Agent-Based System for Discovering and Building Collaborative Communities

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INTRODUCTION

Currently, organizations are under a regime of rapid economic, social, and technological change. Such a regime has been impelling organizations to increase focus on innovation, learning, and forms of enterprise cooperation. To assure innovation success and make it measurable, it is indispensable for members of teams to systematically exchange information and knowledge.

McLure and Faraj (2000) see an evolution in the way knowledge exchange is viewed from "knowledge as object" to "knowledge embedded in people," and finally as "knowledge embedded in the community."

The collaborative community is a group of people, not necessarily co-located, that share interests and act together to contribute positively toward the fulfillment of their common goals. The community's members develop a common vocabulary and language by interacting continuously. They also create the reciprocal trust and mutual understanding needed to establish a culture in which collaborative practices pre-dominate. Such practices can grasp and apply the tacit knowledge dispersed in the organization, embodied in the people's minds. Tacit knowledge is a concept proposed by Polanyi (1966) meaning a kind of knowledge that cannot be easily transcripted into a code. It can be profitably applied on process and/or product development and production. Therefore, community members can powerfully contribute to the innovation process and create value for the organization. In doing so, they become a fundamental work force to the organization.

BACKGROUND

A collaborative community emerges on searching for something new. It can rise spontaneously or in response to a firm request. In both cases, each volunteer can evaluate whether it is interesting to become a member of the group or not.

Whenever a firm needs to make a decision whether it is feasible to develop a new product, usually it asks its senior engineers (experts) technical opinions about the undertaking. The best solution depends on information such as: fitness of the current production processes considering the new product features, design requirements, characteristics of the materials needed, time constraints, and so forth. In short, it requires assessment and technical opinions from many firms' experts.

Depending on the product's complexity, priority, constraints, and so forth, experts start exchanging opinions with those to whom they truly know to be competent in the subject. As the forthcoming news about the new product spreads, a potential collaborative community can emerge and make the firm's technical experience come afloat. This occurs as the experts evaluate how much the firm's production processes fit the new product requirements, how

many similar products it already has designed, what are the product's parts that could be assembled on a partnership schema, and so on. Such opinions strongly support the decision making process related to the new product feasibility.

Every community can develop both individual and collective competence by creating, expanding, and exchanging knowledge. Mutual collaboration among members of a community, as well as with other groups, pre-supposes the ability to exchange information and to make the knowledge available to others. Therefore, collaborative communities should be pervasive, integrated, and supported by the enterprise rules that limit and/or direct people's actions in organizations.

Recommender systems (Table 1) search and retrieve information according to users' needs; they can be specialized on users' profiles or on the users' instantaneous interests (e.g., when users browse the Web). "Recommender systems use the opinions of members of a community to help individuals in that community identify the information or products most likely to be interesting to them or relevant to their needs" (Konstan, 2004, p. 1). By discovering people's interests and comparing whether such interests are the same or similar, recommender systems aid individuals to form collaborative communities.

Usually, this kind of system is based on artificial intelligence technologies such as machine learning algorithms, ontologies, and multi-agent systems. Such technologies can be used separately or combined in different ways to find and deliver information to the people who require it. Ontologies are well-suited for knowledge sharing as they offer a formal base for describing terminology in a knowledge domain (Gruber, 1995; McGuinness, 2001).

Recommender systems can be classified as collaborative filtering with and without content analysis and knowledge sharing. Collaborative filtering with content analysis is based on information from trusted people, which the system recognizes and also recommends. Examples of this kind of system are: GroupLens (Konstan et al., 1997), ReferralWeb (Kautz et al., 1997) and Yenta (Foner, 1999). Collaborative filtering without content analysis examines the meta-information and classifies it according to the user's current context. It can recommend multimedia information that otherwise could be too complex to be analyzed. PHOAKS (Terveen et al., 1997) is an example of a system that associates

Table 1. Recommender systems comparison

	Collaborative filtering		Knowledge sharing	Multi-agent	Uses ontology	Recommends
Recommender systems	With content analysis	Without content analysis				
Yenta (Foner, 1999)	x				x	Scientific papers
GroupLens (Konstan, Miller, Hellocker, Gordon, & Riedl, 1997)	x					Usenet news
Referral Web (Kautz, Selman, & Shah, 1997)	x				x	Scientists
Phoaks (Terveen, Hill, Amento, McDonald, & Creter, 1997)		x		x		Scientists
OntoShare (Davies, Dukes, & Stonkus, 2002)			x	x		Opinions
QuickStep (Middleton, De Roure, & Shadbolt, 2001)			x	x	x	Web pages
OntoCoPI (Alani, O'Hara, & Shadbolt, 2002)			x	x		Communities of practice
Sheik (Nabuco, Rosário, Silva, & Drira, 2004)			x	x	x	Similar profiles