Systems Architecting of IS Support for Learning Organizations: The Scenario-Based Design Challenge in Human Activity Systems

Kam Hou VAT
Faculty of Science & Technology
University of Macau, Macau
fstkhv@umac.mo

Abstract

This paper investigates the architecting of information systems (IS) support for learning organizations through the elaboration of typical organizational scenarios for knowledge work. Specifically, our discussion is based on the belief that the design issues of IS support must be situated in the context of social processes in which, in a specific organizational scenario, a particular group of people can conceptualize their knowledge work and hence the purposeful action they wish to undertake. This provides the basis for ascertaining what information support is needed by those who undertake that action, and how modern information technology can help to provide that support. The paper describes our initiatives in systems thinking to substantiate IS education in terms of expositing the importance of soft systems methodology (SSM) in the process of IS design according to the evolving contexts of human activity systems. To realize the various IS services in a learning organization, whose requirements are increasingly innovated over different organizational scenarios, we stress architecting IS support for knowledge work requires attention to the purposeful action which the IS serves, and hence to the meanings which make those particular actions meaningful and relevant to particular groups of people in a particular situation. This is often facilitated by the provision of an important SSM-based enquiry process constantly attended to, and integrated into organizational activities by which IS professionals could learn of the organization's continual adjustments to its changing world. The paper also brings forth the notion of the learning organization information systems (LOIS) whose design, based on specific organizational scenarios, could only be accomplished through the collaboration between the IS teams and those who truly understand the underlying purposeful actions served.

Keywords: Learning Organization Information Systems, Soft Systems Methodology, Human Activity Systems, Scenario-Based Design

1. INTRODUCTION

Owing to the emerging knowledge economy (OECD, 1996), many an organization today is being compelled to question their entire existing operation and try to redesign it in a way that uses new technology to serve their organization better. Indeed, the excitement brought about by the Internet and the corresponding changes in organizational behavior, has prompted speculation about what the future generations of information systems (IS) support will look like for knowledge work, which is essentially subjective, eclectic, individual, context-specific and often one-off making it traditionally the most difficult to support with technology. Meanwhile, amidst the learning organization movement (Vat, 2003; Gregory, 2000; Rasmussen, 1997; Willard, 1994; Jashapara, 1993; Garvin, 1993; Senge, 1990)

towards empowering responsible organization members to undertake the more challenging roles characteristic of the knowledge-intensive organizations, there is a strong need to share knowledge in a way that makes it easier for individuals, teams, and enterprises to work together to effectively contribute to an organization's success. Therefore, we are often confronted with the question of how to design IS in support of the learning organization (LO) (King, 1996; Levine, 2001). Example support could include such features as: structured and unstructured dialogue and negotiation among colleagues; creative synthesis of knowledge in integrating working and learning; documentation of data, information and knowledge as it builds up; and retrieval of recorded data, information and knowledge, as well as access to individuals with the necessary knowledge resources. To this end, the acronym "LOIS" (Learning Organization Information System) (Williamson & Lliopoulos, 2001) as applied to an organization is often used as a collective term representing the conglomeration of various information systems, each of which, being a functionally defined subsystem of the enterprise LOIS, is distinguished through the services it renders. Collectively, a LOIS can be considered as a scheme to improve the organization's chances for success and survival by continuously adapting to both the internal and the external challenges. Consequently, we stand a better chance of increasing social participation and shared understanding within the enterprise, and thus foster better learning. Although we believe that this positioning of LOIS represents a significant vision of a future generation of information systems, there are serious questions to be addressed in connection with design approach used to characterize knowledge capture and sharing within the enterprise. All these have consequences for organization transformation in such areas as strategies, structures, processes, systems and people.

2. THE ORGANIZATIONAL SETTING FOR IS WORK

It is understood that the variety of real-world problems concerning IS work in an organizational setting, is enormous; however, it is useful to see them as lying within a spectrum which extends from 'hard' to 'soft'. There are a number of ways in which 'hard' and 'soft' can be defined, but the definition often cited is in terms of the degree of agreement about what the problem is among the particular population of individuals to whom the problem is of concern (Wilson 2001). For example, in the IS context, the hard approach often assumes that organizations are systems with information needs which IT can supply; the soft approach takes a process view of organizations and explores, using soft systems ideas (Checkland & Scholes, 1999; Checkland, Forbes, & Martins, 1990; Checkland, 1979) to structure action research, the way in which people in organizations inter-subjectively attribute meaning to their world and hence form a view on what information is relevant.

- *The Hard Strand of IS Work*

In the hard strand of IS work, an organization is often considered to be a socio-technical system whose managing comprises such activities as planning, organizing, staffing, coordinating, directing and controlling. As a member of such a social unit, the fundamental activity in problem solving is decision making, which is the process of identifying a problem, identifying alternative solutions, and choosing and implementing one of them (Zwass, 1992). Information systems have an important role in this; namely, they are there to support individual decision-making. In the words of Herbert Simon (Simon, 1960), problem solving through decision making proceeds by erecting goals, detecting differences between present situation and goal, finding the tools or processes that are relevant to reducing differences of these particular kinds, and applying these tools or processes. At this hard end of the IS problem spectrum, the method of solution essentially consists of the following stages, with stages 2 and 3 being plausibly iterative: 1) define the problem; 2) assemble the appropriate techniques; 3) use techniques to derive possible solutions; 4) select most suitable solution; and 5) implement the solution. This structured

approach to conceiving IS support for organizational work, requires judgment in terms of a set of guidelines, which stimulate the intellectual process of analysis.

- *The Soft Strand of IS Work*

In the soft strand of IS work, an organization is often seen at core as a social process, essentially a conversational process in which the world is interpreted in a particular way which legitimates shared actions and establishes shared norms and standards. There is no single body of work, which underlies the soft approach to IS, but the works of Sir Geoffrey Vickers (Vickers, 1965) provide quite an interesting reference. For Vickers, organizational members set standards or norms rather than goals, and the focus on goals is replaced by one on managing relationships according to standards generated by previous history of the organization. Furthermore, the discussion and debate, which leads to action is one in which social action is based upon personal and collective sense making. Thereby, organizations are also regarded as networks of conversation or communicative exchanges in which commitments are generated (Ciborra, 1987; Winograd & Flores, 1986). And IS support should be thought of as making such exchanges easier – the exchange support systems. Consequently, at the soft end of the IS problem spectrum, a strategy for IS support needs to be thought of, through which desirable change and organizational learning are often considered as the aims. Its stages of development could be characterized as follows with plausible iterations in stages 3, 4, and 5: 1) define the situation that has provoked concerns; 2) express the situation with different sets of concerns; 3) select concepts that may be relevant; 4) assemble concepts into an intellectual structure; 5) use this structure to explore the situation; 6) define changes to the situation as the problems to be tackled; and 7) implement the change processes.

It should be noted that in the 'hard' methodology, the techniques contain both the concepts and the structure, and they are often well defined, whereas in the 'soft' methodology, the concepts and the structure are independent and need to be specified separately. This may involve greater iteration around the stages mentioned as progress is made in learning about the situation. Thereby, we may consider the methodology be it hard or soft, as a description of how to think about the process of analysis prior to doing it. The intellectual process of choosing concepts and deciding how they might be structured in a methodology is indeed concerned with thinking about how to think. This is itself an unusual process; however, it has the advantage that the resultant methodology is tailored to fit the particular situation, and the analyst know why they are doing what they are doing and how and what they are doing relates to what they will be doing next. Given the great variety of organizational design problems for IS support, considerable flexibility must exist in the concepts and structures available to the analysts. It is believed that unless the particular methodology is assembled as a conscious part of the analysis, it is very unlikely that the changes and solutions identified will represent an effective output of the analysis. More importantly, the specific methodology needs to be explicit in order to provide a defensible audit trail from recommendations back to initial assumptions and judgments. Consequently, thinking about how to think in designing LOIS support is about planning the intellectual process to follow up with the design itself. And there are tremendous implications in the underlying process.

3. THE PERCEIVED CHALLENGE OF ARCHITECTING LOIS SUPPORT

From the discussion built up so far, it is not difficult to foresee that architecting LOIS support for knowledge work is not an easy or routine kind of problem solving. First, there is often an incomplete description of the problem to be addressed, but it is always necessary to identify the relevant description of the current situation that is to be altered by the design work. Second, the problem space of allowable and possible moves is often not determined beforehand. In fact, there is often no guidance on possible design moves in reasoning from a description of the

current situation toward an improved version of the situation. Third, design problems themselves characteristically involve many trade-offs; any move creates side effects, such as impacts on human activities. Fourth, design requires many kinds of knowledge and skill; it typically requires teamwork, problem decomposition, and a lot of management. Accordingly, we have a number of issues to be considered in the IS design for knowledge work (Carroll, 1995; 2000): clarifying the problem, identifying design moves, envisioning the solution, recognizing trade-offs and dependencies, and anticipating impacts on human activity.

- *Clarifying the Problem*

This is the first step in design problem solving: What is wrong with the current state of affairs? What is needed? What could be improved? The standard approach in software development is to carry out some sort of requirements analysis. This analysis may initially be couched as a fairly high-level statement provided by the client – the person or organization that commissioned the design work. Such a statement may also be developed by, in collaboration with, or from observation of prospective users of the system to be developed; or it may be based on the hunches of the designers. Nonetheless, this initial requirements statement must be successively elaborated and refined to obtain a precise description of the situation that highlights the specific needs that the design work will address.

- *Identifying Design Moves*

To the extent that a design problem can be clarified, we need to move toward a solution. Typically, we do not know what specific moves are possible or useful a priori; part of the creativity of design is discovering the relevance and effectiveness of a move that has not been tried before. But this is obviously difficult. Much work on design methods has focused on describing what are sometimes called weak decomposition. The basic strategy is to organize an overall design problem into a set of component sub-problems, each simpler than the original problem. This process is re-iterated until the sub-problems are easily solvable, namely, as examples of known problems with known solutions. Nevertheless, starting design work with weak decomposition tends to simplify problems in ways that implicitly discourage creative solutions, bearing in mind that requirements typically change through the course of design work. Today, it is often experienced that an actively synthetic design method of planning by doing that is complementary to the analytic techniques of problem structuring and decomposition, is needed. Designers, nonetheless, might want to make provisional design moves within a concrete design space, explore and develop requirements, and test the consequences of such moves before committing to them.

- *Envisioning the Solution*

The objective in design is to specify a solution that satisfies the needs identified in the current situation. The design solution is typically described by such artifacts as: the technical drawings, diagrams and written specifications, which provide detailed guidance for those who will implement the design and for those who subsequently may debug, enhance, or otherwise maintain the designed solution. However, such specifications can be obstacles to the full participation in the design process of clients and prospective users, who speak the language of the use situation, but not the language of software specification often characterized by rendering the vivid and open-ended designs as stilted enumerations of features and functions. After all, the essence of an interactive IS support is that it is dynamic and responsive: how can this be merely captured in a static list of features and functions? Henry Dreyfuss, in his 1955 book *Designing for People* (Dreyfuss, 1955), energetically confronts these points. He wanted to present a design as something tangible, sharable with clients and prospective users; hence, he created a design paradigm of active, mutual engagement in which designers and their clients and users work in close coordination, noticing the world as it is and responding with mock-ups of the world as it might be.

• *Recognizing Tradeoffs and Dependencies*
Creating a design solution involves subtle trade-offs and dependencies regarding functionality and usability. The sheer number of important details and their many interactions is an intriguing challenge of design. Often, structured design methods seek to manage interactions by grouping requirements and constraints to specify sub-solutions to sub-problems, and thereby to build up a comprehensive design solution. Understandably, the problem decomposition imposed through such methods shapes the ultimate solution, and may in fact conceal important trade-offs and dependencies. Stated another way, specifications that are developed strictly sub-problem by sub-problem cannot ensure an overall coherence in the design. Dreyfuss (1955) rendered a more concrete perspective on the issue of managing trade-offs and dependencies. He stressed the importance of empirical methods for instantiating and evaluating trade-offs and dependencies. These methods rely on the development of design mock-ups and observations of them in use. The understanding gained through these empirical means could then be used to refine the design solution.

• *Anticipating Impacts on Human Activity*
Designed artifacts have a myriad of consequences for people – some intended, some unintended, some that empower people and enrich their lives, and some that frustrate and punish people. They are complex agents of change; they alter our tasks and our social structures; they have both positive and negative effects, often at the same time and in virtue of one another. Historically, these complications work themselves out through trial and error. Doing better than this often requires sophisticated analysis of use situations coupled with flexible strategies to guide an iterative process of refinement and redesign. Typically, if we think of each design project as an isolated activity, we will not be able to see enough of the long-term consequences for people. However, few system designs are completely novel, and we do know some things about human activity and experience that appear to be relevant across many types of situations. There is often the possibility of what might be called cumulative design, in which we observe the human impacts of past designs through time and attempt to direct that knowledge toward guiding the development of future designs.

4. ADOPTING THE PRACTICE OF DESIGN SCENARIOS

Many of today's information systems are difficult to learn and awkward to use; they often change our activities in ways that we do not need or want. The problem lies in the IS development process. Oftentimes, IS designers have to face convoluted networks of trade-off and inter-dependence, the need to coordinate and integrate the contributions of many kinds of experts, and the potential of unintended impacts on people and their social institutions. It has been observed that traditional textbook approaches to IS development seek to control the complexity and fluidity of design through techniques that filters the information considered, and weakly decompose the problems to be solved. In contrast, scenario-based design approach (Carroll, 1995; 2000) belong to a complementary tradition that seeks to exploit the complexity and fluidity of design by trying to learn more about the concrete elements of the problem situation. Thereby, John Carroll characterizes scenarios as concrete stories about use through which IS architects could envision and facilitate new ways of doing things and new things to do. Specifically, scenarios provide a vocabulary for coordinating the central tasks of systems development – understanding people's needs, envisioning new activities and technologies, designing effective systems and software, and drawing general lessons from systems as they are developed and used. Namely, scenarios help IS designers analyze the various possibilities by focusing first on the human activities that need to be supported and allowing descriptions of those activities to drive the quest for correct problem requirements. It is expected that through maintaining a continuous focus on situations of and consequences for human work and activities, IS designers could become more

informed of the problem domains, seeing usage situations from different perspectives, and managing trade-offs to reach usable and effective design outcomes (Carroll, 1994; 1995). Consequently, through the appropriate use of design scenarios, the problems of designing LOIS support for knowledge work, should never be thought of as something to be defined once and for all, and then implemented. Instead, it must be based on the observation that all real-world organizational problem situations contain people interested in trying to take purposeful action. Pragmatically, the idea of a set of activities linked together so that the whole, as an entity called the human activity system (HAS) from the viewpoint of Soft Systems Methodology (SSM) (Checkland & Holwell, 1998; Checkland and Scholes, 1999) could pursue a purpose, could indeed be considered as a representative organizational scenario for architecting LOIS support, which is never fixed once and for all. In practice, given a handful of the HAS models, namely, models of concepts of purposeful activity built from a declared point of view, we could create a coherent structure to debate about the problem situation and what might improve it (Checkland, Forbes, & Martin, 1990). Subsequently, from the IS architect's point of view, while conceiving the necessary IS support to serve the specific organizational knowledge requirements, the fundamental ideas could be integrated as follows: Always start from a careful account of the purposeful activity to be served by the system. From that, work out what informational support is required (by people) to carry out the activity. Treat the creation of that support as a collaborative effort between technical experts and those who truly understand the purposeful action served. Meanwhile, ensure that both system creation and system development and use are treated as opportunities for continuous learning. In this way, models of purposeful human activities can be used as scenarios to initiate and structure sensible discussion about information support for the people undertaking the real-world problem situations.

5. LOIS DESIGN AS A PROCESS OF LEARNING

Undeniably, setting up an organizational information system is a social act in itself, requiring some kind of concerted action by many different people; and the operation of an IS entails such human phenomena as attributing meaning to manipulated data and making judgments about what constitutes a relevant category. In this regard, the use of scenarios in the creation of IS support, can be seen as a process which learns its way to the meanings which characterize an organizational context. This idea of learning the meanings, by which people sharing a human situation seek to make sense of it, is a significant feature of SSM (Checkland & Scholes, 1999). The important point is that we must not lose sight of the fact that the HAS models are not would-be descriptions of parts of the world. Instead, they are abstract logical machines for pursuing a purpose, defined in terms of declared worldviews, which can generate insightful debate when set against actual would-be purposeful action in the real world. The implicit belief behind constructing the HAS models is that social reality – what counts as facts about the social world inside an organization – is the ever changing outcome of a social process in which human beings continually negotiate and re-negotiate, and so construct with others their perceptions and interpretations of the world outside themselves, and the dynamic rules for coping with it. Researching social reality in the context of LOIS development then becomes an organized discovery of how human agents make sense of their perceived worlds, and how those perceptions change over time and differ from one person or group to another. In the process, we do not expect to discover unchanging social laws to set alongside the laws of natural sciences. Rather, an organization is perceived as entailing readiness on the part of its members to conceptualize it and its internal and external relationships in a particular way, though it is also understood that such readiness changes through time, sometimes incrementally, sometimes in a revolutionary way, as perceptions and membership change. The basic shape of the scenario-based learning

approach could simply be described as follows: Find out about the problem situation that has provoked concern; Select relevant concepts that may be integrated into different human activity systems; Create HAS models from the relevant accounts of purposeful activity; Use the models to question the real-world situation in a comparison phase. The debate initiated by the comparison normally entails the findings of accommodations between conflicting interests, that is to say, situations that may not satisfy everyone, but could still be lived with, enabling action to be taken. Oftentimes, the purpose of the debate is to collectively learn a way to possible changes (improvements) to the problem situations, by activating in the people involved, a learning cycle, which counts on their ability to articulate problems, to engage in collaboration, to appreciate multiple perspectives, to evaluate and to actively use their knowledge. It is worthwhile to notice that taking the purposeful action would itself change the situation, so that the whole cycle could begin again, and is in principle never ending. Likewise, through scenarios, IS architects could provide help in articulating the requirements of specific LOIS support through operating the learning cycle from meanings to intentions to purposeful action among the specific group of organizational members.

6. AN ORGANIZATION SCENARIO OF HUMAN ACTIVITY SYSTEMS

Essentially, the use of scenarios in IS work always assumes that the purpose of creating an organized IS, is to serve some real-world action; namely, organized provision of information is always linkable to action (Checkland, 1983). Thereby, in scenario-based design, when a real-life problem situation arises, our typical approach of enquiry is to formulate some HAS models of purposeful activities, which it is hoped will be relevant to the real-world situation, and use them by setting them against perceptions of the real world in a process of comparison. That comparison could then initiate debate leading to a decision to take purposeful action to improve the part of real life, which is under scrutiny. Thus, designing an IS will require attention to the purposeful action which the IS serves, and hence to the meanings which make those particular actions meaningful and relevant to particular groups of actors in a particular situation. What follows is our appreciation of three important knowledge processes considered as indispensable in the daily operations of the learning organization: the personal process, the social process, and the organizational process. Of particular interest here is the idea of appreciative settings, which according to (Vickers, 1972, p.98), could refer to the body of linked connotations of personal interest, discrimination and valuation which we bring to the exercise of judgment and which tacitly determine what we shall notice, how we shall discriminate situations from the general confusion of ongoing event, and how we shall regard them. The word "settings" is used because such categories and criteria are usually mutually related; a change in one is likely to affect others.

- *The Personal Process*

Consider us as individual conscious of the world outside our physical boundaries. This consciousness means that we can think about the world in different ways, relate these concepts to our experience of the world and so form judgments which can affect our intentions and, ultimately, our actions. This line of thought suggests a basic model for the active human agent in the world. In this model we are able to perceive parts of the world, attribute meanings to what we perceive, make judgments about our perceptions, form intentions to take particular actions, and carry out those actions. These change the perceived world, however slightly, so that the process begins again, becoming a cycle. In fact, this simple model requires some elaborations. First, we always selectively perceive parts of the world, as a result of our interests and previous history. Secondly, the act of attributing meaning and making judgments implies the existence of standards against which comparisons can be made. Thirdly, the source of standards, for which there is normally no ultimate authority,

can only be the previous history of the very process we are describing, and the standards will themselves often change over time as new experience accumulates. This is the process model for the active human agents in the world of individual learning, through their individual appreciative settings. This model has to allow for the visions and actions, which ultimately belong to an autonomous individual, even though there may be great pressure to conform to the perceptions, meaning attributions and judgments that belong to the social environment.

- *The Social Process*

Although each human being retains at least the potential selectively to perceive and interpret the world in their own unique way, the norm for a social being is that our perceptions of the world, our meaning attributions and our judgments of it will all be strongly conditioned by our exchanges with others. The most obvious characteristic of group life is the never-ending dialogue, discussion, debate and discourse in which we all try to affect one another's perceptions, judgments, intentions and actions. This means that we can assume that while the personal process model continues to apply to the individual, the social situation will be that much of the process will be carried out inter-subjectively in discourse among individuals, the purpose of which is to affect the thinking and actions of at least one other party. As a result of the discourse that ensues, accommodations may be reached which lead to action being taken. Consequently, this model of the social process which leads to purposeful or intentional action, then, is one in which appreciative settings lead to particular features of situations as well as the situations themselves, being noticed and judged in specific ways by standards built up from previous experience. Meanwhile, the standards by which judgments are made may well be changed through time as our personal and social history unfolds. There is no permanent social reality except at the broadest possible level, immune from the events and ideas, which, in the normal social process, continually change it.

- *The Organizational Process*

Our personal appreciative settings may well be unique since we all have a unique experience of the world, but oftentimes these settings will overlap with those of people with whom we are closely associated or who have had similar experiences. Tellingly, appreciative settings may be attributed to a group of people, including members of a team, or the larger organization as a whole, even though we must remember that there will hardly be complete congruence between the individual and the group settings. It would also be naïve to assume that all members of an organization share the same settings, those that lead them unambiguously to collaborate together in pursuit of collective goals. The reality is that though the idea of the attributed appreciative settings of an organization as a whole is a usable concept, the content of those settings, whatever attributions are made, will never be completely static. Changes both internal and external to the organization will change individual and group perceptions and judgments, leading to new accommodations related to evolving intentions and purposes. Subsequently, the organizational process will be one in which the data-rich world outside is perceived selectively by individuals and by groups of individuals. The selectivity will be the result of our predispositions to "select, amplify, reject, attenuate or distort" (Land, 1985, p. 212) because of previous experience, and individuals will interact with the world not only as individuals but also through their simultaneous membership of multiple groups, some formally organized, some informal. Perceptions will be exchanged, shared, challenged, argued over, in a discourse, which will consist of the inter-subjective creation of selected data and meanings. Those meanings will create information and knowledge which will lead to accommodations being made, intentions being formed and purposeful action undertaken. Both the thinking and the action will change the perceived world, and may change the appreciative settings that filter our perceptions. This organizational process is a cyclic one and it is a process of continuous learning, and should be richer if

more people take part in it. And it should fit into the context of the learning organization scenario.

7. AN ACTIONABLE MODEL FOR LOIS DEVELOPMENT

According to (Checkland & Holwell, 1995; 1998), the main role of an information system is that of a support function in an organizational setting. More specifically, the IS function is to support people taking purposeful action by indicating that the purposeful action can itself be expressed via some activity models, which are called the HAS models from the perspective of SSM (Checkland, 1984; Checkland & Scholes, 1999). As an account of the context of IS work, we can consider an actionable model in which organization meanings are created. Briefly, there are seven elements in this model, worthy of our attention. Element 1 consists of people as individuals and as group members in the organization. Element 2 is the data-rich world people perceive selectively through their various taken-as-given assumptions. Element 3 is the organizational discourse in which meaning is created inter-subjectively. Element 4 denotes the attributions of meanings which yield the necessary information and knowledge through a very complex social process involving perhaps, persuasion and coercion. Element 5 represents the assemblies of related meanings, intentions and accommodations among conflicting interests. Element 6 represents the purposeful action, best thought of and expressed as a managing of relationships. Element 7 covers the formally organized information systems based on various information technologies (IT) which support organization members in conceptualizing their world, finding accommodations, forming intentions, and taking actions (elements 5 and 6). In fact, this model is conceived not as a descriptive account of the specific organization process, but a defensible device with a structure to make sense of life in real organizations and their provision of IS support (Weick, 1995). In a particular situation, the initial focus might, for example, be on action (element 6). It might be found to be inadequately supported by the IS in element 7, or it might be found that some boring action previously taken by people could now be automated. In another situation, a new development in IT (element 7) might cause a re-think of possible knowledge (element 4), intentions (element 5), and action (element 6). Meanwhile, from an IS architect's viewpoint, elements 1-5 describe the organizational context in which people create meanings and intentions; this leads to purposeful action being taken (element 6). Element 7 provides what would usually be described as information support. Thus, we have a process (elements 1-5) and a form of support (element 7) for a main outcome of that process, namely, the purposeful action (element 6), which people take as a result of the process. In general, the model should have pathways, which link all elements with one another; namely, there is no clear starting point for use of the model. However, the cycle might be dominated, in particular circumstances, by changes in (or changed perceptions of) any of the elements in the model.

8. MEANING ATTRIBUTION IN THE CREATION OF IS SUPPORT

One of the most obvious characteristics of human beings is our readiness to attribute meaning to what we observe and experience in the world outside ourselves. If information is interpreted as what we get when human being attribute meaning to data in a particular context, then an information system (IS), in the full sense, will be a meaning attribution system in which people select certain data out of the mass potentially available and get them processed to make them meaningful in a particular context in order to support those engaged in purposeful action (Checkland & Holwell 1995; Checkland & Haynes, 1994). Thus, if we wish to create an appropriate IS in the exact sense of the phrase, we must first understand how people in the specific situation conceptualize their world. We must find out the meanings they attribute to their perceptions of the world and hence understand which action in the world they regard as sensible purposeful action, and why. Having obtained that understanding

we shall be in a position to build some of the purposeful models, and use them to stimulate debate aimed at defining some human activity systems (HAS) widely regarded by people within the situation as truly relevant to what they see as the required real-world action. Once an agreed truly relevant system has emerged, the use of scenario-based development requires us to ask of each activity in the model the following questions: What information would have to be available to enable someone to do this activity? From what source would it be obtained, in what form, with what frequency? Besides, we need to be aware of what information would be generated by doing this activity? To whom should it go, in what form, with what frequency? In this way, an activity model may be converted into an information-flow model. Given the information-flow model, which is agreed to be a necessary feature of the situation studied, we may then ask: What data structures could embody the information categories that characterize such information flows? It is only then that we could start the design of a suitable information system, which should yield the information categories and information flows required by the structured set of activities regarded as truly relevant to the real-world action that is itself relevant according to the meanings which people in the situation attribute to their world as a result of their worldviews.

9. PERSPECTIVES OF IS ARCHITECTING USING THE SCENARIO-BASED APPROACH

Those engaged in the tasks of building LOIS support are involved in the delicate business of creating, within the organization, a conglomeration of different human activity systems (HAS) using the term from soft systems thinking. To create an entirely new organizational dynamics through the HAS's actually requires effort and commitment on the part of everyone involved, as well as a good imagination in the mind of the person charged with directing its implementation. There are a number of issues worthy of our attention in the following discussion:

9.1 Design Situations are Fluid

In everyday life, design changes the world within which we act and experience, and this often changes the requirements for further design. When the fluidity of IS design incorporates new technologies or addresses new arenas of human activity, requirements evolve more rapidly. New design moves and new design goals become possible and necessary to address these requirements. Thereby, design problems in IS support often change significantly during the course of their own solution process. To manage an ambiguous and dynamic situation, we must be concrete but flexible – concrete to avoid being swallowed by the indeterminacies, flexible to avoid being captured by a false step. The use of scenarios makes both ends meet: they are concrete in the sense that they simultaneously fix an interpretation of the design situation, and offer a specific solution. At the same time, scenarios are flexible in the sense that they are deliberately incomplete and easily revised and elaborated.

9.2 Design Moves have Many Consequences

Every element of a design, every move that a designer makes, has a variety of potential consequences. Schon (1983) sees design as a conversation with a situation comprising many inter-dependent elements. The designer makes moves and then listens to the design situation to understand their consequences. When a move produces unexpected consequences, and particularly when it produces undesirable ones, the designer should articulate the theory implicit in the move, criticize it, restructure it, and test the new theory by inventing a move consistent with it. Designers need a language for keeping track of the conversation with the design situation, for recognizing and addressing the numerous trade-offs and dependencies among elements of the design problem. Scenarios as the flexible and multifarious design artifacts, allow designers to do just that. They describe designs at multiple levels of details and with respect to multiple perspectives. For example, a scenario can briefly sketch tasks without committing to details of precisely how the

tasks will be carried out or how the system will enable the functionality for those tasks.

9.3 Design Action Competes with Reflection

IS designers, though skilled at performing complex and open-ended tasks, are aware of the tension between thinking and doing: the former impedes progress in doing, while the latter obstructs thinking. They want to reflect on their activities, and they routinely do. However, they know from experience that it is impossible to fathom all potential consequences as well as inter-dependencies, and they can be frustrated by problem clarification and discussion of alternatives. They want to act – to make decisions and see progress. Yet, as Schon (1983, 1990) mentioned, reflective activities in IS work often occur decoupled from action, instead of tightly coupled. The use of scenarios in IS design help surface individual designers' attributions for public testing, and give directly observable data for other's judgments, with an attempt to guide a restructuring of the current situation that can produce new design actions and new insights. Overall, scenarios provide a language for action that is ineluctably reflection evoking.

10. REMARKS FOR CONTINUING CHALLENGES

The IS staff assigned to redesign the organization in terms of various human activity systems, must be able to create the necessarily detailed models in support of different learning organization objectives. This work often involves with different design alternatives and the IS team must collaborate to make decisions at different levels of design from the comprehensive architectural level (functional structures + resources needed) down to the detailed, dynamic levels of events (Robbins, 1990). To minimize the pitfalls associated with haphazard decision-making, we need a framework by which the organization may be designed and re-designed. This framework must comprise a consistent set of constructs, representing the organizational pieces, their interconnections, and their behaviors. We call this framework an instance of an evolving organization model, and the creation of such framework, the practice of organization modeling (Morabito, Sack & Bhate, 1999). Oftentimes, we consider an organization model as composed of its static and dynamic portions. The static portion is often referred to as the organizational architecture, and the dynamic portion its specific organizational behavior. The major constituents of the organizational architecture are its organizational domains, representing areas of interest to the organization, which are typically composed of two types of constructs: the core and the derived (Daft 2001). Basically, we maintain that an organization can be described in a relatively stable fashion with a constant set of core constructs, such as people, strategy, structure, process and technology. Still, many other management notions are advanced every now and then, which represent variations of existing core constructs. We call such variations the derived constructs, examples of which include culture, empowerment, individual learning, organizational learning, and knowledge management. In practice, it is useful to interpret an organization as a set of behavioral specifications, each of which represents a view (a HAS view) that is designed to characterize the organization premised on some set of organizational domains. Meanwhile, modeling a learning organization requires managerial choice at every stage of development: choice associated with the constructs chosen by management to represent the organization, choice with respect to the organizational domains which management is interested in proactively designing, choice of alignment among such domains, and choice of possible implementation. Throughout the organization modeling process, which includes establishing an organizational philosophy, identifying domains in need of design, specifying an organization's invariant (rules) at all levels of abstraction, it is likened to the act of composing a symphony or painting a picture. The artist starts with an image – the final rendering is visualized even if not fully formed. Planned or emergent, the molded image is a product of visualization. It is the process that interweaves strategic intent,

architecture, and change into molding the organization image. In creating the organization model, we understand that the architecture and the behaviors, with which it operates, form not only the foundation, but also the character of design, and ultimately, the character of the organization itself. The great challenge is to shape the organization so that all of its pieces (organization domains) work together in consonance. In order to make this possible, probably most interpretive action researchers would accept the notion of (Argyris, Putnam, & McLain-Smith, 1982) that the crucial elements in the approach include: a collaborative process between researchers and people in the situation; a process of critical inquiry; a focus on social practice; and a deliberate process of reflective learning.

11. REFERENCES

Argyris, C., Putnam, R., and McLain-Smith, D., 1982, Action Science: Concepts, Methods and Skills for Research and Intervention. Jossey-Bass, San Francisco.

Carroll, J.M., 1994, "Making use a design representation," Communications of the ACM, Vol. 37, No. 12, pp. 29-35.

Carroll, J.M., 2000, Making Use: Scenario-Based Design of Human-Computer Interactions. Cambridge, MA: MIT Press.

Carroll, J.M., (ed.), 1995, Scenario-Based Design: Envisioning Work and Technology in System Development. New York: John Wiley & Sons.

Checkland, P., 1983, "Information Systems and Systems Thinking: Time to Unite?" International Journal of Information Management, Vol. 8, pp. 230-248.

Checkland, P., 1999, "Systems Thinking," in W.L. Currie, and B. Galliers (eds.), Rethinking Management Information Systems, Oxford University Press.

Checkland, P. (1979), "Techniques in Soft Systems Practice, Part 2: Building Conceptual Models," Journal of Applied Systems Analysis, Vol. 6, pp. 41-49.

Checkland, P., Forbes, P., and Martin, S., 1990, "Techniques in Soft Systems Practice, Part 3: Monitoring and Control in Conceptual Models and in Evaluation Studies," Journal of Applied Systems Analysis, Vol. 17, pp. 29-37.

Checkland, P. and Haynes, M., 1994, "Varieties of Systems thinking: The Case of Soft Systems Methodology," System Dynamics Review, Vol. 10, No. 2-3, pp. 189-197.

Checkland, P. and S. Holwell, 1995, "Information Systems: What's the Big Idea?' Systemist, Vol. 17, No. 1, pp. 7-13.

Checkland, P. and Holwell, S., 1998, Information, Systems, and Information Systems: Making Sense of the Field. John Wiley and Sons: Chicheser.

Checkland, P. and Scholes, J., 1999, Soft Systems Methodology in Action. Wiley, Chichester.

Checkland, P., 1984, "Systems Theory and Information Systems," in Bemelmens, Th. M.A. (ed), Beyond Productivity: Information Systems Development for Organizational Effectiveness. North-Holland, Amsterdam.

Ciborra, C.U., 1987, "Research Agenda for a Transaction Costs Approach to Information Systems," in Boland and Hirschheim (eds). Critical Issues in Information Systems Research. John Wiley and Sons, Chichester.

Daft, R.L., 2001, Organization Theory and Design, 7th Edition. South-Western College Publishing.

Dreyfuss, H., 1955, Designing for People. New York: Simon & Schuster.

Garvin, D.A., 1993, "Building a Learning Organization," Harvard Business Review, 71 (4), pp. 78-91.

Gregory, V., 2000, "Knowledge Management and Building the Learning Organization," in T.K. Srikantaiah, and E.D. Koenig (eds.), Knowledge Management: For the Information Professional. ASIS: Information Today, Inc., pp. 161-179.

Jashapara, A., 1993, "The Competitive Learning Organization: A Quest for the Holy Grail," Management Decision, 31(8): pp. 52-62.

King, W.R., 1996, "IS and the Learning Organization," Information Systems Management, 13 (3), Fall, pp. 78-80.

Land, F., 1985, "Is an Information Theory

Enough?" The Computer Journal, Vol. 28, No. 3, pp. 211-215.

Levine, L., 2001, "Integrating Knowledge and Processes in a Learning Organization," Information Systems Management, Winter 2001, pp. 21-32.

Morabito, J., Sack, I., and Bhate, A., 1999, Organization Modeling: Innovative Architectures for the 21st Century. Prentice Hall PTR, New Jersey.

OECD, 1996, The Knowledge-Based Economy. Organization for Economic Cooperation and Development, OCDE/GD(96)102, Paris, 1996.

Rasmussen, R.V., 1997, Learning Organization Links (http://courses.bus.ual-berta.ca/org-a652/learninglinks.htm) 1998, August 13.

Robbins, S.P., 1990, Organization Theory: Structure, Design, and Applications, Third Edition. Prentice Hall, Inc, Englewood Cliffs, NJ.

Schon, D.A., 1990, Educating the Reflective Practitioner. San Francisco, CA: Jossey-Bass.

Schon, D.A., 1983, The Reflective Practitioner. New York: Basic Books.

Senge, P., 1990, The Fifth Discipline: The Art and Practice of the Learning Organization. Currency Doubleday, London, U.K.

Senge, P.M., Roberts, C., Ross, R.B., Smith, B.J., and Kleiner, A., 1994, The Fifth Discipline Fieldbook: Strategies and Tools for Building a Learning Organization. Doubleday Currency, New York.

Simon, H.A., 1960, The New Science of Management Decision. Harper and Row, New York.

Vat, K.H., 2003, "Architecting of Learning Organizations: The IS Practitioners' Challenge in Systems Thinking," Information Systems Education Journal (ISEDJ), Vol. 1, No. 26, December (http://isedj.org/1/26/).

Vickers, G., 1972, "Communication and Appreciation," in Adams et al (eds), *Policymaking, Communication and Social Learning: Essays of Sir Geoffrey Vickers.*Transaction Books, New Brunswick, NJ, USA.

Vickers, G., 1965, The Art of Judgment. Chapman and Hall, London.

Von Bertalanffy, L., 1968, General System Theory. Braziller, New York.

Willard, B., 1994, Ideas on the 'Learning Organization'. http://www.oise.on.ca/~bwillard/ideaslo.htm.

Williamson, A. and Lliopoulos, C., 2001, "The Learning Organization Information System (LOIS): Looking for the Next Generation," Information Systems Journal, Vol. 11, No. 1, Jan., pp. 23-41.

Wilson, B., 2001, Soft Systems Methodology: Conceptual Model Building and its Contribution. John Wiley & Sons, Ltd, New York.

Winograd, T. and Flores, F., 1986, Understanding Computers and Cognition. Addison-Wesley, Reading, MA.

Zwass, V., 1992, Management Information Systems. Wm. C. Brown, Dulbuque IA.

BIOGRAPHY

Kam Hou VAT is currently a lecturer in the Department of Computer and Information Science, under the Faculty of Science and Technology, at the University of Macau, Macau SAR, China. His current research interests include learner-centered design with constructivism in Software Engineering, architected applications developments for Internet software, information systems for learning organization, information technology for knowledge synthesis, and collaborative technologies in electronic organizations.