Designing Sticky Knowledge Networks

The elusive goal of stickiness can be achieved by designing them to raise individual user awareness of their relational and reputational benefits.

By Ashley A. Bush and Amrit Tiwana

Much of any organization's experience and expertise remains underused and underexploited simply because it resides not in databases, repositories, or manuals but in the minds of its employees. Attempting to harness such distributed expertise, organizations have begun implementing collaborative knowledge networks—peer-to-peer digital networks connecting individuals with relevant expertise to their peers who need it [10, 11]. Unfortunately, however, successful knowledge networks represent the occasional island dotting a sea of failures. While many organizations are eager adopters of knowledge network systems, individual users frequently abandon them, leaving a trail of million-dollar paperweights. To be self-sustaining, knowledge networks must be sticky, though stickiness is an elusive design objective.

Illustration by Karin Daisay

What makes a knowledge network sticky? To find out, we conducted a four-year study of 122 users of four successful knowledge networks. We found that the features of the system that manage users' perceptions of their personal reputations and relationships with their peer users within the knowledge network increase stickiness (see the sidebar "How the Study Was Done"). Surprisingly, we also found that putting personalization capabilities in the hands of users is a double-edged sword, sometimes reducing stickiness if implemented without forethought. Here, we discuss the implications of our findings for making knowledge networks sticky by design.

Knowledge networks are as much a social apparatus as they are technological (see the sidebar "Knowledge Networks Vs. Repositories"). Since they rely on connecting people with other people, as opposed to simply pointing people to information provided by experts, enhancing their stickiness requires the interplay of people, relationships, and systems. Careful design choices at the intersection of IT and human psychology can potentially create a virtuous spiral of increasing stickiness.

Stickiness—or users' desire to continue using a knowledge network system—stems from the perception of high costs associated with abandoning accrued resources that make the knowledge network valuable to them. These costs arise from the substantial investments of time and effort users make after the system's initial adoption. In knowledge networks, a user's investments create three potentially valuable resources: a reputation among peers; close working relationships with peer users; and customization of the system's context and content to personal preferences. The value of these resources is limited to the knowledge network in which they were developed. A user's inability to walk away from such an investment is a basic tenet of human psychology [1]. If the loss from abandoning them is perceived as being high, the perception acts as a powerful barrier to abandonment. Thoughtfully designed knowledge networks tap into such perceptions to increase stickiness.

Drivers of Stickiness

Our study traced three key drivers of stickiness (see Table 1). The first two—individual relationship capital and individual user reputation—increase stickiness. To our surprise, the third—personalization—initially reduces but then increases stickiness.

Relationship capital. The urge to form attachments to groups is a universal human trait [9]. Relationship capital—the level of trust, respect, and closeness of working relationships a user has with the rest of a peer user group—characterizes such attachments in knowledge networks. Relationship capital is a valuable resource because it gives individuals access to new information, knowledge, ideas, and opportunities embedded in the network but that would be invisible to outsiders [6]. The likelihood of accessing the otherwise closely guarded knowledge of peer users increases as a user develops a closer-knit circle of friends within a knowledge network [4, 7]. Moreover, relationship capital reinforces reputation by increasing reciprocity in knowledge networks. Users seeking advice get answers, and the users providing answers gain recognition that potentially bolsters their reputations. Like reputation, the value of relationship capital exists primarily inside the knowledge network in which it is developed. Therefore, as a user's portfolio of relationships with peer users grows, the prospect of abandoning the knowledge network becomes increasingly unattractive.

Driver	Reason underlying effect on stickiness	Design features that increase stickiness
Relationship Capital	A large portfolio of close, collegial working relationships with peer users provides privileged access to closely guarded, valuable ideas, opportunities, and knowledge.	• Raise user awareness of network-based relationships • Provide tools to allow users to develop publicly trusted-relationship circles
Reputation	Reputation among peer users adds legitimacy to a user's viewpoints and increases a user's influence in the peer group.	• Make reputational information persistent • Increase reputational profiles' visibility to peer users • Reduce transferability to other networks
Personalization	Content personalization can reduce stickiness because of its easier replicability, unlike context personalization, which is not replicated as readily.	• Increase context personalization capabilities • Reduce content personalization capabilities • Reduce imitability of personalization features by making them idiosyncratic to the system

Table 1. Drivers of stickiness and their design implementation.

Reputation. Reputation refers to the extent to which a user is considered valuable by peer users of a knowledge network. Reputation is built gradually, through a history of contributions of expertise, insight, and ideas that other users consistently identify as helpful and valuable. When given users develop reputations, they have strong incentives to improve and protect them because of the future benefits likely to accrue. These future benefits come from enhanced credibility and legitimacy the user gains among peer users [5]. The stronger a user's accrued reputation, the more he or she stands to forego the future benefits of having invested time and effort by discontinuing use of the knowledge network.

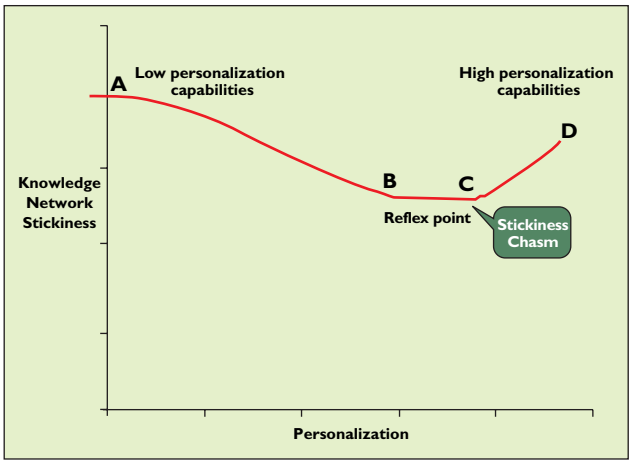
For example, a simple but highly effective knowledge network in the Atlanta-based Ritz-Carlton

Hotel Company helps the company's 1,200 worldwide hotels share best practices and expertise about every aspect of the hotel business, from corporate management to housekeeping. The key to its effectiveness is peer recognition of the contributors of ideas that are most valued by others within the company. Reputations similarly lubricate cooperation among users in all types of digital networks involving person-to-person transactions (such as eBay's trading system, Amazon's book review system, and Epinions' consumer review system) and expertise networks (such as Allexperts.com).

Stickiness-Enhancing Mechanisms	Knowledge Network Design Features
Reputational mechanisms	• Maintain persistence across discrete knowledge exchanges • Maintain visibility across discrete knowledge exchanges
Relational mechanisms	• Raise user awareness of relationships developed through the system • Facilitate peer presence awareness
Personalization capability	• Provide context-personalization capabilities • Limit content-personalization capabilities

Table 2. Guidelines for designing sticky knowledge networks.

Personalization. Personalization is the customization of the system to an individual's idiosyncratic preferences. Users may personalize in order to focus or limit their attention. Personalization can take one of two forms: context or content. Context personalization refers to the customization of the digital environment in which knowledge exchanges occur. Some ways in which context personalization manifested itself in our study included users' memorable, personality-projecting usernames, signatures appended to user IDs, and buddy lists. In contrast, content personalization serves as an attention-conserving mechanism, filtering content based on user preferences. For example, users can specify which peer contributions they see and in what order they want them displayed. It is easier to replicate content personalization than it is to replicate context personalization outside a given knowledge network.



The paradoxical effect of personalization on knowledge network stickiness.

Our findings about this driver are surprisingly counterintuitive (see the figure). As the level of a user's personalization increases from point A to point B, the stickiness of the knowledge network system decreases, flattening out between B and C. Only after it reaches a stickiness chasm at C does the personalization begin to increase stickiness. The reason for this pattern is that content personalization does not invoke a strong sunk-cost effect, as do relationship capital and reputation. Once a user determines the system's optimal content personalization, the tweaks are plausibly replicable in similar knowledge networks elsewhere. However, context personalization is less readily transferable to different knowledge networks.

Considering that most knowledge networks provide content personalization without as much attention to context personalization, their lack of stickiness is no surprise. Our study, which measured the extent of individual users' personalization decisions, has important implications for the design of personalization capabilities in knowledge networks. Designers of knowledge networks must be cautious that uninformed choices about personalization capabilities put in the hands of users can backfire unexpectedly.

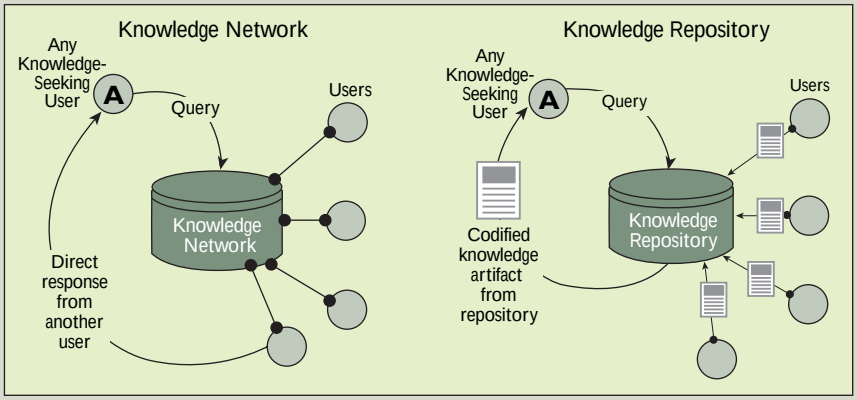
Other findings. What role does satisfaction with a system play vis-à-vis the three drivers of stickiness? We found that relationship capital, reputation, and personalization predict stickiness above and beyond user satisfaction. The loss of associated investments incurred in building a reputation in the peer group, developing close working relationships, and personalizing the system can discourage even a dissatisfied user from abandoning a knowledge network. We also found that individuals with longer histories of using a given knowledge network are more likely to continue using it. However, the intensity of that use (in hours per week) increases stickiness only marginally.

Avoiding Million-Dollar Paperweights

How might these findings be used to design stickier knowledge networks? System designers must recognize that user perceptions matter, and that they can be manipulated through thoughtful system design. The key is to make each user's contributions appear to be indispensable. Designers must accentuate user awareness of the drivers that increase stickiness and suppress the ones that reduce it. Table 1 outlines

Knowledge Networks Vs. Repositories

A collaborative knowledge network is a digital environment through which dispersed users share and apply distributed knowledge. The difference between a café and a library is a good analogy for illustrating the differences between knowledge networks and knowledge repositories. Unlike knowledge repositories, which follow a people-to-documents model, knowledge networks are inherently people-to-people. They do not attempt to codify knowledge in reports, manuals, or documents that are aggregated in a central repository. Instead, they connect people (such as A, the knowledge-seeking user in the figure) to those who possess that knowledge (such as A's distributed peer users of that knowledge network system) Managing knowledge takes a backseat to connecting and applying fragmented experience and expertise to the issue at hand. Even knowledge that cannot be codified or stored in a knowledge repository can be shared through hyperlinks, pointers, multimedia, and perhaps, most important, conversations. The fundamental advantage of this approach is that people who do not know one another can share potentially diverse and novel insights, ideas, and expertise. Moreover, since there is no central repository for archiving knowledge, it is more likely that the knowledge accessed through the network is up to date. These benefits can be realized without having to codify difficult-to-articulate tacit knowledge. C



Knowledge networks facilitate direct (people-to-people) knowledge exchange between a knowledge-seeking user and other users; knowledge repositories facilitate indirect (people-to-documents) knowledge exchange between a knowledge-seeking user and other users.

three knowledge network design choices that influence user perceptions (in order of relative importance in our analysis) and their design implementation.

Increase user awareness of knowledge-network-based working relationships. The first step toward increasing stickiness is to design a knowledge network system that raises users' awareness of the portfolio of working relationships they have cultivated through their use of the system. This can be accomplished by allowing users to publicly maintain a "circle of friends," or subnetwork of trusted peer users. Rudimentary examples of this functionality are found in such advice exchange networks as Amazon and Epinions. Increased awareness of both the extent and network specificity of the working relationships that would potentially be severed by discontinuing use of the system are very likely to increase stickiness. When devising awareness-generating mechanisms, system designers must be wary of inadvertently introducing ways to ease the transfer or relocation of the relationships to other knowledge networks.

Provide persistent and visible reputation tracking. The second step is to develop mechanisms for tracking and managing the reputation of each user that represent an aggregate of the multitude of seemingly isolated interactions with the system's other users. Reputations are socially constructed and valuable to users only when they are visible to peer users of the knowledge network system [8]. To be effective, the design must therefore accomplish two objectives: First, the system must be able to aggregate the user's history of knowledge exchanges into a unified reputation profile. This aggregate can be conveyed in the form of a numerical score (such as total number of contributions and graded seniority levels), as well as feedback from peer users. Second, the persistent reputation profiles of each user must be publicly visible to other knowledge network users.

Approach personalization capabilities with caution. Designers must be cautious about the extent and types of personalization capabilities the knowledge network will provide its users. Basic content personalization capabilities are readily replicated in a different knowledge network and reduce, rather than increase, stickiness. The knowledge network must focus on providing context personalization capabilities that are less readily transferrable out of the network.

The nature and scope of a given knowledge net-

work must be weighed when deciding the extent of content personalization to be made available to users. A knowledge network spanning a range of expertise domains and seeking to attract casual, nonexpert users might make do with little content personalization. On the other hand, a knowledge network primarily targeted at a homogenous collection of domain experts might need high content personalization. If the fine line separating content from context personalization is fuzzy—as it often is—it is safer to err in favor of giving users too little personalization. Uninformed choices by designers, as we found, can do more harm than good.

Conclusion

Building a knowledge network is easy; making it sticky is where most designers flounder. Increasing stickiness requires that the system be designed to manage user perceptions of the costs associated with discontinuing use of the system (see Table 2). This can be done in three ways: raising user awareness of the working relationships users develop through their use of the system; implementing persistent reputation-tracking mechanisms; and carefully choosing the types of personalization capabilities to be given to users. Appropriate design choices about these drivers are simple yet powerful inducers of stickiness because they function at the intersection of technology design and human psychology. C

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How the Study Was Done

The study involved four different knowledge networks and was conducted in two phases. In the first, we collected detailed data from 418 users of two knowledge networks. In the second phase, we surveyed 122 users of these and two other knowledge networks twice, three weeks apart. All four were Web-based knowledge networks in which users shared information, insights, suggestions, and ideas about exceptional pricing deals on specialized products and services. The back-end, serverside software of each network was a database-driven, pull-based system that tracks individual user contributions and usage behavior. The front-end, userside interface was Web-based and required only a Web browser for accessing the network's functionality. We refined the questionnaire through a series of iterations, using existing measures wherever possible. Notably, to measure stickiness, we used an extensively validated measure of information systems continuance [2]. We received 122 responses, of which two were unusable due to missing data. The response rates in the two phases were 20.6% and 71.4%, respectively.

The participants had used their respective knowledge network systems for about a year on average. Their median age was 26–35 years. Though use of the knowledge networks was voluntary, each showed high levels of user participation. On average, each participant had contributed an idea, insight, or response 542 times in the preceding one-year period. Contrast this number to other types of electronic networks (such as Usenet groups, where the average user's contribution intensity is 18 messages a year) [3]. The usage intensity in these knowledge networks was high as well. On average, each respondent reported using the knowledge network 7.5 hours per week. We analyzed data from both time points separately to ensure that our findings were robust over time.

We have over 95% statistical confidence that our findings about the drivers of knowledge network stickiness are not by chance. C