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Introduction

Technological changes and shifting demands make learning essential in present-day organizations. One of the main reasons companies fail is because of their inability to learn and adapt (Argyris, 1998). Courtney et al. (1996) have suggested that Churchman's (1971) models of inquiring systems might form the basis for the design of effective learning organizations. "Inquiring organizations" are described as learning organizations modeled on the theories of inquiring systems, or systems whose actions result in the creation of knowledge. Effective inquiring organizations create knowledge and learn new behaviors to adjust to changing circumstances. Such organizations capture and leverage valid knowledge, making it widely available for use throughout the organization. Learning is a fundamental aspect of these inquiring organizations, and a well-designed learning subsystem is critical to their success. Learning by organizations relies on individuals and groups as agents for the transfer of knowledge. Over time, what is learned is built into the structure, culture, and memory of the organization. This paper continues a theme of adapting Churchman's models of inquiring systems by exploring the philosophies of E.A. Singer as they relate to inquiring organizations. The guidelines presented provide ways for modern organizations to identify themselves as knowledge-generating systems and thereby begin the transition to learning organization.

Singerian Organizations

Singerian organizations are purposeful entities designed according to ethical standards whereby the organization is judged not only by organizational standards, but also by what is good for society. Such organizations practice diligent self-reflection in order to address the challenges in managing the transition from "what is" to "what ought to be." These organizations creatively manage the tension between realism and idealism and between contentment and restlessness.

Singerian organizations are based on metrology, the science of measurement. The Singerian inquirer seeks to achieve progress using a system of measures that are continuously monitored, refined, and revised to generate valid knowledge. To achieve progress, knowledge creation must be connected to measurable improvements. Singerian organizations immerse organizational learners in a process that engenders progress (i.e., enhanced understanding) by promoting, sharing, and refining knowledge. Throughout the process, Singerian inquirers observe, measure, replicate, challenge, learn, revise and measure again in attempt to generate progress. The sacred set of values in a Singerian organization includes valid knowledge, informed choice, and personal responsibility to monitor the effectiveness of the effort.

As in all Churchmanian inquiring systems, Singerian inquiry includes a guarantor, which warrants that the system will generate greater knowledge of reality (progress), rather than its own form of illusion (process). The guarantor in Singerian organizations is something Churchman describes as a heroic mood (p. 201). The heroic mood is a force, created by the collective unconscious, toward progress and fulfillment. The existence of the heroic mood is manifested in an attitude that risks security and comfort; an impulse to challenge the current state of affairs; a pervading belief that progress is not possible without understanding; an ability and willingness to promote and share knowledge; and a march toward overall enlightenment.

The Singerian form of organization seems well suited for businesses associated with information technologies. Rapidly advancing technologies create impetus for Singerian organizations to constantly monitor and update methods and models for conducting business. Today's rapid technological advancements create turbulent environments where risking security and comfort could be viewed as a self-defense mechanism. Advances are occurring so rapidly that it is difficult to define a current state of affairs. To define information technology is to define a moving target. Personal computers, client server architectures, high-speed telecommunications networks and the Internet have revolutionized the way people conduct business all over the world. New business paradigms, such as electronic data exchange, electronic commerce, just-in-time inventories, virtual organizations and telework use technology as an enabler. Such paradigms represent sharp contrasts to traditional business practices and likely would never have come about if organizations had not challenged the status quo. It is an on-going challenge to try to understand these new paradigms and what they will mean in the long run. Intelligent technologies such as software agents, context sensitive search engines, artificial intelligence, adaptive decision support systems and virtual reality attempt to build elements of understanding into the tools of the day. The advent and increasingly wide utilization of the World Wide Web, electronic mail, distributed databases, and group support systems provide access to greater and richer sources of information. Harnessing these tools supports the notion of learning in dynamic organizational environments. Used effectively, these modern technologies can

help Singerian organizations establish the heroic mood (i.e., guarantor of valid knowledge) providing the capacity to create, promote and share knowledge. Coupled with the other constructs described in this paper, they help support the notion of inquiring organizations. The remainder of this paper examines Churchman's work to provide guidelines as to how Singerian inquirers, and by extension, Singerian organizations might be designed.

"Build a system of measures."

Singerian organizations establish procedures to produce valid measurements. To design an inquiring organization that uses measures, decisions must be made about units of measure and standards against which all other measure will be compared. In addition, there must be some justification that the measurement readings accurately describe some aspect of reality. The process of designing a measuring system begins with the selection of a standard of measure and a corresponding unit of measure. A standard consists or a set of operations, which in principle, will resolve disagreements arising in the community of inquirers. Standards bodies such as IEEE, ISO, ANSI, and ASCII are examples of entities that address this fundamental aspect of Singerian inquiry. Objects to be measured are described in terms of the unit of measure. A measuring system is used to assess objects-to-be-measured. Such a system consists of some rule generating system that specifies a series of steps to follow, a measurement tool, a visual system capable of following specified rules, and a second visual system capable of checking the first system.

Measurement can conjure images of quantifiable things such as revenue, unit sales, lines of code, seek time, transfer rate, etc. Designing systems of measure presupposes the object-to-be-measured is quantifiable. However, some things are difficult to quantify (e.g., productivity of MIS staff, benefit of information technologies, return on investment in information technologies, cost of production, etc.). If such cases, the organization may have to rely on surrogate measures, such as customer satisfaction, error rates, delivery schedules, goodwill, faith, and so forth.

"Replicate, replicate, replicate ..."

The ability to replicate results establishes the validity of the system of measures and infers the system accurately describes reality. Replication refers to the ability to go through the same set of steps or operations several times and obtain the same result, or at least a sufficient level of agreement among results. If there is not agreement, the system may not be accurately describing reality. The ability to replicate results establishes the validity of the system of measures and infers that the system accurately describes reality. If I shoot a score of 67 in a round of golf, one might conclude that I am a good golfer. However, my inability to replicate a score anywhere close to 67 would show that my first score did not accurately reflect reality, not that the system of measures is flawed (unless I cheated on my score!).

Even when readings agree, however, we can't necessarily infer that the system is working properly because the measuring system may be flawed to begin with. The measuring system itself must be tested through replication until there are no significant inconsistencies in results generated by the system.

If the system seems to be flawed, or not measuring the appropriate factors, a "sweeping-in" process brings new concepts and variables into the model to overcome inconsistencies. At some point, the inconsistencies in the system are minimized or eliminated. An analysis of variation determines that any disagreement in results is not significant.

Several examples illustrate how information systems have come to rely on reliable replication. Standard operating procedures, such as backup routines and run instructions, exist as a matter of course in IT shops. Software reuse libraries are established and used under the assumption that a piece of code will execute and run the same way each time it is run. Data communications relies on transfer rates, routing distance, packet size, bandwidth, and so on.

"Rock the boat."

The Singerian inquiring system has no real terminating point. Singerian inquirers seek to improve systems of measure continuously through constant refinement. The language of the system needs to convey what has been learned and what has yet to be learned. Adopting this type of organization creates an environment where members can refine, rather than reinvent, knowledge, and thereby respond more quickly to the current demands of customers.

Singerian organizations are built on the notion that when all is well, and data and hypothesis are mutually compatible, then this is the time to rock the boat, upset the apple cart, encourage revolution and dissension (Churchman, 1971, p. 199). It is times such as these, whenever all readings are identical, that the organization must shift its thinking to discover a higher level of refinement. Higher levels of refinement can be achieved by redesigning the measuring system. One strategy to create disagreement uses the rule of partition to create a logical division of knowledge into a set of at least two parts. The rule is applied until the system reaches a system of refinement of its readings where not all of the readings agree.

This process of challenging assumptions continuously should help keep the organization current in its thinking, especially in dynamic environments, and to avoid outdated cognitive maps of the environment. An environment must exist that encourages organizational members to challenge assumptions, models, strategies, and tactics to achieve a greater degree of understanding.

Modern learning organizations have begun to employ strategies designed to rock the boat. Business Process Reengineering (BPR) evaluates existing processes and technologies and tries to reengineer them to make them more effective and more efficient. Total Quality Management (TQM) looks at processes, collects data, analyzes data, makes decisions, implements, etc. The essence

of TQM is continuous improvement. Finally, second generation expert systems are being designed to learn through progressive refinement so that knowledge from experience can be used to learn (Van De Velde, 1997).

"Quest for self-knowledge."

Reflection and experience help create insight and self-awareness. The contribution and enlightenment of individuals serves to make the whole better. Individual contributions stimulate other ideas. Singerian organizations create conditions that enable people to produce valid knowledge and to do so in ways that encourage personal productivity. Churchman (1971, p.10) says that knowledge resides in the user, not in the collection. Still, learning and the quest for personal understanding lead to higher levels of individual and organizational fulfillment, greater levels of collective awareness, and more effective organizations.

Singerian inquiring organizations seek to foster an environment that enables its members to access information and develop knowledgeable insights that lead to personal mastery. Senge (1990) describes a process he calls personal mastery as learning to expand personal capacity to create the results most desired. It is the series of actions, habits and beliefs that are advanced by individuals in the quest to become better. To achieve personal mastery for its members, an organizational environment must be created which encourages all group members to develop themselves toward the goals and purposes they choose.

Singerian organizations provide an environment where members are free to develop a sense of personal mastery by designing what Argyris (1998) has described as Model II organizations. These organizations promote knowledge rather than censor it. The organizational environment fosters and rewards knowledge sharing among individuals to develop a rich knowledge base of experience, rationale, and anecdotal evidence. Organizations are evaluated not only as to whether what was promised was produced, but also by how effective the organization is in monitoring and surfacing information when what was promised is not being produced. Barriers to knowledge sharing, such as internal competition and politics, must be eliminated.

Intranets and active knowledge bases are used extensively to acquire and share knowledge. Several technologies promote these ideas of knowledge creation and sharing including, Organik from Orbital technologies, KnowledgeX from Anderson Consulting, and Lotus Notes from IBM.

Learning organizations begin with the individual. An individual who has attained personal mastery will have developed a willingness to share knowledge, tolerance for ambiguity, mastery of his/her own ego, mastery of learning to learn, the ability to externalize tacit knowledge, the ability to easily develop new mental models, a good understanding of systems thinking concepts, a relatively unfettered mindset, a welcoming attitude toward change, and an ability to participate in team building team-learning (Hok, 1998). These individuals embrace change and warm to the challenge of taking on new and different tasks. Individuals, and by extension, organizations, who quest for knowledge are open to learning. They realize that such a quest involves Singerian inquiry. That is, constant observation, measurement, replication, challenge, learning, revision, and measurement again. Organizational learning is a never-ending process of continuous refinement.

Summary

This paper has continued the tradition of using the principles of inquiring system design to suggest how effective learning organizations might be developed. Specifically, Churchman's description of Singerian inquirers has been used to propose guidelines for Singerian learning organizations. These principles include building a system of measures, replicating experiments and measuring and comparing results, sweeping in new concepts when results do not agree, or rocking the boat when measurements are in agreement, and creating an organizational environment conducive to a quest for individual self-knowledge. These principles should foster the development of effective Singerian inquiring organizations.

References

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