari, Hirschheim and Klein (1997). As noted in the Introduction, these five approaches are called 'alternative' because their relevance to IS development is not widely recognized as the seven contemporary traditions or "schools of thought" of ISD analyzed in Iivari (1991), nor do they have an institutional status comparable to them.

SYNOPSES OF FIVE ALTERNATIVE ISD APPROACHES

The survey of the five approaches is based on the published literature, much of which we might add was not readily (easily) available. Before proceeding to a detailed review of the five approaches, a brief description and listing of the key literature references of each of the approaches is provided.

The **Interactionist approach** refers to the body of research conducted at the University of California at Irvine by Kling as his colleagues (e.g. Kling and Scacchi, 1980, 1982; Kling and Iacono, 1984; Kling, 1987; Iacono and Kling, 1988; and Kling and Iacono, 1989). The **Speech Act-based** (SA) approach to IS development draws its basic concepts from the linguistic philosophy of Searle (Searle, 1969, 1979; Searle and Vanderveken, 1985). It has stimulated considerable debate in the IS community over a number of years (e.g. Flores and Ludlow, 1980; Goldkuhl and Lyytinen, 1982, 1984; Lehtinen and Lyytinen, 1986; Winograd and Flores, 1986; Auramaki, *et al.* 1988; Flores, *et al.* 1988; Dewitz and Lee, 1989; Dietz and Widdershoven, 1991; Dobson, *et al.* 1991; Donaldson Dewitz, 1991; Kensing and Winograd, 1991; Auramaki, *et al.* 1992a, 1992b). **Soft Systems Methodology** (SSM) is a general systems approach developed by Checkland and his colleagues at the University of Lancaster (Checkland, 1981; Wilson, 1984; Checkland and Scholes, 1990). Although SSM was originally a general systems approach, without any specific orientation towards information systems, its advocates are increasingly perceiving it to be well suited to IS development (e.g. Checkland and Scholes, 1990). Within the IS community SSM has been incorporated as an integral part in such approaches as MULTIVIEW (Avison and Wood-Harper, 1990) and FAOR (Schafer, *et al.* 1988). The **Trade Unionist** approach is a tradition which has evolved mainly in Scandinavia as a trade union response to the challenge of Scandinavian co-determination arrangements and laws enacted in the mid-1970's which ensured the employees and unions the right to participate in the design of and decision-making concerning computer systems (*cf.* Ehn and Kyng, 1987). This approach was initially based on a strong 'class politics' perspective to organizations (Kling and Scacchi, 1982). This Marxist ideology has, however, been weakening recently and the approach is in a transition towards "cooperative design" (Greenbaum and Kyng, 1991a) that has raised considerable interest lately (Kuhn and Muller, 1993; Bansler and Kraft, 1994). The **Professional Work Practices** (PWP) approach has been developed during the 1980's in Denmark by Mathiassen and his colleagues (Lanzara and Mathiassen, 1985; Gronbaek, 1989; Jepsen, *et al.* 1989; Nielsen, 1989; Andersen, *et al.* 1990).

The Interactionist Approach

The principal strength of the interactionist approach is that it can shed light on such organizational issues of ISD as user resistance, work around, and/or the failure to realize the full technical potential of IS. This approach refers to the body of research conducted at the University of California at Irvine by Kling and his colleagues (Kling and Scacchi, 1980, 1982; Kling and Iacono, 1984; Kling, 1987; Iacono and Kling, 1988; and Kling and Iacono, 1989). The adjective "interactionist" is selected to characterize the most distinctive aspect of the approach -- its view of organizations. The adjective has not directly been used lately by the representatives of this tradition to characterize their approach, but it is used in Kling's (1980) "The Social Analyses of Computing", and to denote one of the six perspectives for analyzing computing in Kling and Scacchi (1980). In this work Kling and Scacchi distinguish six perspectives, i.e. the rational, structural, human relations, interactionist, organizational politics and class politics perspective. They then assert that "the interactionist and organizational politics perspectives go farther in providing appropriate languages and conceptions of social dynamics to help explain attractions and dilemmas of computer use in organizations than do their competitors" (p. 259 in Kling and Scacchi (1980)). In a later paper, Kling and Scacchi (1982) further suggest that the formal-rational, structural, interactionist and (organization) political perspectives have dominated the literature. We grouped the formal-rational and structural perspectives together and called them simply "structural". Similarly, we grouped the interactionist and political perspectives together and called them simply "interactionist".

One can identify two phases in the conceptualization of ISD within the Interactionist approach: the first phase is based on the distinction between the *discrete-entity model* and the *web-model;* the second phase on the distinction between the *tool* and *institutional* viewpoint of information systems.

The distinction between the *discrete-entity model* and the *web-model* has been applied as an analytical device to analyze different aspects of IS as are indicated in Table 1. These aspects were suggested in Kling and Scacchi (1982) and are important for interpreting the earlier research done within the interactionist approach. "The basic unit of analysis of the discrete-entity model is a computing resource" (Kling and Scacchi, 1982, p. 9), the use of which is isolated "from the actual work practices and organization of labor within which automated data systems are typically developed and used" (p. 3). In distinction to this, "web models make explicit the salient connections between a focal technology and its social and political contexts" (p. 3). The assumptions of these two models are summarized in Table 1 and is borrowed from Kling (1987). Kling and Scacchi (1982) claim that the discrete-entity model is fairly flexible, because it employs not only ideas from the formal-rational perspective, but also from the structural and political. In contrast, the web model cannot be framed in the formal-rational perspective, but can

apply any of the other three theoretical perspectives (p. 24), i.e. the structural, political and interactionist.

The distinction between the *tool* and *institutional* views has been used in a similar way as the discrete entity and web model to analyze social and organizational aspects of IS (*cf*. Table 2). It was proposed by Kling and Iacono in later papers (Iacono and Kling, 1988; Kling and Iacono, 1989). Unfortunately, the authors do not explain the relationship between this later distinction and the earlier one of discrete-entity model vs. web-model, but we conclude that the distinction between the tool view and the institutional view is an evolutionary step towards a more structural view of organizations. Iacono and Kling (1988) contend that computer-based information systems (CBIS), developed from complex, interdependent social and technical choices are better conceptualized as institutions than as tools. They suggest (p. 104) that when "analysts emphasize the information-processing capabilities of a computer-based technology, they are foregrounding its 'toolness' or instrumental value of IS for particular social units". On the other hand, when "analysts emphasize the social and political choices that organizational actors have made over time, they are foregrounding its institutional character". Kling and Iacono's analysis of the social, political and technical determinants of the two views is summarized in Table 2. Their viewpoint suggests that "the image of a CBIS as a tool is associated with tremendous personal freedom", "there is an underlying assumption that computer-based technologies have no inherent politics: they are consistent with any social order" and "attention is focused on a future of technological perfection". In contrast, "institutional analyses emphasize the social use of CBIS and social control over computing arrangements", "politics play an important role" and the focus lies on "the developmental trajectories of CBIS. Institutions develop a character based on the interest they have served in the past, their organizing ideologies, and the world views which bind their participants together" (pp. 104-105).

Kling and Iacono propose that characterizing CBIS as institutions is important for three reasons (Iacono and Kling, 1988; Kling and Iacono, 1989). First, the usability of CBIS is more critical than the abstract information-processing capabilities of the underlying technology. Second, CBIS that are well-used and have stable social structures are more difficult to replace than those with less developed social structures and fewer participants. Third, CBIS vary from one social setting to another according to the ways in which they are organized and embedded in organized social systems.

While the interactionist approach's focus on the broader organizational issues is valuable, it unfortunately has not proposed any clear methods or methodologies for IS development which are based on the web model or the institutional view of IS.

Table 1. The discrete-entity vs. the web model

Discrete-entity model	*Web model*

D1. A computing resource is best conceptualized as a particular piece of equipment, application which provides specifiable information processing capabilities.
  a. Each computing resource has costs and skill requirements which are largely identifiable.
b. Computer-based technologies are tools, and socially neutral.
	W1. A computer system is best conceptualized as an ensemble of equipment, applications, and techniques with identifiable information processing capabilities.
	  a. Each computing resource has costs and skill requirements which are only partially identifiable.
	  b. In addition to its functional capabilities as an information processing tool, computer-based technologies are also social objects.

D2. Role of infrastructure
  a. The infrastructure for supporting the focal computing resource and the organizational procedures by which it is organized and sustained are critical elements.
  b. Each computer-based service is provided through s set of structured computing resources and organized infrastructure. Deploying, managing, and setting procedures for these infrastructural resources is separable from the deployment of the focal computer-based technology. Infrastructure, either technical or administrative, is a neutral resource.
	W2. Role of infrastructure
	  a. The infrastructure for supporting the focal computing resource and the organizational procedures by which it is organized and sustained are critical elements.
	  b. Each computer-based service is provided through s set of structured computing resources and organized infrastructure. This organization of essential resources makes computer-based systems into a form of social organization. Like any organization or institution, it is not necessarily neutral.

D3. Control over infrastructure:
  a. Organizations have ample resources to support all of their computing developments and uses simultaneously. Elements of infrastructure are necessary for making equipment or technique available to developers or users, and they can be counted on to be of adequate quality and available when needed.
	W3. Control over infrastructure:
	  a. Organizations have limited resources. Not all necessary infrastructural resources are available (in adequate quality) as needed.
	  b. Computer-using organizations rarely have complete administrative or political control over all their requisite infrastructure. Infrastructural resources may be spread across several organizational units or nominally independent organizations.

D4. The focal computing resource and any element of infrastructure can be analyzed independently of:
  a. its interactions with other computing resources;
  b. the social or organizational arrangements within which computer-based services are developed and provided (infrastructure and macrostructures).
	W4. The information processing leverage provided by a focal computing resource, and its other costs and benefits are contingent upon:
	  a. its interactions with other computing resources;
	  b. the social or organizational arrangements within which computer-based services are developed and provided (infrastructure and macrostructures).

D5. Social action:
  a. Organizational behaviour is best described by the formal goals, procedures, and administrative arrangements of the acting units.
  b. The use of a computing resource is best described by its formal purposes and features.
	W5. Social action:
	  a. Political interests, structural constraints, and participants' definition of their situations often influence organizational action. An organizational process model or a negotiated order model of social activities is used to analyze social relations.

Table 2. Tool View vs. Institutional View

	Tool	*Institution*
Social	Local and simple negotiating context	Complex and overlapping negotiating context
Political	Local control and self interest	Shared control and interest groups
Historical	Freedom of the present gives hope for the future	Commitments of the past constrain the future

The Speech Act-based Approach

The principal strength of the Speech Act (SA)-based approach is its focus on understanding the rich meanings which are exchanged in ordinary conversation. This language focus makes it particularly suitable for the determination of requirements of groupware or other forms of computer mediated social communication. The theoretical roots of the SA-based approach to information analysis are in Searle's philosophy of language (Searle, 1969, 1979; Searle and Vanderveken, 1985). As is evident from the growing number of references, it has aroused considerable interest in the IS community.[3] Since the vocabulary of speech act theory is quite complex, this synopsis introduces only the main ideas and concepts. More detailed summaries can be found in Lehtinen and Lyytinen (1986), Winograd and Flores (1986), Auramaki, *et al.* (1988) and Dietz and Widdershoven (1991).

Speech acts are basic units of communication expressing a human intent, such as making a promise or asserting a claim. To understand the meaning of a speech act the social situation in which it occurs (its context) must be taken into account. This typically consisted of the speaker, the hearer, time, and place of the communication. The context also includes the set of possible worlds covering all features of speakers, hearers, times, and other aspects.

Speech is very complex in that people often use the same phrase to mean different things. For example a question can actually be a request (can you close the door?) or express doubt (did you say it was raining?). Similarly, assertions are often questions. To complicate things further, in irony or sarcasm a sentence typically means the opposite of what it says. Hence speech is a complex form of human action. In order to sort out what people mean with their words, speech act theory distinguishes utterance acts, propositional acts, perlocutionary acts and illocutionary acts as aspects or "subacts" of speech acts: A speech act is performed by uttering an expression (an utterance act), and when successfully performed it will have effects on the hearer, i.e. the speaker performs a perlocutionary act (e.g. if the question was meant as a request, and this was actually understood, then the hearer will actually close the door otherwise she might say:"no I cannot". If the question was understood as an order the denial has to take the form, "no, I don't want to" or "no, I will not"). Performing a speech act also includes a subsidiary act of expressing the propositional content of the speech act (i.e. the propositional act; in the example this is expressing that the door is currently open and implying that it is possible to close it, i.e. it is not a locked automatic door as in a bus). The core aspect of a speech act is its illocutionary act, which has a propositional content and an illocutionary force. The propositional content refers to propositions expressed in an illocutionary act. The illocutionary force is the principal component of a speech act, including among other things the illocutionary point[4]. Searle claims that speech acts can be classified by their illocutionary point into the following five categories: *assertives* telling how the world is or will be (statements of fact or predictions), *commissives* committing the speaker to doing something (e.g. to promise or to agree), *directives* trying to get the hearer to do things (e.g. to order or to request), *declaratives* changing the world by saying so, and *expressives* expressing the speaker' feelings and attitudes. Directives and declaratives can be regrouped into "imperativa" because they both imply that there is a source of power which can command that the world needs to be changed to fit the state described in the imperative statement.[5]

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[3] The principal references are: Flores and Ludlow (1980), Goldkuhl and Lyytinen (1982, 1984), Lehtinen and Lyytinen (1986), Winograd and Flores (1986), Auramaki *et al.* (1988), Flores, *et al.* (1988), Dewitz and Lee (1989), Dietz and Widdershoven (1991), Dobson, *et al.* (1991), Donaldson Dewitz (1991), Kensing and Winograd (1991), Auramaki, *et al* (1992a, 1992b), Dietz (1992), Janson and Woo (1992), Truex (1993), Klein and Truex (1995).

[4] More exactly, an illocutionary force has seven components: illocutionary point, mode of achievement, degree of strength, propositional content conditions, preparatory conditions, sincerity conditions, and degree of strength of sincerity conditions.

[5] Dietz and Widdershoven (1991) point out that Habermas has criticised this taxonomy in his recent theory of communicative action (Habermas, J., *Theorie des kommunikativen Handelns*, Erster Band, Suhrkamp Verlag, Frankfurt am Main, 1981 and Habermas, J., *Bemerkungen zu J. Searle's 'Meaning, Communication and Representation'*,

In the context of classical IS development, assertives take a prominent place in that the contents of files and data bases are interpreted as "statements of fact" (see Hirschheim, Klein, Lyytinen 1995 for a detailed review of the literature). In distinction to this, some authors of the speech act-based approach (e.g. Winograd and Flores, 1986) paid special attention to directives and commissives as being of particular importance for management from the five categories of illocutionary points. While the direction of fit in the case of assertives is from word-to-world aimed at getting the word to match the independently existing state of affairs of the world, the direction in the case of directives and commissives is world-to-word, i.e. the illuctionary point is a commitment to alter world to match the word (Winograd and Flores 1986 see the obtaining of such commitments as the essence of management). In the former case adjectives such as "true" and "false" characterize how well the matching has taken place while in the latter case adjectives such as "fulfilled" and "unfulfilled" can be used to characterize how well the matching has taken place.

Speech acts form larger wholes, e.g. networks of recurrent conversations (Winograd and Flores, 1986) or conversations and discourses (Auramaki, et al. 1988; Klein and Truex, 1995).[6] A simple example is the case of a question that must typically be followed by an answer or a request for clarification, a refusal to answer or a counter-question. This example is simplified, because the question might have been a rhetorical figure for expressing doubt in which case the subsequent moves are more involved. Hence in order to identify the meanings which are exchanged in larger wholes or speech act patterns, it is necessary to analyze how sequences of speech acts interlink - like the "moves" in a chess game. The analysis of such larger patterns is currently being undertaken (Klein and Truex, 1995).

Even though the pioneering works on the SA-based approach in North America and Europe have had a common theoretical root, they have differed somewhat in their application. Winograd and Flores et al. (1986, 1987/1988) and Flores, et al. (1988), for example, have focused on discourses as ordered sequences of speech acts, especially those related to directives and commissives, whereas Lyytinen et al. (e.g. Lehtinen and Lyytinen, 1986) have covered a wider variety of illocutionary points and have also focused on the propositional content of speech acts. Since the early 1990's, speech act theory has aroused considerable interest in the IS community, leading to a number of methodologies or methodology fragments as is evident from the growing number of references.

This brief synopsis indicates that SA theory consists of a rich set of concepts for the analysis of intricate social communications, but its weakness is that it easily leads to a very complex approach. Efforts to adopt some simplified subset of SA theory has led to a number of IS development approaches that makes the current state SA-based approach quite fragmented (cf. Auramaki, et al. 1988).

Soft Systems Methodology

The strength and distinguishing feature of Soft Systems Methodology (SSM) is its explicit focus on problem formulation by helping to identify the "relevant" systems from the perceptions of possibly disagreeing stakeholders. Although SSM is a general systems approach without any specific orientation towards information systems, its developers have increasingly advocated its application to IS development for which it is well suited (e.g. Checkland and Scholes, 1990, p. 53). It also has aroused considerable interest within the larger IS community especially in Europe and Australasia. For example, soft systems thinking is an integral part of such methodologies as MULTIVIEW (Wood-Harper et al. 1985; Avison and Wood-Harper, 1990) and FAOR (Schafer, et al. 1988). It also has an extensive case history documentation. In order to keep our discussion as close as possible to what Checkland intended, the following synopsis of SSM is primarily based on the original texts of SSM, in particular Checkland and Scholes (1990).[7]

Nachmetaphysisches Denken, Suhrkamp Verlag, Frankfurt am Main, 1988) suggesting a taxonomy of four categories based on four kinds of dominant claims: claims to truth, claims to power, claims to justice and claims to sincerity. The four speech categories are *imperativa* implying a claim to power as do Searle's directives (including questions which Habermas interprets as directives to provide an answer and which can be refused like any other directive); *constativa* making claims to truth and correspond to assertives in Searle's classification; *regulativa* including those directives, commissives and declaratives in Searle's classification which are based on claims to justice; and *expressiva* covering those commissives and expressives which are based on claims to sincerity.

[6] The IS literature often uses the terms 'conversation' and 'discourse' interchangeably despite their fundamental differences (see Ljungberg and Holm, 1996). In view of the need to model larger units of communication as well-formed sequences of speech acts, the term 'discourse' would seem to be more appropriate.

[7] SSM has been evolving since the early 1970's and was developed by Checkland and his colleagues at the University of Lancaster. Its principal versions are published in three books (Checkland, 1981; Wilson, 1984; Checkland and Scholes, 1990).

The overall purpose of SSM is well summarized by von Bulow (1989):

> "SSM is a methodology that aims to bring about the improvement in areas of social concern by activitating in the people involved in the situation a learning cycle which is ideally never-ending. The learning takes place through the iterative process of using systems concepts to reflect upon and debate perceptions of the real world, taking action in the real world, and again reflecting on the happenings using systems concepts. The reflection and debate is structured by a number of systemic models. These are conceived as holistic ideal types of certain aspects of the problem situation rather than accounts of it. It is taken as given that no objective and complete account of a problem situation can be perceived."

The development of SSM has very heavily relied on action research. In distinction to other views of action research, Checkland and Scholes underline the crucial importance of intellectual frameworks (in their case SSM) as a precondition for effective learning in action research (Checkland and Scholes, 1990, p. 16).
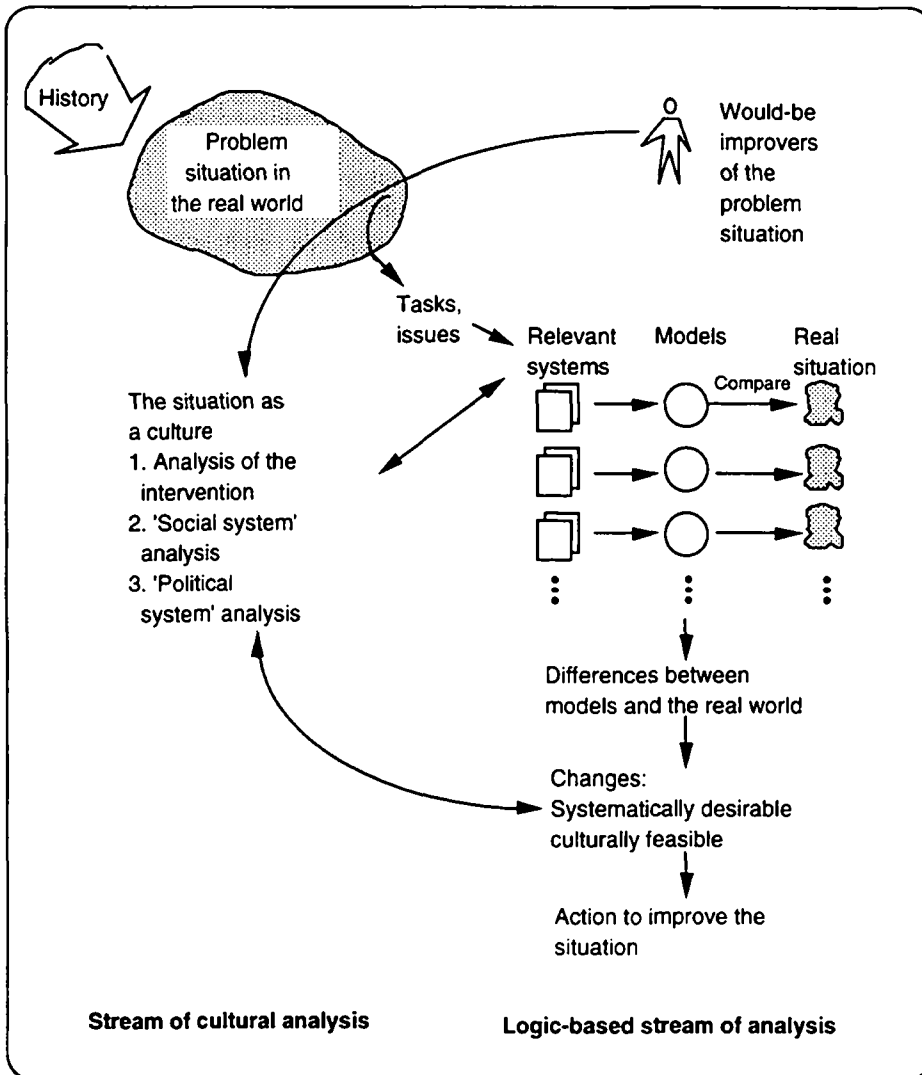
Originally, the inquiry process of SSM consisted of seven stages (Checkland, 1981; Checkland and Scholes, 1990): (1) the identification of the problem situation which is considered to be problematic, (2) the expression of the problem situation, (3) the formulation of root definitions of relevant systems, (4) the formulation of conceptual models of the relevant systems, (5) the comparison of the models and the real world, (6) description of systemically desirable and culturally feasible changes, and (7) action to improve the problem situation. Stages 1-2 and 5-7 are 'real-world' activities whereas stages 3 and 4 are 'systems thinking' activities.

Checkland and Scholes (1990) propose a revised version of SSM which is described in Figure 1. The most essential change in the new version is the incorporation of cultural analysis as a parallel stream to logic-based analysis. The logic-based stream starts with selecting relevant systems. Their choice may be primary task-based or issue-based. A primary task refers to purposeful action (official task) of some institutional arrangement (an organization or a department) in the real world. An issue-based relevant system does not necessarily have an institutionalized counterpart in the real world - it is a nominal system which may be created from scratch. The naming of the relevant systems is based on *root definitions* which express the core purpose of a purposeful activity system. The core purpose is always expressed as a transformation process in which some entity is transformed into some new form of that same entity in order to achieve some longer term aim. SSM proposes the CATWOE mnemonic to help with formulating complete root definitions: C = customers (the victims or beneficiaries of T), A = actors (those who would do the T), T = transformation process (the conversion of input to output), W = Weltanschaung (the worldview which makes this T meaningful in context), O = owners (those who could stop T), and E environmental constraints (elements outside the system which it takes as given).

Modeling relevant systems takes place in terms of *human activity systems*. A human activity system is a notional system model ("holon") which expresses some purposeful human activity, which could in principle be found in the real world (Checkland and Scholes, 1990). They are notional in the sense that they are not descriptions of the actual real-world action but are intellectual constructs, ideal types for use in debate about the possible changes which might be introduced into a real-world problem situation (Checkland, 1981).[8] One of the essential features of SSM is its emphasis on the necessity to create several models of human activity systems. The emphasis on this feature follows from the recognition of multiples stakeholders. As each of these has human ability to interpret the world in different ways, there will never be only one relevant human activity system when examining real-world situations characterized by purposeful action (Checkland and Scholes, 1990). Checkland and Scholes also suggest five 'E's' as criteria for judging the successfulness of the transformation T: *efficacy*, i.e. whether T or the means chosen work in producing the desired output, *efficiency*, i.e. the amount of output divided by amount of resources used, *effectiveness*, i.e. whether T meets the longer term aim, *ethicality*, i.e. whether the transformation is morally right, and *elegance*, i.e. whether it is aesthetically pleasing.

The logic-based analysis stream also requires the analyst to compare the new system models with the actual reality as perceived. SSM suggests four ways of doing the comparisons: informal discussion, formal questioning, scenario writing based on operating the models, and trying to model the real world in the same structure as the conceptual models.

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[8] We shall adhere to Checkland's interpretation of human activity system which differs slightly from that of Wilson. Wilson (1984) defines a human activity system as a system of activities plus social system (p. 25) whereas Checkland (1981) defines a social system as a human activity system plus natural system (p. 121). Checkland and Scholes (1990) do not use this interpretation of a 'social system'.

History

Problem situation in the real world

Would-be improvers of the problem situation

Tasks, issues

Relevant systems — Models — Real situation

Compare

The situation as a culture
1. Analysis of the intervention
2. 'Social system' analysis
3. 'Political system' analysis

Differences between models and the real world

Changes:
Systematically desirable
culturally feasible

Action to improve the situation

Stream of cultural analysis   **Logic-based stream of analysis**

The stream of cultural inquiry consists of three types of analyses: analysis of the intervention, social system analysis and political system analysis. The first, includes a role analysis of the intervention focusing on three roles: the 'client' who caused the study to take place, the 'would-be problem solver' who wishes to do something about the situation in question and the 'problem owner'. For social system analysis Checkland and Scholes propose a model of three interacting elements: roles, norms, and values. A 'role' refers to a social position that is recognized as significant by people in the problem situation. 'Norms' are expected behaviors characterizing a role, and 'values' are the standards used to judge the performance in a role. In the context of social system analysis, the authors point out that the nature of the social system is not likely to emerge from direct questions because the answers are merely likely to reiterate the official myths. Instead, after each conversation, interview, or perusal of documents, etc., one should review the experience in order to form 'best judgments' about the meanings of roles, norms and values in question.

Political system analysis treats politics as a process by which differing interests reach accommodation, with which different parties decide to "go along" even though the conflicts endemic to human affairs continue to exist. Checkland and Scholes recognize the sensitivity of political analysis to public exposure: Politics is ultimately concerned with power and its disposition, and the results of the political analysis will reveal overt and covert power relationships. If these are made public (along with potential vested interests), they can easily become a potent means of power in the real politics of the situation (p. 51). Therefore users of SSM should be circumspect about the use of political analysis.

The purpose of the logical and cultural streams of inquiry and action is to encourage a structured debate about the changes that could help with the problematic situation at hand. SSM proposes that the changes should be 'systemically desirable' and 'culturally feasible'. One problem with SSM in this context is that it does not give clear guidelines on how to proceed from the debate on the relevant human activity systems to the implementation of "systematically desirable and culturally feasible" changes. The likely reason for this is the strict conceptual separation between human activity systems and the real world. Human activity systems by definition

are not domain descriptions of the real-world, they are supposedly purely "notional" systems. If so, this precludes their use as constitutive models for the desirable and feasible changes in the real-world action, because in that case they would describe possible real-worlds and if implemented, would then describe the real-world (the model of the activity system could serve as the documentation for the new system). Even if this point is waved as a mere conceptual difficulty, SSM does not advocate that the activity system should become the new system - hence it is not clear how the transition from the status quo to an improved, feasible system is to be made (of course, structured methods do not solve this problem either, i.e. how to get from the functional model of the existing system to a new and improved functional model).

In conclusion, we can say that SSM has a number of strengths in the area of problem formulation, but its major weakness from the viewpoint of IS development is that its role in IS development is not particularly well articulated. Checkland and Scholes (1990) suggest an approach to IS development which is essentially based on recognizing rather than avoiding conflicts. It does this by defining multiple human activity systems to stimulate debate about their relevance and about the legitimacy of alternative root definitions (world views) behind them. Once a 'truly relevant' system has been agreed upon, one can analyze information flows, data and processing needs. For each activity identified in the relevant human activity, one can ask what information would have to be available to enable someone to do this activity and what information would be generated by doing it (pp. 56-57). From there one can proceed to using more conventional IS development methods (p. 313).[9]

Both MULTIVIEW (Avison and Wood-Harper, 1990) and FAOR (Schafer, et al. 1988) apply the "old" version of SSM that is confined to the logic-based stream of analysis only. MULTIVIEW includes a specific approach for IS development that consists of five stages (Avison and Wood-Harper, 1990): Analysis of human activity, information analysis, analysis and design of socio-technical aspects, design of the computer interface, and design of technical aspects. At this general level of five stages, the postponement of the socio-technical analysis until the information analysis has been completed (which means that the information system's functions and entities are defined) seems problematic. The sequence gives priority to the information system as a technical subsystem rather than giving equal emphasis to the social and technical options. FAOR (Schafer, et al. 1988) applies SSM mainly as a source of general problem-solving and learning heuristics. These are applied in each of the main stages of FAOR: Exploration, method tailoring, analysis and evaluation.

Compared to the other five approaches, SSM is a relative complete, well documented methodology the viability of which is well illustrated in many published cases. It is somewhat surprising that it has not received more widespread attention.

The Trade Unionist Approach

The strength of the trade unionist approach is its focus on political-institutional power issues. It therefore appears to be best suited to organize the cooperation between management and collective bargaining units or trade unions. It suggests that the improvement of systems development is an issue of industrial democracy. This carries on the tradition that has evolved since the early 1960's mainly in three Scandinavian countries, Denmark, Norway and Sweden. The Scandinavian background of the approach can largely be explained by the high unionization of the Scandinavian labor force leading to strong national labor federations and by large social democratic parties with strong links to the national federations (Ehn and Kyng, 1987). This has created a favorable situation for the co-determination arrangements and laws in the mid-1970's which ensured employees and unions the right to participate in the design of and decision-making on computer systems. However, the opportunity to participate in ISD posed a considerable challenge to trade unions for the following reason. Trade unions had traditionally dealt with distribution issues such as pay, working hours, and terms of employment. With the participation in systems development, they were confronted with design and manufacturing issues which are often more unstructured. There were no clearly formulated union objectives and demands. The unions' and employee's previous experience were of limited value (Sandberg, 1985). The recognition of this challenge was an important motivation for the formulation of trade union strategies for the development of computer-based systems.

One can identify three major generations in the evolution of the approach (Ehn and Kyng, 1987).[10] The first covers the first three major projects (i.e. NJMF, DEMOS and DUE, as referenced in the footnote. It proposed a

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[9] The more specific IS development methodology of Wilson is essentially based on similar ideas (Wilson, 1984 pp. 245-247).

[10] The review of the trade unionist approach below and its analysis is based on the following material: Nygaard and Bergo (1974), Carlsson, et al. (1978), Ehn, et al. (1983), Sandberg (1983), Sandberg (1985), Ehn and Kyng (1987), Bodker, et al. (1987), Ehn (1988), Kyng (1989), Bodker, et al. (1991), Bodker and Gronbaek (1991a), Bodker and Gronbaek (1991b), Ehn and Kyng (1991), Ehn and Sjogren (1991). The preferred research strategy of the trade union approach has been action research. The most important action research projects were the NJMF project in Norway (Nygaard and Bergo, 1974), the

model for systems development the essence of which is to have a union-led "shadow organization" to challenge the proposals developed by the management-led project organization and to propose alternatives to it (Ehn and Sandberg, 1983). The second generation, the so-called "collective resource approach" based on the UTOPIA project, has advocated the notion of craftsmanship as an ideal of work and a tool perspective as its natural ingredient. These two generations seem to reflect a gradual softening of the original, quite ideological Marxist tones and goals (Nygaard and Bergo, 1974), to a theoretical synthesis of Marxist, Heideggerian and Wittgensteinian elements (Ehn, 1988). The most recent publications reflect the third phase of the trade unionist approach, called "cooperative design" (Bødker, et al. 1991; Bødker and Grønbæk, 1991a; Bødker and Grønbæk, 1991b; Ehn and Kyng, 1991; Ehn and Sjögren, 1991), which is theoretically based more on the philosophies of Heidegger and Wittgenstein rather than on Marx.[11] A summary of the approach up to the late 1980's can be found in Ehn and Kyng (1987) and in Ehn (1988). The theses derived from Ehn and Kyng (1987) are summarized and presented in Table 3.

Table 3. Major results (theses) of the trade unionist approach

Rationalization of labor processes

1. Systems design is a fundamental division of the labor process.
2. Changes of labor processes must be applied to the totality as well as to the separate parts, to the division of labor between different groups of workers within the labor process of systems design, to the division of labor between systems design and the labor process, and to division of labor within the use labor process.
3. Capital accumulation or generation of profits is the basic driving force in changes of labor processes.
4. Intensification of work and use of new technology are two basic strategies for capital accumulation.
5. Direct control and responsible autonomy are complementary strategies for capital accumulation.
6. Class struggle is an important aspect of actual changes in labor processes. Not only of the use process designed, but also of the systems design process and of possible integration in the future.

Trade union "design" activities

7. In democratization of design and use of new technology in Scandinavia, trade unions – especially on local level – should play an active role.
8. Design and use if new technology requires new trade union activities.
9. A participative approach to the design process is not sufficient.
10. The most important prerequisite for trade union participation in management's design process is a parallel and independent process of accumulation of knowledge on the part of the union.
11. The union investigation and negotiation strategy is a democratic and workable complement to traditional design strategies. But it is very resource consuming for the local unions.
12. Local unions need external resources and support in their design activities.
13. The practical application of the local union strategy has to depend on the particular prerequisites in each case.
14. A local trade union strategy has to be based on solidarity between the different groups of workers involved, a solidarity which goes beyond the traditional division of labor in the labor process and the traditional jurisdictions between the unions involved.
15. A clear distinction based on negotiations between union and management roles in the design process is not in opposition to, but a prerequisite for the democratization of co-operation and decision-making in the work organization.
16. Local union design efforts have to be supplemented by central union design activities.
17. The existing technology in many cases restricts the possibilities to locally reach trade union objectives, especially with respect to skill, but also with respect to work organization.
18. Central trade unions must influence the process of research and development of new technology to change the supply of technological and organizational solutions.
19. There are possibilities to design new technology based on social criteria such as skill and democracy at work.
20. Equally important is a trade union strategy to influence the demand for these technological and organizational alternatives.

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[11] Bødker et al. (1991a) nevertheless, express their sympathy for users as though they are members of "resource weak groups" (as opposed to management or executives), and refer to the trade union-centered approaches for organizing development projects for such resource weak groups (pp. 146-147).

21. Central trade unions must provide training with a trade union perspective on new technology and work organization, and influence the supply of professional training for skilled work.

Design for democracy and skill

22. Tools and techniques for local trade union "design" work have to reflect the specific conditions of the work such as a trade union perspective and the limited resources available.
23. Design of computer support is design of (conditions for) labor processes.
24. Labor processes cannot be reduced to information processes.
25. Design use models.
26. Hardware should be considered early in the design, in parallel with software, not after.
27. Important aspects of labor processes – in relation to design of computer support – cannot be formally described.
28. Professional experience with and knowledge of the labor process for which computer support is being designed are important in the design process.
29. Professional experience with and knowledge of computers are important when designing computer support for a labor process.
30. Design should be done with users, neither for nor by them.
31. Mutual learning should be an important part of the work in a design group.
32. Design by doing.
33. Designers should restrict their activities to a few domains of application, and they should spend at least a year or two getting acquainted with a new area before doing actual design

This third phase emphasizes "cooperative design". As mentioned above, it theoretically leans more on the philosophies of Heidegger and Wittgenstein rather than on Marx. Bodker et al. (1991a) nevertheless, express their sympathy for users if they are members of "resource weak groups" (as opposed to management or executives), and refer to the trade union-centered approaches for organizing development projects for such resource weak groups (pp. 146-147). At the same the trade-unionist approach has lost most of its it critical edge, and has quite ironically approached the sociotechnical approach in many respects. Bjerknes and Bratteteig (1995) remark that despite the intellectual conflict between the sociotechnical approach and trade unionist approach (see Ehn, 1988), it is difficult to see a difference between the two in practice. This is more so in the case of the "cooperative design" in which the "design process is viewed as a (rather harmonious) dialogue between a designer and a user about the design of a particular computer application", the assumption being that the cooperative process leads to improved work situation and that organizations are willing to introduce the proposed changes (Bjerknes and Bratteteig, 1995).[12]

The "cooperative design" approach in particular has recently aroused considerable interest (Kuhn and Muller, 1993). It has focused on the technical prerequisites of user participation in the actual building of IS. To facilitate the greatest possible role for users, it has aimed at developing various tools, techniques and principles to support effective user participation. In research, these tools are explored through experimenting with prototypes. This makes it difficult to evaluate how effective they would be in practice, because little research has been done to evaluate how effective these tools are in developing successful systems, in particular when these cover larger organizational units. The experience with cooperative prototyping tools is mainly based on action research projects with considerable research intervention and funding from researchers (Clement and Van den Besselaar, 1993). Clement and Van den Besselaar also report considerable difficulty with sustaining the continued use of the participatory design approaches after the research intervention when the novelty wanes and other work priorities reassert themselves. The attempts to transfer the ideas of "cooperative design" to North America have also aroused considerable debate in Scandinavia (Kraft and Bansler, 1994; Kyng, 1994).

Even though the proponents of the trade union tradition have used various names to characterize their approach, the label "trade unionist" emphasizes its most distinctive features. These are its origin, the Scandinavian industrial relations as its social background, the role of trade unions as sponsors and partners of its major research projects, and its belief in trade unions as legitimate representatives of resource weak groups.

The Professional Work Practice (PWP) Approach

The strength of the PWP approach is its emphasis on studying the actual work practices of systems professionals before attempting to improve them. Its advocates criticize methodologies for not paying sufficient attention to what system practitioners actually do and if what they do is deficient, to take a realistic look how it could be

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[12] This comes quite close to Mumford's (1983) argumentation that "people should be able to influence the design of their own work situations and that if this kind of intervention is encouraged then there are likely to be both job satisfaction and efficiency gains" (p. 1)

changed for the better. In this sense the focus of the PWP approach has been on the relationship between IS development methods and practice. From this perspective, new methodologies are to be considered as one of the options for improving the working practices, but by no means the only one. The empirical base for the strategy of the PWP approach is derived from investigating the conditions which determine the actual working practices of systems developers. The empirical base of the PWP approach appears to be stronger than its theoretical underpinnings. Its theoretical base is inspired by organizational learning theories, in particular, the "Reflective Practitioner" (Schon, 1983).[13]

The PWP approach's practical starting point is best explained by its historical link to the MARS projects.[14] A small research group which included Mathiassen initiated the MARS projects in Denmark during the early 1980's. They investigated how systems development was actually carried out in practice (e.g. Lanzara and Mathiassen, 1984). They also experimented with different ways of changing working practices (Andersen, et al. 1990, p. xii). These action research projects challenged the popular belief that new IS development approaches (methods, techniques and tools) would improve the effectiveness of IS practitioners by displacing poor approaches. They found that the more experienced the analysts were, the less they followed documented methodologies. This applied even if the organization had introduced a specific method of its own as a development standard. Methods were at best crutches for beginners to be tossed aside after a period of apprenticeship. More important for understanding how systems are in fact developed are the actual working practices of the systems professionals in the organization which the beginners joined.

The basic organizational action learning perspective of the PWP approach is summarized in Figure 2 (ibid, p. 43). It is based on three dichotomies: product-oriented vs. process-oriented view, reflection vs. action, and vision vs. present reality. "Performance" in Figure 2 refers to the actual systems development comprising the reflective functions (analysis and design) and innovative action function (realization). "Management" on the other hand corresponds to project management. The approach especially underlines experience, reflection and learning in the development of working practices towards increased professionalism. Its development is heavily based on empirical experience from practical systems development projects, without any strong theoretical preconceptions. This may explain why the underlying theoretical assumptions of the approach are weakly documented. In addition to the dissertation of Mathiassen (1981), the ideas of Argyris and Schon (e.g. Argyris and Schon, 1978; Schon, 1983) seem to form the only consistent source of inspiration.

Andersen et al. (1990, pp. 46-59) condense their practical recommendations for IS development into a number of principles which are summarized in Table 4. Table 4 indicates that the PWP approach attempts to integrate ideas from different sources into the unifying theoretical framework of Figure 2.

From this framework more specific tools have been derived to support professional learning and reflection. The types of contributions of the PWP approach include: maps for diagnosing problematic situations (diagnostic, ecological and virtual maps, Lanzara and Mathiassen, 1985; Andersen, et al. 1990); the use of metaphors (Madsen, 1989) in generating visions (Kensing, 1987; Kensing and Madsen, 1991); and the systematic maintenance of professional diaries to document how decisions were made through the development process (cf. Lanzara and Mathiassen 1984; Jepsen, et al. 1989).

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[13] The PWP is described in a number of papers Lanzara and Mathiassen (1985), Kensing (1987), Gronbaek (1989), Jepsen, et al. (1989), Madsen (1989), Nielsen (1989), Kensing and Madsen (1991), and in a book (Andersen, et al. 1990). The following review is mostly influenced by the last reference, i.e. Andersen et al. (1990).

[14] We emphasize the differences to the Trade Union approach here rather then the commonalities. The 'Professional Work Practice' (PWP) approach has been developed during the 1980's in Denmark by Mathiassen and his colleagues. While it followed the MARS project, it also has some of its roots in the trade unionist approach. The influences from trade union strategy follow from Mathiassen's association and some of his colleagues with the UTOPIA project (e.g. Kyng and Mathiassen, 1982). However, fundamental disagreements about the practicality of the UTOPIA strategy as the sole basis for professional education prompted Mathiassen to pursue a new strategy which differs substantially from those pursued by Ehn and Kyng.
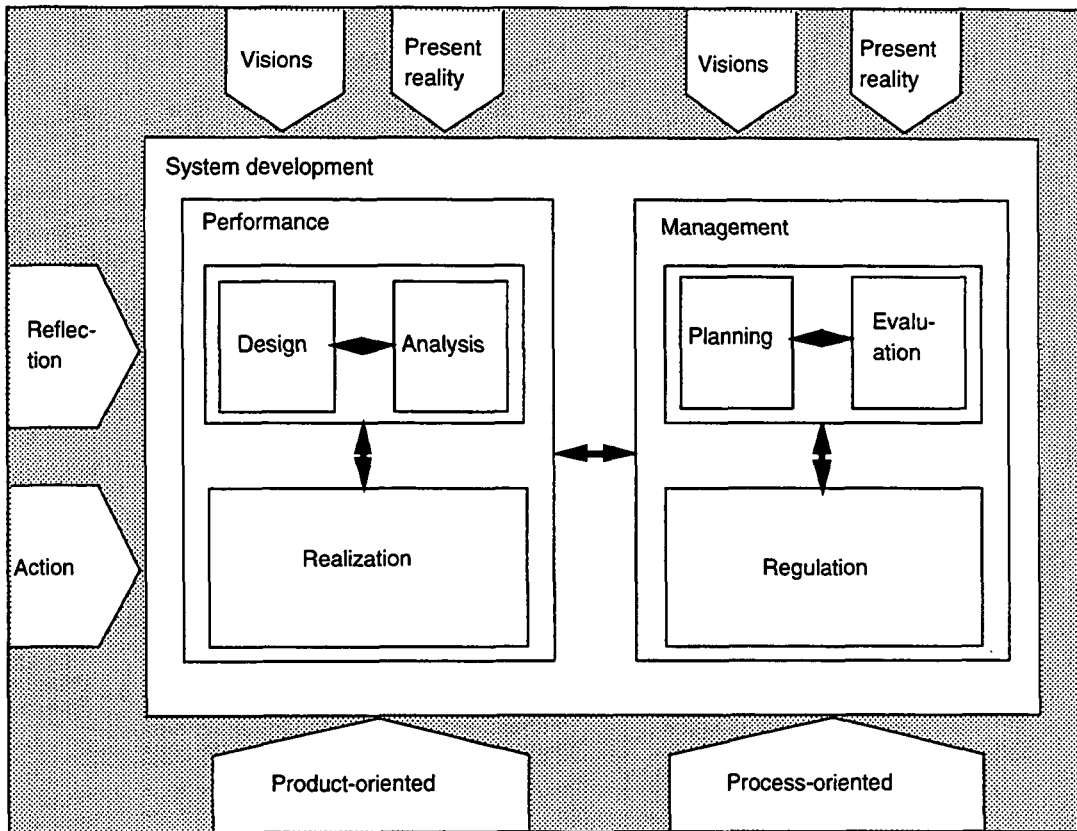
Figure 2. The basic framework of the PWP approach

Table 4. Principles of IS development

Performance principles

P1 Analysis and design are mutually dependent, and should therefore be performed concurrently in order to support each other.

P2 Product-oriented reflection (analysis and design) and realization affect each other, and should therefore be performed concurrently in order to support each other.

P3 It is not possible to perform qualified analysis and design strictly according to given guidelines. The activities require experience, intuition, imagination, and reflection.

P4 The project group's relation to the users is of decisive importance to the quality of the analysis. If direct cooperation cannot be established between developers and users, precise requirements specifications and knowledge about the application situation are needed.

P5 Good design is a question of flying high - and keeping both feet firmly on the ground. New visions and unconventional solutions must be created. It must at the same time be possible to introduce them into the organization.

P6 Technically oriented analysis and design may result in perfect solutions to wrong problems. Qualified analysis and design require technical, organizational and social competence.

P7 Qualified analysis and design require that different perspectives are applied. The choice of techniques and tools, and the choice of how to organize the process depend upon the situation.

P8 Neither the analysis nor the design activities can move unidirectionally from totality to detail. Knowledge of details and the concrete conditions are prerequisites for obtaining a comprehensive view of the situation.

P9 Tests do not solve any problems. Plan with time for repairs, thus preventing permanent firefighting.

P10 Qualified realization requires thorough planning of the conversion. The overall design should include the conversion plan.

Management principles

M1 Evaluation and planning are mutually dependent, and should therefore be performed concurrently in order to support each other.

M2 Process-oriented reflection (planning and evaluation) and regulation affect each other, and should therefore be performed concurrently in order to support each other.

M3 Systems development is characterized by a high degree of uncertainty. The most important prerequisite for qualified management is therefore transparency in both processes and product.

M4 It pays to establish the project systematically.

M5 Baselines and checkpoints are better than traditional phases. Traditional division into phases confuses time and content, thus making dynamic regulation of the project difficult.

M6 Project plans must facilitate evaluations. They must be in writing and contain evaluation criteria and procedures.

M7 Only the systems developers know enough to make realistic plans and to evaluate the status of the project.

M8 It is important that all participants in a project understand and accept the plan.

M9 It is necessary to apply several estimation techniques. The plan should be based on a problem estimate, and express the degree of uncertainty in the estimate.

M10 It is necessary to plan with management activities. Management typically constitutes 15% to 25% of the effort.

Principles of the relationship between management and performance

PM1 A systems development project should be organized in a way which ensures direct and close interaction between performance and management activities.

PM2 The most important intermediate products are the plan and the overall design.

In summary, the basic research question of the PWP approach is to ask how experience, reflection and learning can be marshaled in the development of good working practices towards increased professionalism. The fundamental answer suggested in Andersen *et al.* (1990, p. 60) is that better working practices can be learned by a combination of three strategies. The first is theoretical study (i.e. learning of new methods and tools or frameworks of analysis). The theoretical learning strategy must always be combined with the second strategy, seeking a broad spectrum of practical experience (i.e. by working with accomplished masters of the art). These two strategies should help new practitioners to design and maintain their own ways of learning. An important avenue to achieve professionalism is to help practitioners improve their capabilities to reflect upon their experiences and then change their behaviors accordingly. In this way both successes and failures become important assets for improving the practice. Professional diary keeping is to help track the experience record of success stories and failures - what worked and what did not. The third strategy for improving learning is building open-minded professional attitudes which encourage practitioners to actively seek out pertinent information by interacting with the professional community and through the study of the literature. In order to support good professional attitude formation, Anderson *et al.* also state that an environment and tradition for professional systems development should contain elements such as the following (p. 9): Active system developers, sufficient resources, exchange and evaluation of experience and study of relevant literature. Almost ironically, the PWP approach has failed to see the importance of methods in this process of reflection and learning, not as methods to be followed obediently, but as intellectual frameworks with which the experience can be compared and reflected upon (*cf.* SSM above).

SUMMARY OF THE FIVE ISD APPROACHES

Whereas the five approaches cannot be considered "full-scale" IS development methodologies, they nevertheless represent significant streams of IS research and have the potential of becoming complete methodologies. Although their current contribution is mainly cognitive in nature, i.e. broadened awareness of the phenomena related to IS development, they also provide a fair amount of practical support for IS development at least in the limited areas that are discussed in the above synopses.

Table 5 summarizes the five ISD approaches in terms of their goals, guiding principles, fundamental concepts, and principles of the ISD process (see section 2 of the paper). The characterization of the interactionist approach in Table 5 is based on the web and institutional views rather than the discrete-entity and tool views. This follows from Kling and Scacchi's (1982) preference for providing a rich set of ideas to characterize the web and institutional views. Table 5 is able to summarize only some of their major points. However, the Interactionist approach is very embryonic as an ISD approach, because it has not been elaborated into a concrete methodology for ISD. Nevertheless, we propose to treat it as an approach to exemplify a case of an ISD approach without any methodology instances. Furthermore, Kling and Scacchi (1982) clearly recognize the possibility of elaborating the web model to the level of a more concrete ISD methodology (p. 71).

The SA-approach is an example of an approach with a number of methodology instances. Its interpretation in Table 5 is not entirely based on the abstraction of common features of existing methodologies, but also on its theoretical background. To illustrate this, Table 5 identifies discourse/conversation analysis and propositional content analysis (information modeling in Lehtinen and Lyytinen, 1986) as a fundamental aspect of the SA-based approach. This is based on our interpretation of Speech Act theory (see also Ljungberg and Holm, 1995). As

noted in section 4.2 however, Winograd *et al.* (1986, 1987/1988, 1988) do not address the propositional content of the subject of content analysis. Consequently, we interpret the SA-based methodology of Winograd *et al.* as partial in this respect. It is beyond the scope of this paper to go into details of these specific methodologies. We only wish to point out with this example that each methodology instance of the SA-based approach may use slightly different activities, techniques and tools for discourse and propositional content analysis.

SSM is an example of an ISD approach with a number of methodology instances. For example, SSM (according to Checkland, 1981 and Checkland and Scholes, 1990), SSM (Wilson's 1984 version), MULTIVIEW (Avison and Wood-Harper, 1990) and FAOR (Schafer, *et al.*, 1988) are all methodology instances. SSM can be considered as both an approach and a methodology in parallel. We interpret the extension of the SSM to include the stream of cultural analysis (Checkland and Scholes, 1990) in addition to the stream of logic-based analysis as an evolution of SSM *as an approach*. At the same time, Checkland and Scholes cautiously distance themselves from the seven stage model (Checkland, 1981) of the stream of logic-based analysis. This can be interpreted as an evolution of SSM *as a methodology* from Checkland's (1981) original version. Even though techniques like rich pictures and CATWOE are intimately associated with SSM, they are techniques which do not define SSM as an approach.

Although the trade unionist approach has evolved through a number of generations, these have implied certain changes in emphasis and focus which we interpret as a continued expansion and enrichment of the approach. The development of the trade unionist approach has mainly taken place at the level of an approach. As a methodology the trade unionist approach is still somewhat embryonic, proposing some specific techniques (such the union-led shadow project organization, mock-ups, prototypes) but needing further development of tools, techniques and activities.

PWP has also mainly been developed as an ISD approach. It includes a limited repertoire of specific techniques (such as diagnostic mapping techniques, metaphorical design, future workshops and use of diaries). As an ISD approach, it has been particularly explicit in stating a number of principles for the process of ISD. These principles revolve around the dualities listed under the entry 'concepts' in Table 5 and should be addressed concurrently.

Table 5: Summaries of the five IS development approaches

Approach	Interactionist approach	SA-based approach	SSM approach	Trade Unionist approach	Professional Work Practice approach
Goal	To shed light on the social issues surrounding organizational change and implementation of information systems	To provide a methodology for modelling communicative action in organizations, especially speech acts of changes: creating, maintaining, reporting, modifying and terminating organizational commitments	To provide a learning methodology to support debate on desirable and feasible changes	To develop conditions for effective worker participation in order to support democracy at work and quality of work	To promote increased professionalism of IS designers
Guiding principles	An information system is a social object with social meanings serving different interests; The infrastructure supporting the focal system is critical; Control over the infrastructure is a political process; Commitments of the past constrain the future; IS development is social action of negotiation	An information system is a social system only technically implemented; An information system is a communication system (mediating speech acts); ISD is formalization of professional (work) language	Use of notional system models called "human activity systems" to illuminate different Weltanschauungen which may be applied to any social system; An information system is a system to support the truly relevant human activity system	Design of computer support is design of conditions for work; Craftmanship as the ideal of work; A collective resource approach based on trade union participation	Systems developers must reflect systematically their practice; Methodologies can support inspired practitioners but cannot replace experience; ISD situations are different, requiring different working practices; Effective IS development requires the handling of two types of principles: performance principles and management principles
Fundamental concepts	Information systems as institutions; Social use of information systems; Complex and overlapping negotiation context; Non-neutrality of IS resources	Speech acts; Illocutionary points; Propositional content; Discourses/conversations	Weltanschauung; Human Activity Systems; Root definition; Relevant system	Computers as tools (under the control of each worker)	Performance vs. management; Reflection vs. action; Visions vs. present reality; Product-oriented vs. process oriented; Analysis vs. design; Planning vs. evaluation
Principles of the ISD	N/A	Discourse/conversation analysis;	Stream of cultural analysis; Stream of logic-based	Parallel and independent process of accumulating	All the above dualities are mutually dependent and

process			
Analysis of the propositional content	analysis	knowledge on the part of the union; Design by doing; Cooperative design	therefore should be performed concurrently

DISCUSSION

The synopses and comparison of the approaches not only aimed at introducing the five approaches but also allows us to recognize their strengths and weaknesses. Additionally, we can look how the approaches complement each other. Each of these is explored in the next sections.

Strengths and Weaknesses of the ISD Approaches

The strength of the Interactionist approach lies in its rich and articulated view of organizations. In interactionism, information systems are clearly considered to be first of all, social systems and only secondarily, technical systems. Even though it focuses on organizational symbolism and organizational politics, it also recognizes the potential value of the other views, i.e. the formal-rational, structural, human relations and class politics perspectives of IS. Currently, the Interactionist approach is an analytical framework for analyzing, understanding and interpreting IS development situations without concrete methods on how to actually develop systems.

The SA-based approach clearly has the most rigorous theoretical background - SA theory. It is also the most concrete in many respects as an IS development approach. It has led to a number of technical implementations. The SA-based approach is quite means-end-oriented without any consideration of the actual consequences of IS development and even less critical of the consequences. The conceptual complexity of the SA theory has led to a fragmented situation in which there are a great number of specific IS development methods applying some subset of the theory. They have not yet coalesced into a systematic, cooperative, approach covering all aspects of ISD.

SSM as an IS development approach also has a firm theoretical background. The obvious strength of SSM lies in problematic situations in which there is considerable controversy on the very nature of the human activity system to be supported by an information system. As suggested by FAOR (Schafer, et al. (1988)) SSM may also be useful as a general learning approach in less problematic situations. A clear weakness of SSM is that it is weakly integrated with IS development. It has been subject to evolution during the 1980's as a general systems approach and been updated in Checkland and Scholes (1990). Furthermore, even though Checkland (1981) suggests that the lack of a critical perspective in SSM is a matter of practice rather than principle, there are several aspects in SSM that reflect the values of those in power, i.e. management.

The most distinctive aspect of the Scandinavian trade unionist approach has been its critical view of IS and the primacy given to workers' interests. As pointed out above this aspect has been weakening in the recent evolution of the approach. On the other hand, this less radical ethical stance may explain the increased interest in the trade unionist approach. Its latest two stages - 'collective resource' approach and 'cooperative design' approach - have also advocated a tool perspective of computer artifacts. Even though the tool view can be considered as an ideal, it has led to a quite technical view of computer artifacts (information systems), a view that has lost sight of the possible role of information systems as a means of control and domination. It also explains the artifact-oriented design and development of work in which work is not subjected to any explicit analysis, design and evaluation.

The strength of the Professional Work Practice approach is that it is firmly grounded in IS development practice. The approach is practical and seemingly quite clear, but lacks clarity and structure at a more theoretical level. This is likely so because it lacks a clear, unifying theoretical background. The PWP approach especially focuses on experience, reflection and learning in the development of working practices towards increased professionalism of IS developers, but it does not recognize the potential value of articulated methods as intellectual frameworks facilitating effective learning. The PWP approach as articulated in Andersen et al. (1990) is eclectic. It adopts a collection of concepts, ideas and methods the underlying assumptions of which make it look "orthodox" in some respects.

Complementarity of the Approaches

While the five approaches discussed in this paper were characterized as "alternatives" to the more traditional ISD approaches, it is interesting to ask: "to what extent are the approaches complementary to themselves?" It is our belief that the essences of the five ISD approaches can be interpreted to be broadly complementary. For example, SSM as an approach can be perceived as a general method of inquiry into organizational design and redesign, preceding IS development. SSM is particularly useful when there is a wide spectrum of different meanings and interests related to the organization and its future development. Even though SSM has been described as an approach for IS development, its actual integration with ISD is relatively underdeveloped (Wood-Harper, et al. 1985; Avison and Wood-Harper, 1990). The interactionist approach, on the other hand, has more specific concepts for analyzing the organizational roles and meanings of information systems. It could prove powerful in illuminating the "tragedy and comedy" (Churchman, 1978) of organizational change related to the organizational implementation of information systems. In that sense it could enrich SSM.

Other complementary contributions could be expected from the SA-based approach. Even though the SA-based approach offers some suggestions for the organizational modeling of information systems (Goldkuhl and Lyytinen, 1984), its core contribution lies in modeling communication as structured discourses consisting of speech acts. In that sense it could complement both SSM and the interactionist approach. The strength of the trade unionist approach, in particular in its latest generation, is its support for informal interaction and communication between professional IS developers and users based on mock-ups and prototypes. These methods could complement the relatively formal requirements analysis associated with the SA-based approach. Finally, the PWP approach has focused mainly on project management and its related issues rather than on organizational modeling, redesign, requirements analysis, technical design and implementation. In that sense it could complement all the preceding approaches.

CONCLUDING REMARKS

This present paper has introduced and evaluated five ISD approaches selected to contrast the "orthodoxy" of prevailing ISD approaches. The value of the paper is three-fold. Firstly, it provides condensed surveys of the approaches for a reader who may not have the possibility of studying the original references. Secondly, it includes a condensed evaluation of the strengths and weaknesses of each approach. Third, the paper helps researchers to envision possible directions which future research on ISD approaches might take.

This paper is a piece in our wider research programme on the fundamental aspects of ISD approaches. The paradigmatic assumptions of the five approaches are analyzed in detail in an accompanying paper (Iivari, Hirschheim and Klein, 1997). These two papers together confirm our expectation that the five approaches do, indeed, significantly differ in several respects from the assumptions of the dominant "orthodoxy". As was indicated in the introductory literature review, several earlier research projects employing a variety of research methods, reached the conclusion that IS research is dominated by the functionalist tradition. It is comforting to note that the dominant "orthodoxy" has not completely stifled deviating work.

The results indicate that the five approaches do not form a coherent alternative to the dominant tradition of systems development. There are important differences among them. Each represents a different school of thought with some cross-connections and mutual reinforcements readily apparent. An implication of this point is that the five alternative IS development approaches indicate a fragmentation of IS as an academic discipline. It is thus consistent with Banville and Landry's (1989) diagnosis of the community structure of IS as an academic discipline, namely that it is a fragmented adhocracy. Our comparison provides a type of cognitive map to some of the loosely coupled schools of thought or approaches which Banville and Landry's saw as typical of an adhocracy. This diagnosis puts IS in the company of other related academic disciplines. For example the trend towards increased fragmentation has taken place in management and organizational theory as is discussed in Whitley (1984), (1985) and Astley (1985). In view of the high strategic task uncertainty in IS research, multiple and fluid problem formulations are to be expected. Possibly they are even desirable, testifying to the vigor of a new academic discipline attempting to cope with the complex nature of its subject matter.

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