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Preface

This volume presents the proceedings of the 15th International Workshop of Groupware (CRIWG 2009). The conference was previously held in USA, (Omaha) in 2008, Argentina (Bariloche) in 2007, Spain (Medina del Campo) in 2006, Brazil (Porto de Galinhas) in 2005, Costa Rica (San Carlos) in 2004, France (Autrans) in 2003, Chile (La Serena) in 2002, Germany (Darmstadt) in 2001, Portugal (Madeira Island) in 2000, Mexico (Cancun) in 1999, Brazil (Buzios) in 1998, Spain (El Escorial) in 1997, Chile (Puerto Varas) in 1996, and Portugal (Lisbon) in 1995.

The CRIWG workshops seek to advance theoretical, experimental, and applied technical knowledge of computer supported collaboration. In the CRIWG workshops, researchers and professionals report findings, exchange experiences, and explore concepts for improving the success of people making a joint effort toward a group goal. Topics of discussion are wide ranging, encompassing all aspects of design development, deployment, and use of groupware.

CRIWG embraces both mature works that are nearly ready for publication in peer review journals, and new, cutting-edge works in progress. A total of 30 papers were accepted for presentation this year—16 full papers and 14 works in progress. Papers were subjected to double-blind review by at least three members of the Program Committee. The papers are organized into nine sessions, on eight different themes: Mobile Collaboration, Social Aspects of Collaboration I & II, Technologies for CSCW, Groupware Evaluation, CSCW Design, Geo Collaboration, Collaborative Learning and Modeling CSCW.

CRIWG 2009 would not have been possible without the work and support of a great number of people. We thank the members of the Program Committee for their valuable reviews, the CRIWG Steering Committee for its timely and sagacious advice and support. We owe a special debt of gratitude to our Local Organizing Committee, who worked long hours to produce a fine workshop. Finally, we honor the authors and attendees for their substantial contributions that made CRIWG 2009 a valuable experience for all involved.

September 2009

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Luïs Carriço

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Why Should I Trust in a Virtual Community Member?

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Abstract. A huge amount of virtual communities focusing on different topics currently exist. In this paper we centre on those virtual communities in which people share knowledge and experience. However, the level of knowledge shared may decrease when there is no face to face communication and when members do not have the chance to meet each other personally. In order to reduce this problem we propose a trust model with which to help community members decide whether another person is trustworthy or otherwise.

Keywords: Virtual Communities, Trust, Software Agents.

1 Introduction

The development of groupware technologies and the Internet has led to a new kind of community, "virtual communities", in which members may or may not meet one another face to face and may exchange words and ideas through the medium of computer networks [1]. According to the definition of Rothaermel and Sugiyama in [2] a virtual community can be seen as a group in which individuals come together around a shared purpose, interest, or goal.

The knowledge shared in virtual communities is highly important. It is therefore essential to encourage contributions if the community is to be successful and sustainable. Virtual community practitioners have developed various mechanisms in the hope of encouraging member participation and contribution. Nevertheless, since the people in present-day virtual communities are usually geographically dispersed they do not have a face to face communication and this situation could be problematic since the main knowledge sources in virtual communities are the members themselves. We consider that it is highly important to be able to discover how trustworthy a knowledge source (i.e. another member) is. This knowledge will help members to decide whether or not a document is valuable depending on the knowledge source from which it originates.

Despite the importance of virtual communities, large numbers of them fail. Participation is often sub-optimal, with only a small minority contributing. Under-contributing is a problem even in those communities that do survive [3]. For instance,

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in open source development communities, four percent of members account for 50 percent of answers on a user-to-user help site [4], and four percent of developers contribute 88% of new code and 66% of code fixes [5]. Other problems in this kind of environment are related to communication and coordination, and are made more difficult as a result of differences in culture, timetable, language, etc [6].

Furthermore, although virtual communities are a focus of knowledge sharing there is hardly ever any quality control of the knowledge generated in the community. In order to avoid these situations we propose a trust model to discover which knowledge sources are trustworthy. Moreover, we intend to implement this trust model in a multi-agent system in which one software agent represents one member of the community. The software agent will therefore be able to use the trust model to recommend trustworthy members, knowledge, etc., to the user

The remainder of the paper is organized as follows. The following section presents two important concepts related to our work: trust and reputation. Section 3 presents our model of virtual communities. Section 4 then describes the trust model that we propose for use in virtual communities. Later in Section 5 the prototype based on the virtual community model is outlined. Finally in Section 6 conclusions and future work are presented.

2 Trust and Reputation Models

There are many recent proposals for reputation mechanisms and approaches to evaluate trust in P2P systems in general [7, 8], and multi-agent systems in particular [9-11, 8]. However, there is no universal agreement on the definition of trust and reputation. Since the main goal of our work is to rate the credibility of information sources and of knowledge in virtual communities, it is first necessary to define these two important concepts.

Trust is a complex notion whose study is usually of a narrow scope. This has given rise to an evident lack of coherence among researchers in the definition of trust. For instance in [7], Wang and Vassileva define trust as a peer's belief in another peer's capabilities, honesty and reliability based on his/her own direct experiences.

Another important concept related to trust is reputation. Several definitions of reputation can be found in literature, such as that of Barber and Kim who define this concept as the amount of trust that an agent has in an information source, created through interactions with information sources [12], and that of Mui et al [13] which defines reputation as a perception a partner creates through past actions about his intentions and norms. This may be considered as a global or personalized quantity [13].

The concepts of trust and reputation are sometimes used interchangeably. However, recent research has shown that there is a clear difference between them, whilst accepting that there is a certain amount of correlation between the two concepts in some cases[14, 15].

In our work we intend to follow the definition given by Wang and Vassileva which considers that the difference between both concepts depends on who has previous experience, so if a person has direct experiences of, for instance, a knowledge source we can say that this person has a trust value in that knowledge.

The main differences between previous reputation/trust models and our approach are that most of previous models need an initial number of interactions to obtain a good reputation value and it is not possible to use them to discover whether or not a new user can be trusted. A further difference is that our approach is oriented towards collaboration between users in virtual communities. Other approaches are more oriented towards competition, and most of them are tested in auctions. Before describing the trust model proposed, in the following section we shall define the virtual community model to be used in organizations whose employees are organized in communities.

3 Community Virtual Model

This model is based on the Isakovic and Sulcic proposal [16]. In this proposal the authors consider two factors (purpose and people). However, we consider that trust is another important factor that must be considered in this kind of communities.

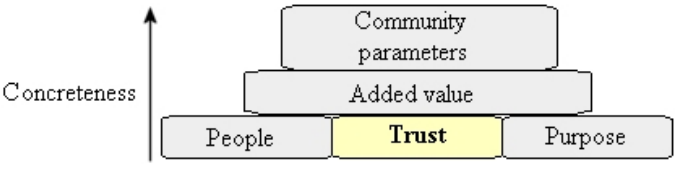

Fig. 1. Virtual community model

Therefore, the bases for our model are three community factors: people, trust and purpose, as is shown in Figure 1.

- The *Purpose* factor defines the purpose of the community in the organization.
- The *People* factor defines the community members' roles and type of participation. For instance, in a virtual community a person can play three types of roles:
  - The person contributes new knowledge to the communities in which s/he is registered. In this case the person plays the role of Provider.
  - The person uses knowledge previously stored in the community. This person will therefore be considered as a Consumer.
  - The person helps other users to achieve their goals, for instance by giving an evaluation of certain knowledge. In this case the role is that of the Partner.
- The *Trust* factor is in charge of generating a trust value for the knowledge sources with which a person interacts in the virtual community. It is of interest to note that members of a community are frequently more likely to use knowledge built by their community team members than those created by members outside their group. This occurs because people trust more in the information offered by a member of their community than in that supplied by a person who does not belong to that community. Of course, the fact of belonging to the same virtual community already implies that these people

have similar interests and perhaps the same level of knowledge about a topic. Consequently, the level of trust within a community is often higher than that which exists outside the community. The aforementioned reasons have led us to consider that the implementation of a mechanism in charge of measuring and controlling the confidence level in a community in which the members share information is of great importance.

Based on community purpose, it is possible to define the community *Added Value*. For instance, in our case, the community purpose is based on providing the users with a friendly environment in order to allow them to share, reuse and learn from their own experience.

After the main community factors have been defined, we define the *Community Parameters* used to specify the community details in more concrete terms, for instance, social norms, profiles, events, rewards, etc. In order to show the feasibility of this model, in the following section we shall describe the trust model proposed for use in virtual communities.

4 Trust Model in Virtual Communities

One of ours aims is to provide a trust model based on real world social properties of trust in virtual communities.

Most previous trust models calculate trust by using only the users' previous experience with other users, but several factors, such as shared social norms, repeated interactions, and shared experiences, have been suggested to facilitate the development of trust [17]. Because of this we propose some social factors such as:

- *Position*. employees often consider information that comes from a boss as being more reliable than that which comes from another employee in the same (or a lower) position as him/her [18]. Such different positions inevitably influence the way in which knowledge is acquired, diffused and eventually transformed within the local area.
- *Expertise*. This is an important factor since people often trust experts more than novice employees. In addition, "individual" level knowledge is embedded in the skills and competencies of the researchers, experts, and professionals working in the organization [19]. The level of expertise that a person has in a company or in a CoP could be calculated from his/her CV or by considering the amount of time that a person has been working on a topic. This is data that most companies are presumed to have.
- *Previous experience*. This is a critical factor in rating a trust value since previous experience is the key value through which to obtain a precise trust value. However, when previous experience is scarce, or it does not exist, humans use other factors to decide whether or not to trust in a person or a knowledge source. One of these factors is intuition.
- *Intuition*. This is a subjective factor which, according to our study of the state-of-the-art, has not been considered in previous trust models. However, this concept is of great importance since when people do not have any previous experience they often use their "intuition" to decide whether or not they are

going to trust something. We have attempted to model intuition according to the similarity between personal profiles: the greater the similarity between one person and another, the greater the level of trust in that person as a result of intuition.

There are three different ways of using these factors, which depend upon the agent's situation:

1. If the agent has no previous experience, for instance because it is a new user in the community, then the agent uses position, expertise and intuition to obtain an initial trust value and this value is used to discover which other agents it can trust.
2. When the agent has previous experience obtained through interactions with other agents but this previous experience is low (low number of interactions), the agent calculates the trust value by considering the intuition value and the experience value. For instance, a person who has to choose between information from two different people will normally choose that which comes from the person who has the same background, same customs etc. as him/her. By following this pattern, the agents compare their own profiles with those of the other agents in order to decide whether a person appears to be trustworthy or not. We could say that an agent 'thinks' "I do not know whether I can trust this agent but it has similar features to me so it seems trustworthy". The agents' profiles may alter according to the community in which they are working.
3. When the agent has sufficient previous experience to consider that the trust value it has obtained is reliable, then the agent only considers this value.

The trust model is translated into a value by using the following formula:

$$\mathrm{T}_{ij} = w_e * E_j + w_p * P_j + w_I * I_{ij} + \frac{1}{n}\sum_{i=1}^{n} QC_{ij}$$

where T_{ij} is the trust value of j in the eyes of *i*, and E_j is the value of expertise which is calculated according to the degree of experience that the person upon whose behalf the agent acts has in a domain. P_j is the value assigned to a person's position. I_{ij} denotes the intuition value that agent *i* has in agent *j*, and is calculated by comparing each of the users' profiles.

Previous experience should also be calculated. When an agent *i* consults information from another agent *j*, agent *i* should evaluate how useful that information is. This value is called QC_{ij} (Quality of *j*'s Contribution in the opinion of *i*). To attain the average value of an agent's contribution, we calculate the sum of all the values assigned to these contributions and we divide it between their total. In the expression n represents the total number of evaluated contributions.

Finally, w_e, w_p and w_I are weights with which the trust value can be adjusted according to the degree of knowledge that one agent has about another. Therefore, if an agent *i* has had frequent interactions with another agent *j*, then agent *i* will give a low weight (or even zero) to w_I since, in this case, previous experience is more important than intuition. The same may occur with w_e, w_p. The weights may therefore have the value of 0 or 1 depending on the previous experience that an agent has.

5 Prototype

A prototype has been constructed to offer virtual community members the possibility of obtaining document recommendations. The prototype also offers the possibility of registering in a community, connecting to a community and sending/evaluating documents.

In order to illustrate how the prototype works, let us look at an example. If a user selects a topic and wishes to search for documents related to that topic, his/her user agent will contact other user agents which have documents concerning said topic, and the user agent will then calculate the trust value for each agent, which means that these agents are considered to be knowledge sources and the user agent needs to calculate which "knowledge source" is more trustworthy. Once these values have been calculated, the user agent only shows its user the documents which have come from the most trustworthy agents (see Figure 2).

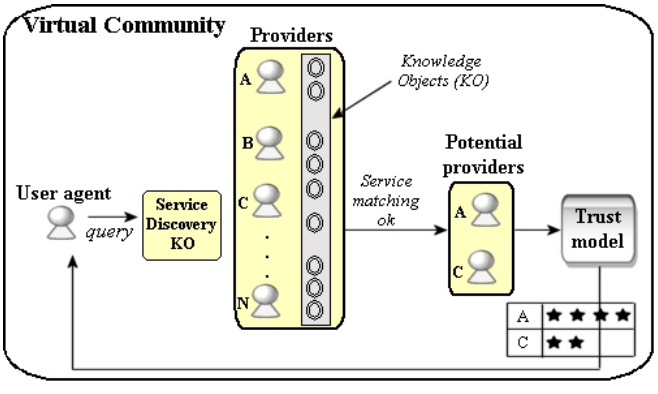

Fig. 2. Trust model integration in a virtual community

This method of rating trust helps to detect an increasing problem in companies or communities in which employees are rewarded if they contribute with knowledge in the community. Thus, if a person introduces non-valuable documents with the sole aim of obtaining rewards, the situation can be detected since these documents will have low values and the person will also be considered to be less trustworthy. The agent will not, therefore, recommend those documents. Moreover, this model implies the reduction of users' overload when they use knowledge management systems, since with this model the user agent only recommends the most adequate and trustworthy knowledge.

6 Conclusion and Future Work

In this paper we have presented a virtual community model and a trust model to create a trustworthy environment for community members. We have also designed a prototype to support virtual communities in which knowledge sources are rated by using

the trust model proposed, and which is to be used solely in virtual communities. In this prototype virtual community members can introduce documents and the software agents must decide how trustworthy those documents are for the user that they represent.

One important contribution of the prototype (described in Section 5) is that it detects experts in a community, since those knowledge sources with high trust values are supposed to be people who contribute with valuable knowledge. The trust model used also helps to detect fraud when users contribute with non-valuable knowledge. Another important feature of our trust model, and that which makes it different from previous models, is that even when a user is new to the community and other agents do not have any previous experience of working with him/her, the trust model allows agents to obtain a preliminary trust value by considering other factors such as the new agent's position and level of expertise, along with the intuition that each agent has with regard to the new member. We thus attempt to model human features, since when a person has to evaluate something and s/he has no previous experience that person uses other aspects such as his/her intuition in order to decide whether or not to trust in it.

In future work, we plan to extend our experiments to consider each of the trust model factors (previous experience, intuition, expertise and position) separately, in order to detect the trust value's variability with regard to the factor used. For instance, trust models that use only direct experiences typically require a great deal of time to achieve stable performance. Furthermore, we shall focus on using different trust models in the virtual community model proposed in order to make a comparison and to measure the feasibility of our trust model with regard to other models.

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References

1. Geib, M., Braun, C., Kolbe, L., Brenner, W.: Measuring the Utilization of Collaboration Technology for Knowledge Development and Exchange in Virtual Communities. In: Proceedings of the 37th Annual Hawaii International Conference on Systems Sciences (HICSS), vol. 1 (2004)
2. Rothaermel, F., Sugiyama, S.: Virtual Internet communities and commercial success: Individual and community-level theory grounded in the atypical case of timezone.com. Journal of Management 27(3), 297–312 (2001)
3. Beenen, G., Ling, K., Wang, X., Chang, K., Frankowski, D.: Using Social Psychology to Motivate Contributions to Online Communities. In: CSCW, vol. 6(3), pp. 212–221. ACM Press, New York (2004)
4. Lakhani, K., Hippel, E.: How Open Source Software Works: "Free" user to user assistance. Research Policy 32, 923–943 (2003)

5. Mockus, A., Fielding, R., Andersen, H.: Two case studies of open source software development: Apache and Mozilla. ACM Transactions on Software Engineering and Methodology 11(3), 309–346 (2002)
6. Boland, D., Fitzgerald, B.: Transitioning from a Co-Located to a Globally-Distributed Software Development Team: A Case Study at Analog Devices Inc. In: 3rd International Workshop on Global Software Development, Edinburgh, Scotland (2004)
7. Wang, Y., Vassileva, J.: Trust and Reputation Model in Peer-to-Peer Networks. In: Proceedings of the 3rd International Conference on Peer-to-Peer Computing, pp. 150–157 (2003)
8. Yu, B., Singh, M., Sycara, K.: An evidential model of distributed reputation management. In: Proceedings of the first international joint conference on Autonomous agents and multiagents systems (AAMAS), pp. 294–301. ACM Press, New York (2002)
9. Huynh, T., Jennings, N., Shadbolt, N.: FIRE: An Integrated Trust and Reputation Model for Open Multi-agent Systems. In: Proceedings of the 16th European Conference on Artificial Intelligence, ECAI (2004)
10. Sabater, J., Sierra, C.: Reputation and Social Network Analysis in Multi-Agent Systems. In: Proceedings of the first international joint conference on autonomous agents and multiagent systems (AAMAS), pp. 475–482. ACM Press, New York (2002)
11. Taecy, W., Chalkiadakis, G., Rogers, A., Jennings, N.: Sequential Decision Making with Untrustworthy Service Providers. In: Proceedings of 7th International Conference on autonomous Agents and Multiagent Systems (AAMAS), pp. 755–762 (2008)
12. Barber, K., Kim, J.: Belief Revision Process Based on Trust: Simulation Experiments. In: 4th Workshop on Deception, Fraud and Trust in Agent Societies, Montreal, Canada, pp. 1–12 (2004)
13. Mui, L., Mohtashemi, M., Halberstadt, A.: A Computational Model of Trust and Reputation for E-businesses. In: Proceedings of the 35th Hawaii International Conference on Systems Sciences (HICSS), vol. 7, p. 188. IEEE Computer Society Press, Los Alamitos (2002)
14. Jøsang, A., Ismail, R., Boyd, C.: A Survey of Trust and Reputation Systems for Online Services Provision. Decision Support Systems 43(2), 618–644 (2007)
15. Sabater, J., Sierra, C.: Review on Computational Trust and Reputation Models. Artificial Intelligence Review 24, 33–60 (2005)
16. Isakovic, J., Sulcic, A.: A Value-Added Methodology for Defining Virtual Communities for Enterprises. In: Proceedings of the 12th international conference on entertainment and media in ubiquitous era, pp. 159–161 (2008)
17. Meyer, R., Davis, J., Schoorman, F.: An integrative model of organizational trust. Academy of Management Review 20(3), 709–734 (1995)
18. Wasserman, S., Glaskiewics, J.: Advances in Social Networks Analysis. Sage Publications, Thousand Oaks (1994)
19. Nonaka, I., Takeuchi, H.: The Knowledge Creation Company: How Japanese Companies Create the Dynamics of Innovation. Oxford University Press, Oxford (1995)

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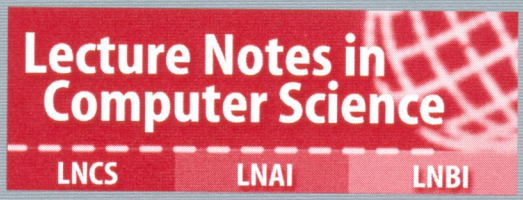

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