Knowledge Management Systems: Linking Contribution, Refinement and Use

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Electronic knowledge repositories represent one of the fundamental tools for knowledge management (KM) initiatives. Existing research, however, has largely focused on supply-side driven research questions, such as employee motivation to contribute knowledge to a repository. This research turns attention to the dynamic relationship between the supply-side issue of knowledge contribution and demand-side issue of knowledge usage, as repository systems are successful only to the extent that their content is actively utilized by organizational members to enhance their work performance. There are two primary objectives of this dissertation research. The first is to examine determinants of high quality knowledge contribution, the knowledge refinement process, and effective knowledge use, by drawing on organizational and dyadic factors. The second purpose is to expand the current understanding of knowledge contribution and use beyond conventional constructs that are based on quantity or frequency. New theoretical frameworks are proposed to conceptualize knowledge quality, knowledge refinement, and knowledge use. Towards these goals, informal qualitative interviews and a survey study with a matched-triad design were conducted with users of Eureka, a successful global knowledge repository system of the Xerox company. Results reveal that procedural justice significantly contributed to the quality of refined knowledge and the extent of knowledge use. However, procedural justice had little impact on the quality of knowledge contribution. In addition, expertise gap and communication frequency significantly influenced the quality of refined knowledge, whereas shared understanding made little contribution. These findings are discussed with respect to implications for knowledge management research and managerial practices.

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1.0 INTRODUCTION

In today's knowledge economy, companies are constantly seeking ways to gain sustainable competitive advantage by leveraging their knowledge assets (Davenport et al. 1998). One of the information technology tools widely deployed to support knowledge management (KM) strategies is the electronic knowledge repository. Defined as "databases allowing the storage and retrieval of explicit research and technical and management knowledge" (King et al. 2002, p. 93), electronic knowledge repositories represent one of the fundamental tools for KM efforts (Alavi 2000; King et al. 2002), particularly for sustaining organizational memory (Olivera 2000). Managing such knowledge management systems (KMS) is an important responsibility of IS managers and executives (Sprague 1995; Swanson et al. 1978). Hence, KMS management has become an important topic in IS research.

In an attempt to deliver value to the firm as well as the individuals who utilize the repository, KM managers face two significant hurdles in managing the supply and demand for knowledge content: The first challenge is to motivate knowledge workers to supply knowledge assets, and the second is to motivate knowledge workers to use the repository and apply the content to enhance their work effectively (Goodman et al. 1996; Goodman et al. 1998). Empirical research on repository systems has provided much insight that addresses the first challenge, highlighting the role of sociocognitive factors (Fulk et al. 2004; Kankanhalli et al. 2005; Wasko et al. 2005) and organizational context (Bock et al. 2005) that motivate people to contribute knowledge.

When contribution to organizational repositories is voluntary, managerial practices to overcome a rational tendency to hoard knowledge and to encourage knowledge sharing are critical for building up repository content.

Such efforts for motivating contribution, however, are successful only if the contributed content is actively used by the audience for which the repository is designed to support. Surprisingly, the literature suggests that valuable content of repository systems is not always used as frequently as desired (Goodman et al. 1998; Gray et al. 2005). For instance, in an empirical study of various knowledge sources, repositories receive the lowest level of usage (Gray et al. 2005).

Research has also shown that managerial practices to proactively address the low demand for knowledge consumption by mandating usage can backfire. When frequent use of repository content is mandatory, more usage sometimes can be associated with lower performance (Haas et al. 2005). In other words, managerial practices that focus exclusively on quantity of repository usage may in fact be counter-productive. Insights are needed about building a repository that encourages effective knowledge use, and not simply quantity of usage behavior.

These findings from the KM literature reveal that it remains unclear what contribution factors encourage people to access repository content and apply it effectively to their work. Existing research has focused on either the supply-side (i.e., contribution) or the demand-side (i.e., consumption) questions, with little emphasis on the relationship between the two.

This research focuses on the dynamics between knowledge contribution and usage in the context of organizational repositories. The success of a repository system is contingent on the extent to which their content is actively utilized by organizational members, either for replication (Dixon

2000; Markus 2001) or for innovation (Majchrzak et al. 2004). KM efforts to motivate knowledge sharing and contributions to repositories may be effective, but the KM process that they support will not be successful if organization members are reluctant to access and apply the contributed knowledge to their own work (Kulkarni et al. 2006-7). How organizations can encourage knowledge use and reduce the knowing-doing gap is an imminently important research question (Alavi et al. 2001).

Prior research speculates that low levels of repository usage or ineffective use can be attributed to questionable content quality (Goodman et al. 1998; Gray et al. 2005; Haas et al. 2005). "[I]n the absence of the ability to monitor and control quality for each contribution, [knowledge sharing] systems can spark a flood of low-quality information contributions" (Fulk et al. 2004). However, there is relatively little research on what dimensions of content quality are relevant for knowledge management systems. Content quality is an important success factor for KM systems (Kulkarni et al. 2006-7; Qian et al. 2005; Wu et al. 2006) and information systems in general (DeLone et al. 2003). Most of the research on knowledge content quality thus far has focused largely on information quality (e.g., Kulkarni et al. 2006-7). However, it is commonly recognized that knowledge content differs qualitatively from information content. Users of KM may demand more than accurate and comprehensive facts when they engage in KM system use.

KM systems represent a category of information systems in general. Theories of information systems use (Barki et al. 2007; Burton-Jones et al. 2007; Burton-Jones et al. 2006), therefore, should be able to explain KM systems use. There is, however, a crucial difference between the approach taken here and information systems use theories. System usage has been defined with respect to three elements – the user, the system, and the task. This perspective puts a greater

emphasis on elements external to the system (i.e., the user and the task) than the content that resides within the system itself. The approach taken here, in contrast, focuses on the role of the system's content on explaining KM use. This emphasis on systems content is critical because KM systems differ from other kinds of information systems primarily due to their contents. The theory developed here complements existing theories of system usage by shedding light on the role that systems content, and its quality in particular, plays in determining system usage. Moreover, we also examine how content use, rather than system use, can be conceptualized in the KM context.

There is some suggestion in the literature that having effective knowledge refinement mechanisms in place is crucial for optimizing content quality (Cho et al. 2008; Zack 1999). An increasing number of organizations commission "knowledge intermediaries" to refine and develop contributed knowledge for maximal reusability (Markus 2001). The effectiveness of such refinement mechanisms, and their impact on contribution and user behaviors, have rarely been examined empirically (Lampe et al. 2004) . The present study focuses on the role of refinement mechanisms in the supply-demand relationship between knowledge contribution and usage in the context of repository systems.

To examine the KM processes of interest here, this research explores factors at both organizational and dyadic levels. At the organizational level, we focus on the role of procedural justice, a dimension of organizational justice, in encouraging quality knowledge contribution, improving knowledge refinement effectiveness, and motivating knowledge use. Organizational justice , defined as "members' sense of the moral propriety of how they are treated" (Cropanzano et al. 2007, p. 34), is an appropriate theoretical frame for examining issues in knowledge

contribution, refinement and use primarily because justice explains employee motivation above and beyond short-term economic gains (Cropanzano et al. 2007). In many organizations, the creation and usage of electronic knowledge repositories rely on employees' voluntary participation and are not necessarily linked directly to compensation or other reward systems. Even when participation is linked to specific reward mechanisms, reward does not necessarily lead to desirable organizational outcomes (Haas et al. 2005). In other words, pure economic incentives are insufficient in creating effective KM processes. When behaviors are not directly linked to economic gains, employees care about whether they would be treated fairly, particularly in the long run (Cropanzano et al. 2007). As discussed later in this thesis, employees contribute, refine and use knowledge in an electronic repository often for long-term or indirect benefits, as opposed to immediate or direct gains. The extent to which organizational procedures such as the refinement process operate fairly, therefore, should influence the success of KM practices.

At the dyadic level, we examine refiner-author factors that facilitate the effectiveness of refinement efforts. These factors include the expertise level difference between the refiner and the author, the extent of their shared understanding, and the frequency of their communications.

To summarize, this research examines the relationships among knowledge contribution, refinement, and usage from an organizational justice perspective. In doing so, four research questions are addressed:

1. How does procedural justice affect knowledge contribution?

2. What are the determinants, including justice factors, of effective knowledge refinement?

3. How does procedural justice affect knowledge use?

4. How do knowledge contribution, refinement and use relate to one another?

This thesis is structured as follows: The rest of this first chapter reviews relevant literatures on two theoretical concepts that form the foundation of this work – knowledge quality and knowledge refinement. Chapters 2, 3 and 4 examine how procedural justice, a specific form of organizational justice, and a number of dyadic factors, affect three critical elements of the knowledge management process - knowledge contribution, knowledge refinement and knowledge use. Chapter 5 details the research methodology and procedures for data collection. Chapter 6 presents data analysis and results from both the pilot study and the full study. Results from the full study are discussed in Chapter 7 with reference to both theoretical implications and management recommendations.

1.1 LITERATURE REVIEW

Given that knowledge quality is critical for the success of repository systems, a conceptual model is needed to understand factors that contribute to knowledge quality. One way to develop such a model is to focus on the knowledge refinement process. Knowledge refinement refers to the process of evaluating, analyzing and optimizing the knowledge object to be stored in a repository (Alavi 2000; Cho et al. in press; Markus et al. 2002; Qian et al. 2005; Zack 1999),

supporting the knowledge creation process of externalization, the articulation of tacit knowledge into explicit forms (Nonaka 1994).

There are several reasons for examining knowledge refinement processes in repository management. First, anecdotal evidence suggests that knowledge refinement processes are increasingly common. Best practices, lessons learned and so on are often vetted and enhanced before being included in a repository. New forms of organizing that take advantage of Web 2.0 technologies, such as Wikipedia and Slashdot (Lampe et al. 2004), allow novel ways of refinement, engaging a broader range of participants in content selection, improvement, and moderation collaboratively in a distributed fashion. Understanding factors that determine the effectiveness of these processes, therefore, is an important issue for both researchers and practitioners.

From a learning perspective, refining knowledge can benefit the organization as well as the individual. Engaging organizational members in selecting and optimizing knowledge quality not only fosters learning at the individual level, the process also supports organizational learning by optimizing knowledge codified as part of organizational memory.

Refinement could address the increasing concern about information overload. Information technology has significantly lowered the barriers for accessing information and knowledge. However, the overabundant availability of information and knowledge could create a barrier for effective use of such resources as human attention is limited in capacity. Research that examines the relative importance of information quantity versus quality has begun to demonstrate that users derive value from high quality content (Gu et al. 2007). Large quantities of content of

unknown quality, in contrast, can raise the costs for accessing and using such resources and subsequently decrease usage levels (Butler 2001).

This section serves three goals. First, a preliminary framework for understanding knowledge refinement is delineated. Second, because the objective of knowledge refinement is to optimize quality, a multi-dimensional framework of knowledge quality is proposed and discussed. Finally, a review of the organizational justice literature discusses how justice perceptions may affect KM practices and why this research focuses on the dimension of procedural justice in particular in understanding the role of justice in various KM processes.

1.1.1 Defining Knowledge Refinement

Information technology has enabled companies to effectively collect and organize knowledge assets in repositories or expert directories (Hansen et al. 1999). However, efficiency enabled by information technology also creates an explosive amount of knowledge that overwhelms user attention. Ensuring content quality of knowledge management systems has thus become an growing concern for executives (Alavi et al. 1999). It is thus argued that a focused strategy for knowledge management is one that employs careful filtering of an organization's critical knowledge base (Milton 2007). An effective knowledge management program does not simply provide infrastructure for general knowledge sharing. Critical for its success are mechanisms to define knowledge of high impact and to direct attention to such knowledge.

Towards this goal, repositories are increasingly implemented with a refinement process that selects, verifies and improves contributions to be included. For example, submissions to the best

practices repository at Shell are subjected to careful validation by a dedicated team (Hicks et al. 2002-2003). These refinement processes serve as filters that allow only a subset of knowledge collected in more permanent storage (Walsh et al. 1991). By evaluating and selecting content given some quality criteria, the refinement process enhances the perception of the knowledge repository system's accuracy (Hicks et al. 2002-2003), credibility, and legitimacy (Olivera 2000), providing "justification" to the knowledge created and gathered via the system (Nonaka 1994, p. 26). Given the critical role of refinement processes, they have been specified as a fundamental component of a life-cycle model of knowledge management (King et al. 2008).

In contrast to environments where knowledge contributions are made in response to direct requests for assistance (e.g., discussion forums), contributions to knowledge repositories require more proactive efforts to raise awareness about an opportunity to contribute, to search for a solution that matches a problem, and to formulate and deliver the solution as a contribution (Olivera et al. 2008). The knowledge refinement process serves as an intermediary that supports these mediating mechanisms for knowledge contribution in the absence of specific requests for help.

Many repository systems implement clear refinement processes. A common approach is to commission a centralized review committee of domain experts to select, refine and approve knowledge that enters repository systems (Goodman et al. 1998; Markus 2001; Zack 1999). At the other extreme is a decentralized system that assigns randomly chosen peers for refinement (Cho et al. 2008) or an open-access system allowing anyone interested to participate in the

refinement effort on a completely voluntary basis, as seen in the Wikipedia project[1] (Voss 2005). Corporations such as Dell, Starbucks, and Harrah's have implemented a similar "beauty-contest" approach to knowledge refinement using Salesforce.com's online voting service "Ideas" (Greenfield 2008). Other companies implement a "stock-market" approach to refinement, allowing employees to buy and trade stock shares of ideas contributed by employees (Greenfield 2008; Grosslight 2008). Both approaches engage employees through all ranks in selecting optimal ideas. They differ only in the extent to which the employee is personally invested in the quality of the decision – employees can obtain personal gains or losses depending on the stocks they choose to invest in with the "stock-market" approach. Somewhere in the middle is Xerox's refinement mechanism for its Eureka system: More than 600 validators, or refiners, dispersed globally are responsible for refining knowledge submissions from more than 20,000 users worldwide (Bobrow et al. 2002; Boucher 2006). Refinement processes also differ in the extent to which they support collaboration among refiners and authors, and whether the refinement can be performed directly on the knowledge artifact or not (Chung et al. 2007).

Universal to these various refinement approaches is the joint participation of the refiner and the author in the knowledge creation process. The author externalizes tacit ideas into an explicit format, while the refiner helps the author optimize the quality of the explicated knowledge. Such a refinement process often involves the collaboration of the refiner and the author with varying degrees of interaction between the two.

[1] According to Wikipedia's protection policy published at http://en.wikipedia.org/wiki/Wikipedia:Protection_policy, there are exceptions to this decentralized refinement mechanism.

The refinement process is conceptualized here using the input-process-output (I-P-O) framework of organizational teams and groups (Hackman 1987; McGrath 1984; Steiner 1972), with the author's contribution as the input, the collaboration between the refiner and the author as the process, and the refined knowledge object as the output of the collaborative process. This view suggests that the goal of effective refinement is to produce knowledge objects of the quality that meets both the producer's and the user's criteria (see Figure 1). Knowledge refinement effectiveness, based on this view, is defined as the degree to which the refinement process produces quality knowledge.

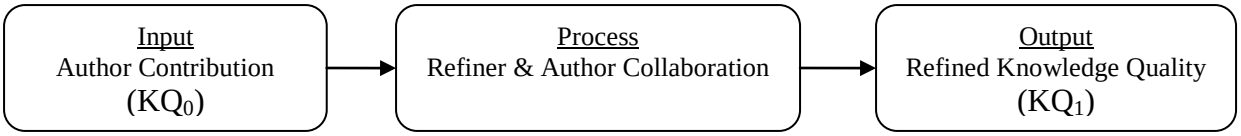

Figure 1. An Input-Process-Output Model of Knowledge Refinement Process

This conceptualization of the knowledge refinement process is built upon two assumptions. First, the refined knowledge quality (KQ_1) should correlate with the initial knowledge quality (KQ_0) because the improvement brought by the refinement process should be rather incremental. Quality of the refined knowledge product should depend on the quality of the initial submission. The refinement process may enhance the quality of the initial submission; however, it is unlikely to turn a poorly written submission around into an outstanding publication. Moreover, when a knowledge refinement process is implemented as part of an organization's knowledge management efforts, the refinement procedure presumably accomplishes its goal of improving the quality of the contribution over time. Specifically, the quality of the knowledge content should be higher after the refinement process than before it. In other words, the output knowledge quality that eventually gets published should be greater than the initial knowledge quality. These basic premises are expressed as the following formal hypotheses:

Hypothesis 1a (H1a): Refined knowledge quality (KQ_1) is positively related to initial knowledge quality (KQ_0).

Hypothesis 1b (H1b): Refined knowledge quality (KQ_1) is greater than initial knowledge quality (KQ_0).

1.1.2 Establishing Dimensions of Knowledge Quality

As stated earlier, the quality of content contribution is essential for KMS success. First, when a KMS's content is perceived to be of high quality, users experience a higher level of satisfaction with the system, which in turn increases their systems usage (Kulkarni et al. 2006-7). User satisfaction with computer systems is highly dependent on the quality of content available from the systems (Bailey et al. 1983). In Bailey and Pearson's (1983) evaluation of 39 factors related to computer user satisfaction, the top four most important factors – accuracy, reliability, timeliness and relevancy – are all about the quality of system content. Moreover, a higher level of knowledge quality leads to a higher level of perceived usefulness of the KMS and then to a higher level of user loyalty (Clay et al. 2005). Overall, knowledge quality determines the level of perceived KMS benefits that users receive (Wu et al. 2006). When users expect to receive more benefits from KMS, they are more likely to use the system (Wu et al. 2006).

Following the quality literature, knowledge quality is defined here as the extent to which a knowledge object successfully serves the purposes of users (Kahn et al. 2002), wherein a knowledge object refers to an electronic document that uses symbols and media to represent

ideas and concepts (Sprague 1995). This definition is consistent with the user-based definition of quality, focusing on the knowledge object's fitness for use (Garvin 1988).

Despite the importance of knowledge quality in understanding KMS success, there is relatively little theoretical understanding of this construct. Empirical examination of knowledge quality thus far has treated knowledge quality as essentially the same as information quality (Clay et al. 2005; Kulkarni et al. 2006-7; Qian et al. 2005; Wu et al. 2006). This practice apparently contradicts the prevailing view of knowledge being conceptually distinguishable from information. Here we attempt to develop a more comprehensive understanding of what constitutes knowledge quality.

Before we can define knowledge quality, we must clarify what we mean by knowledge. The precise distinction between knowledge and information is characterized differently by different scholars (Alavi et al. 2001) and has been the subject of numerous debates (Stenmark 2002). Yet despite these efforts knowledge remains an elusive concept even though people recognize what is knowledge when they encounter it. It is not our intention here to develop a universal or absolute definition of what knowledge is from a philosophical stand point. Rather, our goal is to develop a pragmatic understanding that sufficiently allows us to then develop the knowledge quality construct in contrast to information quality.

Although knowledge cannot be defined independently of information, it is not the same as information. Treating knowledge quality as essentially the same as information quality equates knowledge with information. In fact knowledge that demonstrates information-like characteristics is sometimes perceived to be of low value to knowledge users (Ford et al. 2005). Our approach is thus to identify dimensions of knowledge quality that are above and beyond

information quality. Whereas information derives from data embedded in context, knowledge captures meaningful interpretation of information that usually incorporates personal beliefs and values. For example, an accounting report generated using the bookkeeping software package QuickBooks represents an instance of information. In contrast, a decision, an idea, or a strategy formulated given such reports is intuitively closer to what people mean by knowledge.

One common approach regards knowledge as " information possessed in the mind of individuals: it is personalized information … related to facts, procedures, concepts, interpretations, ideas, observations, and judgments" (Alavi et al. 2001, p. 109). This perspective treats knowledge as information that has been combined with personal experience, interpretation and reflection and embedded in context (Davenport et al. 1998) and leads to the following implications.

First, knowledge derives from information and therefore cannot be defined independently of information. This principle of information dependency suggests that the knowledge versus information distinction should probably be treated as a continuum rather than a dichotomy. The continuum view of the knowledge-information distinction is consistent with the observation that once knowledge has been well established, widely accepted and commonly routinized, it also becomes more information-like. This also suggests that the status of being knowledge is highly subjective. The knowledge status is relative to the user's existing body of knowledge. Therefore, the status is established subjectively relative to expertise, and cannot be established purely based on independent and objective criteria.

The ambiguity inherent in the information versus knowledge distinction is apparent in the knowledge management literature. Authors refer to the same phenomenon as information in one situation and as knowledge in another. The act of contributing to corporate intranets has been

characterized as “knowledge sharing” in one context (Hollingshead et al. 2002), and contribution to “information commons” in another (Fulk et al. 2004) by the same group of researchers. In the same paper, Sussman and Siegal (Sussman et al. 2003) refer to the adoption of colleagues’ ideas as “knowledge adoption” and “information adoption” interchangeably. They also refer to the idea adoption process as “informational influence,” and use knowledge and information interchangeably on several occasions. Such practice is pervasive in the literature and reflects the challenge to clearly distinguish knowledge from information.

The approach taken here is to define knowledge quality in terms of both features that are relatively unique to knowledge objects and also features that knowledge has in common with information. Two features that are often associated with knowledge objects and less so with information are causal explanations and logical arguments, which are discussed below along with qualities that are desirable for both knowledge and information objects, such as novelty.

1.1.2.1 Conceptualizing Knowledge Quality

Again, as stated earlier, we broadly define knowledge quality here as the extent to which a knowledge object successfully serves the purposes of users (Kahn et al. 2002), wherein a knowledge object refers to an electronic document that uses symbols and media to represent ideas and concepts (Sprague 1995). First, we attempt to identify two dimensions that are unique about knowledge quality. A unique feature about knowledge objects is that they contain arguments (Sussman et al. 2003). A knowledge object, such as a proposed solution for a known problem, or a white paper that documents a best practice, usually contains a set of arguments that explain how the idea works. Arguments and explanations that are clear, accurate, and consistent make it easier to apply the knowledge for new tasks and in new contexts. Furthermore, one way

KMS differs from information systems is that KMS is usually designed to help users understand and assign meaning to the knowledge content provided by the system (Markus 2001; Stenmark 2002). Hence, the extent to which KMS content provides sufficient explanations that maximize user comprehension should be an important element of knowledge quality. Thus, argument quality, the degree to which arguments presented in a knowledge object are well constructed and believable (Sussman et al. 2003) can be considered as a dimension along which knowledge can vary in quality.

Another concept that is core to knowledge is causal ambiguity, the extent to which factors that cause the success or failure of an idea or practice cannot be determined with precision (Powell et al. 2006; Szulanski 1996; Szulanski et al. 2004). When the success of an idea is causally ambiguous, or when clear proof of the usefulness of the practice is difficult to obtain, knowledge is less accessible to users who want to apply it (Szulanski 1996). Consequently, causal ambiguity has often been argued as a source of competitive advantage (Lippman et al. 1982). However when the same effect occurs when members of the same organization attempt to apply knowledge and replicate proven practices, the impact of causal ambiguity becomes undesirable.

The third dimension of knowledge quality is novelty. Knowledge can be new, novel, different, unique and original. The content of knowledge management systems can contain opinions, ideas, and proposals that are the result of human creativity and that stimulate new thinking. In the literature on idea generation, the quality of ideas is often assessed in terms of their originality and uniqueness (Fern 1982; Garfield et al. 2001; Wierenga et al. 1998). Knowledge novelty captures the extent to which a knowledge object is perceived to be new, rare, or unique. When a

knowledge object demonstrates a higher level of novelty, it is more distinguishable from other knowledge, which in turn increases its value to potential users (Ford et al. 2005).

Finally, the principle of information dependence suggests that knowledge cannot be defined independently of information. Dimensions that are important in defining information quality, such as accuracy, completeness and concise representation (Rai et al. 2002; Wang et al. 1996), are still of high relevance in defining knowledge quality, although it is debatable how the information quality dimensions should be modified when they are used to measure knowledge quality (Pierce et al. 2006). John and Martin (1984) measure perceived quality of marketing research in terms of accuracy, completeness and consistency of the reports. We include information quality as one dimension of knowledge quality and define it as favorable or unfavorable characteristics of the currency, accuracy, completeness, relevance and reliability of information content (Nicolaou et al. 2006).

In the particular context of repository systems, the searchability of the knowledge objects stored in the system is very important for repository users. When keywords and other metadata are constructed well with high quality, knowledge objects can be more easily located and applied to create value. We hence include metaknowledge quality as a dimension of overall knowledge quality. Metaknowledge is a set of descriptors and identifiers of knowledge objects (Majchrzak et al. 2004). Hence we consider it a specific type of information and operationalize it based on information quality.

Taken together, repository content quality is conceptualized as a formative second-order construct that consists of five dimensions, as illustrated in Figure 2 below.

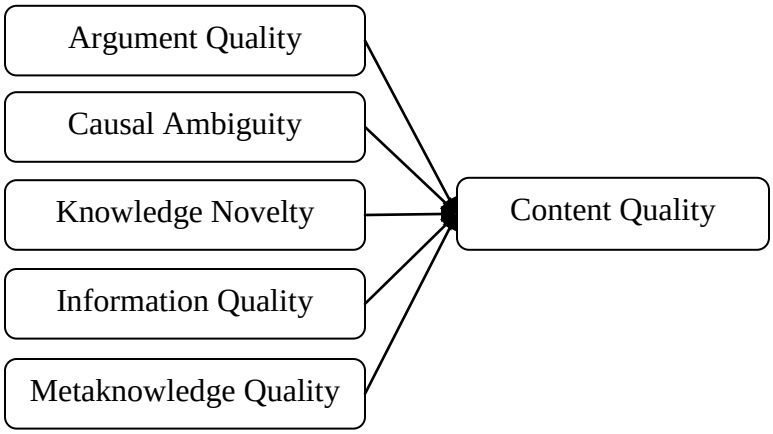

Figure 2. A Conceptual Framework of Repository Content Quality

1.1.3 Organizational Justice

We discussed earlier that KM practices in organizational settings can take place without linkage to direct rewards systems. Employees who share their knowledge through electronic repositories often receive no monetary benefits for their action. Similarly, employees who use knowledge repository content usually receive no tangible rewards for reusing the firm's knowledge assets. Most critically, contribution and use can be completely voluntary and not a mandatory part of the employees' job descriptions. When employee action is not tied directly to economic gains, mechanisms other than economic rewards much be in place to facilitate and encourage such action.

Organizational justice can be such a mechanism for supporting and sustaining KM processes (Kim et al. 1993; Kim et al. 1997; Kim et al. 1998). Research on organizational justice,

employee perception of equity or fairness in organizational settings, has evolved from equity theories (Adams 1963; Adams 1965; Walster et al. 1978) that focused on the fairness of resource allocation. More recently, the research has grown beyond resource allocation and included other sources of fairness perception, such as the extent to which organizational procedures are just, and whether employees are treated fairly during interactions with authority. It is important to note that justice refers to the employee's subjective understanding of whether events are just, as opposed to objective prescriptions of whether something ought to be just or not (Cropanzano et al. 2007). The subjective nature of organizational justice suggests that justice perception can vary among organizational members, and from one event to another.

We focus on organizational justice as the primary antecedent at the organizational level because it is particularly relevant in the discussion of knowledge refinement. Refinement as an organizational process can vary significantly in terms of its design, structure and supporting policies. These differences in process design may lead to differences in employee perception, which in turn can affect the extent to which the employee participates in KM efforts, including contribution, refinement, and use. Prior research has focused much on identifying individual motivational factors for KM participation (Bock et al. 2005; Wasko et al. 2005). These factors, while significant in explaining KM participation behavior or intention, are insufficient in explaining how the design of KM processes such as refinement would influence participation. The justice perspective allows us to examine one aspect of refinement design that may critically determine KM success.

Researchers have identified three components of organizational justice - distributive, interactive and procedural (Cropanzano et al. 2007; Greenberg 1990). Each of these components is

discussed below with respect to KM practices. This discussion illustrates why this research project focuses on procedural justice as an important factor influencing knowledge contribution, refinement and use.

1.1.3.1 Distributive Justice

Early research on organizational justice began with the concept of distributive justice, the fairness of resource or outcome allocation, based on equity theory (Adams 1963; Adams 1965). Equity theory specifies that individuals calculate the ratio of their perceived work outcomes to the amount of their perceived work inputs. This ratio is then compared to the corresponding ratio of a relative other, such as another organizational member. Feelings of inequity result when the two ratios are unequal. The person with the higher ratio is thought to feel overpaid and guilty, whereas the party with the lower ratio would feel underpaid and upset. These feelings of inequity, in turn, would motivate these individuals to take actions that would push the ratios to a more equitable state. For instance, the underpaid individual may reduce the amount of work inputs so that they are more in alignment with the amount of work outcomes he or she receives.

Recent work on distributive justice focuses on more than equity alone (Cropanzano et al. 2007). In addition to the need for equitable return for contribution, people also desire to be treated the same way as others are treated (i.e., equality), and to ensure that resources are allocated to those who need them the most urgently (i.e. urgency.) Common across these various forms of justice is the emphasis on the outcome, as opposed to the process, of an organizational decision. The outcome usually takes the form of either economic (i.e. monetary returns) or socioemotional (i.e., status symbols) compensations.

The role of distributive justice in KM practices depends much on how rewards systems are configured for KM participation. As participation in knowledge management systems is often voluntary in organizational settings, no tangible rewards are specifically linked to the extent of participation. Less tangible rewards such as enhanced reputation may be an important motivation for KM participation (Wasko et al. 2005), these rewards are not necessarily promised by a managerial decision making process, and therefore may not influence the employee's level of justice perception. On the other hand, when no rewards systems are established, employees who are uncertain about the amount of outcome they would receive in return for sharing their knowledge may hoard their more valuable knowledge to protect their self interests (Davenport et al. 1998). Knowledge hoarding can be more common in organizations where the perception of distributive justice is low.

When explicit rewards systems are in place for KM participation, distributive justice can play a potentially critical role in determining the success, or failure, of KM efforts. As KM success often depends on the quality, rather than the quantity, of participation, establishing equitable distribution based on participation quantity could be problematic. Xerox had to discontinue further implementation of its rewards program for knowledge contribution because the process of refining the vast volume of contribution motivated by the rewards program became cost-prohibitive (Boucher 2007). Similarly, when a consulting firm established a rewards program for knowledge use, they did not realize that this equitable distribution policy encouraged knowledge use that hurt consultants' performance (Haas et al. 2005). On the other hand, KM efforts are unlikely to succeed without distributive justice. When employees suspect that using knowledge contributed by internal rivals within the same organization may benefit the rivals

more so than themselves, they may decide to ignore valuable insights from their internal rivals and favor those from external rivals instead (Menon et al. 2003; Menon et al. 2006).

To summarize, distributive justice should definitely play a critical role in KM practices. Both knowledge contributors and knowledge users can be sensitive to the level of distributive justice around KM practices. Efforts to motivate effective contribution and usage are unlikely to be successful without distributive justice. However, distributive justice alone cannot guarantee a successful KM program. Equitable distribution based on quality, rather than quantity, of KM participation is more likely to bring about desirable outcomes.

1.1.3.2 Interactional Justice

Interactional justice concerns the extent to which one is treated fairly when interacting with decision authorities (Colquitt et al. 2001). Usually interactional justice applies to situations where employees conduct one-on-one transactions with decision makers (Cropanzano et al. 2007). In contrast, knowledge contribution and use often involve generalized social exchange where employees share their knowledge with coworkers they may or may not know in person, and use knowledge shared by others that, again, they may or may not know (Wasko et al. 2000). Interpersonal interactions are even less likely when contribution and use are mediated by electronic repositories. Therefore, the relevance of interactional justice in KM contexts may be limited unless direct interaction with decision authors becomes more prominent.

1.1.3.3 Procedural Justice

Researchers began to examine justice perceptions about organizational processes as opposed to outcomes (Thibaut et al. 1975) when they noticed low employee satisfaction despite favorable

outcomes. Empirical reports detail many instances in which employees express frustration even though they received the tangible compensations they desired (e.g., Kim et al. 1997). Organizational justice was thus theorized to contain an additional component – procedural justice (Thibaut et al. 1975). Procedural justice concerns the fairness of the procedure used to allocate outcomes, as opposed to the fairness of the outcomes themselves (Thibaut et al. 1975).

Organizational members evaluate the fairness of a procedure based on a variety of procedural elements, such as decision maker selection, ground rules for evaluating rewards, information gathering methods, how the decision process is defined, how appeals are handled, prevention of power abuse, and formal change mechanisms (Leventhal 1976; Leventhal 1980; Leventhal et al. 1980). This suggests that the method through which a decision is made is probably as important as the decision itself in creating a sense of fairness.

Several meta-analysis studies have revealed that the impact of procedural justice perceptions is significant in several ways. First, procedural justice strongly predicts employee trust in management or the organization (Colquitt et al. 2001). Moreover, procedural justice perceptions enhance employee commitment to the organization, particularly affective commitment (Cohen-Charash et al. 2001). Finally, justice enhances organizational citizenship behaviors (OCBs), employee actions that go above and beyond the call of duty (Organ 1988). Particularly, employees who are treated with justice are more likely to behave altruistically towards coworkers, support company policies, and act conscientiously (Cohen-Charash et al. 2001). As trust, commitment, and organizational citizenship behaviors are all important for KM projects, these benefits suggest that procedural justice could be quite relevant in KM contexts.

As KM practices involve more elaborate processes for decision making, procedural justice could become an increasingly important success factor. The process of knowledge refinement, for instance, is a procedure that decides whether contributed content becomes available for use, or in what form the contributed content would appear for use. How the refinement process is designed, therefore, could impact the degree of perceived procedural justice, which in turn may influence how employees participate in KM projects and the extent of their participation.

The present study focuses on the role of procedural justice in KM for several reasons. First, our interest in the knowledge refinement process makes procedural justice particularly relevant. Refinement is inherently an organizational process, and the extent to which it is perceived to be just could critically determine how organizational members interact with KM systems. Specifically, procedural justice could influence the degree to which employees trust the content of knowledge repositories for their own use, and how much employees are committed to share knowledge and help coworkers out. Distributive justice and interactional justice are less relevant in comparison. As refinement does not necessarily lead to tangible or immediate reward outcomes, it is not clear how distribution equity or equality can be defined in this context. Similarly, refinement does not necessarily involve the interaction between the employee and the decision maker, the concept of interactional justice does not necessarily apply. It is possible that, in some organizations, refinement and KM practices in general involve resource distribution and employee-management interaction. The concepts of distributive and interactional justice, therefore, would be relevant in those contexts. For the purpose of the present study focusing particularly on the knowledge refinement procedure, we believe procedural justice provides an appropriate theoretical vehicle for understanding the role of organizational justice in KM.

Therefore, the remaining discussions will focus on the procedural justice dimension as part of the theory development.

The following chapters develop a theoretical framework to conceptualize various factors, at organizational and dyadic levels, that influence the initial and refined knowledge quality as part of the refinement process, and the extent of knowledge use. Specifically, the theoretical development will elaborate the relationship among these key constructs as illustrated in Figure **3**.

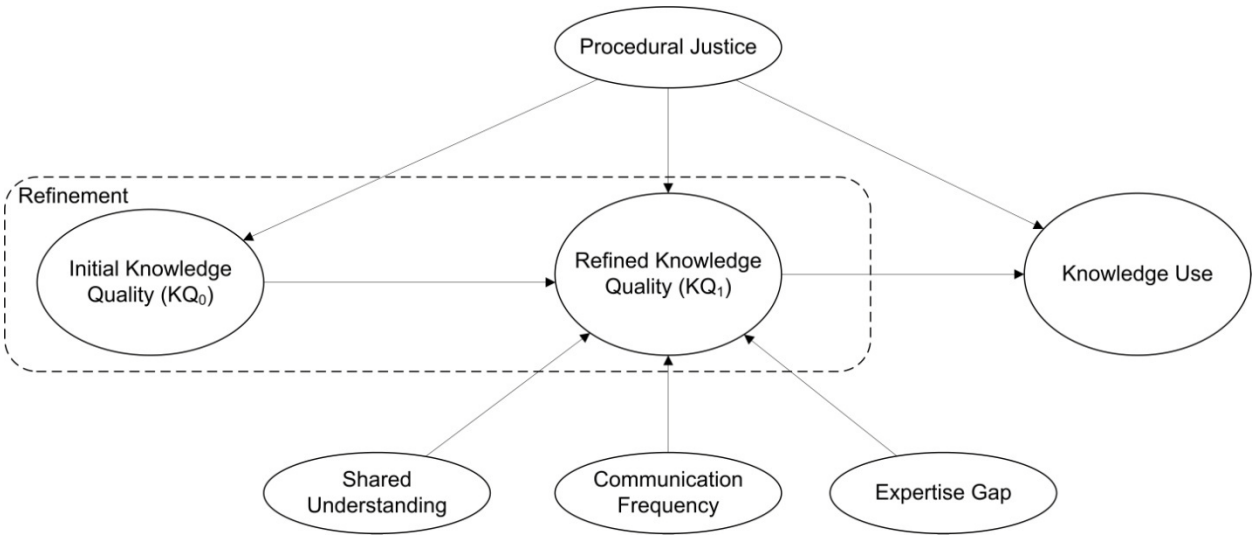

Figure 3. Summary of Research Framework

2.0 PROCEDURAL JUSTICE AS AN ORGANIZATIONAL ANTECEDENT TO KNOWLEDGE CONTRIBUTION

This chapter examines why and how procedural justice influences knowledge contribution. Justice or fairness perceptions constitute an important aspect of organizational climate, a set of perceptions shared by individuals in the same organization or a set of measurable conditions specific to a particular organization (Denison 1996; Muchinsky 1976). Organizational climate can significantly facilitate or deter KM efforts (Alavi et al. 1999; Alavi et al. 2001; Bock et al. 2005; Durcikova 2004; Huber 2001). For instance, Goodman et al. (1996) documented an anti-learning organizational climate in which errors are punished, knowledge sharing is discouraged, and experimentation is considered a waste of time. In contrast, employees who perceive a high level of fairness in the organizational climate are more likely to share knowledge and help others beyond their call of duty (Kim et al. 1997). Empirical studies have reported that organizational climates characterized by fairness (Bock et al. 2005; Durcikova 2004), innovativeness (Bock et al. 2005; Durcikova 2004), and affiliation (Durcikova 2004) are more likely to promote knowledge sharing and use.

Theoretical explanations of the relationship between organizational climate and KM participation, however, are much less common than empirical findings. In particular, the mechanism underlying the impact of fairness perceptions as a component of organizational

climate on KM participation still needs to be clarified. We are particularly interested in how the fairness of the refinement procedure affects knowledge contribution. Administrative procedures represent an important element of an organization's climate (Koys et al. 1991). Studying the fairness perceptions of refinement procedures, therefore, will significantly enhance our current understanding of the relationship between organizational climate and KM.

2.1 FACTORS THAT INFLUENCE KNOWLEDGE CONTRIBUTION

Making a contribution to a knowledge repository in an organizational context represents a voluntary action to make discretionary knowledge available for others to access (Olivera et al. 2008). It is often the case that the individual is not given a specific problem to solve or requested for help. Rather, the problem is discovered and a creative solution is generated on a voluntary basis (Unsworth 2001). These characteristics of knowledge contribution indicate that they are a form of organizational citizenship, or extra-role, behavior.

Sharing knowledge through a repository has often been conceptualized as a public goods problem (Fulk et al. 2004; Hollingshead et al. 2002; Kankanhalli et al. 2005). Public goods are non-rivaled and non-excludable. Therefore, sustaining a collection of public goods is challenging because non-contributors cannot be excluded from benefitting from the good. From a purely economic view, non-contributors have strong incentive to free ride on the contribution of other members (Hardin 1968; Olson 1965).

The question as to why individuals share discretionary knowledge despite an apparent lack of economic incentive has attracted much attention in KM research (Fulk et al. 2004; Kankanhalli

et al. 2005; Olivera et al. 2008; Wasko et al. 2005). Researchers have investigated a wide range of motives for knowledge contribution. Findings on the relationship between contribution motives and contribution levels, however, have been widely inconsistent. For instance, the desire to achieve better reputation is positively associated with contribution level in one study (Wasko et al. 2005) but the relationship is non-significant in another (Kankanhalli et al. 2005). Conversely, in the same studies, the desire to help others is positively related to contribution levels in one context (Kankanhalli et al. 2005) but not in another (Wasko et al. 2005). Strong theoretical predictions often receive weak empirical support. For example, social exchange theory (Blau 1964) is commonly invoked to predict a positive relationship between reciprocity and contribution level. Nevertheless, empirical research has failed to support this conjecture (Kankanhalli et al. 2005; Wiertz et al. 2007). A summary of representative studies of contribution motives and the quality or quantity of contribution is presented in Table 1.

Table 1. Summary of Selected Research Findings on Determinants of Knowledge Contribution

Dependent Variable	**Independent Variable**	**Finding**	**Source**
Self-Oriented Motivation			
Contribution quantity	Loss of power	ns	(Kankanhalli et al. 2005)
	Extrinsic reward	sig.	(Kankanhalli et al. 2005)
	Image /reputation	ns	(Kankanhalli et al. 2005)
		sig.	(Wasko et al. 2005)
Contribution quality	Image /reputation	sig.	(Wasko et al. 2005)
		weakly sig.	(Constant et al. 1996)
Self Resources			
Contribution quantity	Effort	ns	(Kankanhalli et al. 2005)
	Self-efficacy	sig.	(Kankanhalli et al. 2005)
	Expertise	ns	(Wasko et al. 2005)
	Experience (Tenure)	sig.	(Wasko et al. 2005)
Contribution quality	Expertise	ns	(Wasko et al. 2005)
	Experience (Tenure)	ns	(Wasko et al. 2005)
Other-Oriented Motivation			
Contribution quantity	Helping	sig.	(Kankanhalli et al. 2005)
		ns	(Wasko et al. 2005)
	Reciprocity	ns	(Kankanhalli et al. 2005)

		ns	(Wiertz et al. 2007)
		ns	(Peddibhotla et al. 2007)
Contribution quality	Helping	weakly sig.	(Wasko et al. 2005)
		ns	(Constant et al. 1996)
	Reciprocity	ns	(Wasko et al. 2005)
		sig.	(Peddibhotla et al. 2007)
		ns	(Wiertz et al. 2007)
Commitment			
Contribution quantity	Commitment to community	ns	(Wasko et al. 2005)
		sig.	(Wiertz et al. 2007)
		ns	(Kankanhalli et al. 2005)[2]
	Commitment to firm	ns	(Wiertz et al. 2007)
Contribution quality	Commitment to community	sig.	(Wiertz et al. 2007)
		sig. (-)	(Wasko et al. 2005)
	Commitment to firm	sig. (-)	(Wiertz et al. 2007)
Network			
Contribution quantity	Centrality	sig.	(Wasko et al. 2005)
Contribution quality	Centrality	sig.	(Wasko et al. 2005)

ns = not statistically significant; sig. = statistically significant; sig. (-) = negatively significant statistically

Inconsistencies are clearly demonstrated in Table 1 and they illustrate a need for new approaches and perspectives in understanding knowledge contribution. One way to explain the inconsistencies in the literature is that contribution motives may be linked to contribution quality as opposed to quantity. A cursory review of Table 1 appears to show that contribution motives predict quality of contribution more consistently than they predict quantity of contribution. However drawing this conclusion can be premature as the number of reported studies is rather small, and, unlike contribution quantity, quality measures are usually operationalized differently across studies. Another way to shed light on this phenomenon is to understand potential processes that could moderate or mediate the bivariate relationship between motivational factors and knowledge contribution (Olivera et al. 2008). This research focuses on the way perception of

[2]Even though the construct is labeled as identification by Kankanhalli et al. (2005), the measurement items reflect predominantly the construct of affective commitment (Allen and Myer, 1990)

the contribution environment (e.g., management of the repository) influences knowledge contribution.

As discussed earlier, contributing to a corporate repository is in some ways very much like contributing to a common good (Fulk et al. 2004). The critical social dilemma of maintaining a common good stems from the principle that everyone can benefit from the common good whether a given individual has made a contribution or not. The motivation to free ride is logically much greater than the motivation to give. Despite the apparent lack of economically-rational incentives to contribute, certain individuals nevertheless decide to take the action of contributing to the common good. One theory focuses on self-interests, arguing that individuals are more likely to contribute to the common good when they perceive a positive gain from contributing (Fulk et al. 2004; Olivera et al. 2008). To perceive a positive gain, the value of contributing to the common good must outweigh the cost of such an act.

This self-oriented perspective is in sharp contrast to the social view that knowledge contribution occurs as a function of the individual's relationship with a collective (Wasko et al. 2005). Within an organizational context, people often develop strong sense of affiliation, obligation and identification with the immediate groups and the broader organization. This affective relationship with the social groups motivates individuals to act in the group's interests above and beyond pure self interests or the call of duty. Commitment to the organization, in particular, has been examined with respect to knowledge contribution (Kankanhalli et al. 2005; Wasko et al. 2005; Wiertz et al. 2007). These two theoretical perspectives are explored here with respect to contribution quality.

2.2 SELF INTEREST: VALUE

Although contributing to a common good is often characterized as costly, the individual can actually derive various kinds of value from such an act. In an organizational setting, contribution can bring both tangible and intangible rewards. In contrast to classic forms of public goods such as clean air, where no clear association between the good and the source of the good is easily available, the origin of a contribution to a corporate repository is often clearly and prominently labeled. When the contribution is perceived as useful to other members who consume the public good, the contributor may receive higher status and reputation in return. Individuals pursuing more visibility and recognition in their professions are more likely to seek such intangible reward by making a contribution (Fulk et al. 2004).

One of the commonly-cited reasons for contributing is the desire to be visible in a community (Butler 2002). Visibility payoffs are particularly significant when the contribution provides greater insights (Subramani et al. 2004). When participants have innovative ideas to solve a particularly difficult problem, sharing such ideas can create value to the contributor by enhancing the idea owner's status and reputation. Being known for originating good ideas can enhance the idea owner's prestige in the profession (Kollock 1999), which can bring tangible benefits such as monetary rewards or career advancement (Roberts et al. 2006).

The value of contribution can also be utilitarian. Sharing work practice knowledge in a repository can add value because not only can others consume the contribution, the contributor himself or herself can also derive benefit from using this knowledge in the future. In other words, codifying knowledge can increase the reuse value of the knowledge (Markus 2001). For

example, participants in Fulk et al.'s (2004) study on organizational intranet contribution indicated that they saved time and effort by contributing, most likely because they could reuse the knowledge in the future. They can also direct their colleagues to the appropriate content as opposed to having to recreate answers repeatedly.

When an electronic repository is implemented with a refinement process, not all contributions will bring the expected value to the contributor. Rather, only contributions that exceed the quality standards established by the refinement process will be included in the repository. The anticipated value created by knowledge contribution is realized only when the contribution is accepted via the refinement process. Therefore, if the contribution is driven by self-oriented value such as status or reputation gains, the contributor should be motivated to maximize the quality of the knowledge contribution.

2.3 SELF INTEREST: COST

Contributing to a corporate repository involves some degree of effort. Explicating and articulating ideas can be quite effortful, and the level of expected effort is likely to vary across individual contributors (Fulk et al. 2004). In the context of contributing new ideas and solutions to a repository, the extent of effort is particularly significant when the act of contribution represents an extra-role behavior initiated outside of the contributor's normal range of work responsibilities. When the nature of the contributor's primary responsibilities is distant from the act of knowledge contribution, contribution is not simply making available and sharing work products that are already completely compiled and is likely to create a substantial level of

perceived cost (Fulk et al. 2004; Shapiro et al. 1999). Managers report the lack of time as a primary reason for non-contribution to corporate repositories (Goodman et al. 1996), especially when the topic is complex to articulate. The amount of effort the potential contributor is willing to invest in the codification process, therefore, is likely to affect the quality of the contributed product. Specifically, if the contributor takes significant time and effort to articulate and codify an idea, the quality of the contribution would be higher compared to the situation where the contributor invests little conscious effort in the codification process. Time investment in codification increases the quality of the knowledge contribution. However, at the same time the investment also makes contribution a more costly endeavor for the contributor.

Although contribution cost in terms of codification effort has failed to predict contribution quantity (Kankanhalli et al. 2005), it may be related to the quality of the knowledge contribution. Codifying ideas for others to use effectively requires awareness of private knowledge unavailable to others, and the commitment of energy and effort to articulate relevant assumptions and contextual information that facilitates the success of implementing these ideas by others (Markus 2001). Prospective contributors, nevertheless, vary in terms of how much effort they invest in constructing knowledge objects for effective reuse. Authors who invest more time in packaging and refining knowledge objects for reuse incur a higher level of contribution cost.

Higher levels of effort and attention invested in the codification process often discourage people from performing this task, decreasing the likelihood of making a contribution (Fulk et al. 2004). However, when a prospective contributor decides to engage in the codification process despite the perceived contribution cost, more attention and time involvement should lead to knowledge objects with more comprehensive and accurate information content, when all other factors such

as the complexity of the knowledge is held equal. Conversely, authors who experienced little contribution cost may have felt so because of the relatively lower time investment in polishing and revising the information content. Such a lack of time investment could potentially increase the number of visible errors such as misspellings, which negatively affects quality perceptions (Molich et al. 1990).

When contribution represents a costly act, the likelihood that the contributor will enjoy a positive gain, where gain is value (e.g., increased reputation) minus cost (Fulk et al. 2004), is diminished, and the risk of suffering a negative gain increases. In this case, potential contributors are more likely to be cautious when deciding whether to contribute or not (Fulk et al. 2004). Consequently, they would also be more selective in what they contribute when the perceived cost level is high. On the other hand, when contribution involves minimum effort, the potential contributor has considerably less motivation to engage in a systematic decision making process to evaluate the potential payoffs and to determine if the contribution is worthwhile.

2.4 SOCIAL INTEREST: ORGANIZATIONAL COMMITMENT

Organizational members are likely to volunteer knowledge contribution if they are committed to the organization for which they work. The sense of organizational commitment develops as a result of social exchanges with the organization (Coleman 1990), and represents a link between the organizational member to the organization that decreases the likelihood of the member switching to a different organization (Allen et al. 1990).

Members are committed to an organization for different reasons. Some are committed because the perceived cost of switching to an alternative organization is high. Others are committed because they believe that it is their responsibility to be committed to their workplace. The most relevant form of commitment in the discussion of knowledge contribution, however, is affective in nature. When a member develops an affective attachment to the organization, he or she is more involved in the organization, and derives more enjoyment from membership in it. This emotional engagement with the organization, in turn, increases the member's sense of obligation to the organization and willingness to help others who share the same membership. Making quality knowledge contributions is one way that members can express their commitment to the organization (Constant et al. 1996; Wasko et al. 2000; Wasko et al. 2005).

2.5 PROCEDURAL JUSTICE OF THE REFINEMENT PROCESS

When a knowledge repository is implemented with a refinement process, knowledge contribution is the subject of refinement decisions. Authors make contributions knowing that their efforts will be evaluated with the risk of potential rejection for publication. Thus, the decision to contribute may be determined not just by the author's motives, but also by his or her perception of the refinement process. One of the main questions an author may ask is whether the process is fair.

Fair processes are important managerial tools that influence organizational outcomes (Kim et al. 1997). The concept of fairness, or justice, has been examined extensively in the organizational justice literature (Greenberg 1987; Greenberg 1990; Leventhal 1980; Lind et al. 1988; Thibaut et al. 1975). Procedural justice, in particular, refers to the perceived level of fairness of procedures

used in decision making (Lind et al. 1988). In contrast to distributive justice, which concerns the fairness of the outcome of a decision, procedural justice focuses specifically on the fairness of the decision process independent of the outcome of such process.

The organizational justice literature shows that justice perceptions have significant impact on how people behave in organizations. Fairness perceptions promote organizational citizenship behavior, such as interpersonal helping and individual initiative (Moorman et al. 1998; Organ et al. 1993). Contribution to a knowledge repository has been characterized as an altruistic helping behavior (Kankanhalli et al. 2005), and therefore can be considered as a form of organizational citizenship behavior (Constant et al. 1996). It is often an extra-role behavior because repository contribution is commonly voluntary rather than mandatory in performance evaluation. If fairness perceptions promote organizational citizenship behavior, fairness in KM processes should presumably promote knowledge contribution behavior. In other words, if the process through which repository contribution is judged as fair, individuals are more likely to initiate the extra-role behavior of knowledge sharing through a repository.

When individuals feel that they are treated fairly by a group and its authority, they feel more respect from the group members, and they take more pride in being a member of the group. These feelings of pride and respect, in turn, motivate individuals to go beyond the call of duty, and to take action that serves the group's interests in addition to their personal interests (Tyler et al. 1996), such as the extra-role behavior of knowledge contribution. Indeed, procedural justice perceptions have been consistently linked to organizational citizenship behavior that involves discretionary and extra-role actions to promote organizational effectiveness (Podsakoff et al. 2000; Tepper et al. 2003).

Procedural justice is critical for building successful repositories. When organizational members feel they are treated fairly, they develop more positive affect (Tyler 1994), such as trust in management (Chen et al. 2004; Kim et al. 1993) and commitment to a group or organization (Colquitt 2001; Kim et al. 1993; Masterson et al. 2000). These positive attitudes towards the organization as a result of fair process perceptions are crucial in developing voluntary cooperation in knowledge workers (Kim et al. 1993; Kim et al. 1997; Kim et al. 1998). Getting organizational members to contribute to a knowledge repository depends vitally on such voluntary cooperation as "creating and sharing knowledge are intangible activities that can neither be supervised nor forced out of people" (Kim et al. 1997, p.71). Therefore, when procedural justice is exercised, organizational members feel that their knowledge and expertise receive intellectual and emotional recognition. Such recognition not only helps individuals protect their self interests, it also supports their commitment to the group or organization. As people receive intellectual and emotional recognition, they become more willing to share knowledge and less likely to hoard their unique expertise (Kim et al. 1993). An empirical study of knowledge sharing provides support for the positive impact of an organizational climate characterized by fairness on organizational members' intention for knowledge sharing (Bock et al. 2005). Based on these ideas, the following hypothesis is developed:

Hypothesis 2 (H2): Perceived procedural justice leads to higher levels of initial knowledge quality (KQ_0).

3.0 ORGANIZATIONAL AND DYADIC DETERMINANTS OF REFINEMENT EFFECTIVENESS

Chapter 2 discussed how fairness of the knowledge refinement process may affect the quality of knowledge contributed by employees. The refinement process is supposed to improve upon the quality of these initial contributions. What factors determine the effectiveness of the refinement process? This chapter discusses several factors at the organizational and dyadic levels that may determine refinement effectiveness.

Knowledge refinement refers to the process of evaluating, analyzing and optimizing the knowledge object to be stored in a repository (Alavi 2000; Cho et al. 2008; Markus 2001; Qian et al. 2005; Zack 1999), supporting the knowledge creation process of externalization, the articulation of tacit knowledge into explicit forms (Nonaka 1994). With knowledge refinement modeled as a collaborative process (discussed in Chapter 2), the next step is to seek theoretical explanations of knowledge refinement effectiveness.

Knowledge refinement is a complex process that involves multiple activities – selection, evaluation, improvement, etc. Different organizations often implement their knowledge refinement processes differently. However, the ultimate objective of these activities remains singular, which is to optimize the quality of the knowledge object for the target users. The effectiveness of the knowledge refinement process, from the user's perspective, can be

considered as the extent to which the refinement process contributes to quality assessments by the target users. Specifically, the extent to which the initial contribution quality (KQ_0) is increased to the final knowledge quality (KQ_1) represents the effectiveness of the knowledge refinement process.

3.1 ORGANIZATIONAL-LEVEL FACTOR - PROCEDURAL JUSTICE

Procedural justice, in the context of knowledge management, describes the extent to which the knowledge refinement process is perceived to be fair. Because procedural justice represents the degree to which the process, rather than the outcome, is perceived to be fair (Lind et al. 1988), its magnitude should predict the effectiveness of the refinement process. A fair process for reviewing and improving knowledge contribution may not necessarily produce outcomes that are favorable to a particular author, refiner, or user. However, the refinement process, if it is fair, should produce outcomes of maximal utility to the community to which it serves. In other words, procedural justice of the knowledge refinement process should positively enhance the quality of refined knowledge, or KQ_1:

Hypothesis 3 (H3): Procedural justice leads to higher levels of refined knowledge quality (KQ_1).

3.2 DYADIC-LEVEL FACTORS - SHARED UNDERSTANDING, COMMUNICATION FREQUENCY, AND EXPERTISE GAP

3.2.1 Shared Understanding

Shared understanding is defined here as the extent to which the refiner and the author dyad share a common knowledge base and comprehension with respect to the knowledge target of the refinement process (Gerwin et al. 1997; Ko et al. 2005; Nelson et al. 1996). Shared understanding is crucial for collaborative work. However, when teams from different backgrounds work together, the differences in their functional knowledge base and conceptual perspectives often create tension that prevents them from collaborating effectively (Gerwin et al. 1997; Nelson et al. 1996). This lack of shared understanding forms barriers for collaboration partners to appreciate the unique value of team partners' contribution and to develop synergy among team members (Nelson et al. 1996). Empirical studies of collaborative work have consistently demonstrated the importance of shared understanding in team performance (Gerwin et al. 1997; Ko et al. 2005; Nelson et al. 1996).

To the extent that the refinement process represents a collaborative effort between a refiner and an author, the level of their shared understanding should influence the effectiveness of their collaborative effort to optimize the quality of the author's contribution. Collaboration in new product development, for example, depends critically on the level of shared understanding among otherwise autonomous teams (Gerwin et al. 1997; Wheelwirght et al. 1992). The development of a knowledge object for repository storage is similar to new product development in two ways. First, like the creation of a new physical product, the creation of a new idea

involves a certain level of ambiguity in terms of what the end product should be. Participants in the creation process must reduce the level of ambiguity through constant negotiation and communication. A shared understanding provides a common framework that helps the participants make decisions and resolve discrepancies more effectively (Wheelwright et al. 1992). Secondly, the criteria for success involve a certain level of subjectivity for both product and idea creation processes. What constitutes a successful new product or idea can be debatable. When collaborative partners in product development lack a shared understanding, disagreement is more likely to occur, which may require intervention by management that reduces the autonomy of the collaborative partners and consequently the development team's performance (Gerwin et al. 1997).

Existing literature presents some preliminary evidence that shared understanding improves knowledge refinement effectiveness. In a laboratory experiment, Cho et al. (2008) demonstrated that when the refiner and the author are more similar in their levels of expertise, the quality of the refined knowledge, in terms of idea novelty, logical rigor and structural flow, is rated much higher in quality by experts than when the refiner has significantly much more expertise than the author does[3]. Therefore,

Hypothesis 4 (H4): Shared understanding leads to higher levels of refined knowledge quality (KQ_1).

[3] The role of expertise similarity (or gap) between the author and the validator will be elaborated more in section 3.4.

3.2.2 Communication Frequency

Collocated work environments benefit tremendously from the amount of trust and mutual influence developed over time through frequent interactions (Nelson et al. 1996). However, these relationship-based factors may be less relevant in the context of electronic repositories. Authors and refiners who support an electronic repository might have little or no prior experience working together. Knowledge contribution and refinement represent a form of computer-mediated collaborative work between organizational members who otherwise may not work together on a regular basis.

Specifically, the refinement process often involves frequent interactions and multiple iterations between the refiner and the author (e.g., Cho et al. 2008). Sharing an idea through a knowledge repository is a process of externalization which involves the conversion of tacit knowledge into an explicit format (Nonaka 1994). The product of externalization is often less than optimal because the owner of the idea may not be able to effectively convey the full range of information that someone else lacking the same expertise needs in order to understand and apply the same idea. The refinement process, therefore, often involves communication between the refiner and the author in an attempt to fully explicate relevant information needed to codify the idea comprehensively. Frequent communication allows the refiner to clarify the author's intended perspective and to establish a more accurate understanding of the submitted idea. In other words, communication frequency should improve the effectiveness of knowledge refinement:

Hypothesis 5 (H5): Communication frequency leads to higher levels of refined knowledge quality (KQ_1).

3.2.3 Expertise Gap

In addition, the refiner needs to understand the author's view before she or he can help the author communicate the idea to the target audience. This task becomes particularly challenging when the refiner and the author differ significantly in their levels of expertise (Cho et al. 2008). A significantly large expertise gap makes communicating and articulating knowledge extremely difficult, as a large expertise gap reduces the expert refiner's ability to understand the non-expert contributor's perspective (Hinds et al. 2003), which in turn compromises the establishment of common ground for collaborative work. In contrast, two parties with more similar levels of expertise can establish a common understanding more easily, which allows the refiner to facilitate the author in the codification process more effectively. This effect has been demonstrated empirically in an experimental setting (Cho et al. 2008). We anticipate the same effect in the refinement process in a field setting. In the knowledge refinement literature, the refiner is usually more expert than the contributor (Markus 2001; Zack 1999). However the same impact of the expertise gap on the development of shared understanding should be expected whether the refiner or the author is more expert than the other. Therefore, we anticipate the negative impact of the expertise gap on refinement effectiveness in both directions.

Hypothesis 6 (H6): Expertise gap between the author and the validator (in either direction) leads to lower levels of refined knowledge quality (KQ_1).

4.0 DETERMINANTS OF KNOWLEDGE USE

The previous chapters represent theoretical attempts to articulate how aspects of the refinement process affect and improve the quality of knowledge contributions. This chapter describes an attempt to understand how the refinement process drives usage behavior. The chapter begins with a discussion of usage behaviors relevant in the context of electronic repositories. Then a theoretical model that links refinement factors to knowledge use is presented.

4.1 KNOWLEDGE USE

In order to be successful, organizations must realize the value of the unique information and knowledge assets they possess. The ultimate goal of knowledge management is to achieve this ambition by maximizing the use and application of knowledge resources (Alavi et al. 2001). Frameworks of KM success commonly include knowledge use as one of the important success factors for KMS (Kulkarni et al. 2006-7; Qian et al. 2005; Wu et al. 2006). First, as DeLone and McLean (1992, p. 66) argue, “the use of information system reports, or of management science/operations research models, is one of the most frequently reported measures of the success of an information system or an MS/OR model.” The output reports available from KMS are knowledge objects. The extent to which these knowledge objects are used and applied for work, therefore, inherently defines the success of a KMS. Moreover, creating and maintaining

systems such as knowledge repositories is a costly endeavor (Markus 2001). KMS pays off economically only when people are motivated to retrieve the content and apply it to their activities, or more importantly, to novel contexts or new tasks, as knowledge yields increasing returns only through use (Romer, 1994). Similarly, knowledge contributed and shared by organizational members increases productivity and lowers production costs only when it is implemented and used (Arthur et al. 2005).

Usage in the IS literature is most frequently discussed in terms of individual-level systems use (Barki et al. 2007; Burton-Jones et al. 2007; Burton-Jones et al. 2006), or the "individual user's employment of one or more features of a system to perform a task" (Burton-Jones et al. 2006, p. 231). Research on systems usage highlights the importance of examining the interactions among the individual user, the information system, and the contextual task. Building upon this framework for conceptualizing usage, the effort to define and operationalize knowledge use here focuses on these elements as they are applicable to knowledge application: the individual user, the knowledge, and the contextual task. Specifically, Burton-Jones et al.'s (2006) work provides a guideline for the conceptualization of knowledge use discussed below. The section develops a definition of knowledge use and specifies the structure of the knowledge use construct with elements relevant to this research context.

4.1.1 Conceptualizing Knowledge Use

Usage in the information systems literature is a widely used dependent variable that has rarely been examined rigorously until recently (Barki et al. 2007; Burton-Jones et al. 2006). Similarly, knowledge use has been discussed as an important dependent variable in the KM literature

(Alavi et al. 1999; Alavi et al. 2001; Gold et al. 2001), measured in empirical studies (Durcikova 2004; Gray et al. 2005), but has received rather little theoretical investigation. This section attempts to synthesize the current literature on knowledge use and develop a theoretical framework for better understanding this concept.

Knowledge use can be conceptualized and measured along several different dimensions. Quantitative measures such as frequency of use, number of reports accessed or used, time spent on reports (Szajna 1993), and citation counts (Hamilton et al. 1982) provide an objective assessment of knowledge use. However, such measures are highly dependent upon system usage (Burton-Jones et al. 2006) or official attribution and exclude situations in which knowledge is used independently of system usage or without explicit recognition. For example, a service technician may discover a new solution by accessing a knowledge repository once, but later on proceed to use the knowledge repeatedly without accessing the repository. As DeLone and McLean argue (2003), "simply saying that more use will yield more benefits without considering the nature of this use (and context) is clearly insufficient."

These empirical limitations suggest that KM research would benefit from going beyond objective measures, and considering a broader range of type and extent of use (Menon et al. 1992). In the knowledge management literature, knowledge use has been examined perceptually in several different ways. Sussman and Siegal (2003) study the decision to adopt knowledge (that leads to actual use), while other scholars examine frequency and degree of actual use (Arthur et al. 2005; Haas et al. 2005; Kulkarni et al. 2006-7; Zimmer et al. 2007-8). Markus (2001) focuses on congruent use of knowledge for replicating the results, examining various use scenarios that differ in terms of the degree to which the knowledge user shares the source's knowledge and

expertise, and whether they collaborate on the same project or not. Majchrzak and Faniel (Faniel et al. 2007; Majchrzak et al. 2004) on the other hand have examined incongruent knowledge use largely for innovating new products and processes. Similarly, Gray and Meister (2006) examine the outcome of knowledge sourcing in terms of behavioral replication, adaptation, and innovation. These dimensions reflect a predominant emphasis on the tangible impact of accessing and using repository content.

Moreover, knowledge workers consider advice or technical content they receive from colleagues to be useful, even when the information does not solve the problem the information is intended to address (Constant et al. 1996). Similarly, the value of the information rated by these knowledge workers has no relationship to whether the information solves a problem (Constant et al. 1996). This suggests that knowledge users find value and use of the knowledge they consume in ways that are much broader than problem solving. Even when the knowledge does not make a direct impact on their tasks, they derive positive gain in some way from obtaining and applying the knowledge.

To integrate these diverse perspectives on knowledge use, we turn to the knowledge utilization literature for a more comprehensive conceptual framework. Knowledge utilization has commonly been discussed along three dimensions: behavioral use, conceptual use, and affective use (Diamantopoulos et al. 1999; Menon et al. 1992). Behavioral use occurs when changes in user behavior, decisions and practices occur directly as a result of a knowledge object. Behavioral use can be congruent, in which case the knowledge is used exactly as presented. More commonly, behavioral use is incongruent, in which case knowledge is adapted when used to fit the user's specific needs (Larsen 1985). Conceptual use occurs when the user's knowledge

and understanding of an issue changes, usually enhanced, as a result of a knowledge object. The impact of such knowledge use is cognitive as opposed to behavioral. Affective use occurs when the user applies a knowledge object to justify or develop positive feelings about a decision already made or a practice already implemented (Diamantopoulos et al. 1999; Menon et al. 1992).

Juxtaposing these two literatures reveals that most MIS/KM scholars have focused on knowledge use in the behavioral sense. In other words, they have been primarily interested in whether knowledge application has a direct impact on behavioral change, decision making, and work practices. In contrast, there is significantly less attention on conceptual and affective use of knowledge[4]. One of the rare exceptions is Dennis's (1995) operationalization of "information usage" in group decision making. The construct includes the usage of contribution by group members even if it has no instrumental change on the individual's decision or choice. This bias for action-based knowledge use could have a number of explanations, with the most cited being that behavioral use of knowledge is methodologically easier to measure (Menon et al. 1992; Weiss 1980).

Following Kulkarni et al. (2006-7), knowledge use is defined here as the degree to which an individual believes he or she has incorporated a knowledge object into work practices, including problem-solving and decision-making activities. This definition encompasses knowledge use both for replicating existing practices (Markus 2001) and for solving new problems and

[4] Haas and Hansen (2005) ask one question about affective use in their knowledge use instrument: "To what extent did the sales team consult documents available in Centra's electronic databases for the qualifications and value statement?"

generating new practices (Majchrzak et al. 2004), and is theoretically equivalent to the concept of "knowledge reuse" (Faniel et al. 2007; Majchrzak et al. 2004; Markus 2001)[5]. Synthesizing these different bodies of research, we focus on two broadly defined dimensions of knowledge use that have been frequently examined in the MIS/KM literature: quantity and quality of knowledge use.

Quantity of use is defined as a global measure of how frequent a knowledge object has been used within a given time period. *Quality of use*, in contrast, considers three dimensions: innovative use, conceptual use, and affective use.

Innovative use captures the extent to which knowledge is adapted when used. On the one end of the continuum, knowledge is used exactly as presented. This dimension also captures the congruency of knowledge use – the extent to which the way the knowledge is applied is congruent with its intended method of use. On the other end of the continuum, knowledge is used for innovation (Majchrzak et al. 2004), creating radically different solutions in a way that is not suggested explicitly by its intended application. Along the continuum of innovative use, knowledge can be used faithfully as prescribed, applied to the problem it is designed to solve, and the context it is suggested to apply. Conversely, knowledge can be adapted and used in a modified form. Knowledge can also be used only partially in combination with other ideas and solutions.

[5] Conceptually we see no theoretical distinction between what we mean by knowledge use here versus the term knowledge reuse.

Conceptual use refers to the extent to which knowledge use leads to a shift in perspective of thinking, or an increase in the knowledge base, without resulting in actual decisions, actions or behavioral change (Menon et al. 1992). When knowledge is used conceptually, the user's current body of knowledge expands by assimilating the new idea into the current mental structure. When current cognitive structures are no longer adequate to incorporate the new idea, a new mental structure evolves to accommodate the new idea (Piaget 1969). In either case, learning occurs as the new knowledge enables an incremental change in the user's cognitive system.

Affective use describes the extent to which knowledge is used to provide affective support for a decision already made, an action already taken, or an idea already formed. On the one end, knowledge is used purely for justification purposes. A decision has been made independently of the knowledge. The knowledge object is taken into consideration and incorporated into the work process entirely for the purpose of providing ad hoc justification. On the other end of the spectrum, knowledge is used entirely for the purpose of formulating a decision or developing an idea (Diamantopoulos et al. 1999; Menon et al. 1992).

This more nuanced view allows us to consider knowledge use from a portfolio perspective. Knowledge such as repository content can be used in multiple ways by the same user. Considering these different ways in which knowledge is applied to work practices captures knowledge use more comprehensively, and allows researchers to measure the impact of knowledge management systems use beyond the more limited scope of systems use.

4.2 REPOSITORY CONTENT QUALITY AND KNOWLEDGE USE

The quality of a knowledge object residing in a knowledge repository system should positively influence the extent to which the knowledge object gets used. First, knowledge quality, particularly in terms of argument quality and argument usefulness, is an important predictor of the likelihood that a piece of advice gets accepted and eventually adopted by its recipient (Sussman et al. 2003). This is because when arguments are of high quality, they become easier to comprehend and elaborate upon. In turn, such high quality arguments become more useful to the user, increasing the likelihood that the user would decide to use the knowledge.

Moreover, when confronted with newly available knowledge that is of higher quality than knowledge already available, recipients of such new knowledge are more willing to modify their existing work routine and incorporate the new knowledge into their work practices (Kane et al. 2005). These workers are willing to assimilate new knowledge because its superior quality makes it more effective and therefore useful. When knowledge is perceived to be useful, users are more likely to develop loyal and frequent use of the KMS (Clay et al. 2005).

At the same time, knowledge that presents novel and nonobvious ideas can be perceived by managers and knowledge workers to be more useful (Shrivastava 1987) which in turn increases the likelihood of knowledge use (Menon et al. 1992). Knowledge novelty is high when knowledge "transcends 'commonsense' solutions and provides non-obvious insights into practical problems" (Shrivastava 1987, P.80). Although Shrivastava (1987) found knowledge novelty to correlate negatively with knowledge use, other researchers report a positive relationship (Weiss et al. 1980; Wilton et al. 1986).

When exposed to new ideas in the work environment, the probability of creative acts is increased as these ideas stimulate more divergent thinking (Parnes et al. 1972). The presence of more creative ideas in the organizational environment also signals the organization's recognition of creative work, encouraging the knowledge workers to engage in more creative practice (Amabile et al. 1996). Therefore, the degree of idea novelty should predict more innovative use of repository content.

Knowledge objects whose metaknowledge information is well-constructed and keywords are well-chosen are more likely to be discovered by the users with the exact need for them. In other words, metaknowledge quality is positively associated with the likelihood that the supply knowledge objects are available for the market with the demand for them. When the process of searching for ideas is aided by accurate and complete metaknowledge, such ideas are more likely to be reused and developed into more innovative ideas and insights (Faniel et al. 2002; Majchrzak et al. 2004). Therefore, knowledge quality as defined by metaknowledge quality should be positively associated with knowledge use.

On the other hand, low knowledge quality in terms of causal ambiguity increases the probability that the user's efforts to adopt the knowledge for a new task may fail, which in turn decreases the willingness of the potential user to adopt and apply the knowledge (Szulanski 1996). The impact of causal ambiguity is even more pronounced when the knowledge recipient trusts the source from which the knowledge comes. When the source is trustworthy, the recipient is less motivated to examine and challenge assumptions given in the causally ambiguous knowledge, making the effort to apply the knowledge more likely to fail (Szulanski et al. 2004).

Empirical research has demonstrated the positive relationship between knowledge quality and knowledge use both in survey studies (Kulkarni et al. 2006-7; Wu et al. 2006) and in experiments (Harvey et al. 2000; Kane et al. 2005). Specifically, high knowledge quality enables the users to perceive the KMS to be more beneficial, and to experience a higher level of satisfaction. Perceived KMS benefits and user satisfaction, in turn, increase the likelihood that the user would use the KMS's content (Wu et al. 2006). Given the available theoretical justification and empirical evidence, we propose the following hypothesis:

Hypothesis 7 (H7): Refined knowledge quality (KQ_1) leads to higher levels of knowledge use.

4.3 PROCEDURAL JUSTICE AND KNOWLEDGE USE

Procedural justice encourages the use of knowledge repository content for at least two reasons. First, procedural justice increases the likelihood of rule compliance, or the level of adherence to guidelines and regulations that govern a collective (Colquitt 2001; Kim et al. 1993; Tyler et al. 1996). Electronic repositories are usually built with content usage as the ultimate objective, whether this objective is explicitly stated or implicitly assumed. Applying the repository content to enhance work productivity, therefore, represents an implicit or explicit rule that may receive compliance to varying degrees. If the process of selecting and improving the quality of knowledge content for a repository is perceived to be fair, participants in the community that the repository supports would display more deference to the repository usage norm that management would like to establish.

In addition, procedural justice increases the user's trust in management or other authority figures (Chen et al. 2004; Kim et al. 1993; van den Bos et al. 1998). One of the barriers to reusing knowledge created by coworkers is the fear of competition with internal rivals (Menon et al. 2003; Menon et al. 2006). Using knowledge from an electronic repository contributed by coworkers could be a risky endeavor if the coworker receives the credit for originating the idea at the expense of the user's reputation. These concerns, however, can be mitigated significantly if the user develops a higher level of trust in management as a result of procedural justice. For these reasons, the following hypothesis is presented:

Hypothesis 8 (H8): Procedural justice leads to higher levels of knowledge use.

The hypotheses that have been developed in this dissertation are summarized visually in the research model presented in Figure 4.

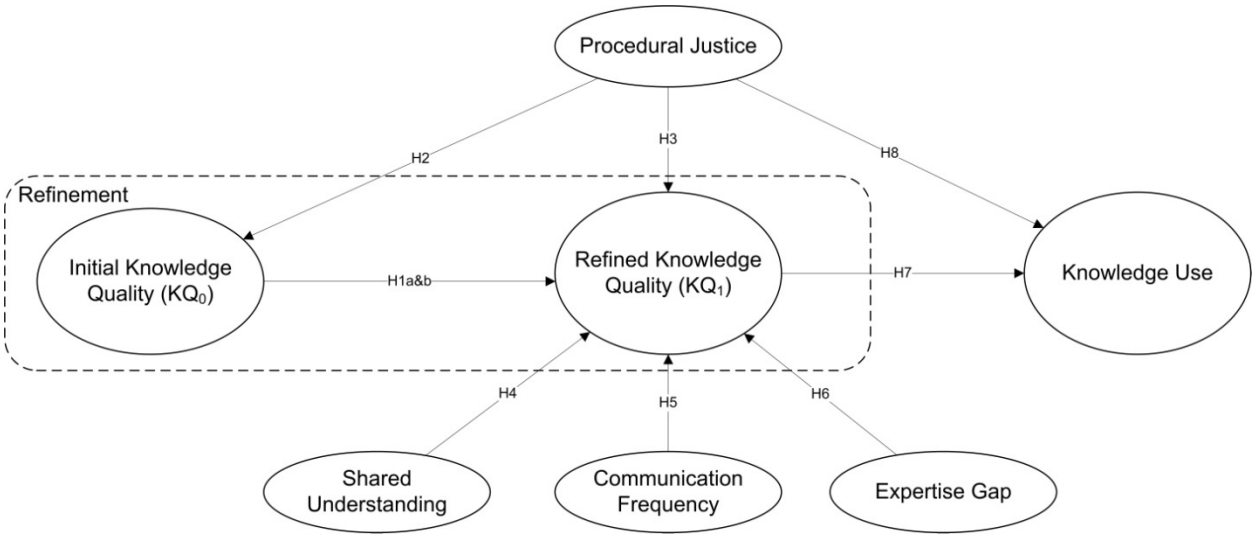

Figure 4. Summary of the Research Model

5.0 RESEARCH METHODOLOGY AND DATA COLLECTION

To evaluate the research model and test the specific hypotheses, an empirical study was designed and conducted with participants of Eureka, a knowledge repository system of the Xerox company that has supported knowledge sharing initiatives at Xerox since 1994. To qualitatively assess the validity of the theorized constructs – knowledge refinement, knowledge quality, and knowledge use, the study was preceded by semi-structured interviews with Eureka participants. In the survey study, quantitative data were collected using questionnaires targeting three groups of Eureka participants: users, validators and authors. The three surveys were designed to collect quantitative data from different informants as a strategy to minimize the influence of common-method bias, which will be discussed more thoroughly in the next chapter.

5.1 THE XEROX EUREKA SYSTEM

Eureka is a knowledge repository system that supports knowledge sharing among Xerox service technicians (Bobrow et al. 2002; Boucher 2006; Hickins 1999) and enables the "globalization of local knowledge" (Von Krogh et al. 2000). More than 20,000 users worldwide access Eureka for service "tips" that are authored by Xerox service technicians who are also Eureka users, and refined by more than 600 expert technicians that serve as "validators," both improving and approving or rejecting tip submissions (Boucher 2006).

Validators are members of the Eureka user community. They are service technicians who have achieved the validator status after completing validator training and certification provided by Eureka management. They are, therefore, considered peers to fellow Eureka authors and users, and not external expert auditors or inspectors. In the year of 2006 alone, nearly 4,800 tips were submitted and 3,500 got validated for inclusion in the repository system. These tips were contributed by authors from 37 countries, with USA, Canada, UK, France and India representing the top five contributing countries.

Tip submissions to Eureka are considered knowledge objects and not just information. A service technician submits a tip when he or she discovers a new way to fix a problem. Thus a tip captures the service technician's understanding of the problem, conjectures about the causes of the problems, insights about a new solution, and rationales for the solution. In other words, a tip represents the externalization of the service technician's ideas in an explicit format. A sample tip is illustrated in Figure 5.

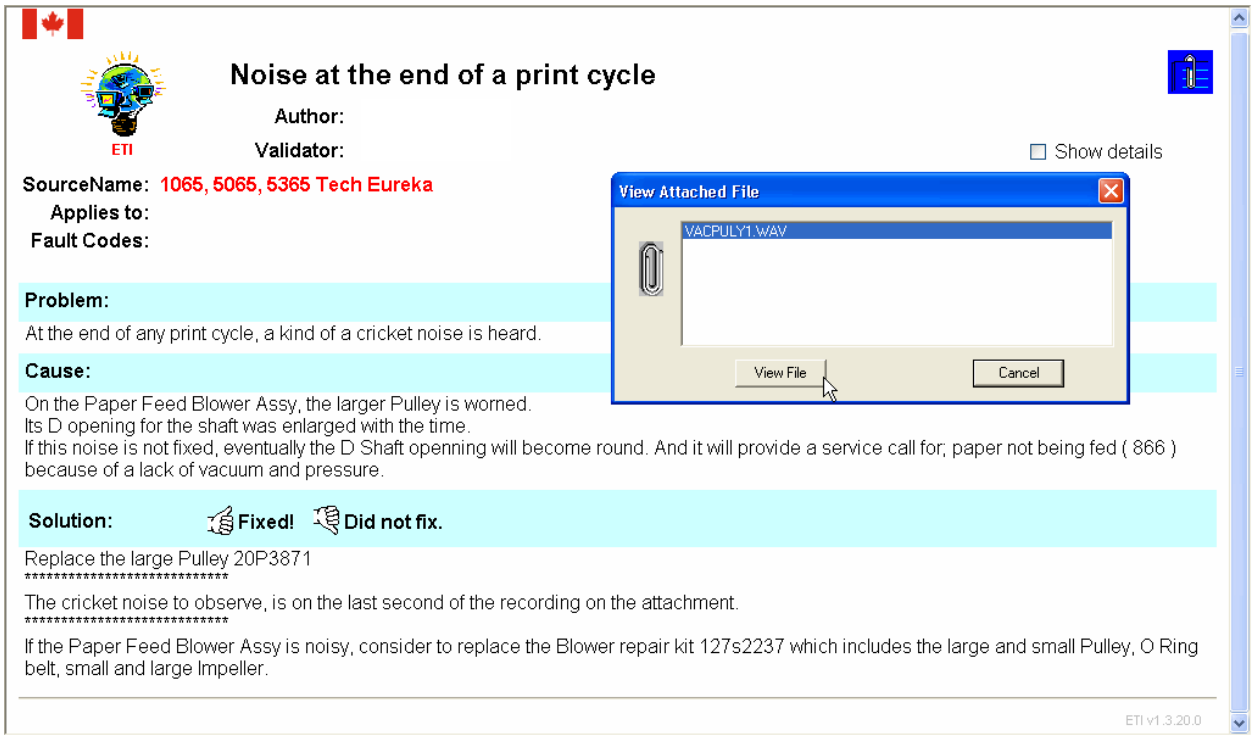

Figure 5. A Sample Tip from the Eureka System

As Figure 5 demonstrates, tip submissions consist of three sections: the problem statement, the cause statement and the solution. These sections are primarily presented in text format, and sometimes supplemented with multi-media content. For example, the tip shown in Figure 5 contains an audio file that demonstrates the cricket noise problem that the tip is intended to address. Other multi-media content such as image or video files can also be included as part of a tip submission up to a set size limit.

When a tip is submitted, validators from the same country as the submitter are notified, and they can volunteer to work with the submitter in developing and refining the tip. After 30 days, validators from any country can evaluate the tip as long as they are experts in the same product family. The validator may decide to reject a tip submission on several grounds: The tip is already included in Eureka, the tip is part of another tip already present in Eureka, the tip duplicates

information available in other repositories (e.g., Xerox's Electronic DOCumentation (EDOC)) or the tip is invalid. If the tip is indeed original, innovative, and worthy of inclusion, the validator goes on to work with the author on refining the tip. The refinement process could include one or more revisions of the submission. The refinement process could last as short as a day and as long as 687 days (mean = 60.8 days; median = 21 days) for the 3485 tips refined and validated in 2006.

5.2 PRE-STUDY QUALITATIVE INTERVIEWS

Since empirical data are scarcely available in the literature that shed light on the refinement process, the formal research study was preceded by site visits and semi-structured interviews with Eureka authors, validators and users about the refinement process. Following the interview protocol described in Appendix A, the interviews were designed to gather information about and gain insights into how refinement practices are actually conducted and implemented. During the interviews, authors, validators and users are encouraged to reflect on what they believe contribute to the success or failure of knowledge refinement. The second objective is to engage users in a discussion of the quality of Eureka content, their usage behavior, and factors that determine the degree to which they use Eureka content.

5.3 QUESTIONNAIRE SURVEY

Validated measurement items were adapted from existing literature for the survey study. The survey instruments were designed to be administered online with three versions: the user version, the author version, and the validator version. The questionnaire data collection process turned out to be fairly complex and challenging. Weekly meetings with the Eureka coordinator were established between January and May 2008 and then between January and April 2009 in order to maintain continuous progress in administering the survey study.

To support a matched-triad design of the survey study, participants were recruited in two waves, similar to the recruitment procedure implemented by Constant et al. (1996). The first wave consisted of the user survey, during which all Eureka users were invited to fill out the user version of the online questionnaire with respect to a Eureka tip of their own choice[6]. In the questionnaire, the user was asked to nominate a tip for inclusion in the study, and specify the tip by specifying the six-digit ID number that uniquely identifies a tip in the Eureka database. Tips identified by the users were included in the subsequent surveys targeting authors and validators.

The user survey (see Appendix B) was first featured as an announcement on the internal service site of the Eureka system (see Figure 6) starting November 13, 2007 and remained on the site for over two months. A follow-up invitation was sent to 800 randomly selected users on February

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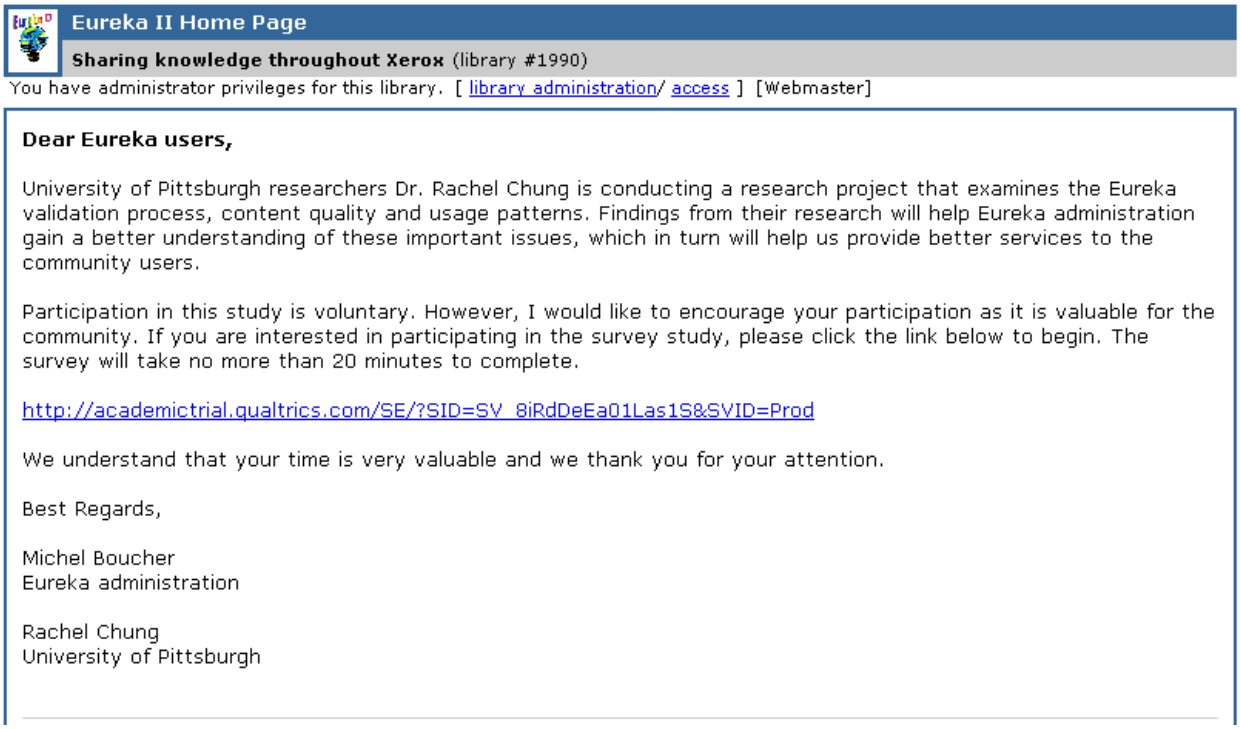
[6] In the proposal, we initially planned to perform the following manipulation: Half of the users will be asked to identify tips that are typical and representative of the Eureka database, whereas the other half of the users will be asked to identify tips that are distinctive, memorable or particularly impressive. This manipulation is not for experimental purposes. Rather it is to increase the variety and range of tips to be included in the study.

After discussing this plan with the Eureka manager, this design was determined to be overly complicated. Instead, the user was instructed to "answer a series of questions regarding one Eureka tip of your choice. Please choose a tip that is NOT authored by you."

28, 2008. Users clicking on the hyperlink embedded in the announcement were directed to the online questionnaire hosted on www.qualtrics.com. By the end of January 2009, a total of 483 users have clicked through the link to the questionnaire, of which 179 participants answered the survey questionnaire, representing an effective response rate of 37.06%.



Eureka II Home Page

Sharing knowledge throughout Xerox (library #1990)

You have administrator privileges for this library. [library administration/ access] [Webmaster]

Dear Eureka users,

University of Pittsburgh researchers Dr. Rachel Chung is conducting a research project that examines the Eureka validation process, content quality and usage patterns. Findings from their research will help Eureka administration gain a better understanding of these important issues, which in turn will help us provide better services to the community users.

Participation in this study is voluntary. However, I would like to encourage your participation as it is valuable for the community. If you are interested in participating in the survey study, please click the link below to begin. The survey will take no more than 20 minutes to complete.

http://academictrial.qualtrics.com/SE/?SID=SV_8iRdDeEa01Las1S&SVID=Prod

We understand that your time is very valuable and we thank you for your attention.

Best Regards,

Michel Boucher
Eureka administration

Rachel Chung
University of Pittsburgh

Figure 6. Announcement of the User Survey on the Eureka internal service site.

After the users completed the survey, authors and validators of the nominated tips were invited to fill out the author (see Appendix C) and validator (see Appendix D) surveys, respectively. For each tip, the goal was to receive responses from both the author and the refiner. As of January 2009, a total of 175 user survey responses were collected that contained a tip ID number. Excluding duplicate tip ID numbers (i.e., tips that were nominated by more than one user), the

Eureka coordinator generated a list of unique author and validator names[7] and contact information on 145 tips (78.95%) with valid ID numbers (excluding ID numbers that were invalid according to the current Eureka database.) These authors and validators were contacted via email and invited to answer the author or validator questionnaire with respect to the nominated tip. Details of their response rates are discussed in the next chapter where analysis results are presented and discussed.

5.4 QUESTIONNAIRE INSTRUMENT

Validated measurement items were adapted from existing literature and a small number of original items were created for the survey. Interviews with Eureka validators and users confirmed that the survey items were appropriate for the Eureka context.

As mentioned earlier, three questionnaires were designed for the survey study – one for the users, one for the authors, and one for the validators. The user questionnaire focused on the assessment of content quality and knowledge for the purpose of testing Research Model 3. Measures for the five dimensions of content quality – argument quality, causal ambiguity, novelty, information quality, and metaknowledge quality, were adapted from existing literature. Items that measured the three dimensions of knowledge use – innovative, conceptual and affective, were similarly adapted from relevant literature. Data on a few additional constructs

[7] To minimize the efforts required for this research study, a Eureka participant was only sent one invitation for participation. If an individual was involved in more than one nominated tip, either as an author or as a validator, a decision was made to invite for the individual for only one of the tips that he or she was involved in. The other tips were excluded from the study.

were also collected, but were not included in the research models - motivation, individual benefits (from using the tip), and author and validator credibility. Perceived system quality as a control variable was also included in the survey.

The author questionnaire focused on assessing the author's perception of the procedural justice of the refinement process. Measurement items for procedural justice were adapted from Blader et al. (2003). Measurement items for reputation, cost, and affective organizational commitment were adapted from the literature and included in the survey study. However these constructs were excluded from this research study and therefore their results will not be discussed in the next chapter. The author's level of expertise was measured using the author's self ratings.

The validator questionnaire focused on assessing the validator's assessment of the quality of the author's initial contribution. The assessment was conducted along the five quality dimensions in the user questionnaire. The validator's level of expertise was measured using the validator's self ratings.

These three questionnaires were used to collect data on the following constructs in the research. Table 2 summarizes the nature and dimensionality of these constructs. Guidelines provided by Petter et al. (2007) were followed to determine if a construct was reflective or formative.

Initial Knowledge Quality (KQ_0): Measured with 21 items in the validator survey on five dimensions.

Procedural Justice (PJ): Measured with five items in the author survey (Blader et al. 2003).

Shared Understanding (SU): Measured with three items in the author and the validator surveys (Ko et al. 2005)

Expertise Gap (EG): Measured with four items in the author and the validator surveys and operationalized as the difference scores between the author and the validator's self-assessments. Similar to difference scores used in prior IS research (e.g., Barki et al. 2001; Jiang et al. 2002), Expertise Gap was calculated as:

Expertise Gap = | Validator's Expertise – Author's Expertise |[8]

Some researchers are concerned about the psychometric integrity of operationalizing a single construct as the difference between data collected from different respondents (Van Dyke et al. 1997). Because different respondents may have different mental conceptualizations of the same construct, taking difference scores between survey responses by different individuals may compromise the psychometric integrity of the construct represented by the difference scores. This concern has become particularly prevalent with using the Service Quality measure in information systems research (Jiang et al. 2002; Kettinger et al. 1997; Pitt et al. 1997; Van Dyke et al. 1997). Jiang et al. (2002) conducted a comprehensive study of the Service Quality instrument, using data collected from both IS managers and IS users. They found that the difference score between the IS manager's and the IS user's responses to the Service Quality questionnaire was reliable, showing the same measurement model structure as data collected from single sources. This study suggests that difference scores are appropriate as construct indicators as long as the measures are properly validated. The psychometric properties of the

[8] || denotes the calculation of absolute value.

Expertise Gap scores will be carefully examined before they are included in the statistical procedures for hypothesis testing.

Communication Frequency (CF): Measured with three items in the author and the validator surveys.

Refined Knowledge Quality (KQ_1): Measured with 21 items in the user survey on five dimensions.

Knowledge Use (KU): Measured with 13 items in the user survey on three dimensions.

Table 2. Summary of Constructs Used in Research Model Testing

Construct	Reflective/ Formative	Respondent	Dimensionality
Procedural Justice	Reflective	Contributor	
Shared Understanding	Reflective	Contributor & Validator	
Expertise Gap	Formative	Contributor & Validator	Difference between the contributor's and the validator's self reports
Communication Frequency	Formative	Contributor & Validator	
Knowledge Quality - Initial (KQ_0)	Formative	Validator	5 dimensions of Knowledge Quality
Knowledge Quality - Refined (KQ_1)	Formative	User	5 dimensions of Knowledge Quality
Knowledge Use	Formative	User	3 dimensions

6.0 DATA ANALYSIS AND RESULTS

This chapter presents summary and referential analyses of the collected data. First we discuss findings from the interview study. Then the results of a pilot survey study are presented before the full survey study is discussed.

6.1 PRESTUDY INTERVIEWS

The goal of the prestudy interviews was to validate the theoretical framework and proposed research model. Although the KM literature is fairly established, applying the organizational justice perspective is a novel approach. In addition, key constructs such as knowledge quality, knowledge refinement and knowledge use are newly developed in this research. The interview process helped ensure that these theoretical developments were grounded in empirical relevance.

Interviews were conducted with nine Eureka participants individually, and ten experienced Eureka validators in a group session. These interviews yielded rich insights into the refinement process that helped to focus the research direction and refine the constructs and questionnaire items for the survey study. Overall, the interview results confirmed major theoretical conjectures developed in this project. Findings from the interviews are summarized below with respect to

these three topics: procedural justice of the refinement process, knowledge quality, and knowledge use.

6.1.1 Procedural Justice of the Refinement Process

Participants commented that their coworkers and they themselves took pride in having a tip published through Eureka. With the validation (i.e., refinement) process, not all tips submitted would appear in the database. Thus, having a tip accepted for publication was validation for the author and other Xerox colleagues that the idea was indeed original and worthy of sharing.

Although no one made explicit statements about the fairness of the refinement process, some participants made remarks that alluded to the concept. For example, one participant commented that "…. occasionally I would come across a tip that really shouldn't be in the database …" in the context of discussing the validation process. This comment suggests that participants may be sensitive to situations where the validation process may appear to be unfair. Another participant commented that "….. I think the validation process was great. Everyone can submit ideas and the validators are trained to determine the value of the tip. The validators usually do a really good job." Many other comments like this one confirm the idea that refinement plays a key role in the success of the Eureka system. Knowing that validators review and improve tips systematically creates a positive perception of the process which enhances authors' and users' trust in this system.

6.1.2 Knowledge Quality

Participants were generally very positive about the quality of the Eureka system content. When discussing the attributes of a good tip, the participants often emphasized novelty. Although this reaction may be an artifact of the Eureka system, as the policy was to publish only tips that are not discussed in traditional manuals or documentation, novelty may be an important quality dimension for other knowledge systems. As people sought help in the electronic repository system, they experienced more satisfaction when they discovered something that they did not know before. Several participants pointed out that Eureka was a very valuable tool because they always learned something new which enhanced their performance at work.

Unlike users who only saw polished tips, the validators dealt with the initial contributions from Eureka users on a routine basis, which required that they develop a different perspective on knowledge quality. A number of validators mentioned the importance of clarifying what the authors intend to document in the tip. "The causal relationship between the problem statement and the solution statement has to be crystal clear," commented one validator participant, "If I don't understand what the author is trying to say, I have to call or email the author and clarify what he or she means." These comments verified the importance of causal ambiguity in the conceptualization of knowledge quality.

More importantly, validators took special care in evaluating the quality of the arguments that the authors made. Sometimes authors would submit a tip about fixing a problem using a novel solution, but the reason why the solution addressed the problem was understood incorrectly. In most cases, the quality of the tip was evaluated not simply based on whether the solution would

work, but also on whether the argument supporting the solution was accurately presented. The importance of argument accuracy was stressed by several validators, noting that a significant part of their work was to screen out tips that appeared to be accurate on the surface but were in actuality misleading. These discussions solidified the conjecture that argument quality forms a core component of the knowledge quality construct.

Validators reported performing many routine tasks, such as verifying the accuracy of product information, entering alternative keywords to improve the effectiveness of tip searches, and correcting spelling errors. Although these tasks were much more mundane than validating argument quality or determining idea originality, they were nonetheless critical to the success of the Eureka system. One validator commented that "I feel a strong obligation to correct errors that I come across, complete information that is missing, and delete records that are no longer good." These efforts to ensure information accuracy, currency, and metadata completeness supported the conjecture that information quality and metadata quality should be considered as part of the knowledge quality construct.

6.1.3 Knowledge Use

Users commented on the various ways they applied knowledge acquired from Eureka. The most common approach was, not surprisingly, using a tip exactly the way it was written and applying it to the same problem for which it was designed. However, exact application was not the only way Eureka participants used the repository's content. They sometimes sought inspiration by browsing through the tips authored by their peers, and learned something new simply by reading the tips. One participant said "I am sometimes surprised by the solutions that other technicians

have developed. They are quite smart and I like reading how different people solve problems differently. I learn a lot from Eureka! It helps me to solve problems creatively when I'm stuck." These comments supported the more nuanced view of knowledge use discussed here. These usage patterns may not necessarily manifest themselves in system usage measurable in terms of page clicks. Nevertheless, they represent the diverse ways in which knowledge usage can take place and suggest that a broadened approach to measuring knowledge use, as the method proposed here, may be more appropriate than automatically captured click-stream usage data. More importantly, these interview data confirm the conjecture that the knowledge use construct must be distinguished theoretically from system use.

6.1.4 Conclusion

Although only a small number of Eureka participants were interviewed for this study, their reports largely confirmed our theoretical development. In particular, participant comments confirmed the relevance of organizational justice as a theoretical perspective, and the structural integrity of knowledge quality and knowledge use constructs. These findings also helped focus and refine the instruments for the survey study in Phase II. Some questions were revised to focus more on features that the participants regarded as important, while others were removed from the study because they were determined to be no longer relevant based on the interviewee's feedback. Overall the interviews proved to be invaluable in solidifying the theoretical foundation of this work and finalizing survey materials for the next stage of this research project.

6.2 PILOT SURVEY STUDY

In order to test the instruments designed for this project and validate the research design, a pilot study was conducted using data collected from the first twenty tips that received completely matched responses from users, validators and authors. The data collection method for the pilot study was identical to that employed in the full survey study, which is discussed in the next section.

Analyses of these twenty records revealed that the two reflective constructs – Procedural Justice and Shared Understanding[9] – displayed satisfactory levels of reliability, or internal consistency (as indicated by Cronbach's α). These constructs also displayed satisfactory averaged variance extracted (AVE), indicating appropriate convergent validity. Confirmatory factor analysis (CFA) using Structural Equation Modeling (SEM) procedure with the software package EQS (Bentler et al. 1995) revealed acceptable levels of model fit for the two reflective constructs. Similarly, CFA verified the validity of the multi-dimensional constructs Knowledge Quality (KQ_0 and KQ_1) and Knowledge Use. However, CFA also identified a number of measurement issues. Measurement items for Casual Ambiguity loaded onto more than one component, with two items (i.e., CA03 and CA04) loading poorly onto any of the components. Moreover, one Metaknowledge Quality item (i.e., MQ02) loaded poorly onto any of the components. These items were dropped from further analysis.

[9] Data collected from the authors were used for evaluating the measurement model of the Shared Understanding construct.

Because data collection was still ongoing at the time of the pilot analysis, item deletion decisions were made on two grounds. First, to reduce the number of items included in the measurement model and the later questionnaire to the validators, items that did not make significant contributions to construct reliability and validity were removed. Item MQ02, for instance, did not affect the reliability and validity measures of the MQ construct, and was therefore removed from analyses and the later questionnaire sent to validators. Next, because loadings for the construct Casual Ambiguity were questionable, the lowest performing items – CA03 and CA04 - were removed first. These items removed based on data collected from users were excluded from the validator's questionnaire, which included the knowledge quality measures. Values of these five dimensions were aggregated as indicators for the formative constructs of initial knowledge quality (KQ_0) and refined knowledge quality (KQ_1).

Similarly, CFA revealed that most Knowledge Use items loaded onto their corresponding components very well (loadings > .70) with the exception of IU2, an item designed to measure Innovative Use. Based on this finding, IU2 was dropped and removed from further analysis. Values of the composite constructs' dimensions were then aggregated as indicators for the formative construct of Knowledge Use.

Measures of several constructs in the research model, such as Communication Frequency, will not necessarily need to covary; in other words, changes in one measure would not necessarily lead to changes in another of the same construct. Therefore these measures were modeled as formative indicators of these constructs (Bollen 1984; Petter et al. 2007). For the same reason, the composite constructs Knowledge Quality and Knowledge Use were also modeled as formative constructs. Validity of these measures of formative constructs was assessed using

exploratory factor analysis with principle component analysis and Varimax rotation. To determine whether data collected from the authors or the validators were useful for the Communication Frequency (CF) construct, both sets of data were included in this exploratory factor analysis. Consistent with prior analyses, only initial Knowledge Quality measures (KQ_0) were included in this analysis. Although factor analyses may yield unstable factor solutions with small sample sizes, the results converged quite well, yielding five components with eigen values greater than one that corresponded with the intended measures. These results confirmed the validity of all formative measures.

6.3 FULL SURVEY STUDY

The full survey study reported here includes data used for the pilot study and data collected after the pilot study was complete. The data collection method was identical to that used in the pilot study with one exception – two measurement items were removed upon the Eureka coordinator's request. The questionnaire item PJ5 "How much of an effort was made to be fair to employees when validation decisions were being made?" was removed from the author survey. The questionnaire item measuring the participant's country of residence was removed from both the author and the validator questionnaires, because the country of residence information was available from systems logs. As no other major changes occurred to the data collection procedures, we felt it was appropriate to combine the earlier dataset with the more recent one. We examined the two datasets and did not notice any systematic differences that were statistically significant.

Of the 185 completed user survey responses by March 2009, 171 contained a valid and unique tip ID, which formed the tip sample base for the present analysis. Email invitations to participate in the survey study were sent to authors and validators of these tips with the following restrictions: The authors and validators had a currently working email address with the Xerox company, and each participant only received one invitation (for either the author or the validator survey). Twenty-two participants were excluded from the invitation process because they had retired from Xerox at the time of the study. The "one-invitation" strategy was adopted to minimize the negative effects of overwhelming the participants and to maximize participation rate. If a participant was author or validator for more than one tip nominated for inclusion in the study, the study invitation referred to only one of the tips with which the participant was affiliated. The other tips with which the participant was affiliated were then excluded from the study. Decisions about tip exclusion were made such that a maximum number of tips were retained in the study. By June 2009, valid responses have been received from 106 author and validator pairs. These responses include the 20 cases from the pilot study. Results presented below are based on the analysis of all 106 cases.

6.3.1 Subjects

With 106 cases, a total of 318 Eureka members[10] participated in the study by filling out the questionnaires online. 106 participants answered the user questionnaire on a tip of their choice, 106 answered the author questionnaire about a tip they authored, and the remaining 106

[10] Although we know for sure that authors and validators were unique participants, we are not certain if the users who answered the survey were not also authors or validators participating in this study. In other words, the total number of unique participants could potentially be fewer than 318.

answered the validator questionnaire about a tip they validated. Descriptive statistics of these pilot study participants are presented in Table 3.

Table 3. Full Survey Study Participant Descriptive Statistics

Role	Gender	Median Age	Job Tenure (S.D.)	Country
User	9 female/98 male	38	8.71 (9.23)	3 Brazil 2 Russia 1 Argentina 1 Denmark 1 Turkey 1 Peru 1 India 1 Greece 1 Malaysia 3 Germany 5 UK 4 Spain 35 Canada 47 USA
Author	2 female /105 male	38	12.43 (11.31)	1 Brazil 1 India 1 Netherlands 1 Spain 2 Germany 1 Finland 2 France 3 UK 34 Canada 60 USA
Validator	8 female/99 male	38	11.07 (5.70)	1 UK 2 Canada 17 USA 86 N/A[11]

[11] Country information was unavailable for 86 validators because the country question was removed from later rounds of the validator survey because the country information was supposed to be available from systems logs. However, the systems logs obtained later did not contain validator country information.

6.3.2 Addressing Common Method Bias

Even though only a single method, the survey method, was used to collect all data for testing the research model, the survey data were gathered from three different sources (i.e., the author, the validator and the user). As discussed earlier, data from three different respondents were collected with respect to one submission. We conducted the research with this multi-respondent design, including constructs for which empirical measures were collected from these different respondents. Although this decision complicated data collection significantly, the practice was chosen as the principle method to minimize common method bias. In addition, objective measures obtained from systems logs were added as control variables (see discussion below), serving as an additional means to minimize the influence of common method bias.

Again, to determine the extent to which common method variance is an issue for this study, a Harman's one factor test was conducted using a principle component analysis of all variables used in the model (Podsakoff et al. 1986). Results indicate the presence of nine components, again suggesting that common method variance is unlikely to be a potential source of bias.

6.3.3 Control Variables

Three systems logs variables were included as control variables in the testing of the research model. Their definitions, operationalization, and descriptive statistics are summarized here.

6.3.3.1 Author Experience

Author experience is defined as the participant's experience as an author contributing to the knowledge management system, and is operationalized as the number of tips that an author has submitted for validation. This measure includes all submission attempts, without regard to whether a tip was eventually validated or rejected. Author experience of participants included in the full survey study ranged from 1 to 17, with a mean of 3.7 (S.D. = 2.13).

6.3.3.2 Validator Experience

Validator experience is defined as the participant's experience as a validator participating in the knowledge management system's refinement process, and is operationalized as the number of tips that a validator has reviewed. This measure includes all submission validation attempts, without regard to whether a tip was eventually validated or rejected. Validator experience of participants included in the full survey study ranged from 1 to 23, with a mean of 4.6 (S.D. = 3.09).

6.3.3.3 Refinement Duration

Refinement duration is defined as the amount of time duration of a refinement process, and is operationalized as the number of days passing from tip submission to the day when a decision was made about the tip's publication status. This measure includes all submission validation attempts, without regard to whether a tip was eventually validated or rejected. Refinement duration of all tips included in the full survey study ranged from 1 to 296, with a mean of 42.1 (S.D. = 39.72).

6.3.4 Measurement Models

Table 4 below presents the means, standard deviations and other descriptive and correlational results of the two reflective constructs – Procedural Justice[12] and Shared Understanding[13] – used in the research model. None of the correlations between independent constructs was greater than .80, the critical level for concerns of multicollinearity (Billings et al. 1978). The constructs display satisfactory levels of reliability, or internal consistency (as indicated by Cronbach's α).

Table 4. Descriptive Results, Internal Consistency, and Correlation Matrix of Reflective Constructs - Full Survey Study.

CONSTRUCT	# Items	N[14]	MEAN	SD	α	Composite Reliability	AVE	PJ	SU
Procedural Justice (PJ)	4	82	6.17	1.33	.91	.94	.79	**.89**	
Shared Understanding (SU)	3	107	5.13	1.49	.94	.96	.89	.39	**.94**

Note: The square root of average variance extracted (AVE) IS on the diagonal in bold font.

Validity of reflective constructs in this full survey study was assessed in three ways. First, dimensionality of the two reflective constructs – Procedural Justice and Shared Understanding - was assessed with confirmatory factor analysis (CFA) using the EQS software (Bentler et al. 1995). As recommended by Gerbing and Hamilton (1996), this CFA was conducted with maximum likelihood estimation with a two-factor model. In other words, we postulated that the five indicators of Procedural Justice would only load onto the latent construct of Procedural

[12] Data collected from both the author and validator were averaged for evaluating the measurement model of the Procedural Justice construct.

[13] Data collected from both the author and validator were averaged for evaluating the measurement model of the Shared Understanding construct.

[14] There were no missing values for the Shared Understanding construct because a valid value was created if the data were collected from either the author or the validator.

Justice, and the three indicators of Shared Understanding would only load onto the latent construct of Shared Understanding.

To evaluate how the model represented the data, we used both absolute fit indices, including the goodness-of-fit index (GFI) and the χ^2 statistic, and incremental fit statistics, including the root square error of approximation (RMSEA) and the comparative fit index (CFI). Following Medsket et al.'s (1994) recommendations, we looked for good fit with values greater than .95 and acceptable fit with values greater than .90 when assessing CFI and GFI. With RMSEA, we followed these generally accepted guidelines: values less than .05 constitute good fit, values ranging from .05 to .08 constitute acceptable fit, values ranging from .08 to .10 constitute marginal fit, and values greater than .10 constitute poor fit (Browne et al. 1992).

CFA results for Procedural Justice and Shared Understanding showed that the model produced an acceptable fit to the data, $\chi^2 = 135.79$, GFI = .93, CFI = .91, and RMSEA = .077. These model fit measures suggested that, when the hypothesized two-factor model was applied to the Procedural Justice and Shared Understanding data, the model was a good fit of the observed correlations observed in the dataset.

Next, averaged variance extracted (AVE), or the percentage of the total variance of a measure represented or extracted by the variance due to the construct, was used to assess the constructs' convergent validity. The AVE scores, shown in Table 4, were all above .5, the minimum level for adequate convergent validity suggested by Fornell and Larcker (1981). Discriminant validity, on the other hand, was established by inspecting the square root of AVE scores (available on the diagonal of Table 4). All values were greater than the off-diagonal correlations, indicating proper

discriminant validity for all constructs. In summary, measurement model validity has been established for reflective constructs with the data collected from the full survey study.

Similarly, validity of the multi-dimensional constructs Knowledge Quality (KQ_0 and KQ_1) and Knowledge Use was assessed with CFA. Although operationalization of these constructs was newly developed in this research, most items were obtained from the existing literature. Therefore, confirmatory factor analysis was appropriate for assessing their dimensionality and construct validity.

CFA results for Knowledge Quality (using KQ_0 measures) dimensions showed that the model produced a reasonable fit to the data, $\chi^2 = 122.83$, GFI = .90, CFI = .91, and RMSEA = .05. These model fit measures suggested that, when the hypothesized five-dimension model was applied to the Initial Knowledge Quality (KQ_0) data, the model was a good fit of the observed correlations observed in the dataset. Values of these five dimensions were aggregated as indicators for the following formative constructs: Initial Knowledge Quality (KQ_0) and Refined Knowledge Quality (KQ_1),

Similarly, CFA for the Knowledge Use dimensions revealed that the model produced a reasonable fit to the data, $\chi^2 = 119.40$, GFI = .89, CFI = .92, and RMSEA = .06. These model fit measures suggested that, when the hypothesized three-dimension model was applied to the Knowledge Use data, the model was a good fit of the observed correlations observed in the dataset. Values of the composite constructs' dimensions were then aggregated as indicators for the following formative construct: Knowledge Use.

Table 5 and Table 6 display descriptive statistics of dimensions of two composite constructs: Knowledge Quality and Use. All dimensions demonstrate satisfactory Cronbach's alpha levels.

Table 5. Descriptive Results of Initial Knowledge Quality (KQ_0) Dimensions - Full Survey Study.

Dimension	# Items	N	MEAN	SD	α
Argument Quality (AQ)	3	107	5.682	1.056	0.941
Causal Ambiguity (CA)	4	105	5.752	1.032	0.766
Knowledge Novelty (KN)	3	89	4.840	1.162	0.887
Information Quality (IQ)	6	95	6.084	0.724	0.728
Metaknowledge Quality (MQ)	3	95	5.540	0.441	0.890

Table 6. Descriptive Results of Knowledge Use Dimensions - Full Survey Study.

Dimension	# Items	N	MEAN	SD	α
Innovative Use (IU)	3	102	4.294	1.790	0.862
Conceptual Use (CU)	4	92	4.193	1.550	0.964
Affective Use (AU)	3	106	5.481	1.568	0.935

As discussed earlier, measures of several constructs, such as Communication Frequency, will not necessarily need to covary and therefore were modeled as formative indicators. Again, the composite constructs Knowledge Quality and Knowledge Use are also modeled as formative constructs. Descriptive statistics of these formative constructs are summarized in Table 7.

Table 7. Descriptive Results of Formative Constructs - Full Survey Study.

Dimension	# Items	N	MEAN	SD
Expertise Gap (EG)	4	105	1.81	1.06
Communication Frequency (CF)	3	107	4.72	1.36
Initial Knowledge Quality (KQ_0)	5	75	5.63	0.56
Refined Knowledge Quality (KQ_1)	5	84	5.90	0.51
Knowledge Use (KU)	3	88	2.72	1.02

Validity of these measures of formative constructs was, again, assessed using exploratory factor analyses with principle component analysis and Varimax rotation. Because data collected for Communication Frequency (CF) construct from both authors and validators were determined to be valid, the average scores of author and validator responses were used for this analysis. Consistent with prior analyses, only initial Knowledge Quality measures (KQ_0) were included in this analysis. The results, again, converged well, yielding five components with eigen values greater than one that corresponded with the intended measures. These results, summarized in Table 8, confirm the validity of all formative measures.

Table 8. Exploratory Factor Analysis of Formative Construct Measures - Full Survey Study

	Component				
	1	2	3	4	5
EG1	**.659**	-.389	.070	.153	-.070
EG2	**.828**	-.278	.151	.014	.018
EG3	**.868**	.066	-.026	-.030	.030
EG4	**.884**	-.114	.030	.033	.044
CF1	-.039	-.129	.043	**.875**	.047
CF2	.165	.155	.054	**.694**	.029
CF3	.039	.333	.002	**.590**	-.556
AQ	-.190	**.676**	.176	.469	.402
CA	.083	**.736**	-.021	.080	.876
KN	-.188	**.858**	-.005	-.096	.070
MQ	-.002	**.796**	.020	.336	-.111
IQ	-.285	**.682**	-.017	.059	.169
IU	-.012	-.022	**.882**	-.070	-.091
AU	.029	-.129	**.869**	.197	-.084
CU	.164	.167	**.734**	.048	.225
Variance Explained (%)	24.16	17.72	12.63	10.22	7.73
Cumulative Variance (%)	24.16	41.87	54.24	64.45	72.19

6.3.5 Hypothesis Testing

Hypotheses 1a and 1b were tested using Pearson correlation and t test. The remaining statistical analysis was performed using partial least squares (PLS) analysis. To test Hypothesis 1a, Pearson correlation scores were obtained for each dimension of KQ_0 and KQ_1 in order to find out if KQ_1 dimension values were significantly related to the values of KQ_0. The analysis of the full survey data revealed that three out of five dimensions were significantly correlated between KQ_0 and KQ_1, providing partial support for Hypothesis 1a. These three dimensions are: Argument Quality, Causal Ambiguity, and Information Quality. The correlation results are summarized in Table 9.

Table 9. Pearson Correlations for Knowledge Quality Dimensions between KQ_0 and KQ_1 – Full Survey Study

Knowledge Quality dimension	Pearson Correlation (between KQ_0 and KQ_1)
Argument Quality	.701**
Causal Ambiguity	.458**
Knowledge Novelty	.027
Information Quality	.204*
Metadata Quality	.108

*p<.05 **p<.01

To test Hypothesis 1b, paired sample t tests were performed between dimensions of KQ_0 and KQ_1. This analysis was performed to examine if KQ_1 dimension values were significantly greater than the values of KQ_0. As in the correlation analysis discussed above, three of the t test results were significant statistically. In other words, KQ_1 was significantly greater than KQ_0 on three dimensions: Argument Quality, Causal Ambiguity, and Information Quality. This data analysis suggests that Hypothesis 1b was partially supported. The t test results are summarized in Table 10.

Table 10. Paired Sample t-Tests of Knowledge Quality Dimensions between KQ0 and KQ1 - Full Survey Study

Knowledge Quality dimension	Paired Sample t Test	P value
Argument Quality	7.003	<.001
Causal Ambiguity	5.146	<.001
Knowledge Novelty	.132	.895
Information Quality	5.398	<.001
Metadata Quality	.615	.540

The structural aspect of the research model was tested using the software package SmartPLS version 2.0 (Ringle et al. 2005). Statistical tests of the model paths were conducted using the bootstrapping technique with 500 resamples. This bootstrapping procedure allowed us to examine the convergent validity of measurement items by examining the t values of outer model loadings (Gefen et al. 2005). All of the outer model loadings of reflective constructs were statistically significant at the .01 level. These results confirmed the strong convergent validity for reflective constructs with multiple indicators.

The bootstrapping procedure with 500 resamples allowed us to examine hypotheses 2-8 with data from the full survey study. A number of the paths in the research model are significant statistically at either the .05 or the .01 level. None of the control variables were statistically significant.

These results are displayed in Figure 7 and summarized in Table 11.

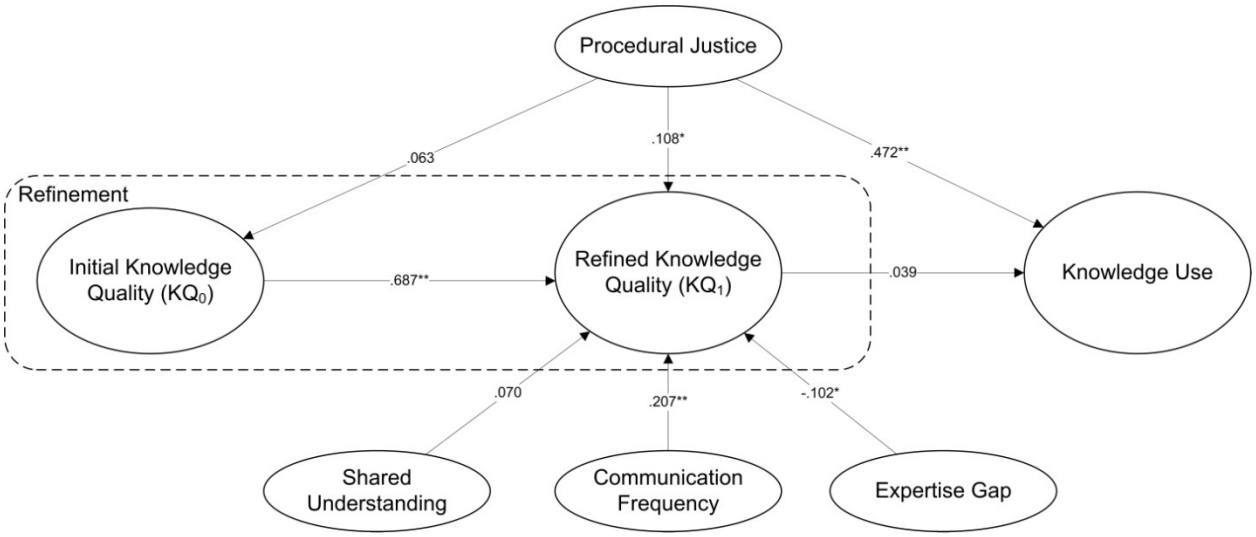


Figure 7. PLS Analysis Results - Full Survey Study

*p<.05 **p<.01

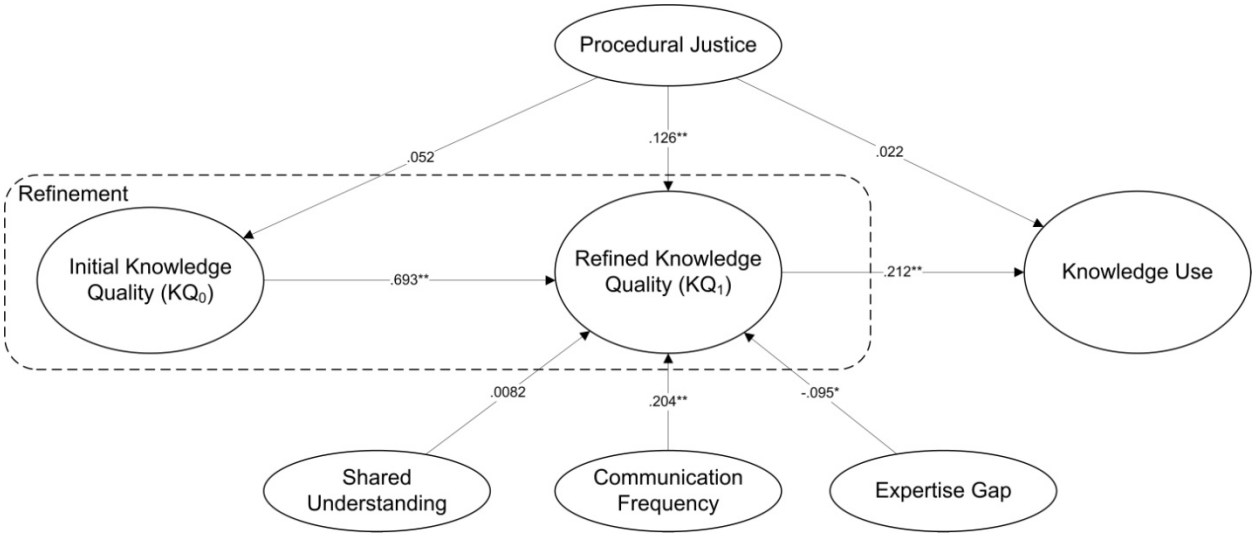
Table 11. Summary of Full Survey Study Findings

#	Hypothesis	Supported?
H1a	KQ_1 is positively related to KQ_0	Partially Supported
H1b	KQ_1 is greater than KQ_0	Partially Supported
H2	Perceived procedural justice leads to higher levels of KQ_0	Not Supported
H3	Procedural justice leads to higher levels of KQ_1	Supported
H4	Shared understanding leads to higher levels of KQ_1	Not Supported
H5	Communication frequency leads to higher levels of KQ_1	Supported
H6	Expertise gap between the author and the validator (in either direction) leads to lower levels of KQ_1	Supported
H7	KQ_1 leads to higher levels of knowledge use	Not Supported
H8	Procedural justice leads to higher levels of knowledge use	Supported

The lack of a significant relationship between KQ_1 and knowledge use is surprising because a significant relationship has been reported several times in the empirical literature. One difference between the approach taken here and the prior literature is the way in which knowledge use is measured. In prior literature, knowledge use has usually been measured in terms of quantity of use. In the present study, on the other hand, knowledge use has been measured in terms of three different qualities of use – innovative, conceptual and conceptual. To find out whether the lack

of a significant relationship between KQ_1 and knowledge use is due to the quality, rather than quantity, measures used to indicate the knowledge use construct, we performed the PLS analysis using quantity, opposed to quality, of use measures to indicate knowledge use.

Results from the re-analysis using quantity of use measures revealed that the relationship between knowledge quality and knowledge use was statistically significant when the knowledge use construct was indicated by quantity of use measures (see Figure **8**). However, the relationship between procedural justice and knowledge use was no longer significant statistically, even though the relationship was significant when quality of use measures were used. The other relationships in the structural model remained unchanged in terms of statistical significance.



*p<.05 **p<.01

Figure 8. PLS Analysis Results - Full Survey Study with Quantity of Use as Indicators of Knowledge Use.

6.3.6 Addressing Multicollinearity

A series of linear regression models were built to address potential concerns of multicollinearity. The first regression model used the sum of Initial Knowledge Quality (KQ_0) dimensions as the dependent variable, and the averages of indicator measures of Procedural Justice as the independent variable. The variance inflation factor (VIF) was 1 for Procedural Justice, which is below the critical value of 10 above which multicollinearity would be a concern (Myers 1990).

The second regression model used the sum of Refined Knowledge Quality (KQ_1) dimensions as the dependent variable, the average of indicator measures of Shared Understanding as an independent variable, and the sum of Expertise Gap dimensions and the sum of Communication Frequency dimensions as independent variables. The VIF was 1.058 for Expertise Gap, 1.314 for Shared Understanding, and 1.377 for Communication Frequency, again all within reasonable ranges.

Finally, the third regression model was built using the sum of Knowledge Use dimensions as the dependent variable, the average of indicator measures of Procedural Justice as an independent variable, and the sum of Refined Knowledge Quality (KQ_1) dimensions as independent variables. Again, all VIF values were within reasonable ranges: 1.074 for Procedural Justice, and 1.074 for KQ_1. This investigation confirms findings from the pilot study that multicollinearity presents little concern for the present research.

6.3.7 Other Notable Findings

In addition to quantitative ratings, qualitative comments were also collected as part of the survey study. While most comments expressed participants' satisfaction with the Eureka system itself, some reflected specifically on the concepts related to the present research. This comment, for example, illustrates the challenges of the refinement process: "The most difficult task in validating is trying to interpret what the author is trying to say: sentences are fragmented and sometimes incoherent. This particular tip was by far one of the best authored." The difficulty in understanding the author's intentions expressed in this comment highlights the importance of shared understanding and communication frequency in achieving effective refinement. Another commented that "the validation process is extremely fair; only valuable tips would get through the process," illustrating the importance of fairness to technicians who submit or use the tips.

When asked whether Eureka should adopt an open refinement process, supported by technology, such as a wiki, where anyone, as opposed to designated validators, could participate in refinement, the majority of respondents were against this suggestion. Many comments raised concerns about the trustworthiness of the repository system if all technicians were allowed to participate in validation. For example, one author commented that "I think running through the validator keeps the trust level on a higher plain (sic)." In fact, out of the 96 written comments we received from author participants in response to the question: "Do you think that all technicians should be allowed to review, edit and directly improve tip submissions, just like how everyone can directly edit Wikipedia? Perhaps tips will be validated more quickly. Perhaps more creative ideas will develop. Or maybe you wouldn't trust the tips as much. Please tell us what

you think” 87 (90.6%) recommended keeping the refinement process as it was. This overwhelming response suggests that the refinement process plays a critical role in establishing trust in knowledge management system.

7.0 DISCUSSION, IMPLICATIONS AND CONCLUSION

This research examines the relationship between knowledge contribution, refinement and use from the organizational justice perspective. This chapter offers a discussion of the empirical findings, limitations, implications for research and practice, and directions for future research.

7.1 DISCUSSION OF RESEARCH FINDINGS

This research provides a framework to understand organizational and dyadic factors that link knowledge contribution, refinement and use. The goal is to identify antecedents that explain the quality of initial knowledge contribution, the quality of refined contribution, and the quality of knowledge use. Each of these areas is discussed below.

7.1.1 Knowledge Contribution

We hypothesized that procedural justice would enhance the quality of initial knowledge contribution. Prior research suggests that procedural justice promotes organizational citizenship behavior. Contributing high quality knowledge to electronic repositories can be considered a form of organizational citizenship behavior. Therefore, promoting procedural justice should enhance the quality of knowledge contribution. However, this study indicates no significant

relationship between procedural justice and knowledge contribution quality. This finding is surprising because the procedural justice literature provides strong theoretical support for this relationship. One possible explanation is that there were difficulties associated with measuring this construct through validators' recollection of the initial quality of knowledge contribution. It had usually been a few years since the validator reviewed the initial tip submissions when the validator participated in the survey study. The dependence on the validator's recall may have weakened the reliability of this measure. In contrast, the measure of the refined knowledge quality was based on the user's current assessment and therefore could have potentially been more reliable than the initial quality measure.

Nonetheless, the initial quality of knowledge contribution was correlated with the refined quality on three out of five dimensions, indicating that the initial quality measure should be adequate at least to some extent. In retrospect, it makes sense that correlation is weak for the dimensions of knowledge novelty and metaknowledge quality. First, the sense of novelty can be extremely sensitive to time factors. Something that was novel five years ago may be outdated today. Because of the time lag between the time validation occurred and the time the survey study took place, the validity and reliability of the knowledge novelty measure could have been compromised to some extent. On the other hand, measuring metaknowledge quality through user ratings could have also been problematic. Metaknowledge such as keywords and title descriptions was designed to optimize search results. Even though users may notice changes overall search effectiveness, they may not be aware of the causes for poor search results. When evaluating the quality of a tip, users may have little experience judging the quality of metaknowledge, whereas validators would have a much more accurate assessment of metaknowledge quality because it was part of the validator's work to verify metaknowledge

content. These reasons may explain the low correlation between initial and refined knowledge quality along the dimensions of knowledge novelty and metaknowledge quality. They would also help explain the lack of a significant relationship between procedural justice and initial knowledge quality.

7.1.2 Knowledge Refinement

We evaluated the knowledge refinement process by observing the evolution in knowledge quality (i.e. the input to refinement) from submission to publication (i.e. the outcome of refinement). While the refined knowledge quality is significantly influenced by the quality of initial submissions, other factors also contribute to the effectiveness of the refinement process. In this study, procedural justice, communication frequency, and expertise gap significantly affected the quality of refined knowledge, whereas shared understanding had little impact on this refinement outcome. Each of these factors is discussed here.

Procedural justice is the extent to which a procedure used to allocated outcomes is perceived to be fair. We theorized that a fair refinement process would be more effective, and this hypothesis was supported by the present study. As the refined knowledge quality was rated by users of the repository system, this finding suggests that a fair refinement process would produce benefits to the users, and not just the authors or validators who participated in the refinement work. Prior research focused largely on the role of fairness in the quantity of knowledge contribution (Bock et al. 2005). This finding demonstrates that, consistent with Kim et al.'s (1997) emphasis on fairness in KM, the impact of fair processes extends beyond knowledge sharing and appears in other domains of KM.

This study also showed that communication frequency positively influenced the quality of refined knowledge, contributing to the effectiveness of the refinement process. This finding supports the view that increased interaction between the author and the validator helps strengthen the validator's understanding of the author's intended goal in sharing a tip, which in turn improves the quality of the refinement outcome. In the interviews and the survey study, some participants commented about the relatively low level of interaction between the author and the validator during the refinement process. Being able to observe this significant finding between communication frequency and refined knowledge quality in such a context is particularly encouraging.

The size of the expertise gap, on the other hand, is negatively related to the quality of refined knowledge. In other words, the greater the difference between the author's expertise level and the refiner's expertise level, the less effective the refinement process was. In contrast, when the author and the refiner were close to each other in terms of expertise level, the refinement process was more effective in improving the quality of refined knowledge. This finding is consistent with existing theory (Hinds et al. 2003) and experimental research findings (Cho et al. 2008). This study is the first time this effect is demonstrated in the context of a corporate KM system, lending much needed external validity to the field of expertise research.

Shared understanding characterizes the extent to which an author and a validator dyad's work values, approaches to problem solving, and understanding of the shared task are similar. Contrary to our hypothesis, shared understanding did not significantly determine the quality of refined knowledge in this study. This lack of finding may be explained by the relationship between shared understanding and the other antecedents included in the research model.

Frequency communication would increase shared understanding. The more often the validator interact with the author, the more likely they would achieve a common ground in their understanding of the common task, and approach to problem solving. Similarly, when the author and the validator are close in terms of expertise levels, they would examine the tip with more similar perspectives, which would lead them to a more common understanding of the validation task. In both cases, the conceptual overlap suggests that the explanatory power of shared understanding may have been largely accounted for by the other factor – communication frequency or expertise gap, leaving little variance in the outcome variable for which shared understanding could explain. If this is true, then this finding by no means suggests that shared understanding in unimportant for refinement. Quite the contrary, shared understanding may have mediated the effect of expertise gap and communication frequency on refinement outcomes.

7.1.3 Knowledge Use

This study examined two potential determinants of knowledge use levels: procedural justice and refined knowledge quality. The findings are discussed with respect to each of these antecedent factors.

Procedural justice, as predicted, significantly enhanced the level of knowledge use. This finding supports the theory that users would develop stronger trust in the repository system if the refinement process is perceived to be fair, and the increased trust would in turn enhances the extent to which the repository content is used. As the justice perception was rated by the authors and the use level was reported by the users, we are confident that this finding is not simply a

product of common method bias. However, because authors are also users of the repository system, it makes sense that author's fairness perception is related to user's activity reports.

The quality of refined knowledge, however, did not significantly affect the usage level. This insignificant finding is surprising because the relationship has appeared in many theoretical frameworks and has been demonstrated in empirical studies (Kulkarni et al. 2006-7; Wu et al. 2006). One possible explanation may be the difference between the newly created measure of knowledge quality used in this research versus the more conventional approach of substituting information quality for knowledge quality, and the difference between the newly created measure of knowledge use versus the more conventional measure. Both new measures are multi-dimensional: The knowledge quality measure contains five dimensions, whereas the knowledge use measure contains three dimensions. Perhaps different dimensions of knowledge quality have differential impacts on the various kinds of knowledge use. Future research should explore the relationships among the multiple dimensions as opposed to at the composite level.

Another explanation is that the relationship may have been weakened due to the presence of a successful refinement process. When the refinement process is effective, the quality of refined knowledge should demonstrate significantly less variance compared to the content quality of a repository without a refinement process. When the content quality is variable, usage behavior could be driven by quality level. However, when content quality is more uniform, whether a knowledge object receives use may be driven more by other contextual factors such as the user's task requirements, and less so by content quality. Therefore, this finding highlights the importance of considering the refinement process in future KM research.

It is quite interesting that, when quantity of use measures were substituted for quality of use measures, the relationship between knowledge quality and knowledge use became statistically significant. In contrast, the relationship between procedural justice and knowledge use was no longer significant when quality of use measures were used. This finding suggests that the quality-based measures developed here capture a unique aspect of knowledge use and are rather distinct from the quantity-based measures used in prior literature. Future research should evaluate both types of measures based on their relevance to the theoretical framework before including one (or both) of them in a research model.

7.2 CONTRIBUTIONS AND IMPLICATIONS

This research makes a number of important contributions by reporting empirical results from Eureka, one of the most successful and long-living repository systems that have been discussed widely in the KM literature. The interview data provided rich insights into the role of procedural justice in knowledge contribution, refinement and use. The survey results provided quantitative support for many of the hypotheses developed based on current theories. In particular, this research makes a number of important contributions to the KM literature. First, by focusing attention on the refinement process that increases repository content quality and subsequently the level of knowledge use, the research sheds light on determinants of knowledge repository system success. Moreover, examining the role of procedural justice brings a new level of understanding to the KM literature. Finally, the study provides new frameworks for understanding knowledge quality and knowledge use. Findings from this research have important implications for managerial practices, including considerations for measuring knowledge quality, designing

effective refinement processes, and promoting both knowledge contribution and use. Each of these is discussed below.

7.2.1 Contributions to Research

This study examined the knowledge refinement process in KM implementation, which has received relatively little attention from researchers. We investigated refinement effectiveness by measuring and quantifying the quality of both initial knowledge contribution and refined content. By exploring major determinants of refinement effectiveness, this study develops a framework at the dyadic level for understanding the dynamics of refinement. More specifically, findings of the present study suggest that initial contribution quality, procedural justice, communication frequency between the author and the refiner, and the size of the expertise gap between the author and the refiner are important antecedents to effective refinement.

Furthermore, this research extends prior research on KM by demonstrating the importance of procedural justice in different knowledge processes. Although we were unable to find a significant relationship between procedural justice and contribution quality, procedural justice critically determined refinement effectiveness and knowledge use levels. Building upon prior research focused on the role of organizational justice in motivating contribution and sharing, the present study provides evidence that the impact of organizational justice extends beyond contribution alone and affects other major KM processes.

This research also provides more comprehensive frameworks for understanding knowledge quality and knowledge use. Although both constructs have been used in prior KM research, little

effort has been made to theorize the constructs and develop appropriate measures. By critically examining and synthesizing prior literatures, the frameworks proposed in the present study could serve as a strong foundation for future research.

7.2.2 Implications for Managerial practices

The refinement research has implications for the management of communities that support the collaborative creation of knowledge repositories, such as Wikipedia. This research highlights the importance of procedural justice in successfully motivating both contribution and use. As these organizations grow in size, disputes over the refinement process or outcomes would surely become more commonplace (Butler et al. 2008). Promoting and maintaining procedural justice may be a key element in the successful operations of these collective commons.

This research also has implications for the management of innovation. A formal review process is often implemented when firms evaluate innovative ideas for further development (Lafley et al. 2008). Results of this research could shed light on the extent to which the perceived level of procedural justice affects the quality and quantity of innovative ideas that are contributed and shared by a firm's intellectual capital. Moreover, the present research could help managers develop processes that review and refine innovative ideas more effectively.

7.3 LIMITATIONS

Findings from this research should have significant implications for repository system management. However, as with all studies, this research is subject to a number of limitations. First, although instructions given to the participants were presented in a neutral fashion, it is likely that participants nominated tips that they recalled particularly favorably or unfavorably. This potential selection bias towards more memorable tips could have reduced the representativeness of the tip sample included in the study.

Moreover, the sampling procedure used in the study excluded tips that were rejected for publication after the validation process. Because tips rejected for Eureka inclusion were never published for user access, they could not possibly have been nominated for the present study. Sampling only tips that were approved by validators has likely limited the range and variation of quality ratings, and skewed the ratings towards higher scores. Future research should strive to overcome these methodological limitations using more creative sampling strategies.

More research is needed to overcome the limitation of the single-system, single-company research context. It should be noted that Xerox is a product-based organization in a high volatility context (Kankanhalli et al. 2003). Findings from Eureka cannot generalize to the management of repository systems for other types of organizations or other contexts without caution. This case-study design allows greater control for systems-level variations that are beyond the focal interest of the present study. At the same time, however, generalization of the study's findings to other contexts must be made with caution. It is possible that the findings are dependent upon the unique organizational setting of Xerox, and the nature of technical tasks that

Eureka is designed to support. Future research should validate the research model in multiple organizations.

Finally, this work only considers the effect of a limited subset of antecedents and consequences. Although the factors considered in the present study provide useful insights, they are by no means the only factors that should be considered in a study of knowledge repositories. Future research should investigate the effect of other factors such as the nature of the task (e.g., technical vs. managerial work).

7.4 FUTURE RESEARCH

This research focuses exclusively on the procedural justice of the refinement process. The organizational justice literature, however, provides rich discussions of other forms of justice – interactional justice, informational justice and distributive justice. Some of these justice concepts have been discussed in the MIS literature (Joshi 1989), but their discussions are largely non-existent in the KM literature. Understanding the antecedents and consequences of these justice perceptions in the KM context can provide important theoretical and managerial insights. At the same time, the organizational justice perspective can enrich the understanding of other KM procedures and practices, such as knowledge sharing, seeking, and transfer.

It would be particularly interesting to explore how distributive justice should be conceptualized in the context of repository contribution. Unlike other forms of work rewards, repository inclusion is not a zero-sum or constant-sum game. In other words, having a submission accepted for inclusion in a repository does not take away the opportunity for another submission to be

accepted. Whether distributive justice is relevant in this context and how it affects contribution behavior should be examined with additional research. Future research should also explore other aspects of the knowledge refinement process than the two examined in the current research – procedural justice and refinement effectiveness. For instance, what structural design – centralized, decentralized, etc. – makes refinement more effective?

The current research examines the refinement process at a dyadic level, focusing particularly on the interaction between the refiner and the author. Newly defined constructs, such as knowledge use, is also defined at a microscopic level. How these constructs can be conceptualized at other levels (e.g., group, organizational) should be explored in future research,

Refinement practices are now increasingly common in contexts outside of knowledge repositories. The open-source environment for software development, for instance, has adopted a variety of refinement practices (Halloran et al. 2002). How concepts and relationships discussed here can be extended or modified to predict knowledge quality and usage in other contexts should certainly be explored in the future.

7.5 CONCLUSION

Although the benefits of the knowledge codification strategy, particularly in the implementation of repository systems, are realized only when knowledge is used, very little is understood about what motivates organizational members to use repository knowledge. When the quality of repository knowledge is suboptimal, significant effort may be necessary before knowledge can

be used effectively and productively. Conversely, users of a knowledge repository system are more likely to use knowledge when they perceive the content to be of high quality.

This research program should substantially improve the understanding of knowledge repository systems. Additionally, the project will stimulate a stream of further research in this important area. For example, what is the best way to design KM governance that promotes knowledge quality? Should quality control processes be centralized or decentralized? What IT design choices are important to consider that promotes quality? What is the impact of these design options on the level of knowledge use? The conceptual foundations for knowledge quality and use developed in the present research should serve as the basis for fruitful research in the future.

APPENDIX A

INTERVIEW PROTOCOL

Interview guide for authors and validators (aka refiners)

(1) How would you describe the usage pattern of Eureka? Do most people use most documents? Or is it closer to 90% of users using 10% of the codified knowledge?
(2) What makes people contribute tips to Eureka? What's the motivation?
(3) What makes people want to serve as a validator? What's the motivation?
(4) Describe your experience working on validating a tip. What was the process like?
(5) Reflect on your tip validation experiences. What was the most notable attributes about the experiences? What were the most challenging aspects of validation?
(6) How do validators determine if a tip is good enough for inclusion? What kinds of things do validators look for, and how do they make sure the tip is useful for many users?
(7) How long is the shelf life of a typical tip? Have you tried to do anything to extend the time for which a tip remains valuable and useful? Has any practice been particularly useful?
(8) Validators: How do you keep tips up-to-date?
(9) In your opinion, what makes a tip reusable over time? Probe for the importance of knowledge quality dimensions.
(10) How easy it is to use tips contributed by authors in a different geographical location? Describe the benefits and challenges.
(11) How easy it is to work with validators/authors in a different geographical location? Describe the benefits and challenges.
(12) Do you think people prefer to obtain knowledge they need from Eureka, or through other means? If so, describe the benefits of these alternative knowledge sources, and why people prefer to use them.

Interview guide for users

(1) Do you use Eukera for your work? If so, how often in what period of time? In general, are Eureka tips helpful to you? Do you actually use the tips for your work?
(2) Why do you think people use or choose not to use Eureka? What's the motivation?
(3) When you access a tip, how do you decide whether or not to use it for your task? Probe if

any of the factors in the research model is mentioned: What you mean when you say that someone is [perceived as an expert]?

(4) When trying to solve a problem, how do you decide if you should search Eureka for solutions? If not, what else do you do?

(5) Can you think of an instance in which you retrieved a Eureka tip, but then choose not to use it for your task? If so, please describe the situation and talk about some of the reasons why you disagreed with the tip or chose not to use it.

(6) Now let's talk about the tips you have retrieved from Eureka today. Starting with the first, please tell me why you opened it, and what thoughts occurred to you upon first reading it? Did your view of it change over time? Ultimately, what did you do with it and why (probe on why). When did you act on it, relative to when you opened it?

(7) In general, do you find Eureka to be a useful tool? Is the quality of the repository content worth the time it takes to search for relevant tips? Why or why not?

APPENDIX B

THE USER QUESTIONNAIRE

University of Pittsburgh Eureka Research Study

Welcome to the University of Pittsburgh Eureka User Study. Your answers are very valuable for the Eureka community because findings from the survey study will help us understand how to improve Eureka tips and how to better serve Eureka users.

Your privacy is protected

We not only value your participation, we also have great respect for your privacy. Please be assured that your answers will remain anonymous and will be accessible only to the University of Pittsburgh research team. Your answers will NOT be available to anyone outside the research team, including Xerox management, and will NOT have any impact on your performance evaluation. Only summary statistics and aggregate data will be reported. Individuals will NOT be identified in any report. Participation is entirely voluntary. Whether you choose to participate or not will NOT affect your relationship with Xerox or University of Pittsburgh.

Your task: Answer questions about ONE Eureka tip

In this study you are asked to answer a series of questions regarding one Eureka tip of your choice. Please choose a tip that is NOT authored by you. Please refer to the specific experience of using the tip when answering questions, and please try not to reflect on the experience of using other tips.

Construct	Dimensions	ID	Measurement Items
Knowledge Quality	Argument Quality (Coulter et al. 2004; Sussman et al. 2003)	AQ1	1. Explanations for how this tip works are complete
		AQ2*	2. Explanations for how this tip works are consistent
		AQ3	3. Explanations for how this tip works are accurate
		AQ4	4. Explanations for how this tip works are believable
	Causal Ambiguity (Szulanski 1996)	CA1	5. The limits of the tip are fully specified
		CA2	6. With the tip, we know why a given action results in a given outcome
		CA3*	7. When a problem addressed by this tip surfaces, the precise reasons for the problem could not be articulated even after the event
		CA4*	8. There is a precise list of the skills, resources and prerequisites necessary for successfully implementing the tip
		CA5	9. It is clear how the components of that list interact to produce the tip's desired output
		CA6	10. The tip describes precisely what people solving the problem actually do.
	Knowledge Novelty (Shrivastava 1987 and original items)	KN1	11. The problem addressed in this tip is novel.
		KN2	12. The solution presented in this tip is novel.
		KN3	13. This tip challenges ideas for this category of service solutions.
		KN4	14. This tip spawns ideas for other problems.
		KN5	15. Ideas presented in this tip are unique
	Information Quality (Rai et	IQ1	16. This tip provides the precise information I need.

	al. 2002)	IQ2	17. This tip provides sufficient information for me to use it
		IQ3**	18. This tip has errors that I must work around
		IQ4	19. I am satisfied with the accuracy of this tip
		IQ5	20. Information contained in this tip is helpful regarding my questions or problems
		IQ6	21. This tip is presented in formats (e.g., text, visual, audio) that are sufficient for my use
	Metaknowledge Quality (original items)	MQ1	22. Keywords for this tip are accurate.
		MQ2*	23. Keywords for this tip are comprehensive.
		MQ3	24. Keywords for this tip are up-to-date.
		MQ4	25. Keywords for this tip are relevant.
Author Credibility (Sussman et al. 2003)		AC1	26. How knowledgeable is the **author** of this tip on the topic?
		AC2	27. To what extent is the **author** an expert on the tip topic?
		AC3	28. How trustworthy is the **author** on the tip topic?
		AC4	29. How reliable is the **author** on the tip topic?
Validator Credibility (Sussman et al. 2003)		VC1	30. How knowledgeable is the **validator** of this tip on the topic?
		VC2	31. To what extent is the **validator** an expert on the tip topic?
		VC3	32. How trustworthy is the **validator** on the tip topic?
		VC4	33. How reliable is the **validator** on the tip topic?
User Motivation	External PLOC (Malhotra et al. under review)	EPLOC1	26. I use this tip because it is required by Xerox
		EPLOC2	27. I use this tip because it is compulsory in my job.
		EPLOC3	28. I use this tip because the Eureka coordinator requires me to do it.
	Internal PLOC (Malhotra et al. under review)	IPLOC1	29. I use this tip because I think it's personally important to myself.
		IPLOC2	30. I use this tip because I enjoy it.
		IPLOC3	31. I use this tip because I want to learn new things.

		IPLOC4	I use this tip because I want to understand the issues and ideas.
	Introjected PLOC (Malhotra et al. under review)	InPLOC1	32. I use this tip because it bothers me when I don't use it.
		InPLOC2	33. I use this tip because I want my colleagues to like me.
		InPLOC3	34. I use this tip so others won't get upset with me.
Knowledge Use	Quantity of Use (Sussman et al. 2003)	QU1	35. How many times have you applied this tip for your work?
		QU2	36. How many times within a week do you usually apply this tip for your work?
	Innovative Use (Fulk et al. 2004; original items; Majchrzak et al. 2004)	IU1	37. I used this tip to solve various problems
		IU2	38. I used this tip exactly the way it is described.
		IU3	39. I developed new solutions by combining this tip with other ideas.
		IU4	40. I adapted this tip to solve new problems.
		IU5	41. I adapted this tip to create new solutions.
	Affective Use	AU1	42. I used this tip to justify a decision already made (e.g., a solution already implemented)
		AU2	43. I used this tip to reinforce customer or management expectations
		AU3	44. Instinct/intuition was combined with this tip when I used it to make decisions (e.g., to implement a solution)
		AU4	45. I used the tip to back up hunches, prior to the implementation of a solution or a decision
		AU5	46. This tip was used to support decisions made on other grounds.
	Conceptual Use	CU1	47. This tip enhanced my understanding of the product.
		CU2	48. This tip increased my knowledge about this product.
		CU3	49. This tip was very educational to me.
Perceived Individual Benefits	(Rai et al. 2002)	PIB1	50. Knowledge gained from using this tip will be helpful to me with other tasks in the future.
		PIB2	51. Knowledge how to use this tip makes me more marketable.
		PIB3	52. Using this tip increases my productivity (e.g., reduces service call duration)

		PIB4	53. Using this tip increases customer satisfaction with my service
System Quality	(Rai et al. 2002)	SQ1	54. Eureka operates reliably.
		SQ2	55. Eureka can be adapted to meet a variety of needs
		SQ3	56. Eureka effectively combines data from different areas of the company.
		SQ4	57. Eureka makes knowledge easy to access.
		SQ5**	58. It takes too long for Eureka to respond to my requests.
		SQ6	59. Overall, Eureka is of high quality.
Demographics		D1	60. How long have you worked for Xerox?
		D2	61. What is your job title?
		D3	62. Please circle your gender: Male / Female
		D4	63. In what year were you born?
		D5	64. Please indicate your country of origin.

*Item deleted after factor and reliability analysis
**Item reverse scored

APPENDIX C

THE AUTHOR QUESTIONNAIRE

University of Pittsburgh Eureka Research Study

Welcome to the University of Pittsburgh Eureka **Author Study**. Your answers are very valuable for the Eureka community because **a tip you authored was nominated for this study**. Findings from the survey study will help us understand how to improve Eureka tips and how to better serve Eureka users.

Your privacy is protected

We have great respect for your privacy. Please be assured that your answers will remain anonymous and will be accessible only to the research team. Your answers will NOT be available to anyone outside the research team, including Xerox management, and will NOT have any impact on your performance evaluation, or your relationship with Xerox or University of Pittsburgh. Only summary statistics and aggregate data will be reported. No individuals will be identified.

Your task: Answer questions about the Eureka tip nominated for this study that you authored

As **<u>the author of the nominated tip</u>**, you can provide us with really important insights into the tip creation process. Please answer the survey questions by reflecting on your decision to develop and submit the tip.

The invitation email contains a RecordID. This ID refers to a tip that you authored. Please answer the survey questions with respect to this tip ("the nominated tip")

Please enter the 6-digit RecordID (e.g., 123456) here _____

Construct	Survey Questions
Reputation (Kankanhalli et al. 2005; Wasko et al. 2005)	1. I wanted to earn respect from others by writing this tip
	2. I felt that writing this tip for Eureka would improve my status in the profession
	3. Sharing this tip through Eureka improves others recognition of me
Cost (Fulk et al. 2004; Kankanhalli et al. 2005)	4. It was hard to find time to enter this idea into Eureka
	5. It was laborious to write up this idea for tip submission
	6. The process of writing and submitting this tip is time consuming
Please answer the following questions reflecting on how you felt around the time of submitting this tip	
Org. Commitment (Allen et al. 1990)	7. I would be very happy to spend the rest of my career with Xerox
	8. I enjoyed discussing Xerox with people outside it
	9. I really felt as if Xerox's problems were my own
	10. I thought that I could easily become as attached to another organization as I was to Xerox
	11. I did not feel like 'part of the family' at Xerox
	12. I felt 'emotionally attached' to Xerox
	13. Xerox had a great deal of personal meaning to me
	14. I felt a strong sense of belonging to Xerox
With the next set of questions, please reflect on the process of validating the tip	
Shared Understanding (Ko et al. 2005)	15. The tip validator and I solved problems the same way
	16. The tip validator and I understood each other when we talked
	17. The tip validator and I had no problem understanding each other
Comm.	18. The tip validator and I communicated over the phone

Frequency	19. The tip validator and I communicated over email
	20. The tip validator and I communicated in person
Procedural Justice (Blader et al. 2003)	21. How often did you feel that validation decisions were made in fair ways?
	22. Overall, how fair would you say validation decisions and processes were in Eureka?
	23. How would you rate the overall fairness with which issues and decisions that came up during validation were handled?
	24. Was there a general sense among employees that submissions were handled in fair ways during validation?
	25. How much of an effort was made to be fair to employees when validation decisions were being made?
The next set of questions involves reflection on your expertise on the topic of the tip. Please be assured that this is not a performance evaluation. Your truthful and honest answers will be kept confidential. The success of this research project, however, depends entirely on your self assessment. We thank you in advance for your honest report.	
Expertise	26. At the time of submitting this tip, how many years have you worked with the product for which this tip supports?
	27. Please rate your expertise on this product at the time when you validated the tip: Novice ….. Expert
	28. How informed were you on this product at the time of the tip submission?
	29. To what extent were you an expert on this product?
Demographics	D1. How long have you worked for Xerox?
	D2. What is your job title?
	D3. Please circle your gender: Male / Female
	D4. When were you born?
	D5. Please indicate the country in which you were residing while validating the tip
	D6. How many years have you worked in your current job position?
	D7. How many years have you used the Eureka system?
Do you think that all technicians should be allowed to review, edit and directly improve tip submissions, just like how everyone can directly edit Wikipedia? Perhaps tips will be validated more quickly. Perhaps more creative ideas will develop. Or maybe you wouldn't trust the tips as much. Please tell us what you think.	
If you have additional comments about writing tips, about Eureka in general, or about this survey study, please provide them here:	

APPENDIX D

THE VALIDATOR QUESTIONNAIRE

University of Pittsburgh Eureka Research Study

Welcome to the University of Pittsburgh Eureka **Validator Study**. Your answers are very valuable for the Eureka community because **you validated one of the tips nominated for the study**. Findings from the survey study will help us understand how to improve Eureka tips and how to better serve Eureka users.

Your privacy is protected

We have great respect for your privacy. Please be assured that your answers will remain anonymous and will be accessible only to the research team. Your answers will NOT be available to anyone outside the research team, including Xerox management, and will NOT have any impact on your performance evaluation, or your relationship with Xerox or University of Pittsburgh. Only summary statistics and aggregate data will be reported. No individuals will be identified.

Your task: Answer questions about the Eureka tip nominated for this study that you validated

As **the validator of the nominated tip**, you are one of the few people who had seen the first draft of the tip submission before validation. Please answer the survey questions by reflecting on the initial tip submission, and please do not consider its current published form.

The invitation email contains a RecordID. This ID refers to a tip that you validated. Please answer the survey questions with respect to this tip ("the nominated tip")

Please enter the 6-digit RecordID (e.g., 123456) here _____

	Please refer to the original submission of the nominated tip when answering the following questions.
Argument Quality	1. Explanations for how this tip worked were complete
	2. Explanations for how this tip worked were accurate
	3. Explanations for how this tip worked were believable
Causal Ambiguity	4. The limits of the tip were fully specified
	5. With the tip, we knew why a given action resulted in a given outcome
	6. It was clear how the components of this tip interacted to produce the tip's desired output
	7. The tip described precisely what people solving the problem should do
	8. The problem addressed in this tip was novel
	9. The solution presented in this tip was novel
Novelty	10. This tip challenged ideas for this category of service solutions
	11. This tip spawned ideas for other problems
	12. Ideas presented in this tip were unique
Information Quality	13. This tip provided the precise information that users would need
	14. This tip provided sufficient information for users to use it
	15. This tip had errors that users must work around
	16. I was satisfied with the accuracy of this tip
	17. Information contained in this tip was helpful regarding the relevant questions or problems
	18. This tip was presented in formats (e.g., text, visual, audio) that were sufficient for my use
Metaknowledge Quality	19. Keywords for this tip were accurate
	20. Keywords for this tip were comprehensive
	21. Keywords for this tip were up-to-date
Shared Understanding	22. The tip author and I solved problems the same way
	23. The tip author and I understood each other when we talked

(Ko et al. 2005)	24. The tip author and I had no problem understanding each other
Comm. Frequency	25. The tip author and I communicated over the phone
	26. The tip author and I communicated over email
	27. The tip author and I communicated in person
The next set of questions involves reflection on your expertise on the topic of the tip. Please be assured that this is not a performance evaluation. Your truthful and honest answers will be kept confidential. The success of this research project, however, depends entirely on your self assessment. We thank you in advance for your honest report.	
Expertise	28. At the time of validation, how many years have you worked with the product for which this tip supports?
	29. Please rate your expertise on this product at the time when you validated the tip: Novice ….. Expert
	30. How informed were you on this product at the time of the tip submission?
	31. To what extent were you an expert on this product?
Demographics	D1. How long have you worked for Xerox?
	D2. What is your job title?
	D3. Please circle your gender: Male / Female
	D4. When were you born?
	D5. Please indicate the country in which you were residing while validating the tip
	D6. How many years have you worked in your current job position?
	D7. How many years have you used the Eureka system?
	If you have additional comments about writing tips, about Eureka in general, or about this survey study, please provide them here:

BIBLIOGRAPHY

Adams, J.S. "Towards an Understanding of Inequity," *Journal of Abnormal and Normal Social Psychology* (67) 1963, pp 422-436.

Adams, J.S. "Inequity in Social Exchange," in: *Advances in Experimental Psychology,* L. Berkowitz (ed.), Academic Press, New York, NY, 1965, pp. 267-299.

Alavi, M. "Managing organizational knowledge," in: *Framing the Domains of IT Management: Projecting the Future.....Through the Past,* R.W. Zmud (ed.), Pinnaflex Educational Resources, Cincinnati, Ohio, 2000.

Alavi, M., and Leidner, D.E. "Knowledge Management Systems: Issues, challenges, and benefits," *Communications of the AIS* (1:2) 1999, pp 1-37.

Alavi, M., and Leidner, D.E. "Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues," *MIS Quarterly* (25:1), Mar 2001, pp 107-136.

Allen, N.J., and Meyer, J.P. "The measurement and antecedents of affective, continuance, and normative commitment to the organization," *Journal of Occupational Psychology* (63:1) 1990, pp 1-18.

Amabile, T.M., Conti, R., Coon, H., Lazenby, J., and Herron, M. "Assessing the work environment for creativity," *Academy of Management Journal* (39:5) 1996, pp 1154-1184.

Arthur, J.B., and Huntley, C.L. "Ramping up the organizational learning curve: Assessing the impact of deliberate learning on organizational performance under gainsharing," *Academy of Management Journal* (48:6) 2005, pp 1159-1170.

Bailey, J.E., and Pearson, S.W. "Development of a tool for measuring and analyzing computer user satisfaction," *Management Science* (29:5) 1983, pp 530-545.

Barki, H., Rivard, S., and Talbot, J. "An integrative contingency model of software project risk management," *Journal of Management Information Systems* (17:4) 2001, pp 37-69.

Barki, H., Titah, R., and Boffo, C. "Information System Use–Related Activity: An Expanded Behavioral Conceptualization of Individual-Level Information System Use," *Information Systems Research* (18:2) 2007, pp 173-192.

Bentler, P.M., and Wu, E.J.C. *EQS for Windows User's Guide* Multivariate Software, Inc., Encino, CA, 1995.

Billings, R.S., and Wroten, S.P. "Use of path analysis in industrial/organizational psychology: Criticisms and suggestions," *Journal of Applied Psychology* (63) 1978, pp 677-688.

Blader, S.L., and Tyler, T.R. "A four-component model of procedural justice: Defining the meaning of a "fair" process," *Personality and Social Psychology Bulletin* (29:6) 2003, pp 747-758.

Blau, P.M. *Exchange and Power in Social Life* John Wiley, New York, 1964.

Bobrow, D.G., and Whalen, J. "Community Knowledge Sharing in Practice: The Eureka Story," *Journal of the Society for Organizational Learning* (4:2) 2002.

Bock, G.W., Zmud, R.W., Kim, Y.G., and Lee, J.N. "Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate," *MIS Quarterly* (29:1) 2005, pp 87-111.

Bollen, K.A. "Multiple indicators: Internal consistency or no necessary relationship?," *Quality & Quantity* (18) 1984, pp 377-385.

Boucher, M. "Growing community knowledge through a socio-technical tip sharing system," Xerox, Montreal, Canada.

Boucher, M. "Personal Communication," 2007.

Browne, M.W., and Cudeck, R. "Alternative ways of assessing model fit," *Sociological Methods and Research* (21) 1992, pp 230-258.

Burton-Jones, A., and Gallivan, M.J. "Toward a Deeper Understanding of System Usage in Organizations: A Multilevel Perspective," *MIS Quarterly* (31:4) 2007, pp 657-679.

Burton-Jones, A., and Straub, D.W.J. "Reconceptualizing System Usage: An Approach and Empirical Test," *Information Systems Research* (17:3) 2006, pp 228-246.

Butler, B.B., Joyce, E., and Pike, J. "Don't Look Now, But We've Created a Bureaucracy: Policies and Rules in Wikipedia," Conference on Human Factors in Computing Systems, ACM, Florence, Italy, 2008.

Butler, B.S. "Membership size: Communication activity, and sustainability: A resource-based model of online social structures," *Information Systems Research* (12:4) 2001, pp 346-362.

Butler, B.S., Sproull, L. Kiesler, S., Kraut, R. "Community effort in online groups: Who does the work and why?," in: *Leadership at a Distance*, S. Weisband and L. Atwater (eds.), LEA, Mahwah, NJ, 2002.

Chen, C.C., Chen, Y.R., and Xin, K. "Guanxi practices and trust in management: A procedural justice perspective," *Organization Science* (15:2) 2004, pp 200-209.

Cho, K., Chung, T.R., King, W.R., and Schunn, C. "Creating a peer-based computer-supported knowledge refinement process," *Communications of the ACM* (51:3) 2008, pp 83-88.

Cho, K., Chung, T.R., King, W.R., and Schunn, C. "Peer-based computer-supported knowledge refinement: An empirical investigation," *Communications of the ACM*) in press.

Chung, T.R., and Cho, K. "E-Collaboration-Based Knowledge Refinement as a Key Success Factor for Knowledge Repository Systems," in: *Encyclopedia of E-Collaboration*, N.F. Kock (ed.), Idea Group, Hershey, PA, 2007.

Clay, P.F., Dennis, A.R., and Ko, D. "Factors affecting the loyal use of knowledge management systems," the 38th Hawaii International Conference on System Sciences, Hawaii, 2005.

Cohen-Charash, Y., and Spector, P.E. "The Role of Justice in Organizations: A Meta-analysis," *Organizational Behavior and Human Decision Processes* (86) 2001, pp 278-321.

Coleman, J.S. *Foundations of Social Theory* Belknap Press, Cambridge, MA, 1990.

Colquitt, J.A. "On the dimensionality of organizational justice: A construct validation of a measure," *Journal of Applied Psychology* (86:3) 2001, pp 386-400.

Colquitt, J.A., Conlon, D.E., Wesson, M.J., Porter, C.O.L.H., and Ng, K.Y. "Justice at the millennium: A meta-analytic review of 25 years of organizational justice research," *Journal of Applied Psychology* (86) 2001, pp 425-445.

Constant, D., Sproull, L., and Kiesler, S. "The kindness of strangers: The usefulness of electronic weak ties for technical advice," *Organization Science* (7:2) 1996, pp 119-135.

Coulter, K.S., and N., P.G. "The effects of cognitive resource requirements, availability, and argument quality on brnad attitudes: A melding of elaboration likelihood and cognitive resrouce matching theories," *Journal of Advertising* (33:4) 2004, pp 53-64.

Cropanzano, R., Bowen, D.E., and Gilliland, S.W. "The Management of Organizational Justice," *Academy of Management Perspectives* (21:4) 2007, pp 34-48.

Davenport, T.H., and Prusak, L. *Working Knowledge* Harvard Business School Press Cambridge, MA, 1998.

DeLone, W.H., and McLean, E.R. "Information systems success: The quest for the dependent variable," *Information Systems Research* (3:1) 1992, pp 60-95.

DeLone, W.H., and McLean, E.R. "The DeLone and McLean model of information systems success: a ten-year update," *Journal Of Management Information Systems* (19:4), Spr 2003, pp 9-30.

Denison, D.R. "What Is the Difference between Organizational Culture and Organizational Client? A Native's Point of View on a Decade of Paradigm Wars," *Academy of Management Review* (21:3) 1996, pp 619-654.

Dennis, A.R. "Information exchange and use in group decision making: You can lead a group to information, but you can't make it think," *MIS Quarterly* (20:4) 1995, pp 433-457.

Diamantopoulos, A., and Souchon, A.L. "Measuring export information use: Scale development and validation," *Journal of Business Research* (46:1) 1999, pp 1-14.

Dixon, N. *Common Knowledge: How Companies Thrive by Sharing What They Know* Harvard Business School Press, Cambridge, MA, 2000.

Durcikova, A. "The Role of Organizational Climate in the Use of Knowledge Management Systems to Support Problem-Solving," in: *Unpublished Dissertation, Katz Graduate School of Business*, University of Pittsburgh, Pittsburgh, 2004.

Faniel, I.M., and Majchrzak, A. "An exploratory study of the factors associated with successful reuse of other's knowledge," Eighth Americas Conference on Information Systems, Dallas, TX, 2002.

Faniel, I.M., and Majchrzak, A. "Innovating by accessing knowledge across departments," *Decision Support Systems* (43:4) 2007, pp 1684-1691.

Fern, E.F. "The use of focus groups for idea generation: The effects of group size, acqaintanceship, and moderator on response quantity and quality," *Journal of Marketing Research* (19:1) 1982, pp 1-13.

Ford, D.P., and Staples, D.S. "Perceived value of knowledge: Shall I give you my gem, my coal?," the 38th Hawaii International Conference on System Sciences, Hawaii, 2005.

Fornell, C., and Larcker, D. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18:2) 1981, pp 39-50.

Fulk, J., Heino, R., Flanagin, A.J., Monge, P.R., and Bar, F. "A test of the individual action model for organizational information commons," *Organization Science* (15:5) 2004, pp 569-585.

Garfield, M.J., Taylor, N.J., Dennis, A.R., and Satzinger, J.W. "Research report: Modifying paradigms - Individual differences, creativity techniques, and exposure to ideas in group idea generation," *Information Systems Research* (21:3) 2001, pp 322-333.

Garvin, D.A. *Managing Quality: The Strategic and Competitive Edge* The Free Press/Macmillan Inc., New York, New York, USA, 1988.

Gefen, D., and Straub, D.W. "A Practical Guide to Factorial Validity Using PLS-Graph: Tutorial and Annotated Example," *Communications of the AIS* (16) 2005, pp 91-109.

Gerbing, D.W., and Hamilton, J.G. "Viability of exploratory factor analysis as a precursor to confirmatory factor analysis," *Structural Equation Modeling* (3) 1996, pp 62-72.

Gerwin, D., and Moffat, L. "Withdrawal of team autonomy during concurrent engineering," *Management Science* (43:9) 1997, pp 1275-1287.

Gold, A.H., Malhotra, A., and Segars, A.H. "Knowledge Management: An Organizational Capabilities Perspective," *Journal of Management Information Systems* (18:1) 2001, pp 185-214.

Goodman, P.S., and Darr, E.D. "Exchanging best practices through computer-aided systems," *Academy of Management Executive* (10:2) 1996, pp 7-18.

Goodman, P.S., and Darr, E.D. "Computer-Aided Systems and Communities: Mechanisms for Organizational Learning in Distributed Environments," *MIS Quarterly* (22:4) 1998, pp 417-440.

Gray, P.H., and Durcikova, A. "The role of knowledge repositories in technical support environments: Speed versus learning in user performance," *Journal Of Management Information Systems* (22:3) 2005, pp 159-190.

Gray, P.H., and Meister, D.B. "Knowledge sourcing methods," *Information & Management* (43) 2006, pp 142-156.

Greenberg, J. "A taxonomy of organizational justice theories," *Academy of Management Review* (12:1) 1987, pp 9-22.

Greenberg, J. "Organizational justice: Yesterday, today and tomorrow," *Journal of Management* (16:2) 1990, pp 399-432.

Greenfield, D. "From Idea to Innovation," *InformationWeek* (November, 10, 2008) 2008, pp 26-35.

Grosslight, G. "Wells Fargo Uses Market To Filter Out Innovative Ideas," *InformationWeek* (September 15, 2008) 2008.

Gu, B., Konana, P., Rajagopalan, B., and Chen, H.-W.M. "Competition among virtual communities and user valuation: The case of investing-related communities," *Information Systems Research* (18:1) 2007, pp 68-85.

Haas, M.R., and Hansen, M. "When using knowledge can hurt performance: The value of organizational capabilities in a management consulting company," *Strategic Management Journal* (26) 2005, pp 1-24.

Hackman, R. "The design of work teams," in: *Handbook of Organizational Behavior,* J. Lorsch (ed.), Prentice Hall., Englewood Cliffs, NJ, 1987.

Halloran, T.J., and Scherlis, W.L. "High Quality and Open Source Software Practices," in: *The Second Workshop on Open Source Software Engineering, International Conference on Software Engineering*, 2002.

Hamilton, S., and Ives, B. "Knowledge utilization among MIS researchers," *MIS Quarterly* (6:4) 1982, pp 61-77.

Hansen, M.T., Nohira, N., and Terney, T. "What's your strategy for managing knowledge?," *Harvard Business Review* (106-116) 1999.

Hardin, G. "The tragedy of the commons," *Science* (162:1243-1248) 1968.

Harvey, N., Harries, C., and Fischer, I. "Using advice and assessing its quality," *Organizational Behavior and HUman Decision Processes* (81:2) 2000, pp 252-273.

Hickins, M. "Xerox Shares its Knowledge," *Management Review* (88:8) 1999, pp 40-45.

Hicks, R.C., Dattero, R., and Galup, S.D. "A verification-based conflict resolution strategy for knowledge management systems," *Journal of Computer Information Systems* (Winter:36-41) 2002-2003.

Hinds, P., and Pfeffer, J. "Why organizations don't "know what they know": Cognitive and motivational factors affecting the transfer of expertise," in: *Sharing Expertise: Beyond Knowledge Management*, M.S. Ackerman, V. Pipek and V. Wulf (eds.), The MIT Press, Cambridge, MA, 2003.

Hollingshead, A.B., Fulk, J., and Monge, P.R. "Fostering Intranet Knowledge Sharing: An Integration of Transactive Memory and Public Goods Approaches," in: *Distributed Work*, P. Hinds and S. Kiesler (eds.), MIT Press, Cambridge, MA, 2002.

Huber, G.P. "Transfer of Knowledge in Knowledge Management Systems: Unexplored Issues and Suggested Studies," *European Journal of Information Systems* (10) 2001, pp 72-79.

Jiang, J.J., Klein, G., and Carr, C.L. "Measuring Information System Service Quality: SERVQUAL from the other side," *MIS Quarterly* (26:2) 2002, pp 145-166.

John, G., and Martin, J. "Effects of organizational structure of marketing planning on credibility and utilization of plan output," *Journal of Marketing Research* (21:2) 1984, pp 170-183.

Joshi, K. "The measurement of fairness or equity perceptions of management information users," *MIS Quarterly* (13:3) 1989, pp 343-358.

Kahn, B.K., Strong, D.M., and Wang, R.Y. "Information quality benchmarks: Product and service performance," *Communications of the ACM* (45:4) 2002, pp 184-192.

Kane, A.A., Argote, L., and Levine, J. "Knowledge transfer between groups via personnel rotation: effects of social identity and knowledge quality," *Organizational Behavior and Human Decision*

Processes (96:1) 2005, pp 56-71.

Kankanhalli, A., Tan, B.C.Y., and Wei, K.K. "Contributing Knowledge to Electronic Knowledge Repositories: An Empirical Investigation," *MIS Quarterly* (29:Issue 1) 2005, pp 113-143.

Kankanhalli, A., Tanudidjaja, F., Sutanto, J., and Tan, B.C.Y. "The role of IT in successful knowledge management initiatives," *Communications Of The Acm* (46:9), Sep 2003, pp 69-73.

Kettinger, W.J., and Lee, C.C. "Pragmatic Perspective on the Measurement of Information Systems Service Quality," *MIS Quarterly* (21:2) 1997, pp 223-240.

Kim, W.C., and Mauborgne, R. "Procedural justice, attitudes, and subsidiary top management compliance with multinationals' corporate strategic decisions," *Academy of Management Journal* (36:3) 1993, pp 502-526.

Kim, W.C., and Mauborgne, R. "Fair process: Managing in the knowledge economy," *Harvard Business Review* (75:4) 1997, pp 65-75.

Kim, W.C., and NMauborgne, R. "Procedural justice, strategic decision making, and the knowledge economy," *Strategic Management Journal* (19:4) 1998, pp 323-338.

King, W., .R., Chung, T.R., and Haney, M.H. "Knowledge Management and Organizational Learning," *Omega* (36:2) 2008, pp 167-172

King, W.R., Marks, P.V., and McCoy, S. "The most important issues in knowledge management," *Communications Of The Acm* (45:9), Sep 2002, pp 93-97.

Ko, D., Kirsch, L.J., and King, W.R. "Antecedents of knowledge transfer from consultants to cleints in enterprise system implementations," *MIS Quarterly* (29:1) 2005, pp 59-85.

Kollock, P. "The economies of online cooperation: Gifts and public goods in cyberspace," in: *Communities in Cyberspace,* M. Smith and P. Pollock (eds.), Routledge, New York, NY, 1999, pp. 220-239.

Koys, D.J., and DeCotiis, T.A. "Inductive Measures of Psychological Climate," *Human Relations* (44:3) 1991, pp 265-285.

Kulkarni, U.R., Ravindran, S., and Freeze, R. "A knowledge management success model: Theoretical development and empirical validation," *Journal of Management Information Systems* (23:3) 2006-7, pp 309-347.

Lafley, A.G., and Charan, R. *The Game-Changer: How Can You Drive Revenue and Profit Growth with Innovation* Crown Business, New York, NY, 2008.

Lampe, C., and Resnick, P. "Slash(dot) and Burn: Distributed Moderation in a Large Online Conversation Space," CHI 2004, Vienna, Austria, 2004.

Larsen, J.K. "Effect of time on information utilization," *Knowledge: Creation, Diffusion, Utilization* (7:2) 1985, pp 143-159.

Leventhal, G.S. "Justice in Social Relationships," in: *Contemporary Topics in Social Psychology,* J.W. Thibaut, J.T. Spence and R.C. Carson (eds.), General Learning Press, Morristown, NJ, 1976, pp. 211-240.

Leventhal, G.S. "What should be done with equity theory? New approaches to the study of fairness in social relationships," in: *Social Exchange: Advances in Theory and Research,* K. Gergen, M. Greenberg and R. Willis (eds.), Plenum Press, New York, 1980.

Leventhal, G.S., Karuza, J., and Fry, W.R. "Beyond Fairness: A Theory of Allocation Preferences," in: *Justice and Social Interaction,* G. Mikula (ed.), Springer-Verlag, New York, NY, 1980, pp. 167-218.

Lind, E.A., and Tyler, T.R. *The Social Psychology of Procedural Justice* Plenum Press, New York, 1988.

Lippman, S.A., and Rumelt, R.P. "Undertain imitability: An analysis of interfirm differences in efficiency under competition," *The Bell Journal of Economics* (13:2) 1982, pp 418-438.

Majchrzak, A., Cooper, L.P., and Neece, O.E. "Knowledge reuse for innovation," *Management Science* (50:2), Feb 2004, pp 174-188.

Malhotra, Y., Galletta, D.F., and Kirsch, L.J. "How endogenous motivations influence user intentions: Beyond the dichotomy of extrinsic and intrinsic user motvations,") under review.

Markus, M.L. "Toward a theory of knowledge reuse: Types of knowledge reuse situations and factors in reuse success," *Journal Of Management Information Systems* (18:1), Sum 2001, pp 57-93.

Markus, M.L., Majchrzak, A., and Gasser, L. "A design theory for systems that support emergent knowledge processes," *MIS Quarterly* (26:3), Sep 2002, pp 179-212.

Masterson, S.S., Lewis, K., Goldman, B.M., and Taylor, M.S. "Integrating justice and social exchange: The differing effects of fair procedures and treatment on work relationships," *Academy of Management Journal* (43:4) 2000, pp 738-748.

McGrath, J.E. *Groups: Interaction and Performance* Prentice Hall, Englewood Cliffs, NJ, 1984.

Medsker, G.J., Williams, L.J., and Holahan, P.J. "A Review of Current Practices for Evaluating Causal-Models in Organizational-Behavior and Human-Resources Management Research," *Journal of Management* (20) 1994, pp 439-464.

Menon, A., and Varadarajan, P.R. "A model of makreting knowledge use within firms," *Journal of Marketing* (56:4) 1992.

Menon, T., and Pfeffer, J. "Valuing internal vs. external knowledge: Explaining the preference for outsiders," *Management Science* (49:4), Apr 2003, pp 497-513.

Menon, T., Thompson, L., and Choi, H. "Tainted knowledge vs. tempting knowledge: People avoid knowledge from internal rivals and seek knowledge from external rivals," *Management Science* (52:8) 2006, pp 1129-1144.

Milton, N. "Filtering an organization's critical knowledge," *KM Review* (10:1) 2007, pp 28-33.

Molich, R., and Nielsen, J. "Improving a Human-Computer Dialogue," *Communications of the ACM* (33:3) 1990, pp 338-348.

Moorman, R.H., Blakely, G.L., and Niehoff, B.P. "Does perceived organizational support mediate the relationship between procedural justice and organizational citizenship behavior?," *Academy of Management Journal* (41:3) 1998, pp 351-357.

Muchinsky, P.M. "An Assessment of the Litwin and Stringer Organization Climate Questionnaire: An Empirical and Theoretical Examination of the Sims and Lafollette Study," *Personnel Psychology* (29:2) 1976, pp 371-392.

Myers, R. *Classical and Modern Regression with Applications*, (2nd ed.) Duxbury, Boston, MA, 1990.

Nelson, K., and Cooprider, J. "The contribution of shared knowledge to IS group performance," *MIS Quarterly* (20:4) 1996, pp 409-429.

Nicolaou, A.I., and McKnight, D.H. "Perceived information quality in data exchanges: Effects on risk, trust, and intention to use," *Information Systems Research* (17:4) 2006, pp 332-351.

Nonaka, I. "A dynamic theory of organizational knowledge creation," *Organization Science* (5:1) 1994, pp 14-37.

Olivera, F. "Memory systems in organizations: An empirical investigation of mechanisms for knowledge collection, storage and access," *Journal of Management Studies* (37:6) 2000, pp 811-832.

Olivera, F., Goodman, P.S., and Tan, S.S.-L. "Contribution behaviors in distributed environments," *MIS Quarterly* (32:1) 2008, pp 23-42.

Olson, M. *The Logic of Collective Action* Harvard University Press, Cambridge, MA, 1965.

Organ, D.W. "Organizational Citizenship Behavior: The Good Soldier Syndrome," Lexington Books, Lexington, MA, 1988.

Organ, D.W., and Moorman, R.H. "Fairness and organizational citizenship behavior: What are the connections?," *Social Justice Research* (6:1) 1993, pp 5-18.

Parnes, S.J., and Noller, R.B. "Applied creativity: The creative studies project - Part II: Results of the two-year program," *Journal of Creative Behavior* (6:3) 1972, pp 164-186.

Peddibhotla, N.B., and Subramani, M.R. "Contributing to public document repositories: A critical mass theory perspective," *Organization Studies* (28:3) 2007, pp 327-346.

Petter, S., Straub, D., and Rai, A. "Specifying formative constructs in information systems research," *MIS Quarterly* (31:4) 2007, pp 623-656.

Piaget, J. *The mechanisms of perception* Basic Books, New York, 1969.

Pierce, E., Kahn, B., and Melkas, H. "A Comparison of Quality Issues for Data, Information and Knowledge," Information Resource Management Association International Conference, 2006.

Pitt, L.F., Watson, R.T., and Kavan, C.B. "Measuring Information Systems Service Quality: Concerns for a Complete Canvas," *MIS Quarterly* (21:2) 1997, pp 209-221.

Podsakoff, N.P., and Organ, D.W. "Self-reports in organizational research: Problems and prospects," *Journal of Management* (12:4) 1986, pp 531-544.

Podsakoff, P., MacKenzie, S., Paine, J., and Bacharach, D. "Organizational citizenship behaviors: A critical review of the theoretical and empirical literature and suggestions for future research," *Journal of Management* (26:3) 2000, pp 513-563.

Powell, T.C., Lovallo, D., and Caringal, C. "Causal ambiguity, management perception, and firm performance," *Academy of Management Review* (31:1) 2006, pp 175-196.

Qian, Z., and Bock, G.W. "An empirical study on measuring the success of knowledge repository systems," Hawaii International Conference on System Sciences, Hawaii, 2005.

Rai, A., Lang, S.S., and Welker, R.B. "Assessing the validity of IS success models: An empirical test and theoretical analysis," *Information Systems Research* (13:1) 2002, pp 50-69.

Ringle, C.M., Wende, S., and Will, A. "SmartPLS," University of Hamburg, Hamburg, Germany, 2005.

Roberts, J., Hann, I.H., and Slaughter, S. "Understanding the Motivations, Participation and Performance of Open Source Software Developers: A Longitudinal Study of the Apache Projects," *Management Science* (52:7) 2006, pp 984-999.

Shapiro, C., and Varian, H. *Information Rules: A strategic guide to the network economy* Harvard Business School, Boston, MA, 1999.

Shrivastava, P. "Rigor and practical usefulness of research in strategic management," *Strategic Management Journal* (8:1) 1987, pp 77-92.

Sprague, R.H.J. "Electronic Document Management: Challenges and Opportunities for Information Systems Managers," *MIS Quarterly* (19:1) 1995, pp 29-49.

Steiner, I.D. *Group Process and Productivity* Academic, New York, NY, 1972.

Stenmark, D. "Information vs. knowledge: The role of intranets in knowledge management," the 35th Hawaii International Conference on System Sciences, Hawaii, 2002.

Subramani, M.R., and Peddibhotla, N. "Determinants of helping behaviors in online groups: A conceptual model," in: *Academy of Management Conference, OCIS Division*, New Orleans, L.A., 2004.

Sussman, S.W., and Siegal, W.S. "Informational influence in organizations: An integrated approach to knowledge adoption," *Information Systems Research* (14:1), Mar 2003, pp 47-65.

Swanson, E.B., and Culnan, M.J. "Document-based systems for management planning and control: A classification, survey, and assessment," *MIS Quarterly* (2:4) 1978, pp 31-47.

Szajna, B. "Determining information system usage: Some issues and examples," *Information & Management* (15:3) 1993, pp 147-154.

Szulanski, G. "Exploring internal stickiness: Impediments to the transfer of best practice within the firm," *Strategic Management Journal* (17:Special Issue: Knowledge and the Firm) 1996, pp 27-43.

Szulanski, G., Cappetta, R., and Hensen, R. "When and how trustworthiness matters: Knowledge transfer and the moderating effect of causal ambiguity," *Organization Science* (15:5) 2004, pp 600-613.

Tepper, B.J., and Taylor, E.C. "Relationships among supervisors' and subordinates' procedural justice perceptions and organizational citizenship behaviors," *Academy of Management Journal* (46:1) 2003, pp 97-105.

Thibaut, J., and Walker, L. *Procedural Justice: A Psychological Analysis* Erlbaum, Hillsdale, NJ, 1975.

Tyler, T.R. "Psychological models of the justice motive: Antecedents of distributive and procedural justice," *Journal of Personality and Social Psychology* (67:5) 1994, pp 850-863.

Tyler, T.R., Degoey, P., and Smith, H. "Understanding why the justice of group procedures matters: A test of the psychological dynamics of the group-value model," *Journal of Personality and Social Psychology* (70:5) 1996, pp 913-930.

Unsworth, K. "Unpacking creativity," *Academy of Management Review* (26:2) 2001, pp 289-297.

van den Bos, K., Wilke, H.A.M., and Lind, E.A. "When do we need procedural fairness? The role of trust in authority," *Journal of Personality and Social Psychology* (75:6) 1998, pp 1449-1458.

Van Dyke, T.P., Kappelman, L.A., and Prybutok, V.R. "Measuring Information Systems Service Quality: Concerns on the Use of the SERVQUAL Questionnaire," *MIS Quarterly* (21:2) 1997, pp 195-208.

Von Krogh, G., Ichijo, K., and Nonaka, I. *Enabling Knowledge Creation: How to Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation* Oxford University Press, New York, NY, 2000.

Voss, J. "Measuring Wikipedia," 10th International Conference of the International Society for Scientometrics and Informetrics, Stockholm, Sweden, 2005.

Walsh, J.P., and Ungson, G.R. "Organizational memory," *Academy of Management Review* (16:57-90) 1991.

Walster, R., Walster, G., and Berschield, E. *Equity: Theory and Research* Allyn and Bacon, Rockleigh, NJ, 1978.

Wang, R.Y., and Strong, D.M. "Beyond accuracy: What data quality means to data consumers," *Journal of Management Information Systems* (12:4) 1996, pp 5-34.

Wasko, M., and Faraj, S. "It is what one does: Why people participate and help others in electronic communities of practice," *Journal of Strategic Information Systems* (9:2-3) 2000, pp 155-173.

Wasko, M.M., and Faraj, S. "Why should I share? Examining social capital and knowledge contribution in electronic networks of practice," *MIS Quarterly* (29:1) 2005, pp 35-57.

Weiss, C.H. "Knowledge creep and decision accretion," *Knowledge: Creation, Diffusion, Utilization* (1:3) 1980, pp 381-404.

Weiss, C.H., and Bucuvalas, M. *Social Science Research and Decision-Making* Columbia University Press, New York, NY, 1980.

Wheelwirght, S.C., and Clark, K.B. *Revolutionizing Product Development, Quantum Leaps in Speed, Efficiency and Quality*, New York, 1992.

Wheelwright, S.C., and Clark, K.B. *Revolutionizing Product Development, Quantum Leaps in Speed, Efficiency and Quality*, New York, 1992.

Wierenga, B., and Van Bruggen, G.H. "The dependent variable in research into the effects of creativity support systems: Quality and quantity of ideas," *MIS Quarterly* (22:1) 1998, pp 81-87.

Wiertz, C., and Ruyter, K. "Beyond the call of duty: Why customers contribute to firm-hosted commercial online communities," *Organization Studies* (28:3) 2007, pp 347-376.

Wilton, P., and Myers, J. "Task, expectancy, and information assessment effects in information utilization processes," *Journal of Marketing Research* (12:4) 1986, pp 469-486.

Wu, J., and Wang, Y. "Measuring KMS success: A respecification of the Delone and McLean's model," *Information & Management* (43:6) 2006, pp 728-739.

Zack, M.H. "Managing codified knowledge," *Sloan Management Review* (40:4), Sum 1999, pp 45-58.

Zimmer, J.C., Henry, R.M., and Butler, B.B. "Determinants of the use of relational and nonrelational information sources," *Journal of Management Information Systems* (24:3) 2007-8, pp 297-331.