THE ELUSIVE BENEFITS OF THE TECHNOLOGICAL SUPPORT OF KNOWLEDGE MANAGEMENT

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It is tempting to conclude that the substantial benefits of communication and information technologies can be seamlessly migrated to knowledge management (KM) applications. However, their success in this capacity is neither certain nor straightforward. The ability of new technologies to support KM in a meaningful manner depends on the types of knowledge they are designed to capture and share, the features and design of the technologies themselves, and the social dynamics among organizational members. Absent careful consideration of these factors, managers and organizational scholars risk either underutilizing these tools or overestimating their utility.

THE NATURE OF KNOWLEDGE

A central issue within the KM literature is what constitutes knowledge. Traditional information processing perspectives distinguish between data (raw numbers and facts), information (processed or analyzed data that takes on relevance), and knowledge (applied information endowed by experience). However, perhaps the most common distinction is between explicit and tacit knowledge (e.g., Nonaka, 1994). Explicit knowledge is that which can be

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codified and communicated in the form of symbols, such as operation manuals and written procedures. Tacit knowledge, by contrast, is gained through experience in a specific context and consists of cognitive knowledge (mental models or beliefs) and technical knowledge (skills or crafts).[1] Thus, whereas explicit knowledge is "transmittable in formal, systematic language," tacit knowledge "has a personal quality, which makes it hard to formalize and communicate" (p. 16).

In addition, the location of knowledge has been conceptualized in a number of ways. Although it is most often assumed that knowledge resides in the individual, other perspectives highlight knowledge as socially embedded (Lundvall & Johnson, 1994), as a shared group resource that is greater than individual inputs (Wegner, 1995), as a network phenomenon (Contractor & Monge, 2002 [this issue]), or as a social property of communities of practice (Brown & Duguid, 1998; see also Iverson & McPhee, 2002 [this issue]). Thus, variations in both the definition and location of knowledge serve to complicate current notions of knowledge management.

THE APPLICATION OF TECHNOLOGICAL TOOLS TO KNOWLEDGE MANAGEMENT

In the face of this complexity, scholars have proceeded to specify several ways in which technological tools can be applied to KM processes. The dominant strategy has been to identify and develop technologies for the capture, storage, retrieval, and dissemination of explicit knowledge. The chief concern has been how to extract an individual's knowledge, place it in a format and location that are accessible to relevant others, and ensure that this knowledge is utilized in the achievement of organizational goals. Tools such as electronic mail, intranets, and data repositories, warehousing, and mining have all been invoked in this pursuit.

Efforts to use advanced technologies to support tacit knowledge sharing, however, have been viewed as problematic. Although groupware technologies, videoconferencing, expert databases, and

synchronous collaboration tools have been proposed in this regard, many contend that tacit knowledge can only be transferred successfully through demonstration, facilitated by face-to-face contact. Because the accumulation of tacit knowledge depends on situated, shared experiences, a consistent claim has been that technologies "are more suited to the transfer of highly codified and standardized knowledge, and less appropriate for the transfer of tacit knowledge" (Roberts, 2000, p. 436). Moreover, it has been argued that tacit knowledge sharing requires common social and cultural contexts not supplied by communication and information technologies alone.

DIFFICULTIES AND DEVELOPMENTS IN THE TECHNOLOGICAL SUPPORT OF KNOWLEDGE MANAGEMENT

Thus, at least three issues cloud the application of technological tools to KM. First, there is a tendency to artificially reduce knowledge complexity with the use of technologies for KM. In essence, the trend in KM has been to condense knowledge to less than it is in order to increase the capacity to process it efficiently (see Iverson & McPhee, 2002). Although this may be a necessary tradeoff for knowledge codification, it also serves to reduce the very richness that makes knowledge a particularly valuable organizational resource.

Second, KM applications may be limited by focusing primarily on the individual as the source of knowledge. Recent changes in organizational structures, forms, and the nature of association, however, endorse a richer view of the location of knowledge. Thus, as the nature of organizational association changes, the application of technologies in the management of knowledge must evolve accordingly, by accommodating the shift of knowledge from the individual to higher levels.

Finally, because tacit knowledge is viewed as tremendously personal and contextual, it is often seen as an inappropriate candidate for technological support in KM applications. If, however, the explicit-tacit dichotomy is relaxed, thus allowing for a broader appreciation of knowledge types, several possibilities emerge. For

instance, not only may important organizational knowledge remain explicit but *un*codified (e.g., knowledge about organizational members to avoid), but some tacit knowledge may also be personalized, contextual, *and* codifiable and supported effectively by advanced technological tools. With this view, only the most deeply tacit knowledge lies beyond technological support.

Indeed, recent developments suggest that technological tools are progressively more capable of providing meaningful support for KM applications, in ways at least partially responsive to these limitations. Organizational knowledge gathering, for example, may be enhanced by several methods: centering resonance analysis (McPhee, Corman, & Dooley, 2002 [this issue]), which can be used to transform written text into conceptual networks to illustrate linkages among groups, contexts, and perspectives; social information filtering tools that use algorithms to elicit individual ratings in order to predict user preferences across a diversity of applications; and tools like Yenta (Foner, 1998) and IKNOW (Contractor, Zink, & Chan, 1998) that map individuals' data, in some cases captured unobtrusively, to locate those who may share interests and might wish to collaborate. These tools can be valuable for highlighting shared (or unshared) understandings, surfacing unarticulated assumptions, and revealing diverse opinions. Furthermore, they recognize that knowledge may reside in the network of information or contacts and not simply or solely in the individual.

The fundamental issue of knowledge sharing may also be facilitated by contemporary technologies. Among the more popular tools are various groupware applications and intranets, which typically include features such as shared databases, collaborative spaces, and advanced communication features. Furthermore, peer-to-peer network connections, which link diverse information and knowledge sources together, serve to expand the locus of contacts and information available to organizations and work groups. Tools for the visual representation of knowledge, too, can enhance the capacity to work collaboratively, through features such as shared diagrams and visual knowledge networks.

Finally, advanced technologies have the capacity to enhance knowledge transfer, potentially facilitating even tacit knowledge sharing. For example, airline pilot and police trainees both take

advantage of sophisticated situation simulators that project scenarios (based on real events provided by seasoned organizational members) that enable them to experience realistic conditions without the considerable risk involved in the field. In such cases, the goal is to capture the tacit knowledge of experienced organizational members, make it more explicit in the form of simulation scenarios, and to turn it into tacit knowledge for trainees through interaction with the simulator, all in a safe, controlled environment.

CONCLUSION

Recent developments in technological support of knowledge gathering, sharing, and transfer illustrate the potential for addressing some of the fundamental shortcomings found in past efforts to apply technological solutions to KM problems. Specifically, advanced technologies suggest ways in which (a) knowledge richness can be retained rather than reduced, (b) knowledge sources beyond the individual level can be leveraged, and (c) the exceptional nature of tacit knowledge can be, at least partially, captured and shared via technological means.

However, these possibilities must be tempered by an understanding that in many ways knowledge remains situated and community based. Absent shared understanding of the community codes, even the most sophisticated technologies will fail to support KM in any consequential manner. Furthermore, KM is driven by multilevel considerations of the conditions under which individuals are more or less likely to act collectively. Nonetheless, the goal of the technological support of KM should be to share organizational knowledge without rendering it useless through reductionism, ignoring the evolving nature of where knowledge resides, or adopting too crude a view of knowledge itself. If we remain sensitive to these issues, we may take better advantage of the extraordinary potential of ever more sophisticated tools of communication and information sharing at a time when their application is increasingly important for effective KM.

NOTE

1. Some suggest that tacit knowledge is required to interpret explicit knowledge, and thus, "a wholly explicit knowledge is unthinkable" (Polanyi, 1966, p. 7). See also Walsham (2002 [this issue]).

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MANAGING KNOWLEDGE NETWORKS

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The concept of Knowledge Management (KM) (Nonaka & Takeuchi, 1995) was popularized in the 1990s at a time when the dominant organizational metaphor was "organizations as computers." Consistent with that metaphor, KM was conceptualized as creating and maintaining a stand-alone repository for capturing organizational expertise. The explosion of the Internet and World Wide Web has made this view obsolete and transformed the metaphor into one of "organization as networks," leading one recent trade book to title a section, "It's the network, stupid!" (Hartman, Sifonis, & Kador, 2000). This reconceptualization from stand-alone repositories to knowledge networks implies that intelligence resides in the network as a whole rather than in particular nodes (Contractor, 2002). These knowledge networks contain the collective competencies that enable organizational members to produce products and services.

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