

# CROSS-COMMUNITY REPUTATION: POLICIES AND ALTERNATIVES

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## ABSTRACT

We discuss and explore the concept of cross-community reputation between multiple communities. Sharing reputation between communities has several advantages in a world where users are members of several virtual communities and where reputation gained in one community may be a useful asset for other communities. The problems and policies regarding sharing reputation are discussed in this paper.

## KEYWORDS

Trust, Communities, Privacy, Cross-community reputation

## 1. INTRODUCTION

Virtual or online communities are any group of people interacting with each other via communication channels such as the Internet (email, instant messaging), phone, etc, for a common goal or shared interest. There are several types of virtual communities. Examples include marketplaces (eBay), social networks (Facebook), expert communities (Experts-Exchange), and online games (Second Life). The existence of easily accessible virtual communities makes it both possible and legitimate to communicate with total strangers. Unfortunately, there is always a group of community members that can make a negative use of that fact and act unfairly or even maliciously under cover.

Trust and reputation systems attain widespread interest as the main tool for enabling safe operation within online communities. The key objective of these systems is to obtain and maintain measures of trust between members of communities based on their behavior during community activities. Trust and reputation models may differ in how they define the terms trust and reputation, in their assumptions on how the system obtains data on trust relationships, and in the algorithms they use to compute trust and reputation. Without being committed to specific definitions of trust and of reputation we define for the sake of this discussion that trust is a one to one relationship between two entities (users, groups of users) while reputation is a many to one relationship inferred by aggregation, from a group of entities being the relying party to a single entity being the trusted party.

Communities that employ trust and reputation systems gain knowledge about the reputation of their users. Such reputation is a valuable resource both for the user and for the community. *Cross-Community Reputation* (CCR) can be achieved by sharing and combining together reputation data from different communities (Pingel and Steinbrecher 2008). The main advantages of using CCR are:

- Leverage of reputation data from multiple communities, producing more accurate recommendations.
- Reputation accumulation – A user does not have to build reputation from scratch when joining a new community.
- Users are able to maintain (either global or community-specific) offline reputation certificates. This is known as *reputation capital* (Labalme and Burton 2001).
- Faster establishment of new virtual communities by importing reputation data from related communities. In group-oriented trust and reputation models (Tian et al. 2006; Gal-Oz et al. 2008) exporting local reputation values speed up the process of identifying clusters of trusting members.

Several websites offer some sort of cross-community reputation services (iKarma; Naymz). Members of these sites can build up a reputation that can be presented in various communities. However, to the best of our knowledge these sites do not consider relations between communities or aspects of managing the sharing of members' reputation among communities.

This paper investigates some of the issues that one must face when designing CCR algorithms and policies. Section 2 discusses the preconditions that are required for any CCR system. Design ideas for different policies of CCR are presented in section 3. The conclusions are in section 4.

## 2. PRECONDITIONS FOR CROSS-COMMUNITY REPUTATION

In order to apply CCR between different communities, two main preconditions are needed – an agreed upon sense of reputation (ontology), and some existing foundation of trust between the communities.

### 2.1 Ontology for Reputation in Virtual Communities

Reputation is a complex term that cannot always be quantified into a single value, but is rather composed of several *dimensions*. Consider a shop that has years of high reputation among the residents of its area. The actual meaning of this high reputation is equivocal – it might concern the shop's low prices, the quality of goods that are sold, the time it takes for a new product to arrive at the shop, or even just the politeness of the shop's employees. Usually it is a mixture of all, and shops that have a relatively high general reputation score, may have a bad reputation in one specific attribute (e.g. prices). While in the case of a shop, a user usually has some knowledge about the different dimensions, an online user in a virtual community might not be as fortunate – it is actually considered lucky to have any indication of reputation.

In order to provide a common and agreeable notion of reputation we propose to define the ontology of reputation in each type of community. A community of a specific type should follow the ontology, or at least define a mapping from its own dimensions to such an ontology. For instance, a general ontology for expert communities may include the following dimensions – Proficiency, Reliability, Promptness, and Politeness. A general ontology for marketplaces may be somewhat different and include the following dimensions – Reliability, Promptness, Customer service, and Warranty. However, existing communities may already have their own dimensions for reputation. For instance, eBay has four criteria by which a seller is rated - Item as described, Communication, Shipping time, and Shipping and handling charges. In order to enable CCR with eBay, a mapping between eBay's criteria and the general ontology for marketplaces should be added. Some dimensions can differ solely by their names making the mapping trivial (Communication → Customer service, Shipping time → Promptness). Other dimensions might have correlation between them (Item as described → Reliability). In such cases, it is up to the community's administrator to decide how to apply the mapping. Finally, some dimensions may not be mapped at all (Shipping and handling charges and Warranty).

The weight given to each dimension may vary in different communities. For example, users in a software development expert community expect proficient and prompt answers, whereas users in a gardening community may have more time but insist on receiving a reliable and polite service.

In the context of CCR, communities may want to import different subsets of, or give different weights to, dimensions of shared CCR data. For instance, proficiency of playing chess may be relevant for a backgammon community, but not suitable for the gardening community.

### 2.2 Trust between Communities

Any system supporting cross-community reputation must maintain trust relations between communities. Trust between two communities measures the extent to which one community relies on another community to provide reputation for members of both communities. The measure of trust that one community has in another community may be derived from static and objective attributes of the two communities. It can also be derived actively from ongoing experience.

- **Related context** – Communities of the same domain are more likely to rely on the reputation they provide to each other assuming the motivation and criteria for ranking in such communities are

similar. The authors in (Kinader and Rothermel 2003) introduce a directed graph of categories (contexts) with weighted vertices representing the impact of the source category on the target category. In a single-community reputation system, these weights are assigned by a user to reflect the relationship between her areas of interest. In our scenario such a graph may be filled by each community. As stated by the authors, detecting these relationships by analyzing communities' activities is quite a challenge.

- **Similarity of the reputation mechanism** – Several algorithms for computing reputation were proposed in the past decade. However, commercial applications implementing trust and reputation mechanisms use relatively simple schemes than those proposed by research papers (Jøsang et al. 2007). In CCR management systems, the amount of trust that one community has in another community may depend on the similarity of their algorithms to compute reputation. Two reputation schemes supporting the same features are probably more compatible. However, this similarity does not guarantee the acceptance of the underlying computation algorithms of one community by the other community.
- **Shared members** – Two communities having a large portion of members in common may benefit more from trusting each other since one community extends the experience gathered in the other with the same members.
- **Member trust** – Trust between communities can also be derived by explicit trust that exists between their members. This approach is taken in (Tian et al. 2006) for groups within one community.
- **The vote of members** – The trust a community agent puts in another community may be evaluated empirically. Comparing a member reputation value provided by one community with the value obtained internally can serve as an active and constant evaluator of the other community's ability to provide an accurate reputation.

### 3. POLICIES FOR CROSS-COMMUNITY REPUTATION

There are two main alternatives for the management of reputation – user-controlled and community-controlled. Different aspects of CCR, such as the completeness, privacy, and openness of the reputation data, are derived from each of the alternatives.

The underlying question is who actually owns a user's reputation – the user or the community. On the one hand, the reputation may be considered as another attribute in a user profile. On the other hand, the community owns the metric of calculating this value and the data used for calculating it. Thus, one may conclude that the community owns the reputation it produces. Without even trying to answer this question it is quite clear that both the user and the community must approve the sharing of a user's reputation with other communities.

Policies for cross-community reputation consist of a set of rules, each specifying for a set of target communities the right to export reputation to this set, the right to import reputation values from this set, and a duration validation statement for the exported reputation values. The set of target communities may be either explicitly defined or realized by predefined criteria.

#### 3.1 User-controlled Reputation

The first alternative is that the reputation is part of the user's profile. This means that the user has full ownership over its reputation data. For each community that the user is a member of, she can choose whether to share her reputation within the community with other communities that she is a member of. This way the user may avoid sharing her reputation from communities in which this value is low (which may be problematic for the wholeness of the CCR value). However, the way that CCR is calculated is still controlled by the communities. Thus, the user can control the use of CCR, but not its results.

Another aspect regarding the handling of reputation is the control of CCR updates. Reputation data may change whenever the user receives a new rating in any of the communities in which she enabled the sharing of CCR. Yet, by owning her reputation data, the user can decide to trigger CCR updates on-demand. Thus, the user may choose to stop updating the CCR when she starts receiving bad ratings.

### **3.2 Community-controlled Reputation**

The reputation of a user within a community represents the way she is perceived by the members of a community in a specific context. This value is essentially a community asset used to manage a reliable environment. Apart from obvious commercial incentives, there are several motivations for a community to participate in a CCR process. A community may be willing to trade reputation with another community provided that trust relations between the two communities exist, as discussed in section 2. Another motivation is the added value a community assigns to its members, by enabling them to utilize the reputation they earned within the community. This can lead to reputation for the community itself, as a reputation provider.

A community may steer clear of participating in CCR interaction with communities it does not trust. In this case we may say that one community can prevent another community from using its reputation, since having its footprint in that other community may have a negative effect on its own reputation.

By definition, trust relations between communities are not symmetric. Therefore, one community may permit reputation exchange with another while the other may allow export of reputation to the first but does not allow import from the first due to low or missing trust value.

### **3.3 Privacy vs. Openness**

Together with the growing interest towards social networking and collaborative systems (e.g. Web 2.0), preaching for information sharing openness and transparency of information for accountability, there is a considerable demand for preserving the user privacy in the network.

A reputation system must create an encouraging environment for members to provide honest ratings. In their review (Jøsang et al. 2007), the authors discuss the problem of positive bias when ratings are provided. They mentioned an experiment by (Resnick et al. 2006) to examine the value of eBay's reputation system. It was found that only 0.6% of all the ratings provided by buyers and only 1.6% of all the ratings provided by sellers were negative, which seems too low to reflect reality. The possible explanation they provided for the positive rating bias was that positive ratings are a sort of exchange of courtesies, whereas negative ratings are avoided because of fear of retaliation from the other party.

The actual ranking is not the only parameter that should be kept private. In CCR the demand for transparency leads to the need for finding out the origin of a CCR value, i.e., the communities it was imported from, the basis of computation, and the textual comments attached to it (e.g. eBay). In many cases members would rather not expose the fact that they have consulted another member on a certain subject. For this reason the system should keep their privacy protected by disabling the linkage between a user and a rating she provided. Moreover, the trusted user herself may wish to export a CCR value assembled from her reputation in several communities without revealing exactly in which community she has acted and what was the exact reputation value she gained there. However, preserving user privacy and maintaining a global CCR without revealing its origin may be interpreted as misleading. The inability of the individual to realize which communities construct the reputation value essentially makes it less reliable since there is always a chance it was compiled out of one single community in which the relying member has no trust.

## **4. CONCLUSION**

As virtual communities are and will be playing increasingly important role, and as many users will become members in multiple communities, sharing reputation between such communities becomes an extremely important issue. Some of the problems associated with such reputation sharing were discussed. In future work we plan to investigate mechanisms which will provide a flexible set of solutions to the discussed problems thus enabling a rich and flexible range of CCR policies.

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