

BY AMRIT TIWANA

Affinity to Infinity in Peer-to-Peer Knowledge Platforms

Adapting the social paradigm of face-to-face human communication, they promote ad hoc knowledge exchange among peers, leveraging individual expertise at the periphery of the network.

Social theorist Douglas Rushkoff envisioned how simple components could spontaneously aggregate into a powerful, collective mind [6]. Although organizations have much individual expertise, their ability to aggregate it has largely eluded them. Notwithstanding the impressive computational benefits of the peer-to-peer computational model, its social appeal as a technology that works the way humans naturally do promises much business potential. Its philosophy values adaptability and flexibility over structure and predictability to facilitate the spontaneous formation of autonomous (sometimes temporary) digital knowledge networks. Here, I explore the implications of this emerging model for building organizational platforms for knowledge application.

Knowledge and expertise generate more value when applied quickly in organizations than when they are accumulated gradually in systems and software. Application entails the quick integration of fragmented expertise rather than its relatively plodding transfer across individuals and organizational units. Integration implies application without the excessive delay and cost of transferring distributed expertise. Enterprise knowledge transfer tools reflect the difficulty of sustaining any collaborative platform that contradicts the human tendency

to safeguard valuable knowledge.

Any technological solution intended to harness the collective intelligence of dynamic networks of people must intrinsically value the kinds of relationships, affinities, and interdependence that characterize human interactions. To do this, it must quickly involve the right people, enabling them to collectively apply (not just transfer) their expertise.

Knowledge is information put to productive use. A transition from information to knowledge is possible only when a col-

ILLUSTRATION BY MARC MONGEAU

laborative system does not force individuals to do what they are most reluctant to do—give away their most valued knowledge.

Peer-to-peer networking naturally supports knowledge management (KM) by closely adopting the conventions of face-to-face human communication. Peer-to-peer networking is defined as the sharing of resources via direct exchange among individual systems in a digital network [4]. These resources include human expertise, including tacit knowledge, insight, rules-of-thumb, and lessons learned, not just files, processing cycles, and disk storage. Each peer is connected directly to the Internet and transacts with other peers within his or her dataspace.

Both pure and hybrid variants of the peer-to-peer model facilitate ad hoc knowledge exchange among peers, without the traditional dependence on servers as middlemen (see Figure 1 for a comparison). The potential for value creation by any network is compounded by removing digital or human middlemen [5]. In contrast, knowledge transactions in client/server arrangements are possible only among individuals who previously agreed to collaborate. The group-forming capacity of each variant of peer-to-peer networks easily dwarfs the potential of server-centric arrangements by leveraging individual expertise at the periphery of the network.

Reaching Friends of Friends

Sociologists have long noted the potential of weak ties for sparking innovation, bringing together expertise whose existence is unknown by individuals [2]. Members of peer-to-peer networks are connected through weak ties but can spontaneously convert them to temporarily strong ties of direct exchange and coordination.

By facilitating the digital equivalent of informal hallway chat among individuals, peer-to-peer networks facilitate the flow of peers' know-how and tacit expertise, not just digitized content. Facilitating access to people and enabling new, instantaneous connections among them lays a foundation for creative social dialogue [1]. Consider this simple example: Alice asks Diane a specialized question and Diane does not know

the answer, but she can ask her friends, who then ask their friends until an answer is found. Digital peer networks facilitate such spontaneous linkages among friends of friends. Successful public peer-to-peer networks include eBay's reputation management system

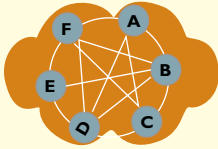
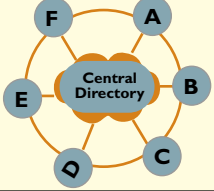
Knowledge characteristics	Pure peer-to-peer	Hybrid peer-to-peer
		
Flow	Serverless	Initiated through central directory
Search efficiency	Low	High
Knowledge use anonymity	High	Low
Autonomy	Highly self-organizing	Intermediate
Reciprocity Measurement	Not possible	Possible through directory server
Knowledge network externalities	High	Low
Value-creation potential	High	Low
Expertise maintenance overhead	Low	Medium
Scalability	High	Centralized directory server a choke point
Applications	Internal, codified knowledge sharing	Tacit knowledge integration in dispersed business networks

Figure 1. The two shades of peer-to-peer knowledge networking.

(see pages.ebay.com/community) and the eOpinions review system (www.eopinions.com).

Tapping into the distributed knowledge of human networks differs in pure and hybrid peer-to-peer networks. In a pure peer-to-peer network (see Figure 2), Alice (A) sends a request for an expert's help with a specific best practice to immediate peers Bill (B), Charlie (C), Diane (D), and Ed (E). If each of them lacks the necessary knowledge, he or she automatically passes Alice's trigger to their immediate peers until one of two things happens: either they run out of time, that is, time exceeds a predetermined "time-to-latency" or one of the peers confirms having matching expertise. If Kim (K) has the expertise, peer K sends a confirmation back to peer A via the same route, informing peers on the way that a match has been found. Alice then directly accesses and leverages Kim's expertise, bypassing the rest of the network.

The potential of this model for integrating nondigitized tacit expertise is even more notable. If Alice is looking for an answer to a specific question rather than a relatively well-documented best practice and does not know whom to contact, she can still send a request. In this case, the matching process might use a combination of digital resources with each peer—a

dynamic skills profile, history, and self-reported expertise—to determine the best person to ask. Based on the match, Alice and Kim might even videoconference through a temporary raw-IP private network. This ability to locate the best potential expertise

to strongly tied groups needed to integrate the network [3]. Seamless, ad hoc unification of expertise facilitates simultaneous distribution and integration of problem-solving efforts among employees, customers, and partners. As these people span corporate boundaries, peer-to-peer networks equalize the simultaneous undersupply and oversupply of knowledge in niches of collaborative communities.

Peer-to-peer networking also redresses three other issues that have long plagued KM technology: profile maintenance, bandwidth bottlenecks, and ubiquity. Decentralization eliminates the overhead of maintaining resource and expertise profiles for individuals in the equivalent of corporate

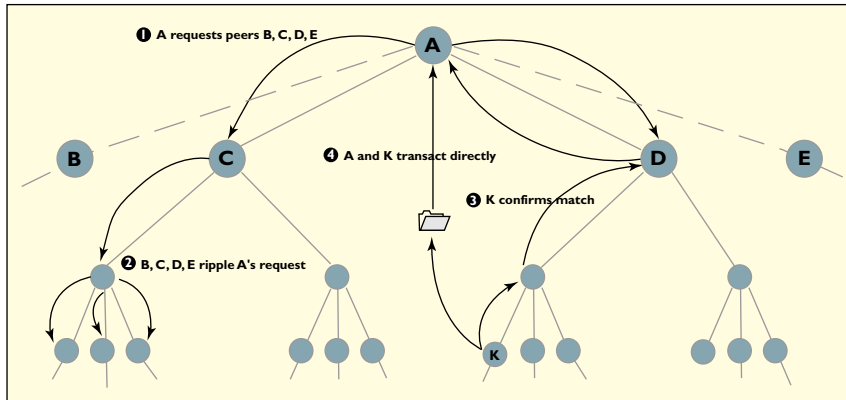


Figure 2. Pure peer-to-peer knowledge integration.

match across an expansive but loosely coupled affinity network is unprecedented.

Hybrid peer configurations facilitate similar exchanges, except the transactions are mediated by the central directory peer (see Figure 3). Although comprehensive indexing facilitates fast, efficient, comprehensive, and scalable knowledge search, its costs reflect the need to centrally index everything each time a user logs on. However, the inability to track both contribution and use of distributed expertise casts doubt on the viability of the pure peer-to-peer model for corporate KM platform applications. Hybrid arrangements appear to be more feasible, as transactions are initiated at the central node.

To Infinity

Individuals begin to share information, expertise, best practices, and content in peer networks because of the affinity created by the networks. In business, professional interests and tasks create organization-spanning affinity. Opportunities for value creation and the likelihood of finding answers increase exponentially as such networks expand. Each additional member increases the network's potential value, or, in economic terms, returns.

Intricate webs of affiliations represent opportunities for collaborative knowledge integration in autonomous groups that spontaneously assemble and disassemble. Unless individuals know how to find and use human expertise, as well as unstructured information and codified knowledge, that expertise continues to be underutilized. By coupling individuals in and out of smaller peer networks, groups opportunistically toggle from weakly tied groups for finding knowledge

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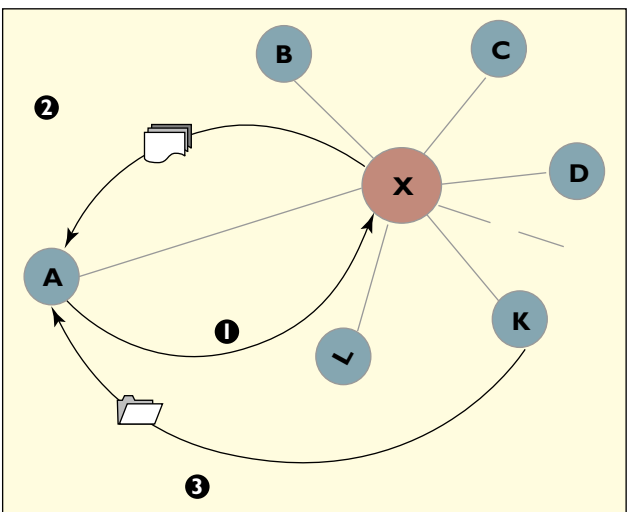


Figure 3. Hybrid peer-to-peer knowledge integration.

their explicit knowledge and profiles of mobile users are replicated across nodes to ensure ubiquitous availability. As wireless networks embrace this model, collaboration extends seamlessly to mobile individuals anytime, anyplace.

Caveats

Notwithstanding these opportunities, human behavior, not technology, represents the most daunting caveat. Unlike information sharing, knowledge sharing has a competitive dimension: The more valuable

a nugget of knowledge is to an individual, the less likely he or she is to share it. Individuals' knowledge makes them valuable to their organizations while identifying them as experts to their peers. Given a choice, individuals tend to acquire more prestige than they contribute to their organizations.

However, KM is sustainable only when it is reciprocal, encouraging give, as well as take, among individu-

expertise over time provides future collaborators a historical perspective of one another's value in past relationships. Reputations can be based on dynamic, ubiquitous user profiles that automatically update themselves as the individuals interact in a peer-to-peer environment. Such mechanisms balance both contribution and use of distributed knowledge over time, allowing participants to think long-term but deliver in the short-term.

Knowledge component	Function	Implementation features
Community building	Reinforces the value of participation/contribution	Threaded discussion, real-time chat, peer awareness, and voice-over-IP
Context sharing	Shared context through overlapping affiliations and subnetworks	Temporary shared workspaces and shared contacts
Joint-activity tools	Facilitates knowledge integration and application, rather than transfer	Co-browsing, multiuser brainstorming, and asynchronous task coordination tools
Reputation-building mechanisms	Tracks each individual's contribution history and expertise-based assistance received from various peers	Quality and quantity rating mechanisms for individual contributions over time

The four components of a knowledge integration platform.

als. Peer-to-peer knowledge platform implementations must ensure that individuals contribute, not just receive, expertise. Attention to four components—community building, context sharing, joint-activity tools, and reputation-building mechanisms—helps organizations, as well as their individual members, exploit the business potential of the peer-to-peer model as a general-purpose knowledge-integration platform (see the table here).

Understanding how people are innately motivated to apply their personal expertise is the key to avoiding the trap of building technology marvels no one uses. First, users contribute and share their insights only when they value their digital community. Community building reinforces not only the number but the quality of interconnections among individuals. Mechanisms that openly track contributions discourage free riding. Second, shared context is essential for contributing to collective tasks; shared workspaces and contact lists provide such context. Third, peer-to-peer environments emphasize knowledge integration over acquisition and learning. The intent is not to teach peers how to do their jobs. That is expensive, time-consuming, and threatening to individual ownership of expertise. Instead, it must be possible to bring several individuals' expertise to bear on solving problems, typically through joint-activity tools. Finally, such environments must provide reputation-building mechanisms to foster the pervasive thread of trust needed in any community. Aggregating individual contributions to the community and using others'

reputation-building mechanisms described here can be implemented only in hybrid peer-to-peer architectures that are better suited than pure architectures for KM platform applications.

Pervasive and inexpensive computing power, bandwidth, wireless networking, and storage are likely to serve as the main triggers for KM platforms over the next five years. Business gains from aggregating distributed intelligence at the edge of networks are limited only by the imagination of KM platform architects. **C**

Peering into the Future

The peer-to-peer model is naturally extensible to KM applications because of its ability to spontaneously facilitate the rapid integration of previously unconnected expertise. Peer-to-peer knowledge platforms can sustain themselves only when their design accounts for how individuals are motivated to use them. The key community- and

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