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Systems thinking: an approach for advancing workplace information literacy

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As the importance of information literacy has gained increased recognition, so too have academic library professionals intensified their efforts to champion, activate, and advance these capabilities in others. To date, however, little attention has focused on advancing these essential competencies amongst practitioner advocates. This paper helps redress the paucity of professional literature on the topic of workplace information literacy among library professionals.

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Introduction

Increasingly, successful professions in contemporary information and knowledge organisations are reliant on individual and collective information literacy capabilities. This paper argues that within the library and information management industry, professionals enjoy especially rich opportunities to cultivate requisite workplace information literacy knowledge, skills and abilities. Furthermore, in adopting a 'relational' information literacy (Bruce 1997) approach, they can concurrently re-invent workplace processes and practices 'with and for' organisation beneficiaries.

This initiative seeks to advance workplace learning and build upon other organisational effectiveness initiatives in the United States (e.g. Phipps 1993, 2004; Giesecke & McNeil, 2004). However, this project is distinguished in its overt adoption of a unique definition for 'organisation': a purposeful social interaction system (Checkland & Holwell 1998). In so doing, this three year study sought to acknowledge and advance Lloyd's findings about workplace information literacy (Lloyd 2004, 2005a, 2005b, 2006), that collective capabilities develop through workplace socialisation processes. From this point of departure, the project aimed to establish

and embed the sustainable social interactions which, through conversation based communication, enable investigation and negotiation of the interests, judgments, and decisions through which people learn interdependently (Stacey 2003). Within this context, 'culture' can be understood as a shared basis of appreciation and action developed through communication within an organisational system (Checkland 1994, Jenlink & Banathy 2005).

The project was conducted from 2003 to 2006 at California Polytechnic State University (Cal Poly) in San Luis Obispo, a comprehensive state-funded institution of higher education on the west coast of the United States. The primary intention was to overtly develop workplace information literacy competencies among professional employees.

The assumptions underpinning this initiative included a radical proposition – that active involvement and collaboration with present and potential library users is required for the evolution of a learner centred approach for co-designing libraries of the future. Therefore, project planners assumed that in order to develop organisational capacity for nimble responsiveness, librarians must actively discover new roles, responsibilities and relationships 'for and with' users. As the following case study demonstrates, fulfillment of these propositions required forging new social relationships within the university library organisation as well as with campus community constituencies.

While a variety of holistic organisational development methodologies exist (Jackson 2003), project planners chose Soft Systems Methodology (Checkland 2000) due to its proven success in promoting organisational inquiry and learning. In addition, its abiding focus on the process of converting data into information and knowledge serves to overtly advance project participants' information literacy, as expressed in the Australian and New Zealand Institute for Information Literacy (ANZIIL) framework (Bundy 2004). Thus, the ANZIIL framework has served as a foundation throughout the development of an enabling approach for initiating and advancing Lloyd's socialisation model for workplace information literacy.

Soft Systems Methodology (SSM) was also deemed particularly suitable as it does not require the establishment of clear goals before problem resolving can begin. Rather, it provides management tools for considering chaos and advances forward thinking agreements for action, opening up novel and elegant proposals for change (Checkland 1999).

Finally, the 'soft' systems thinking methodology was selected because of its propensity to heighten organisational members' appreciation for the 'whole' university, of which the library organisation is a 'part', in terms that cultivate the critical thinking proficiencies necessary for librarians to become architects of knowledge enabling spaces and places (Somerville, Mirijamdotter, & Collins 2006) – a promising 'new frontier' for 21st century librarians (Materska, 2004). In addition, 'soft' systems thinking encourages the essential components of workplace information literacy including collective enquiry – in this case between users and librarians – and the development of shared understandings and practices integral to the socialisation processes for organisational learning.

Workplace information literacy

Workplace information literacy is a collaborative, socio-cultural practice within a context specific environment (Bruce 1999; Bawden & Robinson 2002; Lloyd 2004; Lloyd 2005b; Kirk 2004) consisting of a 'constellation of skills, practices and processes' (Lloyd 2006). Illustrated in Lloyd's (2005b) findings from her doctoral study of firefighters, workplace information literacy focuses on the construction of shared professional meanings and development of collective outcomes through situated engagement with information. These contextualising experiences reflect various information literacy conceptions (Bruce, et al 2006) which, once acquired, provide pathways to lifelong learning (Bundy 2004; ALIA 2006).

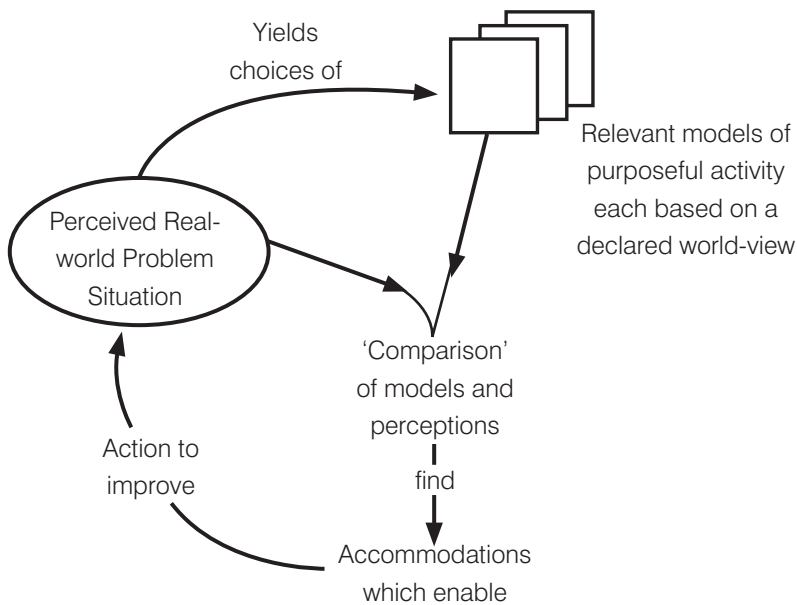
Workplace information literacy is not simply an individual experience. Rather, it develops within a workplace context and is collectively experienced at both group and organisational levels. As identified by Billett (1999), four key sources of workplace learning encompass the activities of work, the workplace, other workers, and the practices of listening and observing. Adding further dimension, Bruce's study of workplace information literacy experiences acknowledged close correspondence between the information literacy facets and common workplace activities (Bruce 1999). These relationship-based frameworks can guide the appreciation for and advancement of information literacy within professional practice experiences of both individuals and organisations. Similarly, Lloyd (2005a) found that workplace information literacy is a context specific learning process in connecting information sources in the workplace with learning practices required to access them. Information literacy facilitates the conversion from individual to collective views of practices and competencies, as well as integration within a situated context (Lloyd 2005a).

For the purpose of this paper, we use Lloyd's (2004) definition of information literacy: 'information literate people are engaged, enabled, enriched, and embodied by social, procedural, and physical information that constitutes an information universe'. This definition encompasses the socialisation processes and workplace context that facilitate workplace information literacy identifying it as a collaborative process, forged largely by informal workplace social relationships. It is dependent on engagement with and drawing meaning from social and physical information sources as much as from textual knowledge sources (Lloyd 2006). Information exchange and knowledge creation occurs within organisational culture through everyday social interactions with colleagues. In corroborating Lloyd's results, Kirk's (2004) study of senior management found that information use was embedded within workplace social relationships. Lloyd (2006) takes this insight further by discussing workplace information literacy as not only the social distribution but also the social production of information and knowledge, in which access to it may be affected by social relationships.

In the following highlights from a three-year case study in North America, an evidence-based, systems thinking 'research-in-practice' approach (Somerville et al 2007) is advanced for purposeful introduction of a sustainable, social relationship-based approach to cultivating workplace information literacy among information and knowledge professionals. The project aims to concurrently foster both information distribution and knowledge production.

'Soft' Systems Methodology

The foundation for this action research study was Soft Systems Methodology developed over a thirty year period by Dr Peter Checkland and his associates at the University of Lancaster in the United Kingdom. The systems thinking approach is comprised of an iterative four stage process – finding out, modeling, comparison, and taking action (Figure 1).

Figure 1: Soft Systems Methodology Basic Process (after Checkland, 2000)

The information literacy capabilities of recognising an information need and identifying information sources animate the data collection activities which drive the continuous learning processes in the workplace. Following information gathering, researchers initiate evaluation, interpretation, and organisation of collected evidence, which is presented in the form of visual models depicting findings. These user-centred renderings are then contrasted in the comparison stage against models of the current real-world situation. The aim throughout is to discover problems and recommend improvements. Following organisational implementation, a new cycle of problem discovery and user consultation begins.

SSM is well known for its contributions to organisational learning. Adaptation of SSM's constitutive elements to the institution's student-centred 'learn by doing' educational philosophy produced a highly collaborative, interactive, and 'voiced' approach. This served to achieve two purposes – the gathering and interpreting of data and, concurrently, the (re)designing of systems 'for and with' users. With particular relevance to this case study, it encourages reconsideration of workplace assumptions – moving the librarians from a narrow understanding of their department to a broader and deeper knowledge of the University environment and its stakeholders.

As the project illustrates, this research-in-practice activated and challenged participants' prior understandings and assumptions. Concurrently, individual learning was advanced to produce organisational learning (Stacey 2003), affirming that 'no matter what the previous history, every system can be altered and reinvented [i.e.] if organisations are constructed, they can be reconstructed' (Norum 2001, 324). Throughout, organisational leaders encouraged reflective communication (Varey 2005) reinforcing learning and workplace information literacy through social relationships and enabling professional dialogue necessary for libraries to serve as dynamic centres of instruction, exploration and learning.

In these SSM applications, librarians participated in an ambitious series of projects in which student-generated results informed the design and development of several digital initiatives, including an academic research guide, a digital research portal, and a website persona prototype. Throughout, a wide array of research methodologies, including focus groups, usability studies, rapid prototyping, and user surveys (Somerville & Brar, in press), were employed within the framework of 'soft' systems thinking, which ensured consideration of the human element in systems analysis and design. The action research orientation encouraged real world benefits, including advancement of an evidence-based workplace learning culture (Somerville et al. 2007), contributing to collective practices and competencies essential to workplace information literacy.

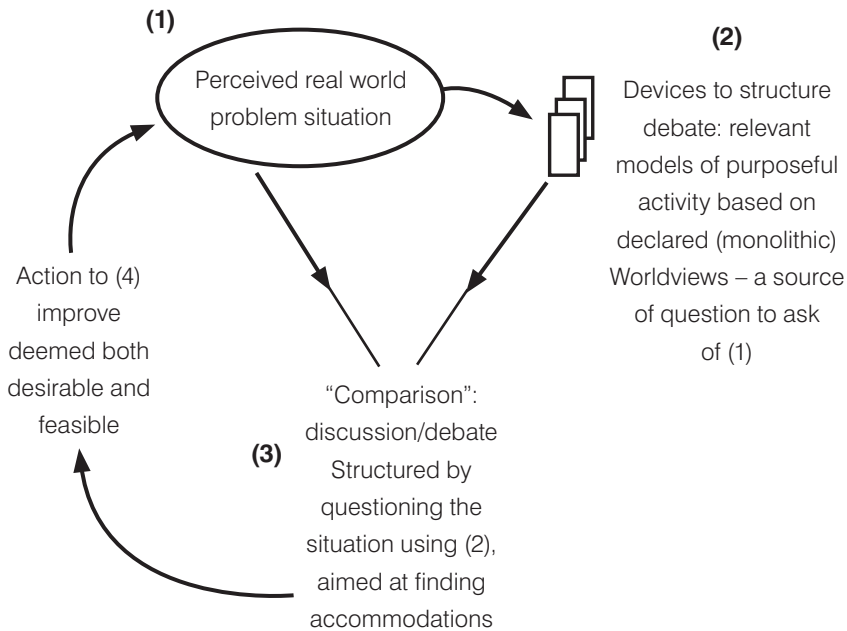
Systems thinking-enabled library projects

The Cal Poly organisational learning approach utilises systems thinking within a participatory action research framework to inform and guide outcomes. In contrast to other types of applied research where the researcher is seen as the expert, participatory action research involves practitioners as both subjects and co-researchers. In this case, the university's student-centric 'learn by doing' educational philosophy informed creation of a collaborative user-centred design approach. It drove librarians' agreement to invite student-generated research projects, with the aim of obtaining authentic perspectives on 'user experience' expectations, preferences, wants, and needs. This approach required relinquishing control of the research process: students, with faculty supervision, generated problem definitions, chose research methodologies, conducted data analysis, and reported research results.

Librarians were prepared to work with user-centred evidence through practice with SSM processes and tools. The holistic systems thinking framework

guided interpretation of student-generated evidence, providing a common language and shared tools for discussion and analysis of complexities and interdependencies. More particularly, the constitutive elements of SSM – finding out, modeling, comparing, and taking action – informed the iterative process of identifying and evaluating meaningful data, comparing and contrasting multiple interpretations, and delineating and infusing thoughtful insights and unsolved curiosities, into a continuous learning process. This information formed the foundation for engaging, enabling and enriching librarians within their ‘information universe’ (Lloyd, 2004), contributing to their workplace information literacy skills (Figure 2).

Figure 2. Sense-Making Model for SSM Practices (after Checkland & Winter 2006)



Note: Steps 1–4 are not sequential. Once initiated, a study will exhibit action in all four simultaneously.

In customising this inquiry-based learning approach to campus culture, librarians invited Human-Computer Interaction (HCI) students, supervised by senior professors, to contribute to problem definition, methodological implementation, and data analysis activities (Somerville & Brar 2008; Somerville et al 2007). Over a three year period, from 2003 to 2006,

reliance on student-framed, student-conducted, and student-reported research results shifted project decision making from 'library centric' to 'user centric.' This occurred naturally as student-generated and student-interpreted evidence caused librarians to question existing ways of seeing and doing things and 'opened up novel and elegant proposals for ... advancing thinking and taking action' (Jackson 2003).

SSM's action research orientation compelled librarians to become both reflective (re)learners and also responsive action takers. In addition, it ensured that practical problem solving occurred simultaneously with professional enrichment as librarians reconsidered organisational purposes, reinvented constituency relationships, and re-imagined workplace roles within the context of a 'big picture' appreciation for the larger academic enterprise (Somerville et al 2005a; Somerville et al 2005b; Davis & Somerville 2006).

As librarians exercised and advanced their workplace information literacy proficiencies, they moved beyond their departmental information 'planet' into the information 'universe' of the University. In working with raw data, they found SSM taxonomy helpful for making discriminating distinctions between data, information, and knowledge. For instance, the subtle but critical difference between 'capta', data selected or attended to, and 'information', meaningful selected data in a context, prepared them to desire 'knowledge', larger, longer-living structures of information (Checkland & Howell 1998).

For professionals accustomed to making information organisation and access decisions for authoritative refereed literature – but not working with the ideas embodied in those resources nor with 'pre-screened' information, SSM classifications aided development of both contextual and situated perspectives on user needs and creator viewpoints (Somerville et al 2005b).

Over time, as project participants internalised this understanding, their work priorities reflected that, in the conversion of data to knowledge, data becomes more valuable at the point that it is transformed into information within a context. Librarians experienced this phenomenon early in the project when they used SSM to reflect upon the service usage statistics collected and reported annually. They had never before analysed and interpreted the data. Through SSM-guided discussion, selected data proved especially informing, for example declining transaction numbers became capta. In furthering the foundational SSM 'finding out' phase, librarians compared usage and resource patterns over time providing an improved understanding of the organisation's situation, as well as advancing collective 'sense making' capabilities. Through such

ongoing conversation-based, data-driven inquiry, librarians developed shared understandings for repurposing and reorganising priorities.

Of significant – though unanticipated – importance, the very nature of the SSM inquiry process encouraged participants to move beyond previously circumscribed professional boundaries in librarianship that permit ‘getting to’ but discouraged ‘getting into’ domain content. Through explicit incorporation of ‘sense making’ and ‘meaning making’ into librarians’ professional repertoire their boundaries of concern and influence expanded. Concurrently, they developed first hand knowledge of the continuum of users’ information conceptions and capabilities, as reported elsewhere (e.g., Cheuk 1998a, 1998b, 2000, 2002; Bruce, 1999; Kuhlthau 1999; Kuhlthau & Tama 2001; Smith & Martina 2004; Lloyd 2004, 2005a, 2005b, 2006; Al-Daihani, S. M., et. al., 2007).

Throughout, librarians’ explicit development of information literacy proficiencies built collective capacity to frame appropriate questions, select authoritative resources, and interpret and apply richly textured insights that accelerated sound decision making about work purposes, processes, and relationships. Mindful of ANZILL’s relational precept, librarians concurrently developed both disciplinary knowledge domain and information literacy proficiencies that increasingly expanded their boundaries of concern, involvement, and influence.

At its core, the SSM approach seeks to explicate multiple stakeholders’ perspectives. In so doing, it enriches participants’ understanding of situations through illuminating others’ viewpoints. It also provides context in which individuals can view their own perceptions anew. Finally, SSM advances information competence within organisational members as they experience information literacy (learning), reflect on experience (becoming aware of learning), and apply experiential insights to novel contexts (transfer of learning). The latter proficiencies were cultivated through coaching participants through increasingly complex learning activities involving identifying and framing questions, gathering and evaluating information, organising and synthesising it, and presenting insights to inform and advise. Learning emerged out of progressively ambitious evidence-based, user-centred collaborative inquiry processes.

Collaborative Design Elements

This SSM enabled user-centred co-design approach is 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. A key feature of this design methodology is the integral and extensive use of qualitative data collection and analysis methodologies – open ended interviews, focus groups, ethnographic

studies, and participant observation, while quantitative methods provide supporting evidence. In addition, the emphasis on iterative design leading to rapid prototyping of solutions which can, in turn, be evaluated, modified, and implemented in a relatively short time frame, ensures users' instant gratification.

Data collection and evidence interpretation required frequent face to face discussion between university librarians and student researchers throughout the design and redesign processes. This ongoing dialogue served to advance mutual sense making during decision making and action taking activities to improve user experiences throughout the three year study. During such discussions, librarians obtained valuable 'voiced' insights into user constituency perspectives. Ongoing relationships with supervising faculty also offered the possibility to continue studying different aspects of a particularly perplexing problem in subsequent academic quarters enabling ongoing workplace learning and collaboration opportunities. Finally, the action orientation and workplace information literacy outcomes encouraged quick prototype problem solutions, service improvements, and organisational changes that enabled continuous improvement and promoted sustainable communications within the library and campus community.

The role of organisational leadership

Responsibility for creation of this robust organisational learning environment, which activated and furthered workplace information literacy, ultimately resided with the organisational leader. The leader became the enabling workplace environment architect. As such, the leader's actions were critically important for making and sustaining organisational change and fostering workplace information literacy. At the conclusion of the collaborative projects, four critically important behavioural elements for organisational leadership emerged.

1. *Role model*. The leader must reflect in all communication and action that systems thinking is both a preferred and successful method for structuring individual and group thinking processes. For example, in a discussion among team members, the leader reinforces individual and collective knowledge and encourages librarians, together, to apply their expertise to the problem situation at hand.
2. *Holistic focus*. In making tacit systems thinking explicit, the leader sets the stage for organisational transformation. For instance, even when speaking about the individual, the leader explores the relational context, providing a holistic viewpoint. The leader places formal and informal conversation in the context of the four stages of SSM: finding

out, modelling, evaluation, and taking action. In this way, the leader incrementally builds the infrastructure for rich relational information experiences that produce new insights.

3. *Communication enabler.* Concurrently, the leader instills and advances the vision held among information organisation members by leveraging group communication opportunities to further the systems thinking process. To ensure 'any time, any place' access to shared knowledge, the leader uses participatory systems design strategies to build suitable infrastructure for organising organisational knowledge and making it available through different media, including intranets, databases, and mail groups. Throughout, the leader encourages exploration of better ways to create contextual meaning.
4. *Knowledge facilitator.* Finally, the leader infuses shared knowledge into both formal and informal socialisation efforts intended to ensure and extend the holding of collective context amongst individuals, for the purpose of institutionalising organisational memory. Through appropriate capturing strategies within a systems thinking context, such as internal reports and in-house courses and seminars, the leader co-creates new stories and new meanings. The leader also explores possibilities for leveraging technologies to advance collaborative knowledge creation.

Through displaying the four behavioural elements above, the organisational leader fosters and sustains workplace socialisation processes and organisational learning supporting the development of workplace information literacy. Through this organisational discovery process, librarians developed a shared vision for a repurposed organisation, relinquishing long standing traditional functions and models. 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. This awareness developed through the iterative SSM guided projects, as librarians worked collaboratively with students to rethink, repurpose, and retool. As they practised identification and consideration of others' points of view, they progressively synthesised a 'big picture' of all the pieces of the situational puzzle. In so doing, librarians' information literacy skills were enhanced as they became consciously immersed within the social, procedural and physical information of their organisational environment.

As project participants considered further uses for systems thinking, they recognised that organisational responsiveness depended on transforming their workplace culture from reactive to proactive. Throughout, the organisational leader assumed responsibility for guiding the (re)design of workplace environments rich in relational information experiences and social interaction

opportunities. Conversations and contexts were created which revealed and related the information of workplace participants and, increasingly, organisational beneficiaries.

The four-stage Soft Systems Methodology process – finding out, modeling, comparison, and taking action – was used to structure relational dialogue-based processes for making librarians' tacit knowledge explicit. In this way, the application of SSM tools both invited and required information sharing and, as a result, tacit knowledge made explicit emerged quite naturally. Furthermore, by its very nature, SSM creates relational context for information held by individuals and shared by groups as they practice framing appropriate questions and evaluating possible choices. Systems thinking, in this case, serves as the process tool for insightful learning, workplace information literacy and organisational development.

Conclusions and reflections

Throughout, the quintessential elements of systems thinking – processes, purposes, relationships, and properties – comprised the framework for initiating and sustaining socialisation processes enabling workplace information literacy. Over the course of the three year project, system design and redesign initiatives progressively reflected the methodology's four part cycle: initiating dialogue, creating meaning, forming intentions, and taking action, prompting the observation, in the words of Jackson, that 'perhaps the main strength of systems ideas ... is the guidance they offer to practitioners' (2000, 423).

Among the most profound implications for this organisation's collaborative design approach were the robust learning relationships established with system beneficiaries. This required that, in the process of engaging in conversations and dialogue, librarians reconsidered their purpose within the higher education enterprise and, subsequently, re-invented their roles and responsibilities, processes and relationships. This required engagement with and appreciation for multiple perspectives and situations. Shared commitment to build upon these diverse viewpoints produced a more inclusive workplace climate.

Within this workplace context, systems thinking processes ensured careful consideration of student produced evidence to guide the iterative process of evaluating meaningful data, comparing and contrasting multiple interpretations, and infusing reflective insights, and unsolved curiosities, into a continuous learning process. Growing conversance with a variety of user-centred (re)design strategies incrementally aided librarians in fulfilling 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. In such an appreciative setting within a leader orchestrated learning environment, individuals exercised and expanded their information literacy proficiencies. Self improvement was transferable to creation of successful teams which leveraged the strategic advantage of powerful inquiry tools and reflective practice to 'learn the way' for and with present and potential library beneficiaries.

At project's end, this holistic systems thinking framework overtly guided participants' performance of day-to-day work activities which reflected Lloyd's (2004) definition of information literacy. Librarians were re-engaged within their organisational environment – which came to extend well beyond the boundary of the library unit and also the library walls. They were noticeably empowered by the emergent collaborative socialisation processes. In this spirit, project participants' outcomes included a common language and tools for discussing and analysing complexities and interdependencies within an extended universe of organisational influence. Through these contextualising socialisation processes, born through the systems thinking framework, workplace information literacy capabilities were fostered, as documented by regular evaluations provided by an external project reviewer (Mirijamdotter & Somerville 2009, in press).

In turn, workplace learning informed co-design processes of initiating dialogue, creating meaning, forming intentions, and taking action. Such rich context additionally guided iterative processes for evaluating meaningful data, comparing and contrasting multiple interpretations, and infusing reflective insights, and unsolved curiosities, into a continuous learning process that challenged existing ways of seeing and doing, even as it informed co-creation of digital futures.

Although the study results are specific to the Cal Poly situation, they may also inform other library organisations as the project investigates the evolution of traditional academic libraries into nimble 21st century learning organisations. Information intensive 'soft' systems thinking, fortified by relational information literacy, was used to re-invent organisational structure, service priorities, and staff assignments, guided by organisational leaders who fostered the application and advancement of information literacy, knowledge generation, and collaborative learning among faculty, staff, and students.

As a result, the authors advance Lloyd's earlier research findings that workplace information literacy among Australian fire fighters occurs primarily through socialisation processes. Project planners desired to discover a way to identify

and cultivate success factors which 'naturally' developed among Lloyd's fire fighter subjects, for reasons of ensuring their physical survival. In attempting to identify and replicate the critical factors, this exploratory study in an academic library environment employed a contextualising 'systems thinking' framework to guide collective inquiry for the purpose of exercising and advancing individual and team information literacy capabilities. This requires revisiting and re-inventing professional roles, campus relationships, and library institutions defined by industrial age models. In so doing, librarians can move from traditional information gatekeeper functions to fulfill new knowledge enabling opportunities.

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