Informed Systems Approach: New Directions for Organizational Learning

Mary M. Somerville,[1] PhD, Professor, University Librarian, and Library Director, Auraria Library, University of Colorado Denver, 1100 Lawrence Street, Denver, Colorado 80204-20141 USA, mary.somerville@ucdenver.edu

Anita Mirijamdotter, PhD, Professor and Head, Department of Informatics, Linneaus University, SE-35195 Växjö, Sweden, anita.mirijamdotter@lnu.se

Christine S. Bruce, PhD, Professor, Information Systems School, Science and Engineering Faculty, Queensland University of Technology, GPO Box 2434, Brisbane, QLD, Australia, 4001, c.bruce@qut.edu.au

Marical Farner, PHR, Associate Director, Auraria Library, University of Colorado Denver, 1100 Lawrence Street, Denver, Colorado 80204-20141 USA, marical.farner@ucdenver.edu

Abstract: The Informed Systems Approach offers models for advancing workplace learning within collaboratively designed systems that promote using information to learn through collegial exchange and reflective dialogue. This systemic approach integrates theoretical antecedents and process models, including the learning theories of Peter Checkland (Soft Systems Methodology), which advance systems design and informed action, and Christine Bruce (informed learning), which generate information experiences and professional practices. Ikujiro Nonaka's systems ideas (SECI model) and Mary Crossan's learning framework (4i framework) further animate workplace knowledge creation through learning relationships engaging individuals with ideas.

Key words: organizational learning; informed learning; SSM; SECI; multi-level learning; participatory design

1. INTRODUCTION

The Informed Systems Approach reflects insights from ten years of applied research at three North American academic libraries. Throughout, researchers intended to create resilient workplace learning environments for agile decision-making and action taking amidst increasingly volatile circumstances. Absent a unified theory of organization learning (Crossan, Mauer, and White, 1999), researchers identified and integrated complementary theories, frameworks, and models that emphasize information and its connection to learning. The resultant Informed Systems Approach guides collaborative design (co-design) of enabling systems and associated practices that cultivate and sustain using information to learn across organizational units, with a special emphasis on exploring how information is used and how information can be used to promote understanding of circumstances and opportunities.

The Informed Systems Approach aims to further informed learning (Bruce, 2008) – the kind of learning made possible through evolving and transferable capacity to use

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[1] Corresponding Author: Mary M. Somerville, PhD, Professor, University of Colorado Denver, 1100 Lawrence Street, Denver, Colorado 80204-20141 USA, mary.somerville@ucdenver.edu, 303 556 4587 (voice), 303 556 3528 (fax)

information to learn - in the workplace. The Approach recognizes that desired learning outcomes result from information exchange, sense making, and knowledge creation activities that advance information use and learning relationships. These information experiences occur within collaboratively designed communication systems that recognize the social nature of using information to learn and encourage collegial interdependence. Working together is promoted through collaborative design of enabling learning systems to activate and extend prior understanding through contextualized information encounters and associated professional practices (Somerville, 2009; Bruce, Hughes, and Somerville, 2012). As workplace learning occurs, employees can see the world in new and more complex ways. Collective worldview evolves through using information to learn, as organizational capacity for discussion and analysis of complexities and interdependencies advance within an extended information universe (Somerville and Mirijamdotter, 2014).

These potentialities are catalyzed and sustained through collaborative design (co-design) of a purposeful social interaction system in which collective information experiences produce new knowledge through socialization processes supported by enabling infrastructure. Co-design activities, informed by innovative integration of information-focused theories, produce purposeful communication systems further animated by professional practices which establish and sustain social interactions to investigate and negotiate the professional interests, judgements, and decisions by which people learn interdependently (Somerville and Mirijamdotter, 2014). When discourse and reflection assumes the twofold purpose of advancing understanding of topics under discussion and simultaneously improving organizational systems and professional practices, informed learning occurs.

The Informed Systems Approach acknowledges that, first and foremost, the organization is a system. Within such a systemic framework, the Approach guides development of transferable capacity for using information to learn through enabling nimble deliberations, unified purpose, and collective learning. Of special importance here, consistent integration of theories and frameworks which emphasize information and its connection to learning advance workplace discovery of how information is used and how information could be used across organizational units to promote increased understanding of contemporary circumstances and future possibilities. Significantly, none of the theories in and of themselves (alone) explain how to catalyze workplace learning through using information to learn.

The search for theoretical guidance arose from real world needs over the past decade in three North American academic libraries. These organizations and their parent higher education institutions face tremendous turbulence and, therefore, uncertainty as volatile and disruptive forces in the scholarly ecosystem alter traditional relationships among researchers, librarians, publishers, and vendors (Somerville, Schader, and Sack, 2012; Somerville and Conrad, 2014). These systemic changes require systemic responses because a case-by-case or incident-by-incident response is inadequate, given the magnitude of transformative changes underway. The Informed Systems Approach – which integrates established theories offering different levels of granularity - aims to address a research problem that emerges from a problem of practice –i.e., the lack of an integrated model to inform workplace problem identification, research methodology, data interpretation, information usage, systems design, knowledge management, and organizational learning.

2. ANTECEDENT CONTRIBUTIONS

Over the past decade, four theories were identified as critically important to activate and foster information usage in the workplace, with the explicit purpose to learn from using information - i.e., informed learning, and, furthermore, to design and sustain workplace systems, practices and processes that enable and advance using information to learn. The systemic approach to informed learning in the workplace expresses the learning theories of Peter Checkland (Soft Systems Methodology/SSM), which advance systems design and informed action, and Christine Bruce (informed learning), which generate information experiences and professional practices. Ikujiro Nonaka's systems ideas (socialization, externalization, combination, and internalization/SECI model) and Mary Crossan's learning framework (intuiting, interpreting, integrating, and institutionalizing/4i framework) further animate workplace knowledge creation. These complementary contributions acknowledge that the potential of using information to learn can best be achieved within a holistically designed organizational environment.

At the same time, the efficacy of a systems-based approach to organizational effectiveness depends on using information encounters to intentionally advance learning. Therefore, the Informed Systems Approach incorporates principles of systems thinking and informed learning through an inclusive, participatory design process that fosters information exchange, reflective dialogue, knowledge creation, and conceptual change. The Approach aspires, over time and with practice, to evolve employees' twofold capacity for creating systems and producing knowledge.

2.1. Informed Learning Theory

Informed learning focuses on people's experience of using information to learn in different contexts (Bruce, 2008; Bruce, Somerville, Partridge, and Stoodley, 2013; Bruce, Partridge, Hughes, Davis, and Stoodley, 2014), including what is necessary to make that learning possible (Marton, 2014). Furthermore, using information to learn is necessarily purposeful and contextual. When well contextualized, information experiences enable new learning (Bruce, 2013). Stated differently, learning is recognized as a change of awareness or way of seeing the world, and may be individual or collective (Marton and Booth, 1997). For learning of this kind to occur in the workplace, information experiences must be experienced as sufficiently relevant to bring about change in how work teams see or understand what is important in their environment. Therefore, workplace circumstances must encourage reflection and dialogue to promote engagement with information for learning and transference of insights to novel circumstances.

To accomplish this, consideration must be given in the organizational knowledge vision to how employees are experiencing both information use and also information content. As employees experience the efficacy of information experience and information usage as empowering, they further their understanding of its practical application in advancing organizational purposes. In this way, both workplace learning and organizational culture are transformed for the better, as new learning experiences lead to understanding the world in new or more complex ways – i.e., engaging with and making sense (Weick, 1995) of increasingly more complex information experiences.

The transformative power of applying informed learning theory is that, at its very essence, it furthers collective experience at individual, group, and organizational levels through context specific learning processes – i.e., professional practices - that connect

information sources in the workplace with learning practices required to access and utilize them. Bruce's ground breaking work identified seven faces (facets) of the informed learning conception, including: information technology, information sources, information process, information control, knowledge construction, knowledge extension, and wisdom (Bruce, 1997). Within the Informed Systems Approach, these requisite professional capabilities are expressed as follows:

1. Information and communication technologies: harnessing technology for information and knowledge retrieval, 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 Bruce, Hughes, and Somerville, 2012).

Purposeful attention to improving the efficacy of these professional practices and, thereby, individual, group, and organizational experiences can advance informed learning capacity within a co-designed learning organization.

2.2. Collaborative Systems Design

Soft Systems Methodology (SSM) offers a methodology for collaborative design of multi-level learning systems. "The organizing idea is that the word 'system' is the name of a concept. It refers to a whole entity that is an adaptive whole. It can adapt and survive in a changing environment. It will have emergent properties, and may contain sub-systems or be part of a wider system; it will have processes of communication and control (regulation) which allow adaptation to occur" (Checkland, 2011).

The inclusive nature of SSM co-design establishes a workplace environment conducive to exploration of issues, sharing of ideas, and expansion of knowledge. Within this fertile workplace landscape, learning models, such as the Processes of Organizational Meaning (POM) model (Checkland and Holwell, 1998), guide purposeful information experiences to promote organizational learning through sense making activities.
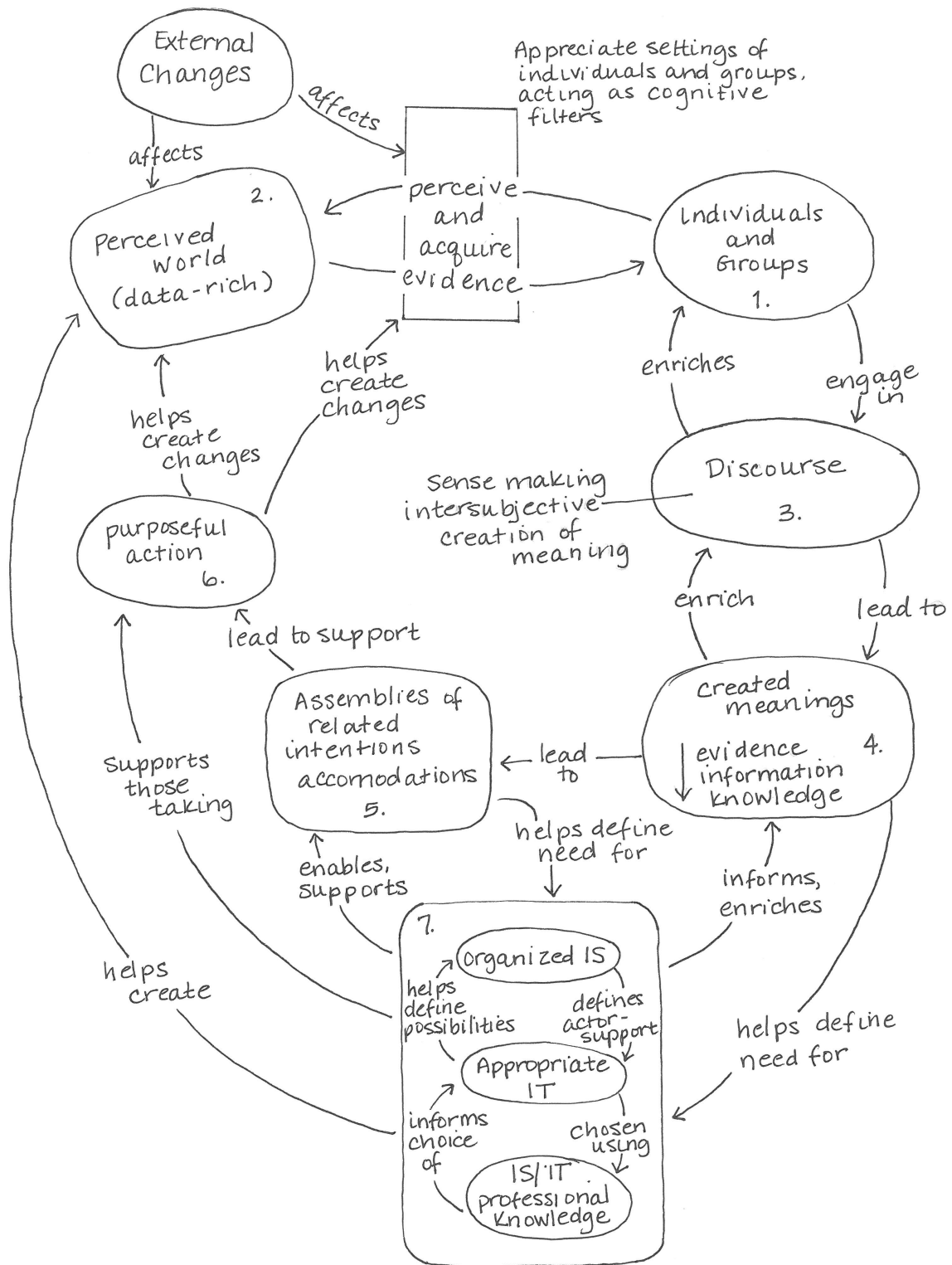
Figure 1. Sense making through the Processes of Organizational Meaning (POM) model (adapted from Checkland & Holwell, 1998 and Mirijamdotter & Somerville, 2005)

Figure 1 delineates processes that advance using information to learn through interactive relationships between the organizational context (elements 1-5), in which individuals and groups create meanings and intentions, which leads to purposeful action (element 6) being taken, with the support of information transfer and knowledge generation systems (element 7).

The Processes of Organizational Meaning (POM) model recognizes that individuals select information from the workplace (and extended) environment based upon a worldview consisting of existing interests, experience, and values (Checkland and Holwell, 1998). In other words, unless purposeful intervention occurs, individual perception is highly selective and tends to reinforce existing assumptions. So the first step in designing a sense making process for organizational (re)learning is to initiate conscious reconsideration. Raising awareness to stimulate re-thinking requires catalyzing the innate mental processes that are performed tacitly, without individuals making conscious decisions about what is being admitted for consideration, and can eventually widen consideration about what assumptions to make or which data to select.

Elements 1 and 2 and the interaction between them involves selectively perceiving reality and making judgments about it through filtering processes that influence what individuals choose to mind and, consequently, use as perception and interpretation filters. These dimensions of information experience are negotiated through sense making processes, including dialogue and reflections (element 3).

Learning thereby emerges within the context of workplace vision and shared assumptions, including cultural beliefs and associated interpretations and workplace practices, as depicted in element 4. Organized information systems (IS) and appropriate information technology (IT), together with information and information technology skills (element 7), further inform, enrich, and enable learning.

In this way, tacit assumptions represented in a worldview are explicitly reconsidered in the light of emergent new norms and values. Judgments evolve and are explicated among employees through dialogue, which then become the bases for forming intentions (element 5) towards particular actions to be carried out (element 6). As is characteristic in systems models, the seven elements are seen as interacting - i.e., element 7 informs and enriches element 4, and it enables and supports element 5, even as it helps to create the perceived world (element 2), including vision, values, and practices.

These learning processes illustrate that the norms and values on which collective judgments are based is the result of previous individual, group, and organization experiences and history. Ideas are shaped by shared workplace vision and expressed by professional practices. However, both thinking and behaving can evolve as co-workers learn from workplace information experiences (Checkland and Casar, 1986; Checkland, 2000; Checkland, 2005) enabled by purposeful designed systems. This occurs because "The knowledge that individuals and organizations have of themselves provides the framework in which they choose alternatives from among a huge, often unaccountable, range of possibilities. Typically, self-knowledge is mediated by the culture and language in which discussions take place and the extent to which it is possible to integrate various perspectives and models in order to act as a purposefully entity" (Leonard, 1999).

Within this context, intentional interventions can offer "filters to select what is important from the mountain of available information models to expand their ability to understand and use it" (Nonaka, 1994). This is challenging work because tacit knowledge "consists of mental models, beliefs, and perspectives so ingrained that we take them for granted and therefore cannot easily articulate them" (Nonaka, 2007). However, as "new explicit knowledge is shared throughout an organization, other employees begin to internalize it – that is, they use it to broaden, extend, and reframe their own tacit knowledge" (Nonaka, 2007).

2.3. **Organizational Knowledge Creation**

Creating new knowledge represents a critical dimension of using information to learn (Bruce, 2008). In fact, knowledge construction and knowledge extension represent the ultimate outcomes of the informed learning phenomenon (Bruce, 1997). Nonaka's complementary ideas reveal the nuanced dimension of using information to learn through a spiraling process of systemic interactions between explicit and tacit knowledge (Nonaka, 1994; Von Kough, Ichijo, and Nonaka, 2000) to create new knowledge. This systems model, Socialization, Externalization, Combination, and Internalization (SECI), recognizes that knowledge exists in a continuum of two forms: tacit (unarticulated knowledge gained through experience) and explicit (articulated knowledge that can be easily created and transmitted to others, stored, managed, and reused).

The addition of Nonaka's system ideas makes it possible, in Figure 2, to conceptualize four conversion patterns: socialization, externalization, combination, and internalization. Socialization and externalization activities are the starting points for the organizational learning spiral in which the tacit knowledge of individuals is articulated and thereby made explicitly available for others. When the knowledge is then contextualized so that employees understand its applicability to their situations, the collective knowledge of the organization is enriched. The fourth conversion pattern, internalization, reflects the importance of accumulating understanding so that new learning will induce fresh understanding. In accumulating, explicit knowledge is added to tacit knowledge and the enhanced understanding becomes internalized at both individual and collective levels. Stated differently, "Knowledge creation is based on individuals performing activities in which their existing tacit and explicit knowledge is combined and used for refinement of activities and for exploring new possibilities" (Kodama, 2006).
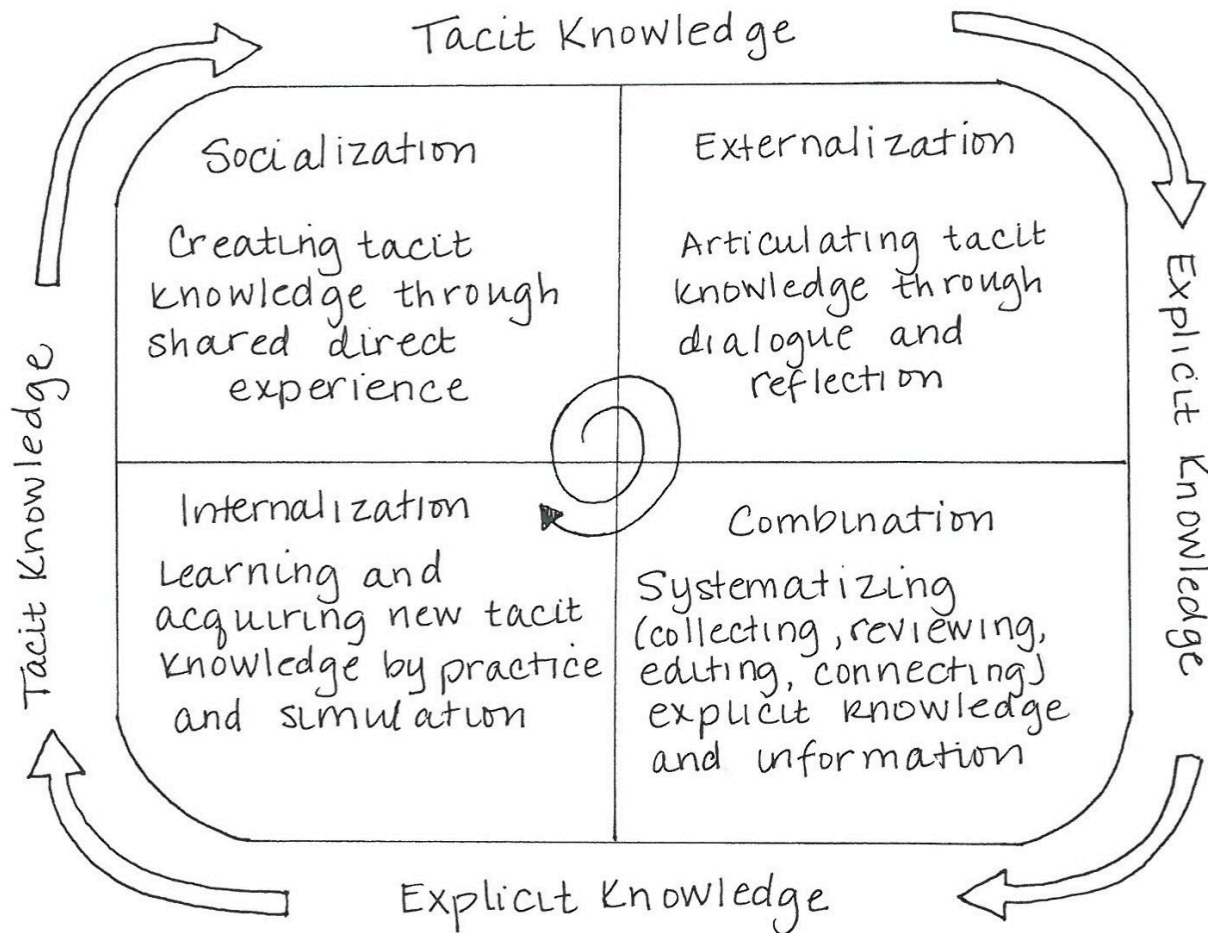
Figure 2. Knowledge spiraling process (after Nonaka and Takeuchi, 1995 and O'Dell and Hubert, 2011)

After internalization, the process 'spirals up' and continues at a new level as a result of dialogue and reflection among organizational members engaged in collaborative knowledge creation activities. To achieve this ideal requires rich dialogue and interaction opportunities within an organizational workplace designed for using information to learn at multiple levels.

2.4. **Multi-Level Learning**

Acknowledgement of multi-level organizational functions and interrelationships – and consequential multi-level learning - recognizes that learning organizations are necessarily systems. An organizational system is itself a part of a larger whole within which it fulfills specific functions. Simultaneously, it is also comprised of subsystems. In Checkland's words, an organization "may contain sub-systems or be part of a wider system" (Checkland, 2011). Each layer includes the same structure with the same communication and coordination patterns between the subsystems and its external organizational context, i.e., its environment. Thus, these systemic ideas capture "the rich interplay between processes and level[s]" (Crossan, Lane, and White, 1999).

The importance of the idea of a layered structure is to recognize various layers' functions within the whole system. This in turn encourages the acknowledgment of properties, both characteristic and emergent, produced through interactions at and between specific levels. At the applied level, systems ideas, as explicated in Soft Systems Methodology, SECI, and 4i models, support exploring various perspectives, discovering layers' elements, and defining learning indicators. When paired with informed learning theory, systems ideas can guide coordinated action through informed learning experiences that, for instance, further: a) environmental scanning and communication strategies which ensure staff are up-to-date on important matters, b) resources and services that ensure staff can access required information, c) preferred approaches to problem solving, decision-making, project management, and reporting; and d) strategic processes for ensuring information management and capturing corporate memory.

3. WORKPLACE SYNERGIES

Systems models offer valuable insights into creating knowledge enabling workplace processes and systemic structures for advancing informed learning, a way of knowing an information landscape (Lloyd, 2010). As explicated by Nonaka (1994) and Crossan, Mauer, and White (2011), among others, multi-level learning is essential to create a workplace environment capable of activating and sustaining knowledge creation through continuous social interaction of tacit and explicit knowledge. In an iterative fashion, this dynamic interplay of ideas among individuals and groups produces knowledge through social learning (Kodama, 2006; Nonaka, Konno, and Toyama, 2000). Within an Informed Systems Approach, robust exchange relationships further the sharing of information, skills, expertise, and experience for the purpose of establishing a common ground and common practices to influence purposeful actions.

More specifically, within enabling workplace learning systems, informed learning occurs through assimilating new learning (exploration) and using what has been learned (exploitation), thereby advancing organizational renewal (Crossan, Mauer and White, 2011). More than the sum of individual learning processes and team learning processes (Di Millia and Birdi, 2010), the three levels of organizational learning (individual, group, and organization) are linked by social and psychological processes—intuiting, interpreting, integrating, and institutionalizing – i.e., the 4i framework (Crossan, Lane and White, 1999). These four processes connect the three levels of analysis and define the structures through which workplace learning takes place. Intuiting and interpreting occur at the individual level, interpreting and integrating occur at the group level, and integrating and institutionalizing occur at the organizational level (Crossan, Lane and White, 1999).

It follows that organizational learning "incorporates the dynamic multilevel nature of the phenomenon and captures the rich interplay between processes and level" (Crossan, Lane and White, 1999). In a reciprocal fashion, cognition affects action, and action affects cognition within individual levels of analysis. As well, cognition influences collective learning captured and institutionalized in the form of processes, routines, systems, structures, strategies, and practices that in turn affect the 'what' of cognition and the 'how' of behavior across levels (Crossan, Mauer and White, 2011). Adoption of an informed learning approach to workplace, which explicitly acknowledges using information to learn, furthers the 'what' of topical knowledge and the 'how' of professional practices.

In this way, an organization can be conceptualized as a purposeful social interaction system (Checkland and Holwell, 1998) in which collective capabilities develop through workplace learning processes. An organization's commitment to establishing workplace learning must therefore recognize the importance of establishing sustainable organizational structures and communication systems that encourage and enable the social interactions which promote investigation and negotiation of the interests, judgments, and decisions through which people learn interdependently.

Through an ongoing interplay of action, observation, and evaluation, nimble responsiveness is enabled and animated, thereby initiating perpetual individual, team, and organizational learning aimed at ever-deepening insight and performance which reflect-in- and on-action (Schön, 1983). Such reflection "includes the ability to carry on 'learningful' conversations that balance inquiry and advocacy, where people expose their own thinking effectively and make that thinking open to the influence of others" (Senge, 1990). Through increasing variance in workplace information experiences, employees become reoriented to the wide range of forms that information experiences and information practices might take as "the boundaries of what may be experienced as information widens" (Bruce, 2008).

Building knowledge production capability within an organization therefore relies on development and implementation of appropriate flexible organizational environments that foster robust exchange relationships and effective collaborations (Von Kough, Ichijo and Nonaka, 2000). This in turn requires an organizational design vision that recognizes the importance of cultivating both formal and informal interactions among individuals and with information to ignite contextualized information experiences that enable knowledge creation and advance workplace learning.

4. INFORMED SYSTEMS APPROACH

The Informed Systems Approach advances participatory organizational learning which purposefully employs collaborative systems design (Checkland and Poulter, 2006; Checkland and Holwell, 1998; Checkland, 1994) to enable situated learning experiences for using information to learn (Bruce, 2008). Both theorists, Checkland and Bruce, understand that information is central to learning. Both see technology as enabling and both agree that inclusive design processes of technology-enabled communication systems can initiate, further, and sustain learning.

The most complete version of the Informed Systems Approach evolved from 2008 to 2014, after earlier research projects that advanced workplace learning and systems design within discrete workplace units in two North American academic libraries. Maturation of the Approach became possible when lead author Somerville's portfolio increased to permit organization wide influence. Coincidentally, Bruce's initial workplace learning theory (Bruce, 1999), gained fuller expression in a book titled *Informed Learning* and published in 2008. The monograph significantly elaborated Bruce's discovery that learning occurs when information is encountered within context (Bruce, 2013). Since she reported initial findings, Bruce and her colleagues have explored the applicability of this theory in a variety of settings, including its efficacy in the contemporary workplace (Bruce, Somerville, Partridge, and Stoodley, 2013).

Concurrently, beginning in 2006 with a co-authored publication, *Learning for Action: A Short Definitive Account of Soft Systems Methodology and its Use, for Practitioners, Teachers and Students* (Checkland and Poulter, 2006), Checkland created more

accessible explanations for the design, learning, and action aspects of his learning focused methods. This permitted the international research team (who are the paper co-authors) to refer colleagues and beneficiaries to a more popular expression of Checkland's work, now in development for over forty years.

Thus, upon the foundation of the informed learning theory, the Informed Systems Approach recognizes that multi-level use of information to learn in contemporary organizations requires shared professional practices supported by enabling learning systems infrastructure. Further, the Approach acknowledges the interplay of enabling systems and socializing practices, which determine how organizations function, change, and adapt. Figure 3 illustrates this holistic approach, which recognizes the processes for spiraling knowledge conversion that produce ever increasing variation and complexity in information experiences. This depends, of course, on the efficacy of co-designed professional processes and enabling systems for cultivating formal and informal interactions among individuals and ideas.
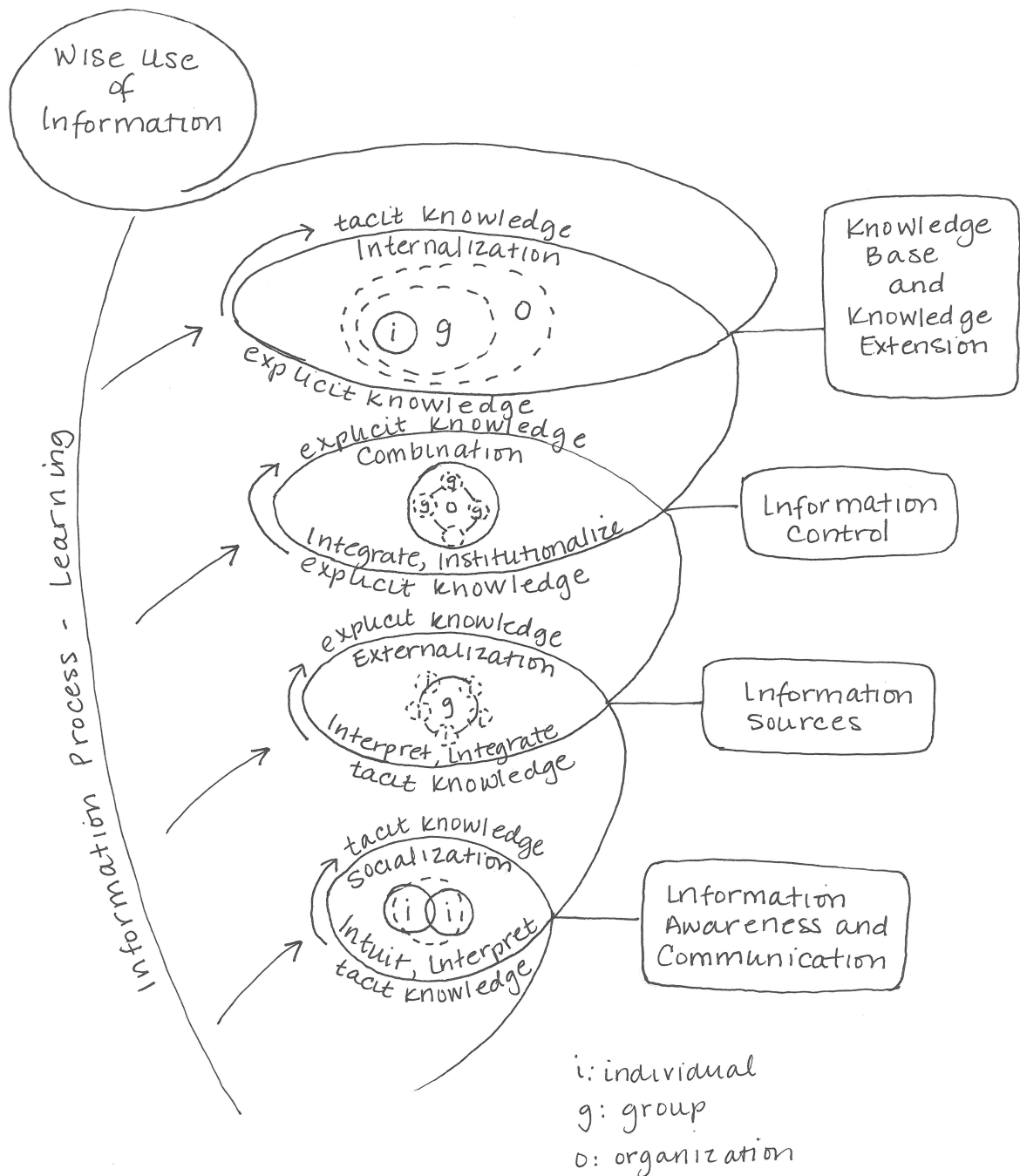
Figure 3. Synergistic aspects of informed learning theory, POM and SECI models, and 4i framework contributions to the Informed Systems Approach

Figure 3 illustrates the conversion of knowledge in an organizational learning spiral catalyzed by using information to learn within the iterative learning construct of the SSM Processes of Meaning (POM) model. At the bottom of the figure, tacit knowledge is illustrated as becoming explicit through socialization processes employed by individuals exercising shared professional practices. From an informed learning perspective, this first spiral corresponds to information users first becoming aware and then finding ways to communicate with each other to learn as they gain proficiency in

making tacit knowledge explicit. The second phase illustrates the externalization process, including individuals turning their attention to new information sources, including but not limited to colleagues' knowledge. Here information use is experienced as extending individual awareness and use of collective information sources.

In the third step, combination, knowledge is contextualized and systematized, and made available through organizational documents or other mediums. Bruce refers to this kind of information use as information control, in which new explicit knowledge is shared within the organization for agreed upon purposes and through shared practices in order to foster collaborative learning. In the fourth phases of the spiral, learning requires internalization in which individual and group knowledge is made tacit and integrated into the organization's knowledge base. In Bruce's framework, this phase denotes that acquired knowledge influences personal perspectives in such a way that novel insights are gained and personal knowledge bases are extended. Additionally, the combination and internalization steps recognize that, throughout, information users are engaged in evaluation processes and critical analysis of intentions and actions to be taken, represented here as an organizational sense making model.

Nonaka's knowledge conversion model further acknowledges that the knowledge creation process is iterative, just as learning is continuous. So, appropriately, the Informed System Approach is cyclical: upon completion of Nonaka's four phases, amplified by Crossan's 4i's, Checkland's sense making processes commence. On a meta-level which characterizes all phases of the knowledge conversion model, the ability to successfully navigate unfamiliar situations requires an agile capacity for finding, valuing, and using information to learn. This requires being aware of personal values, attitudes, and beliefs in order to make wise decisions that place information in a larger context that ensures ethical and optimal decisions for the benefit of self and others (Bruce, 2008).

5. INFORMED ORGANIZATIONAL OUTCOMES

The holistic Informed Systems Approach to generating informed action within the workplace offers a robust information-centered and systems-enabled organizational learning approach for contemporary organizations. The Approach combines proven theories, models, and frameworks offering information, learning, and systems ideas. Sense making processes and associated sub-processes recognize that every level of an organization (individual, group, and organization) must work together to generate purposeful action. This action must be coordinated in order to ensure fulfillment of strategic purposes and core activities identified through continuous multi-level exchanges that focus on using information to learn – i.e., informed learning.

As using information to learn becomes a shared basis of appreciation and action, the workplace culture reflects heightened regard for initiating, maintaining, and sustaining communication and relationships that promote collective alignment and shared understanding of the organization's purposes and priorities. Such collective understanding guides fiscal and human resource allocations, as well as day-to-day decision-making. In addition, pervasive systems thinking encourages understanding self and others as part of a larger whole – e.g., the librarian within the academic library within the university and beyond to higher education. In combination, informed learning and systems ideas can construct supportive multi-level learning infrastructure, fortified by enabling professional learning practices. Over time and with experience, as

environmental conditions change, design tools and techniques can manage complexity and ensure adaptability of workplace learning systems and associated professional practices (Mirijamdotter and Somerville, 2009). In an ongoing fashion, this is accomplished through clarifying and adjusting the cultural worldviews and workplace norms, at individual, group, and organizational levels, which are used to filter information and evaluate relevance and thereby inform decision making and action taking.

In the case of academic libraries in the digital age, continued viability requires that organizations must transform outdated filters so that appropriate worldviews can guide reimagined value propositions, service models, and curation strategies (Somerville and Farner, 2012; Somerville, 2013; Bruce, 2013). Applied research results in three North American academic libraries illustrate that enhanced information availability and coordinated learning veracity, guided by systems ideas grounded in informed learning, constitute both the subject of workplace inquiries, which use information to learn in individual, group, and organizational settings, and also inform the substance of professional practices, which use information to advance multi-level learning that engages, enables, and enriches informed employees' experiences in an expansive information universe.

References

Bruce, C. S. (1997), *Seven faces of information literacy*, Auslib Press, Adelaide, Australia. See also: http://www.christinebruce.com.au/informed-learning/seven-faces-of-information-literacy-in-higher-education/

Bruce, C. (1999), 'Workplace experiences of information literacy', *International Journal of Information Management,* vol. 19, pp. 33-47.

Bruce, C. S. (2008), *Informed learning*, Association of College & Research Libraries, Chicago, IL.

Bruce, C. S. (2013), 'Information literacy research and practice: An experiential perspective. Keynote address', in S. Kurbanoglu, E. Grassian, D. Mizrachi, R. Catts, and S. Spiranec (eds.), *Worldwide commonalities and challenges in information literacy research and practice: European Conference on Information Literacy*, ECIL 2013, Istanbul, Turkey, October 22-25, 2013. *Communications in Computer and Information Science Series*, vol. 397. Heidelberg, New York, Dordrecht, London, Springer, pp. 11-30. DOI 10.1007/978-3-319-03919-0

Bruce, C. S., Hughes, H. and Somerville, M. M. (2012), 'Supporting learners in the 21st century,' *Library Trends*, vol. 60, no. 3, pp. 522-545.

Bruce, C., Partridge, H., Hughes, H., Davis, K., and Stoodley, I. (eds.) (2014), *Information experience: Approaches to theory and practice*, Emerald, Bingley, England, in press.

Bruce, C., Somerville, M. M., Partridge, H., and Stoodley, I. (2013), 'Diversifying information literacy research: An informed learning perspective', in M. Hepworth and G. Walton (eds.), *Developing information capabilities*, Emerald Group Publishing Limited, Bingley, England, pp. 225-242.

Checkland, P. B. (1994), 'Systems theory and management thinking', *American Behavioral Scientist*, vol. 38, pp. 75-91.

Checkland, P. (2000), 'Soft Systems Methodology: A thirty year retrospective', *Systems Research and Behavioral Science*, vol. 17, pp. S11-S58.

Checkland, P. (2005), 'Webs of significance: The work of Geoffrey Vickers', *Systems Research and Behavioral Science,* vol. 22, pp. 285-290.

Checkland, P. (2011), 'Autobiographical retrospectives: Learning your way to 'action to improve' – the development of Soft Systems Thinking and Soft Thinking Methodology', *International Journal of General Systems*, vol. 40, pp. 487-512.

Checkland, P. B. and Casar, A. (1986), 'Vickers' concept of an appreciative system: A systemic account', *Journal of Applied Systems Analysis*, vol. 13, pp. 3-17.

Checkland, P. and Holwell, S. (1998), *Information, systems and information systems – Making sense of the field*, John Wiley & Sons, Chichester, England.

Checkland, P. and Poulter, J. (2006), *Learning for action: A short definitive account of Soft Systems Methodology and its use, for practitioners, teachers and students*, Wiley, Chichester, England.

Crossan, M. M., Lane, H. W. and White, R. E. (1999), 'An organizational learning framework: From intuition to institution', *Academy of Management Review*, vol. 24, pp. 522-537.

Crossan, M. M., Maurer, C. C. and White, R. E. (2011), 'Reflections on the 2009 AMR Decade Award: Do we have a theory of organizational learning?', *Academic of Management Review*, vol. 36, pp. 446-460.

Di Millia, L. and Birdi, K. (2010), 'The relationship between multiple levels of learning practices and objective and subjective organizational financial performance', *Journal of Organizational Behavior*, vol. 31, pp. 481-498.

Kodama, M. (2006), 'New knowledge creation through leadership-based strategic communities: Case studies in Japan', *Systems Research and Behavioral Science,* vol. 23, pp. 21-38.

Leonard, A. A (1999), 'Viable System Model: Consideration of knowledge management,' *Journal of Knowledge Management Practice,* August. http://www.tlainc.com/articl12.htm

Lloyd, A. (2010), *Information literacy landscapes: Information literacy in education, workplace and everyday contexts,* Chandos Publishing, Oxford, England.

Marton, F. (2014), *Necessary conditions of learning*, Routledge, Oxford, England, in press.

Marton, F. and Booth, S. (1997), *Learning and awareness*, Erlbaum, Mahwah, NJ.

Mirijamdotter, A. and Somerville, M. M. (2005), 'Dynamic action inquiry: A systems approach for knowledge based organizational learning', In *Proceedings of the 11th International Conference on Human-Computer Interaction*, Las Vegas, NV, USA.

Mirijamdotter, A. and Somerville, M. M. (2009), 'Collaborative design: An SSM-enabled organizational learning approach', *International Journal of Information Technologies and Systems Approach*, vol. 2, pp. 48-69.

Nonaka, I. (1994), 'A dynamic theory of organizational knowledge creation', *Organization science*, vol. 5, pp.14-37.

Nonaka, I. (2007), 'The knowledge-creating company', *Harvard Business Review*, vol. 85, pp. 162-171.

Nonaka, I., Konno, N. and Toyama, R. (2000), 'SECI, *ba* and leadership: A unified model of dynamic knowledge creation', *Long Range Planning*, vol. 33, pp. 5-34.

Nonaka, I. and Takeuchi, H. (1995), *The knowledge-creating company: How Japanese companies create the dynamics of innovation*, Oxford University Press, New York, NY.

O'Dell, C. S. and Hubert, C. (2011), *The new edge in knowledge: How knowledge management is changing the way we do business*, Wiley, Hoboken, NJ.

Schön, D. (1983), *The reflective practitioner: How professionals think in action*, Basic Books, New York, NY.

Senge, P. (1990), *The fifth discipline: The art and practice of the learning organization*, Doubleday/Currency, New York, NY.

Somerville, M. M. (2009), *Working together – Collaborative information practices for organizational learning*, Association of College & Research Libraries, Chicago, IL.

Somerville, M. M. (2013), 'Digital age discoverability: A collaborative organizational approach,' *Serials Review*, vol. 39, pp. 234-239.

Somerville, M. M. and Conrad, L. Y. (2014), *Collaborative improvements in the discoverability of scholarly content: Accomplishments, aspirations, and opportunities. A SAGE White Paper*, Los Angeles, CA, SAGE Publications Ltd. DOI: 10.4135/wp140116. Available:

http://www.sagepub.com/repository/binaries/pdf/improvementsindiscoverability.pdf

Somerville, M. M. and Farner, M. (2012), 'Appreciative Inquiry: A transformative approach for initiating shared leadership and organizational learning', *Revista de Cercetare si Interventie Sociala [Review of Research and Social Intervention]*, vol. 38, pp. 7-24. http://www.rcis.ro/images/documente/rcis38_01.pdf

Somerville, M. M. and Mirijamdotter, A. (2014), 'Information experiences in the workplace: Foundations for an Informed Systems Approach', in C. Bruce, H. Partridge,

H. Hughes, K. Davis, and I. Stoodley (eds). *Information experience: Approaches to theory and practice,* Emerald Group Publishing Limited, Bingley, England, in press.

Somerville, M. M., Schader, B. J. and Sack, J. R. (2012), *Improving the discoverability of scholarly content in the Twenty-First Century: Collaboration opportunities for librarians, publishers, and vendors*. A SAGE White Paper. Los Angeles, CA, SAGE Publications Ltd. Available:

http://www.sagepub.com/repository/binaries/librarian/DiscoverabilityWhitePaper/

Von Kough, G., Ichijo, K. and Nonaka, I. (2000), *Enabling knowledge creation – How to unlock the mystery of tacit knowledge and release the power of innovation*, Oxford University Press, New York, NY.

Weick, K. (1995), *Sensemaking in organisations*, SAGE, London, England.