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Collaborative design: An SSM-enabled organizational learning approach

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Collaborative Design: An SSM-enabled Organizational Learning Approach

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ABSTRACT

Within the context of a three year applied research project conducted from 2003-2006 in a North American university library, staff were encouraged to reconsider organizational assumptions and design processes. The project involved an organizational leader and an external consultant who introduced and collaboratively applied Soft Systems Methodology (SSM) practice. Project results suggest the efficacy of using 'soft' systems thinking to guide interaction (re)design of technology-enabled environments, systems, and tools. In addition, participants attained insights into their new roles and responsibilities within a dynamically changing higher education environment. Project participants also applied SSM to redesign 'in house' information systems. The process of employing systems thinking practices to activate and advance organizational (re)learning, and initiating and elaborating user-centered interaction (re)design practices, culminated in a collaborative design (co-design) approach that readied participants for nimble responsiveness to continuous changes in the dynamic external environment.

Keywords: action research interaction design; governmental IS; participative design; process design; soft systems methodology; user-centered design; user participation

INTRODUCTION

Amidst rapid technological change, aggravating financial uncertainty, and escalating community expectations, librarians at California Polytechnic State University in San Luis Obispo (Cal Poly, USA) recognized

that nimble organizational responsiveness required reinventing library processes, procedures, and services. They understood that this would require changing how they think and what they think about, as they readied themselves for new roles in the academic enterprise.

Concurrently, librarians in this comprehensive polytechnic teaching university observed a consistent pattern of declining gate counts and diminishing transactions, despite student enrollment increases. These data suggested that even the traditional “library as place” role was eroding at this institution, which offers a wide range of bachelor’s and master’s degree programs. Librarians were not alone in recognizing that the library was increasingly marginalized on campus: when campus administrators announced permanent budget cuts, the library’s share was consistently greater than other academic support units.

So when a new group leader was hired in September 2003, public services librarians agreed to examine the underlying assumptions that historically guided organizational decision making. Systems thinking was used to reconsider the academic library’s purpose(s), including project participants’ roles and relationships, within the context of the university mission. This exploration also benefited from learning-centered consultation with user communities, which served to refine the alignment between organizational intentions, actions, and outcomes.

Within the systems thinking community, ‘soft’ systems thinking is widely recognized for its contributions to organizational learning through revisiting workplace assumptions (e.g., Ackoff, 1998; 1999; Ackoff *et al.*, 2006; Checkland, 1981; 2000; Flood & Jackson, 1991; Flood & Romm, 1996; Jackson, 2000; 2003; Midgley, 2000; Checkland & Winter, 2006). For this project, Soft Systems Methodology (SSM) was selected because of its proven usefulness in building larger frames of reference (Checkland, 1981; 2000; Checkland & Holwell, 1998a; Checkland & Poulter, 2006; Checkland & Scholes, 1990; Checkland & Winter, 2006), which librarians recognized

as necessary to bridge boundaries within the library and across the campus.

During a three year project conducted between 2003 and 2006, nineteen university librarians and thirteen support staff were led by the group leader (Somerville) through an organizational learning initiative facilitated by an external trainer and project evaluator (Mirijamdotter), who introduced both Soft Systems Methodology and also Scandinavian ‘participatory design’ (Bansler, 1989; Bratteteig, 2004; Iivari & Lyytinen, 1998; Jansson, 2007; Langefors, 1995; Löwgren & Stolterman, 1998; 2004). Library leaders asked the external trainer and evaluator to deliver systems thinking workshops and conduct regular outcomes evaluations over the course of the project. Mirijamdotter was selected because her participatory design and user involvement orientation were compatible with the strong collective bargaining (labor union) orientation of the library workplace.

In this instance, Somerville and Mirijamdotter aimed to depart from typical SSM interventions in which a consultant enters the workplace for the life of the project and then, upon her departure, SSM usage ceases. Therefore, in addition to advancing SSM-guided projects, the leader and the consultant articulated a transferable leadership model for readying a workplace environment for rethinking, repurposing, and relearning. Thus, the purpose of this paper is to offer an account of using soft systems ideas to generate user-centric collaborative design ideas. The paper also illustrates the benefits of reflective practice focused on organizational learning. Finally, the efficacy of this interaction approach—which transformed organizational outcomes—inspired creation of a transferable leadership model.

In the following section, we introduce the underlying assumptions of our participatory action research approach followed by the guiding SSM framework. Next, we present student-generated studies that provided initial 'finding out' data and dialogue-based modeling practice, using Rich Pictures to represent various perspectives. Results fortified library staff resolve to engage in the change initiative, fueling their continuation of this user-generated approach, as illustrated by the example of a content architecture design project. Over the life of the three year initiative, these SSM-enabled projects served to produce organization wide re-design of work roles and tasks, including considerably extended interactions based on participants' perceptions of enlarged boundaries of concern and influence. To conclude the paper, we present and discuss a process model for organizational leadership, which surfaced during the project, that aims to use systems thinking to advance workplace learning.

PARTICIPATORY ACTION RESEARCH

In the Cal Poly project, systems thinking benefited from a participatory action research orientation (Agryris & Schön, 1991; Ghaye, 2007; Heron & Reason, 2001; Jacobs, 2006; Jansson, 2007). "Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework" (Rapoport, 1970, 499). In other words, action research aims to solve a practical problem and at the same time increase scientific knowledge. The usefulness of

combining systems thinking and action research has been well elaborated by leading systems thinkers (e.g., Checkland, 1985; Flood, 1998; Midgley, 2000; Stowell & West, 1994; Wilson, 2001).

In action research, the researcher's role is to create organizational change while simultaneously studying the process (Baskerville & Wood-Harper, 1998; Champion & Stowell, 2003; Checkland & Holwell, 1998b; Dick, 2004). Hence, the action researcher becomes part of the study and interprets the inter-subjective meaning of the observations. Although there is significant variety among action research approaches, they have in common a cyclic process where, following Susman and Evered (1978), the 'systemic' research cycle consists of situation diagnosis, action planning, and action taking (intervening), followed by evaluating and reflecting - i.e., learning.

Participatory action research is a form of action research that involves practitioners as both subjects and co-researchers (Agryris & Schön, 1991). This is in contrast to other types of applied research where the researcher is seen as the expert (Whyte, *et al.*, 1991). In contrast, participatory action research aims to construct an environment where participants freely exchange information and make informed choices, thereby promoting commitment to the investigation results (Agryris & Schön, 1991). Through co-constructing, testing and improving theories about particular interpretations and experiences, people learn by interacting with each other that they can better control their social world (Elden & Levin, 1991). Thus, following Checkland and Holwell's (1998b) illustration of an action research situation, the ideas inherent in participatory action research, in which research subjects act as both practitioners and researchers,

are inherent in the framework of ideas that guides this intervention. In a complementary fashion, the underlying philosophy of SSM, which is both interpretivistic and constructivistic, reinforces the notion that people who want to improve a situation perceived as problematic can make improvements, or changes, through learning their way. In this journey of discovery, SSM-enabled systems thinking guided the dialogue-based (Banathy & Jenlick, 2005) appreciative inquiry (Checkland & Casar, 1986; Vickers, 1983a; 1983b) which furthers organizational learning.

In this case, to encourage the university library's assumption of a new role as a dynamic center of instruction, exploration and learning, we introduced the participants to systems thinking tools which activated and challenged their prior understandings. The iterative learning cycle characteristic of Soft Systems Methodology (SSM), including Rich Picture modeling (Checkland, 1979; 1981; Lewis, 1992), aided librarians to, for example, (re)design web based pages, portals, and personas. In a complementary fashion, additional SSM tools, particularly the Processes for Organizational Meanings (POM) model (Checkland & Holwell, 1993; 1998a; Rose, 2002), were used by the external consultant and organizational leader for direction setting and project planning (Mirjamdotter & Somerville, 2005 - i.e., used on a meta-level to plan or design, carry out, evaluate and reflect. In combination, as the following sections illustrate, these process tools supported participatory, collaborative systems thinking activities focused on advancing emergent insights from user-generated research projects. This resultant organizing model for encouraging interaction and transformation is presented as Figure 5.

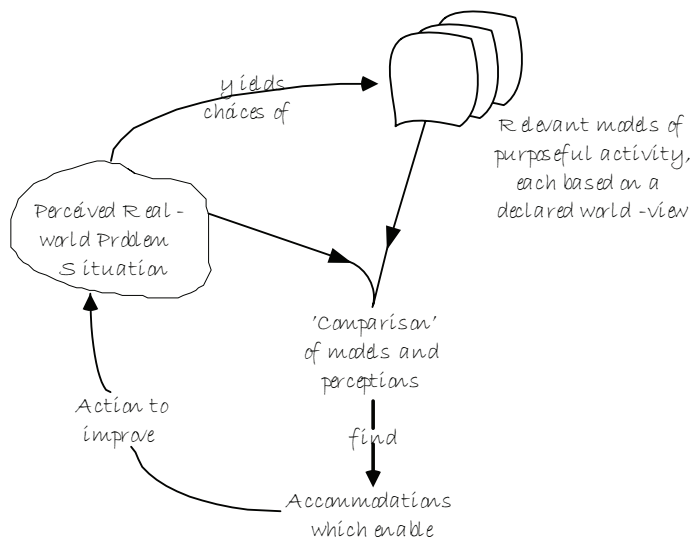
RESEARCH PROJECT FRAMEWORK

Soft Systems Methodology (SSM), the main research framework around which we organize our change process, was development for management and information systems development by Dr. Peter Checkland and his associates at the University of Lancaster in the United Kingdom. Typically, SSM is facilitated by an external consultant who departs at the conclusion of the design activities. In this case, participants aimed to embed systems thinking processes into ongoing workplace practices. Therefore, in addition to advancing systems design projects, the external consultant and organizational leader also evolved an SSM-inspired leadership model (Figure 5) which guided the process and enabled continuation of systems thinking.

The SSM systems thinking approach is commonly described as comprising an iterative four-stage process—finding out, modeling, comparison, and taking action. See Figure 1.

Project participants were prepared to implement these iterative SSM processes through training by the external consultant supplemented by coaching from the organizational leader. However, they did not utilize the traditional sequence of SSM modeling techniques since learning the rules would have diverted attention from inquiring into the content of the situation. Therefore, Rich Pictures were used to visualize different perspectives, or 'world-views', on user experiences and library services, for the purpose of initiating reflective dialogue aimed at comparing perceptions and mental models for subsequent action taking.

Over time and with experience, participants increased their working knowledge

Figure 1. Soft systems methodology basic process (after Checkland, 2000)

of Soft Systems Methodology ideas and participatory action research. Workplace learning was advanced through SSM training complemented by both formal and informal socialization activities. For instance, the organizational leader integrated systems thinking concepts into internal e-newsletters and other organizational communications. She also used face-to-face information sharing opportunities to summarize group successes in confronting long standing assumptions and moving beyond insular behaviors. These accomplishments were also noted in annual performance appraisals, which constitute an important part of the organization's 'reward structure'—i.e., rankings convert to salary increases. In addition, the leader cultivated dialogue-based social relationships among participants and with users to ensure satisfying inter-subjective 'meaning making' experiences. In a variety of ways, then, participants gained SSM conversance adequate to produce shared practices, vocabulary, competencies,

and memories. This led them to question existing ways of seeing and doing things and to "open up novel and elegant proposals for ... advancing thinking and taking action" (Jackson, 2003, 208).

INITIAL 'FINDING OUT'

In January 2004, following an introduction to SSM 'thinking terminology', the process of 'finding out' about library users' needs and preferences commenced in advance of participants' introduction to SSM tools. The initial activity required librarians' consideration of research data generated from open-ended phenomenographic interviews with nineteen representative polytechnic students. The aim of the interviews was to learn about undergraduate college students' conceptions of both information and also information usage.

Phenomenographic studies explore differing ways in which people experi-

ence, perceive, apprehend, understand, and conceptualize various phenomena in and aspects of the world. Since Bruce (1997a) introduced it into educational research in Australia, Lupton (2004) and Edwards (2006) in Australia and Limberg (1999) in Sweden have used the methodology to investigate students' conceptions of information literacy, information searching, and research processes.

With supervision from Somerville, graduate student Maybee modified Bruce's research questions to explore the differing ways that students experience, perceive, apprehend, understand, and conceptualize information. He asked subjects: "How do you use information to complete class assignments?" "How do you use information outside of your coursework?" "Tell a story of a time when you used information well." "Describe your view of someone who used information well." "Describe your experience using information." Recorded interview data was transcribed in preparation for interpretative analysis which focused on aggregated data—i.e., individual interview transcripts were analyzed as a whole. Categories were assigned to describe students' varying ways of experiencing the phenomenon of information usage and its advancement (Maybee, 2006).

As librarians reflected and created meanings based on Maybee's research findings, they recognized the importance of considering undergraduates' perceptions in designing information services and systems. They also recognized that "to adequately address the needs of student learners, a user-centered approach must be adopted that reflects the complexities inherent in the current information environment" (Maybee, 2006, 79). In addition, they were convinced that learning is about changes in conceptions, that learning always has a

content as well as a process, that learning is about relations with the learner and the subject matter, and that improving learning depends on understanding students' perspective (Bruce, 1997a). These compelling insights fueled participants' subsequent exploration of user-centric design methods. And it moved them, over the course of the project, to reject the traditional 'library centric' information gatekeeper role in favor of assuming 'user centered' responsibilities as designers of knowledge enabling systems and services. During the life of the three year project, aspects were reported in conference proceedings and journal articles (Mirjamdotter & Somerville, 2004; Somerville, Huston, & Mirjamdotter, 2005; Somerville & Mirjamdotter, 2005; Mirjamdotter & Somerville, 2005; Somerville, Schader, & Huston, 2005; Somerville, Mirjamdotter, & Collins, 2006; Somerville & Brar, 2006; Somerville & Brar, 2007; Somerville & Brar, 2008).

SSM RICH PICTURES

Maybee's phenomenographic research results revealed three primary ways in which undergraduate students conceptualize information and its usage. His depictions of student conceptions introduced librarians to the function of a model as "an analytical tool to help precipitate a debate about the 'whats and hows' of a situation" (West & Stowell, 2000, 295). These new understandings whetted librarians' appetites to know more. So, in a series of workshops, the external consultant introduced them to SSM philosophy and tools, including the Rich Picture modeling technique. A Rich Picture is defined as "the expression of a problem situation ... often by examining

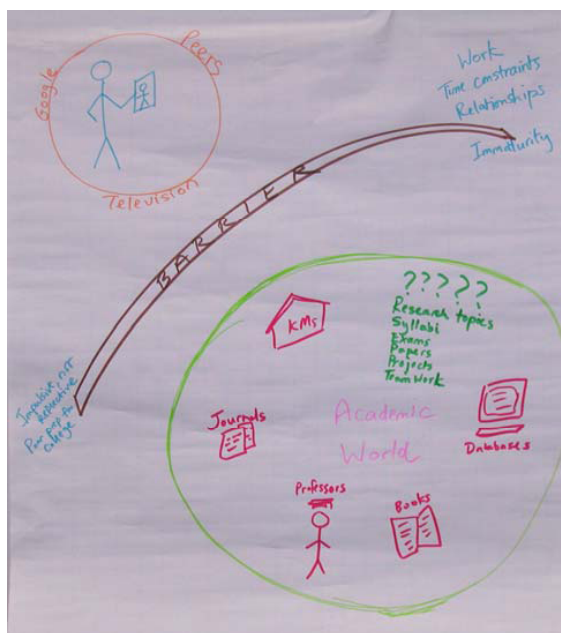
elements of *structure*, elements of *process*, and the situation *climate*” (Checkland, 1981, 317). In relation to the SSM basic process, Figure 1, Rich Pictures are traditionally used to express the perceived real world situation. Here we used Rich Pictures as a modeling tool where each picture aimed at capturing the perspective of main actors involved in the situation. These pictures were then contrasted and compared with the real world situation rather than further exploring their content through SSM modeling techniques.

Librarians first practiced Rich Picture technique on themselves—i.e., they depicted the ‘real-world problem situation’ of their personal practices of information search and retrieval. Although the workshop participants worked in three groups, the drawings were all quite alike and reflected the ‘ideal’ information literacy model adopted by the professional association of North American

academic librarians (ACRL, 2000). In subsequent discussion, however, the librarians ‘admitted’ that they had not depicted what they actually did. Rather, they presented an ideal model of information search and retrieval which placed the library at the center of the process.

In modeling how their professional association felt people ought to search for information, rather than how they actually conducted research, participants presented ‘what it should look like’ from their viewpoint. Surfacing this ‘should’ assumption served to create some additional ‘healthy doubt’ about the adequacy of the library’s current approach to enabling students’ information finding and using—since it failed to consider students’ viewpoints and behaviors. Subsequently, candid dialogue—within a ‘safe’ reflective workplace environment—served to move participants from mimicking professional assumptions

Figure 2. Rich picture of student processes



to sharing authentic perceptions. Building on this, the external consultant then asked participants to construct Rich Pictures based on the phenomenographic study results. As an example, see Figure 2.

Rich Picture results acknowledge the considerable information proficiencies that freshmen students possess when they enter college. The main information sources were categorized as Google, peers, and television. Upon entry to the university, however, students must acquire an expanded set of capabilities—including conversance with peer reviewed scholarship.

In the weeks following creation of the Rich Pictures, librarians considered how best to transition students from 'where they were' to 'where they needed to be' upon graduation. Their growing appreciation for students' rich interactions with (non-academic) information sources prompted librarians to build—in a constructivist fashion—upon students' prior learning. This required identifying the ways in which students use information within different disciplines and at different stages—from first to final year of study. Known as 'relational information literacy', this approach recommends that domain knowledge advance concurrently with information proficiencies (Bruce, 1997b). Finally, given students' usage of the Internet, librarians recognized that they needed to enhance librarian and library web presence. Hence, in this instance, the Rich Picture technique was used to illustrate student perspectives on information search and retrieval and on library services, and the action outcome of the subsequent debate was to continue to explore student behavior with the purpose of finding ways to better serve their needs.

In building upon baseline phenomenographic findings, librarians decided to adopt a radically different approach as they

continued their finding out process. They asked computer science professors teaching Human-Computer Interaction (HCI) courses to invite their students to assume responsibilities for problem definition, methodological implementation, and data analysis. This proved to be a fortuitous decision: from 2004 to 2006, reliance on student-framed, student-conducted, and student-reported research results produced rich evidence about different types of students, their information use at various stages—and why this is so, and their learning style and delivery media preferences.

USER-CENTERED PROJECTS

Enabled by SSM thinking tools, librarians worked with students over a three year period to (re)design several digital initiatives, including an academic research guide, a digital research portal, and a website persona prototype. In keeping with their commitment to learn from students about students, librarians relinquished control of the research process: students were supervised by their professors as they generated problem definitions, chose research methodologies, conducted data analysis, and reported research results.

Students' initial research explored: "What do Cal Poly students know about library resources? What do they want to know? And how do they want to learn it?" Students employed a variety of quantitative and qualitative methods to obtain a rich profile of student behaviors. For instance, they conducted interviews, administered paper and pencil surveys, facilitated focus groups, and implemented usability tests. Results revealed that seventy-two percent of student respondents used the Internet

for research while only four percent reported using the library. Given the Net Generation's Web usage patterns, student researchers advised librarians to improve their digital discovery tools. They urged librarians to discontinue their 'library centric' (structure of bibliography) assumptions and adopt a more 'student centric' design perspective. In return, students offered to explore form and content issues in support of librarians' new roles as content providers for Web-based learning environments. Hence, in this phase of the project, student generated data and interaction led to an intention to improve the web site design to better support students' information search and retrieval preferences and needs.

In continuing exploration of student research habits, research skills, and learning styles, two new lines of inquiry evolved—effects of learning styles and implications of class level (years toward graduation). In response, student research-

ers decided to use preliminary findings to create a two-dimensional (2-D) model for content architecture. The emphasis on learning styles emerged out of the recognition that the Web honors multiple forms of intelligence—e.g., abstract, textual, visual, musical, social, and kinesthetic. Therefore, digital technologies offer opportunities for higher educators to construct tools, systems, and environments that enable individuals to experience information in preferred learning modes. "The Web affords the match we need between a medium and how a particular person learns" (Brown, 2002). In addition, student researchers reasoned that students early in their college career needed to receive foundational information for required liberal arts and general studies coursework. Then, beginning in the third year of a four year undergraduate degree program (when most students declare their academic degree/major), students needed discipline-specific resources and research

Table 1. 2-D content architecture model excerpt (adapted from Somerville et al., 2007)

	Lower Years (first two of four year program)	Intermediate Year (third)	Advanced Year (fourth)
Visual and Kinesthetic	More research content breadth but less depth and basic research strategies needed, paired with visual and kinesthetic presentation elements – e.g., use graphics and demonstrations and replace textual information with visual representations (graphs or diagrams)	Discipline-based coursework and higher order thinking experiences require more in depth information resources and research strategies, with continued application of visual and kinesthetic design elements	More depth topical content, presented within disciplinary framework, to enable more ambitious research purposes, with consistent application of visual and kinesthetic design elements
Auditory and Read/Write	More research content breadth but less depth and basic research strategies needed, paired with audio and read-write presentation elements – e.g., re-organize diagram or graph content into statements and offer both textual narrative and audio recordings, such as podcasts	Discipline-based coursework and higher order thinking experiences require more in depth information resources and research strategies, with continued application of audio and read-write elements	More depth topical content, presented within disciplinary framework, to enable more ambitious research purposes, with consistent application of audio and read-write elements

navigation assistance appropriate to the knowledge building traditions of the academic field. See Table 1.

The design concept acknowledged the 'dimensionality' of the target audience, including academic level considerations and other user attributes which produce different needs at various stages in students' careers. Students also recommended that viewing experiences accommodate learning style differences. The study and design work are reported in more detail in Rogers *et al.* (2005) and Somerville *et al.* (2007).

Data collection and interpretation required frequent face-to-face communication between university librarians and student researchers throughout iterative design processes. This ongoing dialogue served to advance mutual 'sense making' during decision making and 'action taking' designed to improve user experiences. During these discussions, librarians obtained valuable 'voiced' insights into user constituency perspectives which corroborated the wisdom of applying relational information literacy tenets to advance both domain mastery and information proficiencies. Continuing relationships with supervising faculty also ensured opportunities to study different aspects of particularly perplexing problems in subsequent academic quarters.

To sum up, this user-centric project resulted from participatory and collaborative systems thinking activities. It demonstrates that the evolving SSM-enabled collaborative design (co-design) approach reflects both a philosophy and a process in which the needs, wants and limitations of end users play a central role at each stage of the design process (Somerville & Brar, 2008). While quantitative methods are sometimes included in these approaches, a key feature of all these design methodologies is the integral and extensive use of qualitative

data collection and analysis methodologies, including dialogue-based appreciative inquiry. Finally, interaction and collaboration produce the shared vision, mutual empathy, and committed focus to sustain continuous dialogue-based relationships with system beneficiaries and other campus stakeholders (Somerville & Nino, 2007). The action orientation further encourages quick prototype problem solutions as well as library service improvements and other organizational changes. As evidence of its transferability, co-design now informs creation of virtual and physical 'learning commons' at a university library in California's Silicon Valley (Somerville & Collins, 2008).

ORGANIZATIONAL SYSTEM RE-DESIGN

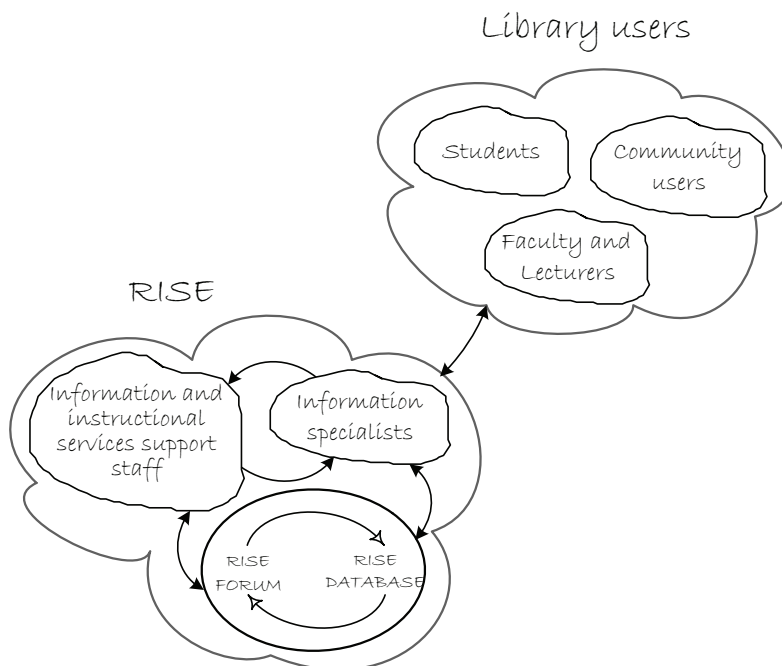
The leader and the consultant next decided to expand participation and include library support staff. These paraprofessional staff carry out day-to-day operational tasks, which free librarians for more high level, subject specific responsibilities. Having observed from afar the benefits of a user-centered design approach, staff were eager to rethink 'in house' information systems. Encouraged by the results of the student generated projects reported in previous sections, they began the 'finding out' phase by establishing and analyzing a transaction log at the reference desk. Preliminary findings were then extended through examination of assignments provided by librarians, who acquired the documents from faculty in advance of delivering information competence instruction sessions. Results informed the design of an information capture and exchange system to support problem

solving at the reference desk (Somerville & Vazquez, 2004), for which staff had assumed responsibility as one result of an SSM-guided organizational redesign (Somerville, Huston, *et al.*, 2005). Over time, through application of the iterative SSM process of finding out, modeling, comparison, and taking action, library support staff experienced empowerment and efficacy, anchored in common understandings and interactive relationships, as reflected in Figure 3.

This figure illustrates library support staff members' conceptions of the interaction between themselves, now termed 'information and instructional service support staff', and university librarians, termed 'information specialists'. The interaction is formalized in a proposed Research and Information Service and Education (RISE)

workplace learning system. The change in terminology is significant—as it replaces the traditional word 'reference desk' which connotes esoteric scholarly consultation on bibliographic references at a single physical service point within the library, isolated from the learning activities of the academic community. The technology-enabled component of the holistic RISE system is also significant, as it reflects both the need for a domain knowledge database (course assignments) as well as continuous information exchange (RISE forum). The knowledge base continues to grow as information specialists acquire, annotate, and contribute the documents that enable information and instructional service support staff to apply 'solutions and strategies' at the newly constituted 'research help desk'—a term recommended by students. Intentional

Figure 3. Interactive processes of the research and information service and education (RISE) system



virtual and face-to-face exchanges fuel continuous workforce learning.

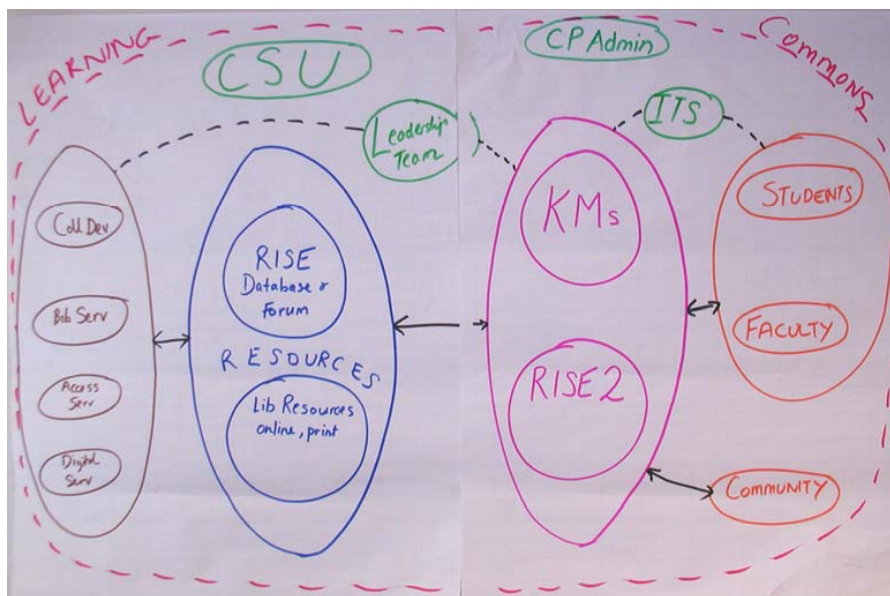
Finally, the two-way communication between librarians and support staff is expressed through ongoing education, informally occurring throughout the workplace and formally provided in weekly training and education sessions which anticipate students' assignment-based needs. This outward looking, technology-enabled decision-support system presents a sharp contrast to traditional professional assumptions whereby questioners were expected to come to librarians 'sitting at the reference desk'. Instead, information specialists now move beyond library walls to forge relationships that influence faculty members' assignments and thereby enrich student learning experiences. In addition to coaching the library staff members who assist students in completion of their assignments, information specialists also design and deliver disciplinary web pages complemented by digital learning objects that introduce essential information resources and search strategies. Now they also offer virtual research 'live chat' services that provide personalized 24/7 online advisement to students, any time, any place. In these various ways, librarians have fulfilled their shared aspiration to increase the library's web presence. Their co-design activities with students gave them the necessary expertise and confidence. In addition, through SSM practice, librarians have forged satisfying relationships with library staff, whose work has also been transformed in the process.

ORGANIZATIONAL LEARNING ASSESSMENT

In an evaluation session held at the end of this three year action research study, the external consultant invited all library participants to apply 'soft' systems principles and practices to depict their enlarged workplace context. Their conceptions were captured in visual SSM-like drawings which provided a common reference for renegotiating increasingly more complex and better contextualized organizational effectiveness, as well as larger boundaries of influence and concern. Illustrative of the renderings, the Rich Picture in Figure 4 presents an enterprise level model of university interactions—including consideration of what parts and relations to include—e.g., hierarchical levels, main processes, primary beneficiaries, relevant perspectives, and leading questions.

The figure illustrates the workplace learning enabled by SSM rethinking activities. For instance, the librarians refer to themselves as Knowledge Managers (KMs). They reside in the same circle as RISE 2, an enlarged group of information and instructional services support staff whose transformation processes were reported in the earlier section. To the right, the importance of relationships with students and faculty are recognized. Another circle indicates the need to also serve the community. The drawing on the left indicates recognition that both these groups, librarians/knowledge managers and research information and instructional services/support staff, interact with (increasingly digital) information resources which, the left most drawing illustrates, are acquired and organized by collection development and bibliographic services staff and made

Figure 4. Perception of interactive processes



accessible by information technology specialists. Finally, at the top of the figure, the relationships with university administrators, campus information technologists, and library leaders are acknowledged, as is the California State University (CSU) system in which Cal Poly serves as one of twenty three campuses. This high level 'system' is termed 'Learning Commons' - a phrase which refers to a physical, technological, social, and intellectual place (or space) for collaborative learning (Somerville & Harlan, 2008; Somerville & Collins, 2008). In the view of project participants, the Cal Poly library environment had become a learning commons over the course of the project.

Before this project began, workplace participants had never collectively reflected on their roles in a holistic context. As Figure 4 demonstrates, one of the most profound outcomes of this three year rethinking project

is clarification of workplace participants' relationships to internal and external stakeholders. These insights emerge quite naturally, as one of the defining characteristics of SSM practice is intentionally entertaining multiple perspectives. Furthermore, by its very nature, Soft Systems Methodology creates a relational context that encourages individuals' recognition of the aspects of their workplace expertise which, when shared, advances collective knowledge creation and integration (Checkland, 2000), even as it extends boundaries of influence and concern.

Organizational learning is also revealed through comparison of the Rich Pictures generated by project participants. These images demonstrate the maturation indicators that, early on, librarians agreed were significant to student learning. They were therefore able, at project's end, to appreciate their own learning in these terms: learning

is about change in conceptions, learning always has a content as well as a process, learning is embodied in the relationship between the learner and the subject matter, and advancement of learning depends on the readiness to change perspectives.

LIBRARY ORGANIZATION LEADERSHIP

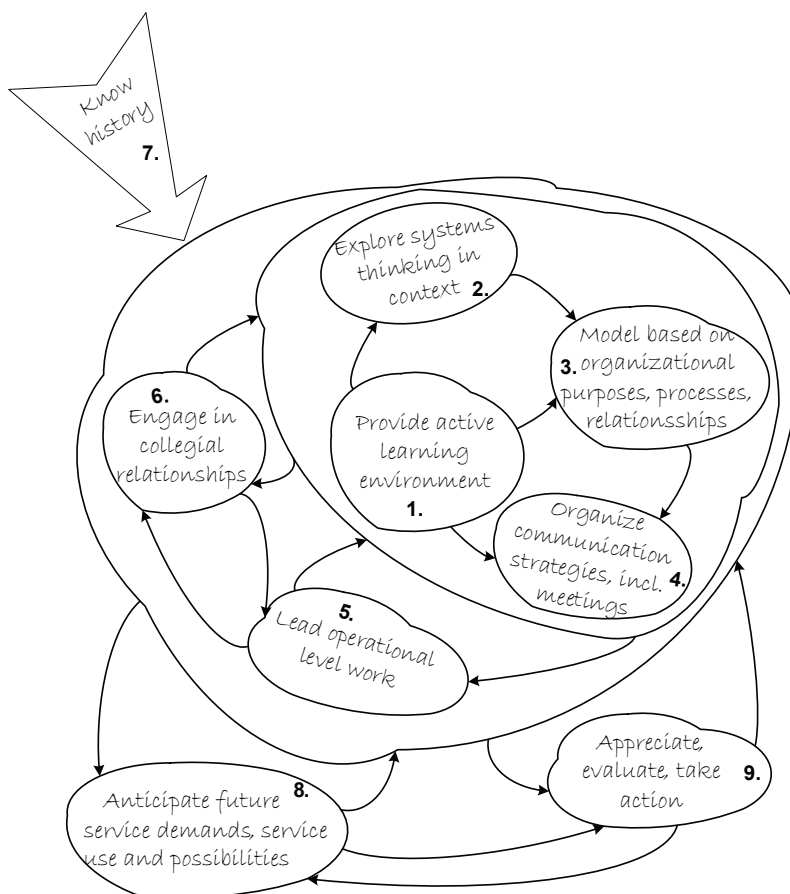
The transformation of the workplace environment was orchestrated by the organizational leader. She served as creator of the contexts for the conversation-based relational information experiences that fueled collaborations with campus partners—i.e., co-design activities. In doing so with coaching from the external consultant, she advanced SSM's learning orientation to enable librarians and staff to become both reflective (re)learners and also responsive action-takers (Somerville, Huston, *et al.*, 2005; Somerville, Schader, *et al.*, 2005). Organizational purposes were revisited, constituency relationships were reinvented, and workplace roles were re-imagined within the context of a 'big picture' appreciation for the larger academic enterprise. Through this organizational discovery process, librarians and staff developed a shared vision for a repurposed organization. They came to appreciate and embrace new applications for their expertise within the larger context of the university's core knowledge creation and dissemination mission.

In recognition of the considerable organizational benefits achieved through embedding SSM in the workplace culture, the leader and consultant anticipate that leaders in other libraries and information organizations will choose to involve external SSM consultants in context specific projects.

Therefore, they developed an activity model to enable organizational leaders to embed SSM philosophy and practices within the workplace and thereby facilitate recoverability according to principles suggested by Checkland and Holwell (1998b). The model in Figure 5 is based on the experience and learning which we now recognize accrued during the three year project. In short, it illustrates the aspects we found necessary for enabling staff engagement in participatory and collaborative re-designing processes. This model evolved over the life of the project; a first version to guide the intervention was developed and reported in Mirjamdotter and Somerville (2004). Subsequently, facets of the multi-dimensional approach represented in this model have been reported in conference papers and journal articles (Somerville & Mirjamdotter, 2005; Somerville *et al.*, 2006; Davis & Somerville, 2006; Somerville & Howard, 2008). By providing this model, which complements the case description, the aim is to further establish the authenticity of the inquiry process (Champion & Stowell, 2003).

The model, Figure 5, illustrates the responsibilities of the organizational leader who chooses to enable, employ, and operationally implement systems thinking practices and processes. It represents layers of activities that interact with each other. At the very center of the figure, activity 1 represents the activities that are involved in providing an active learning environment. Its placement at the very heart of the model conveys the belief that a contemporary organization should be designed so as to be able rapidly to learn from and adapt to its own successes and failures, and those of relevant others. It should also be capable of adapting to internal and external changes that affect its performance, and of anticipating

Figure 5. Process model for library organization leadership



such changes and taking appropriate action before these changes occur. This requires, among other things, that the organization be susceptible to continual redesign by its internal and external stakeholders (Ackoff *et al.*, 2006). Therefore, the organizational leader should create the conditions for employees to easily access and exchange information in terms that extend their interpretive and appreciative capabilities. Accomplishing this requires understanding “the process through which an organization (re)constructs knowledge” (Huysman

& de Wit, 2003, 29)—i.e., organizational learning.

The figure recognizes that active learning environments allow practice in systems thinking, activity 2. The leader advances systems thinking within the organizational context to further the understanding of its parts and their interrelations. Linked to systems thinking and also team success is a shared vision (Senge, 1990). Activity 3 represents modeling the organizational mission within the wider system. This visualization is to be co-developed and further evolved through conversations among staff.

The final activity on this level, activity 4, illustrates that physical and virtual meetings are vital for facilitating active and dynamical engagement in information exchange as depicted in the interactions of SSM. To create adequate infrastructure, SSM is utilized to both define the purpose of the organization and also design the intentional learning environment, including its processes, in which organizational purposes are reconsidered (Checkland & Winter, 2006).

For the sake of model completeness, activity 5 recognizes the importance of leading operational level work. Its counterpart, activity 6, refers to engagement in internal and external relationship building. Historical context, activity 7, represents understanding how and why the present situation has come into being. This perspective offers relational context for envisioning the future, activity 8, including anticipated services and systems.

Finally, processes and outcomes need to be appreciated in the light of organizational purpose and vision, activity 9. In the Cal Poly example, the leader focused on systems thinking, problem solving, team building, and information sharing. Evaluation involved assessing how well these factors were represented in the active learning environment and how well the activities supported the development and sustainability of learning. SSM-guided systems thinking, in this instance, served both as the process tool for inquiry learning, i.e., “SSMp” and, ultimately, organizational transformation based on “SSMc” (Checkland & Winter, 2006, 1435).

REFLECTIONS AND CONCLUSION

This action research project involved an organizational leader coached by an external SSM consultant. Nineteen library professionals and thirteen library staff were trained to use Soft Systems Methodology (SSM) philosophy, methodology, and tools during a three-year participatory action research project. As described in the preceding sections, library employees used systems thinking to invent workplace purposes, processes, and practices ‘with and for’ an ever expanding set of organizational beneficiaries. In so doing, they experienced the social nature of learning—i.e., that “all learning derives from experience, own and others” (Ackoff, 1998, 35) and that learning is about change of conceptions.

From the earliest finding out activities, employees found that cherished assumptions were challenged by user-generated research results which urged them to assume new roles and responsibilities. Systems thinking tools prompted their recognition that the organization’s role had shifted from archiving print collections for potential usage to ensuring information access and enabling information usage for knowledge creation. When employees acquired new knowledge, skills, and abilities through co-design with faculty and students, they extended their boundaries of concern and influence to participate more fully in the teaching and learning activities of the university. As Midgley (2000) explains it, systems thinking philosophy highlights the bounded nature of all understandings and refocuses attention on comprehensiveness as an ideal.

In addition, because authority for problem identification was delegated to student beneficiaries and supervising professors, the content of the problematical situation (SSMc) as well as the intellectual process of the intervention itself (SSMp) enabled students to experience extra-ordinary inclusion—i.e., they directed the ‘way finding’ to agreed upon actions perceived as improvements in the situation. While this collaborative design (co-design) approach certainly informed library participants’ systems thinking—“seeing the world in a holistic way” (Mingers, 2007, 84), the classic Analysis One (finding out about the problem) roles of client, problem solver, and problem owner (as described in lay terms by Checkland & Winter, 2006) were transformed. This proved convenient, however, in realizing the ultimate aim of the action research project—to apply systems approaches to information systems (Stowell, 2007) in terms that enhance and extend (over temporal time) action research outcomes, especially the culminating fifth phase of learning (Susman & Evered, 1978).

The quintessential elements of systems thinking—processes, purposes, relationships, and emergent properties—comprised the ‘learning tool kit’, corroborating Jackson’s observation that “perhaps the main strength of systems ideas ... is the guidance they offer to practitioners” (2000, 423). In this case, SSM provided an excellent basis for real world problem identification, exploration, implementation, and evaluation. Relatedly, appreciation for multiple perspectives served to considerably extend organizational boundaries. Consequently, expanded boundaries of design processes were used to incorporate user ‘needs finding’ results into system interfaces, research portals, and library websites. These choices

affirmed that “no matter what the previous history, every influence and concern produced new conversations and collaborations. As a result, interaction system can be altered and reinvented” (Norum, 2001, 325)—i.e., “if organizations are constructed, they can be reconstructed.” (Norum, 2001, 324) Growing conversance with a variety of user-centered (re)design strategies also enabled librarians to fulfill their expanded responsibilities as collaborative architects of digital information and knowledge enabling spaces. They learned to approach their new responsibilities with confidence, grounded in collaborative SSM-enabled evidence-based practices for decision making and action taking.

Of perhaps greatest significance, at the conclusion of this three year action research project, SSM-enabled systems thinking guided day-to-day workplace decision making. Project participants shared a common language and tools for discussing and analyzing complexities and interdependencies, using the thinking framework of finding out, modeling, comparing, and taking action. Furthermore, they were able to adapt these precepts to further co-design relationships through initiating dialogue, creating meaning, forming intentions, and taking action. Organizational learning advanced naturally through new ‘habits of mind’—i.e., evaluating meaningful data, comparing and contrasting multiple interpretations, and infusing reflective insights and unsolved curiosities into perpetual discovery. By reflecting on the learning process and its crucial elements, such as methods and tools employed to engage participants, and also evaluating anticipated outcomes of the participatory action research approach, the authors follow recommendations advanced by Champion and Stowell (2003) for making evident the authenticity and credibility

of the inquiry process. Doing so facilitates recoverability for participants and interested others, with the aim of enabling more organizational learning grounded in Soft Systems Methodology.

In summation, this paper gives an account of using soft systems ideas in a participatory and collaborative organizational design project in which inexperienced participants employed SSM tools to interpret what they found meaningful and useful in coming to a new understanding of organizational purpose. The paper delineates a process which combines the SSM elements of interaction and transformation into a transferable leadership model for guiding organizational re-design of work roles and tasks, including interactions based on perceptions of extended boundaries. Its expression is conveyed through description of user-centric and user-led (re)design of the organizational website, which benefited from user-generated research results.

Overall, participants learned from this project that it is rewarding for change initiatives to use systems thinking processes in organizational settings when the tools are adapted to the needs and preferences of the participants. Additionally, results suggest that leadership responsibilities include collaborative design of a learning environment which is rich in interactions and conversations and that, concurrently, advance information sharing and exchange relationships which purposefully extend collective interpretive and appreciative qualities and capabilities.

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