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# Informed Systems: To Advance Organizational Capacity and Co-Worker Capability

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## Abstract

*Since its introduction at HICSS-39, Informed Systems has evolved both through and as a process of organizational design for 'learning in action.' Fortified by Bruce's informed learning theory and fostered by Checkland's soft systems methodology, the approach is catalysed by participatory design, elaborated by action research, and expressed as information experience. The aim throughout is information exchange for knowledge creation through 'working together.' Organizational capacity builds as colleagues use information to learn in ever expanding professional contexts. This paper explores aspects of the 'bridge' between individual and collective learning through enabling organizational systems and associated professional practices. An Informed Systems Capability Bridge Model and Information Curation and Knowledge Management Map detail processes and elements of a prototype system, generated from original research on co-workers' information experience. Concluding reflections explore value added synergies from information-centered, action-oriented, technology-enabled, and learning-focused systems design.*

## 1. Introduction

Since its introduction at the 39th Annual Hawaii International Conference on Systems Sciences a decade ago, a collaboratively designed 'informed systems' approach has been advanced by an international and multidisciplinary research team. As suggested in the HICSS-39 paper title, *Systems thinking and information literacy: Elements of a knowledge enabling workplace environment* [24], Informed Systems appreciates that an organization is a knowledge ecosystem consisting of complex interactions between people, process, technology, and content. It anticipates that in contemporary organizations, the workplace environment is fraught with ill formulated 'wicked problems' [12], "where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing" [12] p. B141]. In response, applied research initiatives have purposefully engaged colleagues with diverse cultural viewpoints, national origins, disciplinary perspectives, and professional expertise, as reflected by this conference paper's co-authors, for more than a decade.

The Informed Systems approach derives from the work of Christine Bruce [1], [2] in Australia (who advanced relational information literacy, informed learning, and information experience) and Peter Checkland [8], [9] in England (who developed soft systems methodology). Bruce provides high level theory on 'using information to learn' [1], [2] through information experience [7]. In a complementary fashion, Checkland offers a robust systems design cycle for making sense of 'messy' situations, 'learning for action' [10] through using information to learn. Since 2003, this antecedent thought has been applied, in combination, to co-design of collaborative workplace systems and associated professional practices to advance agile organizational responsiveness [14], [17], [18], [23].

The following paper describes the genesis and evolution of Informed Systems. Within this context, a systems co-design initiative at University of the Pacific, California, USA, is presented to explore advancing information exchange and knowledge creation through intentional workplace information experience and systems design to advance organizational capacity concurrent with co-worker capability.

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## 2. Informed Systems Evolution

The Informed Systems approach has evolved both through and as a process of organizational design for 'learning in action' [18] amongst dynamically changing circumstances. The intention throughout has been to foster information exchange, reflective dialogue, knowledge creation, and conceptual change. Evaluation results reveal that, over time and with practice, Informed Systems progresses co-design of systems and practices that enable workplace responsiveness [15], [17], [18], [25], [26].

The genesis of Informed Systems is informed learning, catalyzed by participatory design, elaborated by action research, amplified by systems design, and expressed as information experience [18]. The aim, throughout, is information exchange for knowledge creation. In 'working together' [17] to generate knowledge, co-workers contribute complementary role perspectives, social viewpoints, and professional expertise to advance social, relational, and interactive aspects of work life. Organizational capacity builds as colleagues use information to learn in ever expanding professional contexts [2] that exercise evidence-based decision-making and action-taking capabilities [20], [22]. Within this context, knowledge emerges through individuals' exchange of resources, ideas, and experiences.

### 2.1. Systems Design Collaboration

For over a decade, initiatives at California Polytechnic State University (2003-2006) and University of Colorado Denver (2008-2015) applied systems thinking tools and human activity models to advance soft systems design of technology-enabled workplace systems. Throughout, technology was the privileged starting point and project focus for co-design activities. Secondarily, human-centered practices activated relationships and animated processes to connect people and ideas through social interaction within workplace systems.

In the current implementation, since 2016 at University of the Pacific in Stockton, California, informed learning and information experience are privileged in the Informed Systems approach for co-creation of a robust workplace learning environment. This shift in attention - from systems design to information experience design [16] - reflects the maturation of Bruce's theories from relational information literacy [1] to informed learning [2] and, finally, to information experience as a research domain [4], [6], [7] framed through an informed learning lens [7]. In addition, illustrative of the maturation of Informed Systems, the University of the Pacific initiative reflects heightened aspirations for accelerating and deepening organizational learning through placing the "'I' in IT" [15] in the foreground.

### 2.2. Collecting and Analyzing Informed Learning Patterns

To establish shared understanding of the local situation, nineteen participant narratives about "a best experience of using information to learn at work" were collected. The organizational leader's invitation explained that contributed narratives would be shared and discussed "to guide our thinking about how we want to share information, save information, and use information." Her email message communicated regard for current practices, noting the intention "to ensure that choice of technologies and development of practices reflect the best of how we work now." Within this contextualizing framework, organizational members were asked to write about an experience of using information to learn in the workplace.

**2.2.1. Phase one: Interrogating data.** These narratives provided the content for sharing, discussing, analyzing, and interpreting instances of 'informed learning' (i.e., using information to learn) during workshop activities facilitated by Dr. Christine Bruce, Professor at Queensland University of Technology, in August 2016. Initial exchanges focused on exploring this question in small groups: "What was informing in the narratives?" Conversations revealed the variance in definitions of and experiences with information. As participants shared aspects of their narratives, they came to recognize that there is "no one right way to reach learning outcomes." Rather, what is informing for one person may not be informing to another person. They also recognized that "we do things that work for us." The group concluded that sharing these "amazing stories" permitted "learning from each other". In that spirit, participants acknowledged the value of expanding their individual practices. In expressing collective opinion, one person stated: "We need to find different ways to communicate with others - other approaches, other tools."

In the following small group discussion, participants reconsidered the narratives to explore: "What was learning?" Participants noticed that "we all have different circumstances" and "we draw upon what is available", so "everyone learns in a different way." As one person said, "You draw upon what you

know and what you think will be useful to you." This includes "extraneous information that we did not expect enhancing the learning." In concluding reflections, one participant observed the value of social interactions, noting: "it's about the personal connections and relationships in the organization." Another person added: "Drawing from our differences and supporting our differences will be key to keeping the learning going."

On the second day, library unit heads re-examined the narratives. Their analysis was guided by three questions: "How is informed learning happening? Where is it taking place? What is valued?" They discovered considerable variation in how participants used information to learn. They also observed that most participants referenced self-directed self-learning. This naturally led to discussion of where learning was taking place. Narratives revealed virtual spaces, such as Internet sites and professional webinars, and physical places, such as formal meetings and informal exchanges. As for the final question of "what is valued" in the workplace, more than two dozen attributes appeared in the personal narratives. These elements ranged from appreciating different perspectives and building collegial relationships to organizing information effectively and enjoying in person (face-to-face) conversations.

How, where, and what analysis results were presented to organizational members on day three by unit heads. Presentations conveyed "what we learned" about "where we are now". Then participants discussed "where we want to be" and "how do we get there", within the larger context of building conditions for learning supportive of "open communication, decision-making and planning activities". In anticipation of connecting information use (informed learning) narratives with workplace (soft systems) design, concluding reflections appreciated the need for "different ways, different channels, to inform self and to inform others to use different ways to exchange information and to teach each other." This in turn required further investigation of informed learning patterns in the local workplace.

**2.2.2. Phase two: Coding data.** The decision to focus on information rather than technology emerged from recognition that informed learning – which values information and its contexts of use - is grounded in, and emerges from, practices for information use. It naturally follows that the answer to the question - 'What are information practices in specific contexts?' - must necessarily be situated within an understanding of local workplace contexts

and professional practices. Through that frame, formal analysis of invited narratives aimed to reveal information use patterns, practices, and processes for organizational decision making, evidence-based practice, and professional problem-solving.

Coding of informed learning narratives applied informed learning categories, ranging from information and communication technologies to professional wisdom and workplace learning, as detailed below:

1. Information and communication technologies: harnessing technology for information awareness, communication, and management,
2. Information sources: using information sources (including people) for workplace learning and action taking,
3. Information and knowledge generation processes: developing personal practices or heuristics for finding and using information for novel situations,
4. Information curation and knowledge management: organizing and managing data, information, and knowledge for future professional needs,
5. Knowledge construction and worldview transformation: building knowledge through discovery, evaluation, discernment, and application,
6. Collegial sharing and knowledge extension: exercising and extending professional practices and knowledge bases to workplace insights, and
7. Professional wisdom and workplace learning: contributing to collegial learning through using information to learn to take better action to improve [adapted from[19].

The seven elements represent the experience of informed learning, ''the phenomenon as a whole'' [1], within which learning is understood as changes in how phenomena are experienced through exploring a full range of ways of experiencing multi-faceted phenomena.

Analysis of informed learning narratives through this framework produced further insights into workplace patterns. Most narratives discussed informed learning categories 1-3 that emphasize particular aspects of information use (technology, sources, processes). Fewer narratives described category 4-5 (information curation, knowledge management, knowledge creation, worldview transformation). Workplace informed learning categories 6-7 (information sharing and knowledge creation) were largely absent [21]. Although findings revealed considerable variation, no participants' narratives expressed the full range of informed learning categories nor the depth of those categories.

Also of significance, the vast majority of narratives recounted technology, source, and usage experiences for individual learning that was not shared with others. Within the context of informed learning, which recognizes the social character of learning experience [2], these findings suggest the need to enrich professional relationships to animate information exchange and knowledge creation.

## 3. Co-Worker Co-Design Beginnings

With the intention to build upon these discoveries, revealed through analysis of workplace narratives about using information to learn, organizational representatives were selected for the Information Curation and Knowledge Management Team (ICKMT - pronounced "I see KM team"). The membership invitation stated: "*So the aim of this group's work will be to both design communications systems (human-centered and sometimes technology enabled) and also encourage information exchange for knowledge creation (associated information practices). This pilot project will permit the design team to both better understand how co-workers use information to learn and to better assess the comparative efficacy of information resources and technology choices. Based upon insights gained, technology tools and workplace practices will be identified that build upon what works well for organizational members.*"

Soft Systems Methodology (SSM) guided group dialogue and reflection on local informed learning patterns and local organizational learning aspirations. ICKMT aspirations and SSM outcomes aligned well since, as often described by Checkland, SSM is an action oriented process of inquiry into problematical situations in which participants learn their way from finding out about the situation to taking action to improve it [10], [11], see Figure 1.
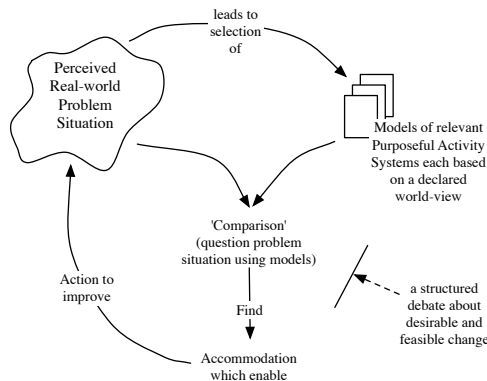


**Figure 1. The SSM learning process [9]**

The SSM learning cycle commences with a perceived real-world problematic situation, which leads to selection of models of relevant purposeful activity systems, each based on a declared worldview. A structured debate about desirable and feasible change informs 'finding out' through comparison, to question the problematical situation using models. Accommodation enables action to be taken to improve the real-world situation. The cycle, thus, may commence again, leading to continuous learning and improvements..

The iterative learning cycle offers a process model for making thoughtful decisions related to identifying, curating, sharing, and using information "to experience information and the information environment surrounding it in a range of increasingly complex ways which offers … a richer, broader and more effective information engagement experience" [16]. This assumption derives from the relational perspective [1] at the heart of informed learning, which values being able to use information in different ways in various contexts. In that spirit, ICKM design team members consider such questions as: "What information … experiences do we want to facilitate or make possible? What information and learning experiences are vital to further our…professional work?" [3].

Early discussion confirmed the necessity, based on narrative analysis results, of fostering 'workplace adapted' informed learning categories of collegial sharing, knowledge extension, professional wisdom, and workplace learning, which were found to be largely absent in the original organizational culture. Also, the informed learning essentials of information curation, knowledge management, knowledge construction, and worldview transformation were understood to be 'bridge' capabilities which both allow individuals to contribute their insights to evolution of collective learning and also enable groups to capture, organize, interpret, and apply information to generate knowledge and, ultimately, wisdom.

## 4. SSM Tool Applications

The University of the Pacific project builds upon local findings about information use and professional practices. Project aspirations are clarified in an Informed Systems Capacity Bridge Model, to 'bridge' individual information use and collective information experience, see Figure 2. The Informed Systems approach guided this application of SSM learning cycles for reaching shared intention to advance both individual co-worker capability and collective organizational capacity.
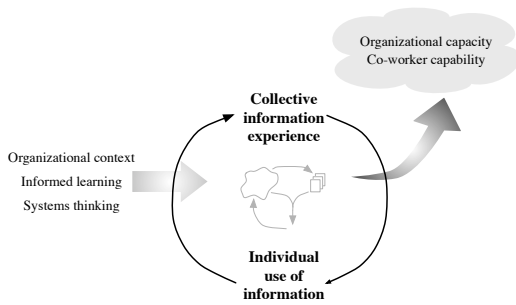
**Figure 2: Informed Systems Capacity Bridge Model**

The genesis of the Informed Systems learning cycle are informed learning and systems thinking, customized for local circumstances, as depicted on the right side of the model. Systems design progresses through dialogue and reflection processes, depicted in the center of the model. In this instance, attention focused on advancing the informed learning categories found to be absent in the workplace culture assessment: information exchange and knowledge creation categories 6-7 supported by organizational systems and professional practices categories 4-5. The iterative nature of Informed Systems design activities assumes that continuous improvement occurs as learning processes evolve.

To initiate systems design, the ICKM team selected the facilities renovation as a pilot project focus. The PQR framework [11], a tool in the SSM toolkit where PQR refers to the questions: *what*, *how*, *why*, was used to consider technology options for the renovation project's information transmission – the *what*. Discussion was initially quite simple because *how* was assumed to be very straight forward. So a blog was determined to suffice because, in answering *why*, participants assumed content would be limited to text formats and small files. This early decision was soon challenged when team members discovered that the blog could not accommodate university documents detailing construction phases – an unexpected *what* of high resolution architectural renderings. This new development required reconsideration of a second *how* – given the need to satisfy another *why* – to curate and manage organizational communication, committee, and project files, for easy discovery, retrieval, and usage.

Recognition of this *why* suddenly produced recognition that other documents (*what*) also needed a hosting solution (*how*) in order to preserve institutional memories (*why*). So SharePoint, which had earlier been considered but rejected, was then

added as a pilot project technology tool. Soon other documents, such as meeting agendas and meeting minutes (*what* that resided only on individuals' desktops), were uploaded and organized on SharePoint (*how*) for access and preservation (*why*).

The pilot project boundaries next expanded considerably when one ICKM team member decided to conduct an inventory of the content and the channels used by his team, providing rich opportunity for collective conversation about *how* best to satisfy *what* and *why* considerations. Broad oversight of the workplace information landscape was accompanied by deep exploration of particular communication situations, using the the SSM 'CATWOE' tool [11], which appreciates that stakeholder viewpoints produce multiple perspectives and varying experiences.

Figure 3 illustrates use of the PQR framework to recapture this discusson. At the top of the figure, "advance organizational capacity and co-worker capability" (the *why* as illustrated as purpose in Figure 2) is achieved by lower level *whats*, i.e., "bridge individual use of information to collective information experience" and "preserve institutional memory", respectively. These, in turn, are achieved by the *hows* "create knowledge", "exchange information", and "identify and test digital hosting solutions". This map visualizes requisite elements of human- and technology-enabled systems design for renovation information transmission and preservation. It guides iterative consideration of digital hosting solutions, which are identified, tested and discarded until a solution is found that accommodates the need to exchange information as well as preserve institutional memory.
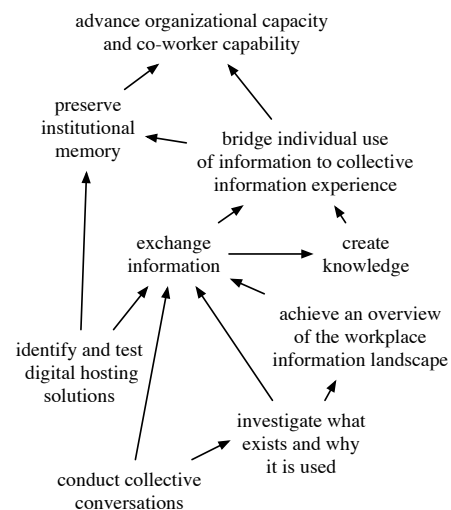


**Figure 3: PQR map of Information Curation and Knowledge Management**

Given the emphasis on the information aspect, dseign team discussions also considered what constitutes information. This included reflection on the value of information experience characteristics, revealed in early collective analysis about how, what, and why, which were subsequently fortified by formal analysis of workplace narratives according to the seven informed learning categories.

In addition, as content and understanding evolved, ICKM team members' attention turned to other related matters, including content organization, information architecture, and workflow processes. Hence, the *what, how,* and *why* SSM framework and the SSM learning cycle continue to structure meeting discussions. Outcomes to date include standardized document folders, file names, and meetin minutes conventions. In a complementary fashion, co-designed workplace practices continue to advance shared information curation, information flow, and knowledge creation intentions.

Widespread agreement on the necessity of organizational efficiencies and workplace effectiveness – well aligned with the SSM 3E's of effectiveness, efficiency, and efficacy [10], [11] - now encourages additional organizational developments. As one example, unit heads co-create the agenda and minutes for library planning team meetings (effectiveness). In addition, the transformative potential of meeting conversations is furthered by construction of an inexpensive computer-on-wheels (COW) which permits easy transport of the monitor from room to room if no wall monitor exists (efficacy). Meeting minutes are also now instantly published at the conclusion of meetings, to ensure widest possible readership among library group members (efficiency). Finally, mindful of the importance of face-to-face exchanges, regular library group meetings are held so co-workers can hear, as well as read, facility renovation (and other) updates. Innovations emerge 'naturally', within the shared workplace context framed by Bruce's informed learning and information experience theories and Checkland's systems design tools and human activity models.

## 5. Informed Systems Reflections

As these workplace examples illustrate, informed learning and systems design, guided by holistic Informed Systems, can *together* further organizational transformation through local customization, which promotes the intersection of information, technology, and learning. At the heart of Informed Systems, intentional and iterative

(re)thinking and re(learning), animated by co-designing, advances knowledge creation and, ultimately, knowledge strategy. This occurs as co-workers learn to co-create and formulate complex experiences of information exchange, sense-making, and action taking, amplified by shared professional behaviors that recognize complexities and interdependencies. Then, as co-workers exercise 'learning in action' [18], which is information-centered, action-oriented, and learning-enabled, they reinvent and revitalize roles, responsibilities, processes, and relationships, as active collaborators. Through exploring problematical issues, comparing relative consequences, and taking organizational actions, participants generate habits of mind transferable to other (as yet unanticipated) situations.

As these University of the Pacific examples suggest, placing information experience in the foreground has accelerated thinking about the phenomenon of 'becoming informed' [13]. More specifically, co-workers have come to appreciate underlying context and assumptions. This new relational understanding predisposes them to adjust their assumptions and strategies as they learn – in other words, as they change their awareness or experience of their appreciative settings. In addition, as teams adopt and adapt systems thinking, systems co-design, and informed learning, collective organizational capacity for nimble responsiveness grows. In other words, information, technology, and people "evolve to adopt and adapt, create and recreate, contextualize and re-contextualize through wider and wider circles of consultation, cooperation, and collaboration" [19]. Grounded in information experience design, collective capacity evolves through "being aware of the kinds of information we are using, how we are using information and how different forms of information come together to inform and transform our work" [5].

## 6. Conclusion and Contribution

Analysis of co-workers' narratives about using information to learn in the workplace revealed a paucity of collective processes, experiences, and systems. In response, insights emerging from dialogue and reflection about informed learning narratives guided co-design activities - in contrast to typical system design initiatives which privilege technology solutions. This practical example illustrates how information experience-centered workplace structures and practices can be incrementally built to extend 'what works well', including technology, sources, and processes, through co-worker co-design of inviting conditions

for 'learning together'.

The Informed Systems Capacity Bridge Model, which simultaneously advances individual capability and organizational capacity, visualizes the relevance of informed learning to workplace systems and practices design. It thereby advances the Informed Systems' toolkit. Further, it shows how informed learning can elevate individual information use to collective information experience and thereby accelerate organizational learning to advance workplace responsiveness. These research results advance the small but important literature on informed learning, information experience, and information experience design in the workplace. More specifically, the new process model clarifies the requirement for an organizational 'bridge', placing information experience in the foreground, to foster the collective knowledge creation and worldview transformation required for nimble responsiveness and continuous learning in contemporary organizations.

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