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Knowledge Management and Churchman's Inquirers: Evidence of Supporting Research

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ABSTRACT

This paper examines current knowledge management research with respect to Churchman's (1971) inquiring systems. Given that two of the most important constructs in knowledge management are knowledge creation and organizational learning, these systems should reflect the characteristics of inquiring systems as defined by Churchman (1971) and subsequently conceptualized by Mason and Mitroff (1973) and Hall, Paradice, and Courtney (2003), and should support inquiring organizations as conceptualized by Courtney, Croasdell, and Paradice (1998). This paper presents a case for using Churchman's inquiring systems as a lens through which to view knowledge management research and examines extant research for areas appropriate for such a framework. Understanding Churchman's inquirers and their characteristics may be critical to the direction and focus of future knowledge management research.

Keywords

Knowledge Management, Knowledge Creation, Churchman's Inquirers

BACKGROUND

From early in its existence, information systems have been designed to support management decisions. The management information systems of the 1970s were used to aggregate data into useful reports for effective control of the organization (Grover and Davenport, 2001). Soon after information systems proved their value in automating simple processes, new organizational systems were deployed. These information systems were the beginning of attempts to facilitate executive decision-making. These systems were often referred to as decision support systems or executive information systems. As information systems matured, the requirements and complexity of these systems has increased dramatically.

One of the most dynamic research fields today is that of knowledge management. Advanced information systems (intranet, extranet, data mining, etc) can be used to systematize, enhance, and expedite large scale knowledge management (KM) projects (Alavi and Leidner, 2001). Additionally, the use of collaborative technologies such as groupware has become much more common in organizations, providing necessary infrastructure for the social concepts required by KM. Data mining, databases, electronic bulletin boards, knowledge directories, and expert systems are all examples of the type of supporting information technologies potentially available in a comprehensive KM system (Alavi and Leidner, 2001).

A KM system requires more than the creation and sharing of knowledge; it is also necessary to conceptualize a system that aids decision-making (Hall et al., 2003) and can focus on addressing complex, unstructured (wicked) problems (Mason and Mitroff, 1973). These types of problems incorporate many modern management decision domains that appear overwhelmingly wicked (Raffia, 1968) or ill-behaved (Mason and Mitroff, 1973). Further, Courtney (2001) posits that globalization will lead to increasingly wicked problems for all types of organizations and that methods are needed to facilitate effective decisions in such situations. KM, with its focus in unstructured and moderately unstructured problems, should assume the role of facilitating these types of decisions.

In one of the most widely cited information systems research works, Churchman (1971) described information systems as inquiring systems based on the work of five influential western philosophers (Courtney, 2001). Each system uses processes and information uniquely to analyze and support different types of problems (Mason and Mitroff, 1973). Managers need information systems that present evidence for the types of problems both the organization and its managers face (Mason and Mitroff, 1973). A KM system, like other information systems, should aid decision-making and information discovery (Hall et al., 2003). This paper will examine KM research in the context of Churchman's inquiring systems and give specific examples of KM research addressing complex problems.

KNOWLEDGE MANAGEMENT AND COMPLEX PROBLEMS

Information systems have evolved dramatically. From their initial applications of automating routine administrative tasks, to more complex systems of today, information systems have supported the organization with mixed results. Thirty years ago, almost all information systems activities were directed toward structured decisions, although most areas of greatest concern to managers are moderately to fully unstructured (Gorry and Scott Morton, 1971). Although organizations of the past certainly faced many unstructured decisions, today's organizations are finding themselves competing in increasingly complex environments. Turbulent economics, fast-paced technological changes, and a need to compete in a global environment has increased the complexity of these problems.

KM systems should support this argument by adding flexibility to the decision-making and problem-solving environment by maintaining knowledge on structured decisions made in the past, organizational experiences, explicated tacit knowledge, and directories of expertise. Further, a KM system should align with organizational strategy as well as enable decision makers to access knowledge more appropriate to unstructured decisions. These systems may also contain specific knowledge creating technologies such as learning centers and collaborative centers to support communities of practices, thus allowing an organization to not only reflect on its past but to better define its future.

As problems become increasingly unstructured in the dynamic environment challenging organizations today, it is critical for KM systems to effectively address the "wicked" problems facing organizations. While problem evaluation and solution is critical, organizations must holistic adopt systems that incorporate not only information technology, but also processes and people to coordinate the transformation of an organization from reactive to effectively proactive. An organization is most effective when applying different inquiry processes as appropriate for the task at hand (Hall and Croasdell, 2005).

An organization's ability to create new knowledge is regarded as a primary source of competitive advantage already today and increasingly so in the future. Finding ways to actively support the process of organizational knowledge creation is an activity that should be prioritized (Roth, 2003; Stenmark, 2003). Organizational learning has been one of the foundations of KM systems since the initial research in the topic. An inquiring organization is a learning-oriented organization that strives to include both creation and management of knowledge in its cache of core competencies (Hall and Croasdell, 2005). Based on the philosophies underlying Churchman's (1971) inquirers, an inquiring organization applies a multitude of knowledge building processes to achieve its goals; each of these processes depends largely on the structure of the problem it faces.

PROBLEM STRUCTURE AND CHURCHMAN'S INQUIRERS

The role of information systems in problem solving can be classified as to the degree of structure in the problem; the degree of difference between the classifications is how much of the decision can be automated, i.e. structured, versus the degree to which the human decision maker must provide judgment and insight into the problem, i.e. unstructured (Gorry and Scott Morton, 1971). Examples of structured decisions include dividends, purchasing, and billing; semi-structured decisions include forecasting, budgeting, and assignments; and unstructured decisions include e-commerce, career paths, and grievances (Courtney, 2001). How an organization responds to a given problem is dependent largely on their ability to recognize its structure. While routine (structured) problems are relatively easy to discern, many times moderately or fully unstructured problems appear to be structured until analysis reaches a depth at which missing or unavailable information is recognized. The process of inquiry that is used to formulate solutions may be tailored to the complexity of the problem by further dividing problem structure into a combination of structure and type. Most problems can be categorized by their propensity for analytical solution, likelihood of conflict, or its need for a consensual solution. These categories can be reviewed through the characteristic processes of Churchman's (1971) inquiring systems.

Inquiring systems are characterized by the properties of five inquirers described by Churchman (Courtney et al., 1998; Hall and Paradice, 2005; Mason and Mitroff, 1973). Churchman (1971) described five categories of inquirers based on the underlying philosophies of Leibniz, Locke, Kant, Hegel, and Singer. These inquirers share capabilities and can work together in a system designed to maximize both KM and knowledge creation by supporting storage and retrieval of explicit information, organizational learning, and knowledge transfer (Hall et al., 2003).

The Leibnizian Inquirer

Information derived from models or proved from axioms is Leibnizian in nature (Mason and Mitroff, 1973). The Leibnizian inquirer is the most basic of the inquirers and provides the inquiring organization with its initial set of facts and axioms that comprise the foundation of organizational memory (Hall and Croasdell, 2005). A Leibnizian system uses its set of built-in elementary axioms with formal logic to generate more general facts or tautologies. The Leibnizian inquirer is best suited to structured problems. These problems would be characterized as having a solution and allowing for analytical formulation,

such as transportation routing. Typical systems that facilitate this inquirer are decision support systems and document management systems.

The Lockean Inquirer

The Lockean inquirer is a well-suited system for a relatively stable and highly social environment and is founded on principles of agreement embedded in classification of observations (Hall and Croasdell, 2005). Whereas in a Leibnizian system the networks are theoretically and deductively derived, in a Lockean system, they are empirically derived; databanks and accounting are examples of Lockean systems (Mason and Mitroff, 1973). Empirical information, gathered from external observations, is used inductively to build a representation of the world. The Lockean inquirer is best suited for structured problems where a strong consensual position is required such as the creation of a multi-section coordinated college course. Typical systems that facilitate this inquirer are groupware and networks.

The Kantian Inquirer

Kantian systems are the archetype of multi-model, synthetic systems (Mason and Mitroff, 1973). The Kantian inquirer is designed to incorporate both multiple perspectives and facts to determine models that are appropriate for the situation (Hall and Croasdell, 2005) and incorporates multiple perspectives and an analytic process to create knowledge: it is sensitive to the environment and attempts to apply the best fit answer to a problem. Each problem analysis will result in at least two alternative representations or models of the problem which elevates the Kantian system over both the Leibnizian and Lockean systems that provide only one view of the problem. The Kantian system is multi-perspective in its view representations; perhaps the most unique feature of Kantian systems is that the theoretical component allows an input to be subject to different interpretations. The Kantian inquirer is best suited for moderately unstructured problems that may not have a clear solution but still allow for analytical formulation. An example is new product development which combines both known and unknown variables into a "best guess" model. Typical systems that facilitate this inquirer are databases and model management systems.

The Hegelian Inquirer

The Hegelian inquirer is one of the more complex of the five inquirers (Hall and Croasdell, 2005). Like Kantian systems, Hegelian systems are multi-perspective, synthetic systems, but rather than a minimum of two representations, it constructs two antithetical representations of the problem (Courtney et al., 1998; Mason and Mitroff, 1973). Each of these opposing views is examined in turn, and the strongest assumptions underlying each are synthesized into an overarching representation that, in effect, presents the best of both views. Hegelian systems function on the premise that greater enlightenment results from the conflict of ideas. The Hegelian inquirer is best suited for unstructured conflictual problems such as contract negotiations. Typical systems that facilitate this inquirer are repositories and negotiation systems.

The Singerian Inquirer

The Singerian inquirer is the most complex inquirer; its primary purpose is to seek out inconsistencies throughout the organization and resolve the inconsistencies through a process of measuring, partitioning, and refining (Hall and Croasdell, 2005); the very complexity that makes it suited to complex and unstructured problem domains makes it equally difficult to interpret. Singerian systems involve continual learning and adaptation through feedback (Mason and Mitroff, 1973). Two basic premises guide Singerian inquiry. The first premise established a system of measure that specifies steps to be followed in resolving disagreements among members of a community while the second premise is the strategy of agreement. Singerian inquiry provides the capability to choose among a system of measures to create insight and build knowledge (Courtney et al., 1998). The Singerian inquirer can be used to answer any of the problem types described above and may by facilitated by all systems. However, it functions best when working with unstructured problems of a social nature, such as balancing between a corporation's profit motive and its social responsibilities. Table 1 summarizes the above inquirers, the problem type under which they function most appropriately, examples of typical problems, and representative technologies for each.

	Problem Type	Example of Problem Type	Examples of Supporting IT
Leibnizian	Structured	Transportation Routes	Decision Support Systems, Document Management
Lockean	Structured, consensual	Multi-section Course Coordination	Groupware, Networks
Kantian	Moderately unstructured	New Product Development	Databases, Model Management Systems
Hegelian	Unstructured, conflictual	Union Negotiations	Repositories, Negotiation Systems
Singerian	Unstructured	Corporate Ethics and Social Responsibility	Groupware, Networks, Repositories

Table 1 - Overview of Churchman's Inquirers (Courtney, 2001; Hall et al., 2003)

GENERAL OVERTONES OF KNOWLEDGE MANAGEMENT RESEARCH

Mason and Mitroff (1973) stated that the design of most if not all of MIS to date has been undertaken from the standpoint of Leibnizian and Lockean inquiry; the neglect of the other inquirers has been almost total because of the preoccupation of OR/MS with well–structured problems. Obviously, information systems have changed dramatically since 1973. However, some may argue that information systems have still not been adequately deployed to assist in solving more complex problems such as those described above as moderately or fully unstructured. KM research has addressed this problem to a certain degree, although perhaps not directly in the domain of inquiring systems. By their very nature, KM systems seek to apply organizational knowledge to unstructured problems. Using experts, organizational knowledge directories, and team enhancing technologies and processes, KM systems are focused on providing support for unstructured problem solutions of varying degrees.

Alavi and Leidner (2001) address decision-making and problems in several different contexts. Corporate directories may enable individuals to rapidly locate the individual who has the knowledge that might help them solve a current problem. A knowledge integration mechanism is the creation of self-contained task teams. Teams of individuals with prerequisite knowledge and specialty are often formed for solving unstructured problems. They note that while management reporting systems, decision support systems, and executive information systems have all focused on the collection and dissemination of explicit organizational knowledge, KM systems may provide an opportunity for extending the scope of information systems based knowledge provisions to handle different forms of knowledge.

Davenport and Prusak (1998) take a holistic view of KM's support of decision-making. What makes knowledge valuable to organizations is ultimately the ability to make better the decisions and actions taken on the basis of the knowledge. Evidence of the importance of problem structure is evident in the examples they present. For example, General Motors (GM) is interviewing managers to learn what knowledge they use when making key decisions which, in the context of the example, is a decision based on a moderately or fully unstructured problem (Davenport and Prusak, 1998). 3M provides an example the importance of knowledge transfer, particularly in complex problem domains such as product development; new ideas are often sparked by access to existing ones (Davenport and Prusak, 1998).

The above frameworks are two of the most frequently cited frameworks in KM research (Jennex and Croasdell, 2005). The concepts apparent in these frameworks define not only those in KM, but also those underlying Churchmanian systems. Other frameworks address different but related concepts. Becerra-Fernandez and Sabherwal (2001) proposed a contingency framework to examine the suitability of KM processes based on two attributes of the organization's tasks: process or content orientation and focused or broad domain. Like problems, tasks can be categorized into different levels of structure.

Holsapple and Joshi (2001) introduced a framework that identifies classes of knowledge resources that must be considered when examining systems for successful support of effective decisions, particularly those of an unstructured nature.

Generally, it appears from the above that problem structure, while often not directly addressed in research, is a critical element. This is also true for research that examines complexities such as multiple perspectives, conflict, and interdependence. These Churchmanian influences are examined but the underlying philosophy is unstated. Below, we describe extant KM research that combines problem structure and Churchmanian principles to show that they are an important, albeit relatively unspoken aspect.

EVIDENCE OF CHURCHMAN'S INQUIRERS IN EXTANT KNOWLEDGE MANAGEMENT RESEARCH

A significant quantity of KM research has addressed many of the concepts defined by Churchman (1971) and subsequently conceptualized by others (Hall et al., 2003; Mason and Mitroff, 1973). This research has appeared in a variety of management and information systems journals. The current paper is not an inclusive examination of this work, but rather provides examples of research that demonstrates ideal situations for applying Churchman's (1971) inquirers. These articles are examples of Kantian, Hegelian, and Singerian inquirers and based on the moderately unstructured and unstructured problem types. Given that other information systems are focused more extensively on structured problems, KM systems should facilitate decision making on all problem types, but particularly the more complex problem domains; the following articles represent examples thereof.

Kantian

The use of stories for sharing experiences and disseminating lessons learned is a well-known KM practice. These can vary from unstructured stories to structured narrative techniques specifically intended to build organizational learning such as learning histories. Patterns complement these approaches. The elements of a pattern (context, problem, forces, solution, rationale, resulting context, related patters) allow readers to draw together a judgment as to its usefulness, appropriateness, and applicability in different contexts (May and Taylor, 2003). This research is an example of a Kantian inquirer where a repository would be used to access and store an organization's learning histories, and from that, develop differing representations of the problem.

Massey and colleagues (2002) examine new product development (NPD) process at Nortel Networks. The NPD process is a highly knowledge-intensive endeavor based on the individual and collective expertise of employees. This is another type of moderately unstructured problem where some factors are fairly well defined but other factors are unstructured and thus an example of an area where Kantian inquires would prove useful by introducing appropriate processes to the technology already in place.

Multiple perspectives have been considered in other contexts than those above. The need to synthesize and/or support perspectives is evident in research on group support systems (e.g., Mark, 1997) and system development (e.g., Finkelstein, Kramer, Nuseibeh, Finkelstein and Goedicke, 1992). Other research has been conducted regarding multiple perspectives in the knowledge domain, such as multiple perspective support systems (Janssen and Sage, 2000) and knowledge-based systems (Stolze, 1994). However, most of this work emphasizes synthesis of the perspectives rather than using the perspectives to represent information in a way that informs managers.

Hegelian

Similar to product development, a study in product launch revealed that groups which use Group Support Systems (GSS) to support their activities produce a greater number of ideas/knowledge that prove more useful to managers making product launch decisions (Parent, Gallupe, Salisbury and Handelman, 2000). These decisions are also moderately unstructured given the variability in product, price, location, and other factors pertinent to a product launch. While the multi-perspective characteristics of a Kantian inquire may be beneficial, it is likely that a negotiation between stakeholders will arise. For instance, management may prefer a low-cost launch, whereas commission-based salespeople would prefer a grand launch with which to generate immediate interest and increase sales potential. A situation such as this would be characterized as Hegelian, requiring the appropriate inquirer using a negotiation system to synthesize a solution with benefits to each side.

Hasan and Gould (2001) propose that cultural-historical-activity theory (CHAT) is appropriate for the unstructured decision-making environment of senior managers. CHAT provides a practical model of what people do, focusing on the relationship between the subject and object of an activity, a relationship mandated by tools and community; sense-making is the central activity to the problem of KM support for decision-making of senior managers. Given the complex nature of the problems described in this article, particularly given the often socially-constructed nature of the information being considered, conflict is likely to arise during the decision-making process. A Hegelian inquirer is an appropriate support component for this scenario and for CHAT generally.

In addition to the articles discussed above, there is much literature in negotiation and negotiation systems (e.g., Bose and Paradice, 1999; Lee, Chang and Lee, 2000; Lim and Benbasat, 1993; Swaab, Postmes, Neijens, Kiers and Dumay, 2002). While not directly approached as KM research, it is obvious from the context that such research is an extension of Hegelian theory. What differs primarily from the intent of the Hegelian system, however, is that much of this research examines underlying differences to mediate, whereas the Hegelian Inquirer examines underlying assumptions of value to integrate. A second difference is that the Hegelian inquirer emphasizes the most opposing viewpoints to synthesize, thus examining the extremes of the context.

Singerian

Knowledge creation is one of the key factors in addressing unstructured and moderately structured problems. Research suggests that the seven factors critical to knowledge creation are: no-preconceptions principle, autonomy, serendipity, diverse stimuli, rich information provision, internal communication, and motivation (Stenmark, 2003). The specific factors critical to knowledge creation can be enabled by a corporate intranet. Of the factors listed above, no-preconception principle and rich information provision were the two creativity enabling conditions best matched by the specific characteristics of an intranet (Stenmark, 2003); however, policies in place to control intranets place restrictions on the process. Corporate intranets are likely to become useful only in organizations where management empowers the organizational members to design the information landscape. This empowerment is not only beneficial, but is a requirement of the Singerian inquirer, which routinely challenges the status quo and encourages examination by members of existing paradigms that may need changing.

Courtney (2001) proposed a new decision-making model for Singerian inquirers for decision support systems. The model emphasizes the need to consider many perspectives beyond the technical and has suggested ways to develop these perspectives. Support for the softer aspects of the decision such as the organizational, ethical, and aesthetic perspectives must be provided. The new decision-making environment paradigm for inquiring organizations calls for a greatly expanded view of decision support systems and KM; this process focuses on developing multiple perspectives, the basis of the Singerian inquirer.

Massey and colleagues (2002b) propose a performance centered design (PCD) methodology for structuring knowledge intensive, ill-defined processes. PCD provides a holistic view of a performance environment by considered the complex interdependencies between the organizational context, business processes, and individual performers. Given the complex interdependencies described in this research, such a methodology would benefit from the characteristics of a Singerian inquirer. This inquirer is particularly adept at uncovering perceptual differences between individuals in relation to a given context, making it a natural fit for this methodology.

Markus and colleagues (2002) identified a class of design problems they called emergent knowledge processes. This class of problems has different processes, user, and knowledge requirements from those of semi-structured (moderately unstructured) decision supporting systems, a class of problems that is not adequately supported by existing systems such as DSS, groupware, etc. This is, however, the class of problem with which the Singerian system best interacts, making the inquirer a potential support component for emergent knowledge processes.

Zhuge (2003) presented an agent-based workflow model for distributed team co-operation for problem solving. While this work did not specifically address the structure of the problem, it did focus on large problems requiring teams, generally a characteristic of a moderately unstructured or unstructured problem. The emphasis on teams, workflow, interdependency, and the need to work through contextual differences exemplifies a system that would benefit from the complexities of the Singerian inquirer.

Perhaps because of the level of complexity it incorporates, more KM articles can be selected that investigate the principles behind the Singerian inquire than either the Kantian or Hegelian inquirers. Some might argue that the Singerian inquirer is the ultimate KM support technology, but each of the inquirers, even the most basic, has a place in a truly knowledge-enabled organization.

CONCLUSION

This research has demonstrated, through several examples, that the characteristics and capabilities of inquiring systems are evident in extant KM research. The examples cited above are not meant to be inclusive, but instead to show examples of KM research that examines the complex problems facing organizations today for which a Churchmanian framework may be particularly appropriate. While early information systems focused somewhat more extensively on automating processes and assisting structured decision making, recent work in information systems, and particularly in KM, shows considerable support and capability for improving decision-making in moderately unstructured and unstructured decision environments.

The research outlined in this paper shows the relationship between KM, problem structure, and Churchman's (1971) inquirers. Future research should look to examine in more detail the necessary cultural and process environments in an organization that will further facilitate effective use of Churchman's inquirers in designing effective information systems. Information systems must be centered around important decisions of the organization, many of which are relatively unstructured (Gorry and Scott Morton, 1971). While many implementations of information systems provide valuable service to organizations, many of them do not address the complex problems faced by organizations today. Further examination of these problems, and use of Churchman's inquirers as a design basis, will enable KM researchers to focus on the transformation of organizations into inquiring organizations capable of effective problem structuring within the knowledge management domain.

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