

# Applying Argumentation to Enhance Dialogues in Social Networks

Stella Heras<sup>1</sup> and Katie Atkinson<sup>2</sup> and Vicente Botti  
and Floriana Grasso and Vicente Julián and Peter McBurney

**Abstract.** Nowadays, many websites allow social networking between their users in an explicit or implicit way. In this work, we show how argumentation schemes theory can provide a valuable help to formalize and structure on-line discussions and user opinions in decision support and business oriented websites that held social networks among their users. Two real case studies are presented and analysed. Then, guidelines to enhance social decision support and recommendations with argumentation are provided.

## Introduction

Currently, the Web has evolved from read-only HTML documents and personal websites to social sites where people interact, share and constantly update huge amounts of decentralised information. This new conception of the Web as a platform for computing and collaborative interaction has been supported by the development of so-called Web 2.0 technologies and standards like AJAX, SVG, FOAF, PHP, Ruby, XHTML, P2P or XSL. The result has been the fast proliferation of web-based communities, on-line social networks, web applications and webservices.

Nowadays, many websites allow social networking between their users in an explicit or implicit way. While some are declared leisure oriented social networking sites, others are more decision support or business oriented while still allowing their users to interact, share their preferences and profiles, form communities with other users and give advice, recommendations and feedback about their experiences. Some examples of the former type are Facebook<sup>1</sup>, Flickr<sup>2</sup>, MySpace<sup>3</sup>, Orkut<sup>4</sup> and Twitter<sup>5</sup>, whose general purpose is to keep users in contact by providing them with a smart interface to show their profile, manage their acquaintances list, join groups, share media content and chat. The latter is the case of on-line shopping companies, such as Amazon<sup>6</sup> or eBay<sup>7</sup> and consumer review sites, like Tripadvisor<sup>8</sup> or Epinions<sup>9</sup>, which provide their users with a means of networking and discussing matters related to their business or reviewing topic. In addition, there is a third type of on-line social networking site whose orientation lies between leisure, business and decision support. Some examples of this further type are websites such as Ethicaleconomy<sup>10</sup> or Kiva<sup>11</sup>, which support networking and debate to promote ethical

values and social help. Regardless of the purpose of the social networking, in all of these communities discussions arise from the difference of opinion between users, and individual views are mixed in the tangle of user-generated content posted in discussion boards, wikis and blogs. Therefore, there is an obvious need for mechanisms to structure this information and to elicit as much useful knowledge as possible from it.

In this work, we show how Argumentation Theory (concretely Argumentation Schemes Theory [19]) can provide a valuable help to formalize and structure on-line discussions and user opinions. Argumentation schemes are stereotyped patterns of human reasoning that can improve the user's understanding about discussions and provide a means to evaluate what users have stated and why. When opinions are product recommendations to other users, they are usually justified because they match the user profile (i.e. fit the content of user's declared preferences and likes), the profile of similar users (i.e. collaborative filtering) or both (i.e. hybrid recommendations). Usually, there is not an explanation about the reasoning process that has been followed to come up with specific recommendations. In fact, these recommendations tend to come directly from the recommendation algorithm that runs the website and not from the acquaintances that a user has in his social network. However, this does not follow future trends on the Web, where discovering is becoming social (as reported by Joe Kraus, Google's director of product management in a talk at the Supernova conference 2008) and consequently, recommendations could be expected to come directly from acquaintances in a decentralised way. Moreover, people trust recommendations more when the engine can explain why it made them [13] and what is understood as a good recommendation is changing from the one that minimises some error evaluation measure about the output of content, collaborative filtering or hybrid recommendation methods to the one that really makes people happier.

On the other hand, when user opinions are conveyed in reviews and guides that users write to provide pieces of advice to other users, the reasons that the author has put forward his ideas may be implicit in the text. However, for non-expert users identifying and developing a deep understanding about all such implications can be difficult. Moreover, many reviews and guides are written collaboratively between several users, starting with an initial review followed up with many comments and replies. Thus, each individual opinion can be blurred as the number of posts grows.

Regarding evaluation, user opinions are commonly assessed using some measures of trust and reputation (e.g. usefulness degrees, reviewer ranks, seller ratings and customer feedbacks) in decision support or business oriented websites. These values are internally computed in the website by providing users with rating tools to score

<sup>1</sup> Departamento de Sistemas Informáticos y Computación. Universidad Politécnica de Valencia, Spain, email: sheras@dsic.upv.es

<sup>2</sup> Department of Computer Science, University of Liverpool, UK

<sup>1</sup>www.facebook.com    <sup>2</sup>www.flickr.com    <sup>3</sup>www.myspace.com

<sup>4</sup>www.orkut.com    <sup>5</sup>twitter.com    <sup>6</sup>www.amazon.com

<sup>7</sup>www.ebay.com    <sup>8</sup>www.tripadvisor.com

<sup>9</sup>www.epinions.com    <sup>10</sup>www.ethicaleconomy.com

<sup>11</sup>www.kiva.org

the posts of other users or to leave feedback about their experiences. However, they are not usual on leisure oriented social networking sites, where the truthfulness of the user opinion has a lesser importance since its final consequences do not usually give rise to a wrong decision or an unsuccessful commercial transaction. Nevertheless, even when user opinions are attached with trust and reputation values, these measures do not provide an objective way of assessing them, for instance, by looking at the reasoning patterns that they follow to come up with specific conclusions. Thus, user opinions can be misunderstood and rated low, decreasing unfairly the trust and reputation values of their authors.

In this work, we focus in particular on business oriented websites that allow a social interaction among their users. We leave out of our analysis for the time being decision support, leisure or ethics oriented social networking sites, as the scope and target of on-line business websites makes them more suitable to define tools to analyse opinions and elicit knowledge from their users. In this paper, we start with a brief overview of related work which, though not necessarily explicitly related to social networks, applies argumentation theory to classical social network activities. Then we formalise our notion of social network, and we show how this definition fits to Amazon and eBay, probably best epitomize how implicit social networks emerged from business websites. Finally, we discuss how argumentation schemes could be best utilised to improve social networking features of these sites.

## 1 Related Work

Although not directly applied to social networks, the work most relevant to our purposes is perhaps the work on recommender systems [1]. Recently, research has investigated the impact of the social network dynamics on the recommendation, typically based on the notion of "social trust" [7, 16, 17]. A relevant work [9] applies argumentation to manage the interaction that emerges from the recommendation dialogues between a social network of agents, by means of a dialogue game that controls the recommendation process. It uses Argumentation Schemes [19] to define a set of potential attacks to the recommendations provided by agents. Here, the concepts of argumentation, recommender systems and social networks are studied together for the first time. The recognition that current recommendation systems are unable to make use of the large amount of quantitative data to empower recommendation has led to the consideration that a more sophisticated approach based on argumentation could be the key [5]: preferences formalised according to Defeasible Logic Programming [6] inform an inference tool able to analyse and decide conflicts among the set of equally viable recommendations. An important additional contribution of [5] is the identification of a number of research questions, such as *exposing underlying assumptions* behind recommendations, *approaching trust and trustworthiness* from the perspective of backing arguments and *providing rationally compelling arguments* for recommendations. The work in the present paper contributes to these areas but from the different perspective of structuring and clarifying the reasoning process followed by users to provide pieces of advice and recommendations to other users of their social network.

Other relevant research, though not directly applied to social networking, applies argumentation to support trust and reputation. In [11], a framework for evaluating trust-related arguments in on-line stores is proposed, evaluated empirically, and extended by applying the Toulmin model of argument to provide guidelines for the implementation of well-structured trust-assuring arguments and to in-

vestigate if the provision of these arguments actually increases the customer trust in Internet stores. A novel quantitative trust model for argumentation-based negotiating agents is proposed in [2], suitable to emerging applications like e-business, based on a negotiation dialogue game, and presenting a model for securing agent oriented systems in which agents can utilise an argumentation system to reason over the reputation of other agents. Our approach of applying argumentation to social networks does not intend to provide new measures of trust and reputation for the users of the network, but support the existing measures with arguments that justify them and clarify the reasoning process behind them.

Finally, preliminary work on applying argumentation to prediction markets was proposed in [14]. Prediction, or information, markets, are a special type of social network whose purpose is to aggregate the information held by their users to make predictions about specific events or parameters. The work analyses the influence of the social relationships on the predictions made by group judgement, where a group of agents linked via a social network argue on the final outcome of a prediction.

## 2 Definition of a Social Network Model

We studied a number of social networks, focusing in particular to the argumentation activities that, either implicitly or explicitly, users would engage in. In particular, following the typology of argumentative dialogue in [18], we assessed how different social networks compare with this feature. This comparison is shown in Table 1. From this analysis, we extrapolated a general abstraction of social network.

For our purposes, we consider a social network as an abstraction to represent social structures that link individuals or organisations. Links can stand for different types of interdependency, such as friendship, trade, shared knowledge, common hobbies, etc. We distinguish between **explicit social networks**, which openly represent users and links among them, so that users can, for instance, search their *contact list* to interact with other users, and **implicit social networks**, which may or may not store information about social relationships among users, but which usually do not make this information accessible to users, who cannot access their contact lists to retrieve previous partners or do not have an easy way of searching reports about previous exchanges. For both types, we identify the following features that define a social network in our model:

- Overall **purpose** of the network: e.g. friendship, business, shared hobbies.
- Permitted **tasks**: e.g. recommend, provide opinions, evaluate others' opinions.
- **Nodes** representing individuals or organisations.
- **Roles** that individuals or organisations can play in the social network.
- **Knowledge databases**: individual or shared knowledge databases associated with each node and representing information about the issues related with each role.
- **Ties**, or links, between nodes, which can be of different sorts, depending on the overall purpose of the network (e.g. values, visions, ideas, financial exchange, friendship, personal relationships, kinship, dislikes, conflict, trade). Ties can be directed or not. Undirected links represent social relations that are present in the network, but whose related information is not stored nor explicitly supported.
- Social network **analysis measures**, used to evaluate the relations that a tie represents. Values of trust and reputation are common examples of these measures.

- Types of **argumentative dialogues** that can be held in the network.

In what follows we concentrate on two case studies, analyzing arguably the two most popular business oriented websites that allow social interaction among users, despite this not being their primary purpose: Amazon and eBay. For each, we analyse the features that make them considered *de facto* social networks, and we represent them in the light of the model we defined above.

## 2.1 Amazon

Amazon (www.amazon.com) is possibly the largest on-line retailer offering, either directly or via "marketplace" associated sellers, a very wide range of products, from books, to groceries, from furniture to clothes and shoes, and so on. Social networking features allow users to interact in different ways. Amazon's users can:

- write reviews about products, whether purchased or not. As part of their review, users can rate products. Reviews can be annotated with the nickname of the reviewer or his popularity as reviewer ("reviewer rank"), based on both positive and negative votes received, as well as the time when the review was published. In addition, other users can write comments on reviews, rate them as useful/unuseful, and report them to the company if they consider them offensive or inappropriate.
- leave feedback about "marketplace" sellers after a purchase, with a comment. Seller ratings are computed using the votes received over the transactions performed in a specific period of time. Sellers have the opportunity to respond to the comment/rating and rate the transaction, but they cannot rate buyers (only feedback submitted by buyers is considered to compute a seller rating).
- join customer communities: users can create a profile and share it with other users, join different communities, participate in forum, create *Listmania* lists with the Amazon products they like or recommend and *Wish* lists with the products they are interested in, suggest products to their communities by adding a tag, write *So You'd Like to...* guides to directly recommend products. Posts can be replied to, rated and reported, but these ratings are not used to compute customer ranks.

On top of this, Amazon website runs a powerful recommendation algorithm that matches each customer's purchased and rated item to similar items, and outputs a personalised recommendation list [12]. This algorithm follows an *item-to-item collaborative filtering* approach that scales to massive data, producing recommendations in real time with a brief explanation (e.g. "N% customers buying X also bought Y").

Depending on the activities that customers perform in Amazon, different customer **roles** can be identified. Figure 1 shows a use case diagram with the roles that take part in the Amazon social networking features and the activities that customers can carry out when they are playing each role. Note that customers can play different roles when they are carrying out different activities on the website. In addition to them, Amazon customers can play other roles (e.g. administrators, developers, associates, etc.) and perform other operations using other features (e.g. Amazon Web Services, Amazon Marketplace Payments, etc.), but they are out of the scope of this paper.

The most frequent type of customer is a potential *buyer* that checks the website searching for a specific product. For clarity purposes, we consider this role as the default role that any customer that registers on the website plays. Furthermore, specific users can also play

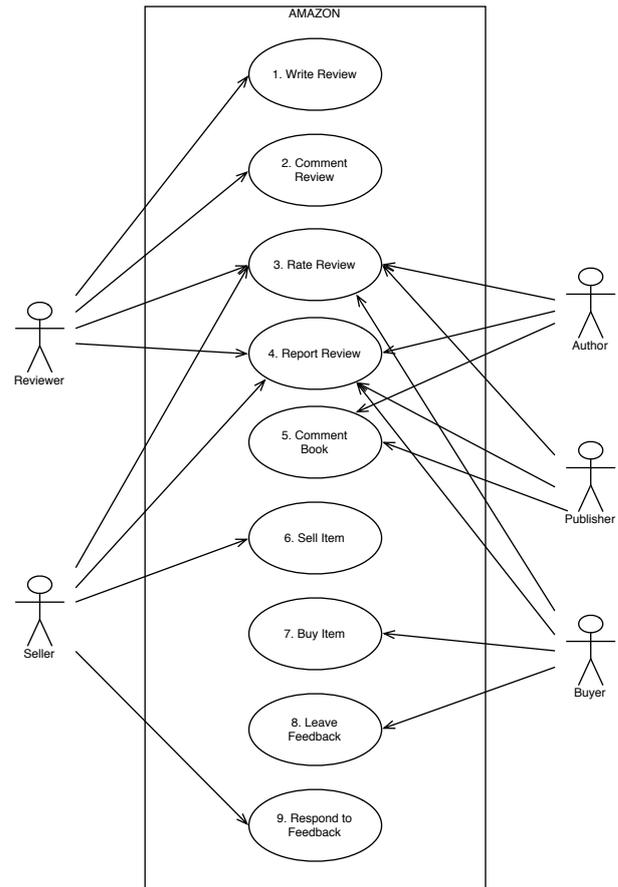


Figure 1. Amazon Use Case Diagram

the *seller*, *author* and *publisher* roles, depending on their business or their relation with the product. As explained above, after a purchase, the buyer has the opportunity of leaving feedback about his experience with the seller, reviewing the transaction. Apart from selling their products, *sellers* can also answer to this feedback if they want to add any comment or reply. In addition, Amazon allows *authors* and *publishers* to write comments on their works.

Other important roles from the social networking perspective is the *reviewer* role, which is played by any Amazon customer as soon as he writes a review on any product or a comment on a review, sharing his knowledge and opinions about the product and making recommendations to other Amazon customers. Note that we consider that customers play the reviewer role both when they start a new review and also when they make comments on a review written by other customers. Finally, any Amazon customer is able to rate a review as useful/unuseful or report a review to the website if it is considered inappropriate.

### 2.1.1 Amazon Social Network Models

Explicit social networks are formed by the users joining communities, while implicit social networks emerge from the activity of writing reviews and from sales and their subsequent feedback. In the spirit of our analysis, we focus here on the latter, and we analyse the social networks emerging from reviews and sales according to

| Activity  | Persuasion | Negotiation | Inquiry | Deliberation | Information Seeking | Eristics | Examples   |
|---|------------|-------------|---------|--------------|---------------------|----------|--|
| Blogs   | X          |             |         |              | X                   |          | Pingback, Slashdot, LiveJournal, BlogSpot  |
| Collaborative RT Editors                              |            |             |         |              | X                   |          | SubEthEdit, SynchroEdit, ACE, Moonedit, Google Docs & Spreadsheets and Zoho  |
| Commercial Sites                                      | X          |             | X       | X            | X                   | X        | Amazon and eBay  |
| Commercial Social Networks                            |            | X           |         |              | X                   |          | Dell IdeaStorm   |
| Consumer Review Sites with Social Networking features | X          |             | X       | X            | X                   | X        | TripAdvisor and ePinions   |
| Deliberative Social Networks                          | X          |             |         | X            |                     | X        | Webs of discussion and debate for decision-making purposes between individuals and government  |
| Ethical Sites   | X          |             | X       | X            | X                   | X        | Kiva and Ethicaleconomy  |
| Forums  | X          |             |         | X            | X                   | X        | Yahoo! Groups and Google Groups  |
| Instant Messaging                                     |            |             |         |              | X                   |          | Gtalk, Skype, ICQ, Yahoo! Messenger, MSN, Pidgin AOL and Jabber  |
| Social Cataloguing                                    |            |             | X       |              | X                   |          | CiteULike, Connotea, BibSonomy and rebase  |
| Social Guides   |            |             |         |              | X                   |          | WikiTravel   |
| Social Libraries                                      |            |             | X       |              | X                   |          | discogs.com, imdb.com and LibraryThing   |
| Social Network Search Engines                         |            |             |         |              | X                   |          | Newstrove  |
| Social Network Sites                                  | X          |             |         | X            | X                   | X        | Facebook, Flickr, MySpace, Orkut and Twitter   |
| Social On-line Storage                                |            |             |         |              | X                   |          | Using servers or P2P technology  |
| Text Chat   |            |             |         |              | X                   |          | IRC and other technologies   |
| Virtual Worlds  | X          | X           | X       | X            | X                   | X        | Dotsoul, SecondLife, Active Worlds, the Sims on-line, There, Planeshift, Croquet project, VOS, Solipsis, Everquest and World of Warcraft |
| Wikis   |            |             | X       |              | X                   |          | Wikipedia, Wikisource  |

**Table 1.** Argumentation dialogues enabled by social networking activities.

our model.

### *Social Network of Reviews*

Reviews that Amazon users write give rise to social relations from which emerges an *Amazon Social Network of Reviews*, with the **purpose** of sharing information on the products, and with **nodes** representing buyers, sellers, reviewers, authors (of books for example) and publishers/manufacturers. The **tasks** permitted are: writing reviews on Amazon products, writing comments on reviews, rating reviews or reporting reviews. The main type of **dialogue** enabled by this social networking activity is information seeking and sharing, but persuasion is also enabled by means of free comments and responses to them. Figure 2 is an example of a network of reviews with six Amazon customers playing each role that is involved in the activity of writing reviews. Arrows stand for **social ties** implicitly created from users' activity. In the example, arrows from User 1 to Users 3, 4, 5 and 6 stand for social ties meaning that User 1 has written a review about a product related with those other users (because they are sellers, authors, publishers or buyers of the product). Arrows from Users 3, 4, 5 and 6 to User 1 stand for a social tie that represents that those users rated or reported the review of User 1. Finally, arrows between Users 1 and 2 represent social ties that can be created when reviewers comment, rate or report the review of other reviewers. Also, comments on reviews can also be commented, rated and reported. **Knowledge databases** are attached to each role, denoting the information that the website stores for each role, e.g. the

reviews made by a reviewer and how they were rated, though not always the information is accessible to a user (e.g. there is no obvious way for users to check their list of reviews). **Analysis measures** evaluate users' performance in the social network, e.g. the reviewer's rank can be used as a reputation measure to evaluate the importance of a reviewer. Measures can also label ties, e.g. individual reviewers' trust measures could be computed from the usefulness ratings assigned over a certain period of time.

### *Social Network of Sales*

The overall **purpose** of the *Amazon Social Network of Sales* is to run commercial transactions between its members and to inform about them. Therefore, the **tasks** permitted on the network are sell and buy products and leave feedback about these commercial transactions, while **nodes** are simply buyers and sellers (as feedback cannot be left unless a transaction has occurred). The main type of **dialogue** that these tasks enable is that of information seeking and sharing, by leaving feedback, and persuasion, by supporting this feedback and responding to it. Figure 3 shows an example of an Amazon social network of sales with one seller (User 1) and two buyers (Users 2 and 3) and their respective **knowledge databases**. As before, arrows show **social ties**: the arrow from User 1 to Users 2 and 3 means that this customer has sold a product to Users 2 and 3 and thus, a social tie between them has been created. The arrow from User 2 to User 1 represents that User 2 has provided feedback about his sale with User 1 and hence, this has generated a new social tie. This arrow can

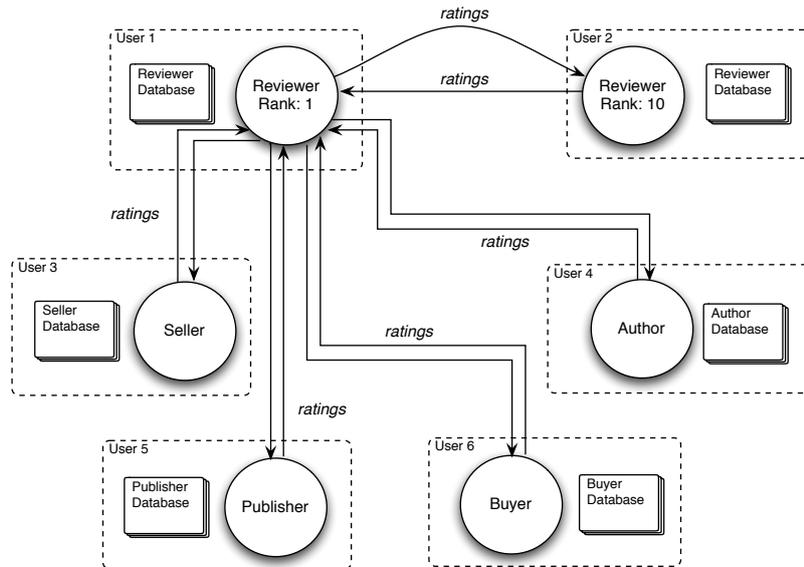


Figure 2. Amazon Social Network of Reviews

be labelled with the numeric feedback (ranging from 1 to 5 stars) that the buyer has left about the transaction, which we consider as a social network analysis measure. Amazon aggregates these numbers to compute a seller rating, which can also be used as a reputation measure to label nodes that represent customers playing the role of sellers.

In addition, the seller can also leave comments about the transaction and the feedback received (although not about the buyer himself and hence, this assessment does not count towards any rating about him). This is represented in the figure by the arrow from User 1 to User 2. Thus, this arrow cannot be labelled with a feedback score.

## 2.2 eBay

eBay (www.ebay.com) is the world's largest on-line marketplace, an open trading platform that allows sellers and buyers to get in touch. Unlike Amazon, eBay does not sell products directly and does not centralise transactions and payment, but it charges a fee to sellers for publishing their adverts. After the purchase, buyers directly pay sellers, either on-line (though they are encouraged to do this via the system, e.g. with PayPal) or in person. The core business model of eBay are auctions, though products can also be sold directly via a "Buy It Now" option. The main social network features in eBay are:

- reviews and guides. Reviews are labelled with reviewer information, which consists, among other things, of the reviewer's profile with the number of reviews, number of times starting the reviews for an item, number of guides written, helpfulness votes and *reviewer rank* (i.e. number of positive votes on the total amount of the reviewer's reviews). Reviews can be rated as helpful/unhelpful, but, unlike Amazon, they cannot be commented.
- feedback about completed transaction. Unlike Amazon, in eBay both feedback on sellers and buyers counts towards customer ratings. Detailed comments can also be left: buyers can review sellers on the details of their purchase (e.g. if the item really was as described in the ad, if the delivery was quick enough, etc.) and

viceversa (the buyer paid promptly, etc.). These detailed comments are anonymous and do not count towards the overall feedback score. Users' feedback profiles can be made private, so that comments on the purchase are hidden to other users, though the positive or negative ratings received cannot.

- Community services: such as *Neighbourhoods*, communities of people who share common interests; *My World*, allowing the creation of a profile; *Discussion boards*; *Groups*, which are member led discussion areas that allow members to share ideas, opinions and information quickly and easily; *Blogs*, and *Chat rooms*.

As pointed out before, all these activities allow eBay customers to interact and form social networks. The main **roles** that eBay customers play when they are performing them are shown in figure 4. For comparison with Amazon and clarity purposes, we have only included in the figure the roles that eBay customers play when they write reviews or perform sales, since the activities enabled by the eBay community services are mostly equal to them. Moreover, posts in other community forums can be commented upon, but not rated, so users cannot leave a numeric value that stands for their opinion about the post, which makes it more difficult for other users and even for the website administrators to have an overall view of the real opinion of the user that has written the post. However, any post in eBay can be reported to the site for misuse.

The most common roles that eBay customers play are the *seller* and the *buyer* roles, selling and buying items on the website respectively. By default, any user that registers on eBay plays the role of a potential *buyer*. In addition, both users can leave feedback about their counterpart and their commercial experience with him. The figure also shows an important difference between Amazon and eBay users when they play the reviewer role, since in eBay reviews cannot be commented by other users which would also play in that case the role of reviewers. Thus, reviews can be only written by one user and discussions are not permitted. However, any eBay customer can rate reviews, leaving his opinion about them. Also, reviews can be reported to the website if they are considered as inappropriate by any user.

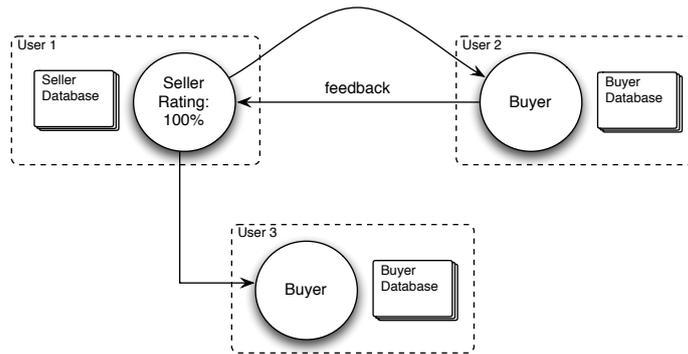


Figure 3. Amazon Social Network of Sales

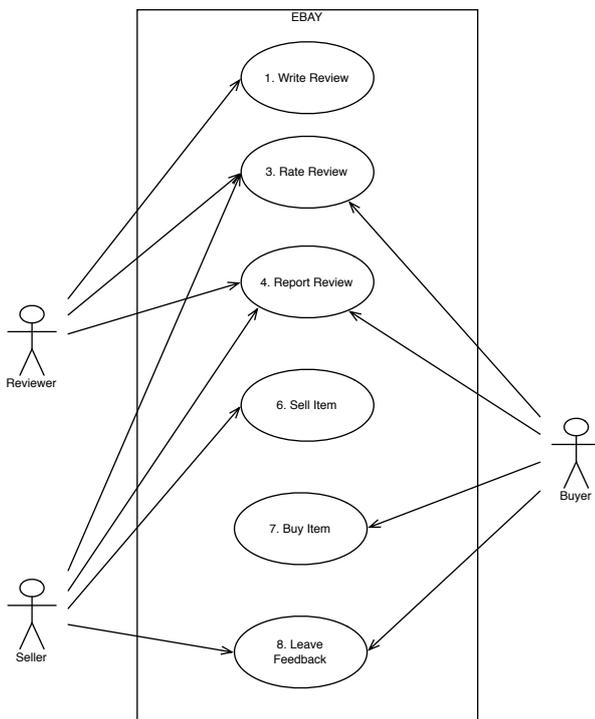


Figure 4. eBay Use Case Diagram

### 2.2.1 eBay Social Network Models

As with Amazon, eBay enables explicit social networks, via community services, and implicit social networks, emerging from the reviews and sales, with similar characteristics. As before, we concentrate on the implicit, business driven networks.

#### Social Network of Reviews

The reviewing facility that eBay offers to its customers enables the creation of an implicit social network that we have named the *eBay Social Network of Reviews*, whose main **purpose** is to share knowledge and experience about the items sold in eBay. Therefore, the **tasks** that eBay customers perform on this network are writing re-

views and evaluate them (by rating or reporting them). Unlike Amazon, reviews on eBay cannot be commented upon, so the main type of **dialogue** enabled in this network is information seeking and sharing.

Figure 5 shows an example of the network. As shown in the figure, **nodes** represent individuals playing the possible roles that take part in the social network of reviews with their associated **knowledge databases** and arrows stand for **social ties**. These are customers that have written reviews (i.e. reviewers) and other customers that have rated or reported them (i.e. sellers and buyers). Therefore, arrows from User 1 to Users 2, 3 and 4 imply that User 1 has written a review about an item sold or bought by the other users. Also, arrows from Users 2, 3 and 4 to User 1 mean that those users have rated or reported to the website the review written by User 1.

Figure 5 also shows some values computed by the website that can be considered as **analysis measures** to evaluate the performance of each user on the social network. For instance, nodes are labelled with the reviewer's rank computed by the website. Also, arrows from Users 2, 3 and 4 to User 1 are labelled with the ratings that those users have provided about the review of User 1, which are also used in the reviewer's rank calculation. In addition, some other complex analysis measures could be considered. For instance, the number of ratings or reports provided by a user could be used to evaluate his level of participation in the activities developed on the network.

#### Social Network of Sales

The core activity held on the eBay website has the **purpose** of buying and selling of products. Underlying to this activity, eBay allow both buyers and sellers to provide ratings on their partners, sharing with the website and other users their opinions about their commercial transactions. These activities give rise to social relations between the eBay customers, which we have represented by means of an *eBay Social Network of Sales* abstraction. Therefore, as in Amazon social network of sales, the **tasks** permitted on the network are buy and sell products and leave feedback about these transactions. Regarding types of **dialogues**, both information seeking and sharing, and persuasion are enabled, since customers are not only able to leave their opinions on sales, but also about their partners on these sales (i.e. opposite to Amazon, eBay allows both sellers and buyers to evaluate the commercial transaction and the user that they have done business with). Figure 6 shows an example of the eBay social network of sales.

In this network, customers interact playing either the seller or the

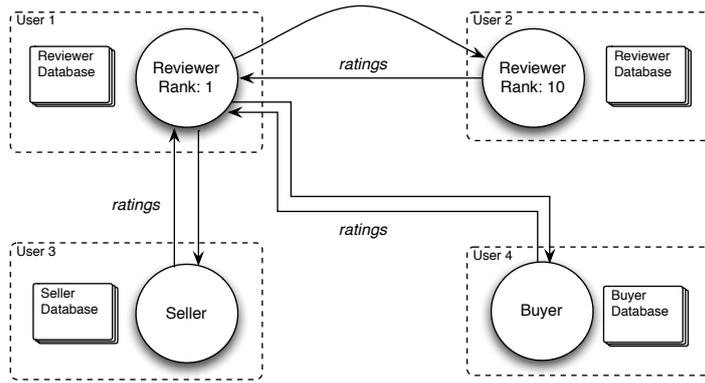


Figure 5. eBay Social Network of Reviews

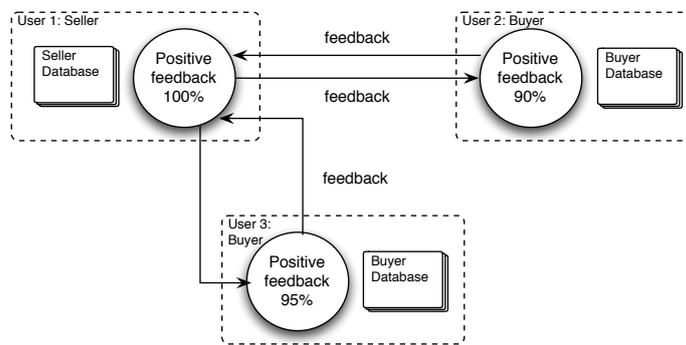


Figure 6. eBay Social Network of Sales

buyer role, which are represented on the network by **nodes** and their associated **knowledge databases**. The arrow from User 1 to User 3 means that User 1 has sold a product to User 3 and hence, a **social tie** has been generated. As pointed out before, sales can be evaluated by buyers, who leave feedback scores about it. An example of the associated social tie is represented in the figure from the arrows from Users 2 and 3 to User 1. Optionally, sellers can also evaluate buyers (although they are only allowed to leave positive feedback on buyers). This type of tie is shown in the figure by means of the arrow between User 1 and User 2. Feedback ratings can be used as social network **analysis measures**. eBay computes several scores for feedback (see eBay website for more information<sup>12</sup>). The figure shows, for instance, how the percentage of positive feedback could be used to label nodes with a reputation measure for each user playing a specific role on the network.

### 3 Argumentation Schemes to Support On-line Dialogues in Social Networks

So far, we analysed the reviews and sales features of Amazon and eBay, characterising the underlying interactions among their users by means of social network abstractions, which, we believe, are general enough to be transferable to other similar websites. In this section, we concentrate on how argumentation could enhance the performance of the emergent activities carried out by the users of a social

network, with a preliminary step towards the application of argumentation schemes to formalise the underlying reasoning shown in the dialogues held among the users of the networks in our cases of study. Argumentation schemes [19] are characterised by a set of premises and their underlying conclusion, and are associated with a set of critical questions (CQs) that stand for potential attacks that could refute the conclusion drawn from the scheme. This feature is very useful to guide argumentation dialogues. Thus, if a proponent of a position uses a pattern of reasoning that matches with an argumentation scheme, an opponent can try to pose one of its critical questions to attack that position. We analysed a number of typical dialogues held in the situation described in the two cases studies above, and we identify the following advantages of applying argumentation schemes to social networked business:

- *To provide a formal structure to opinions and recommendations*, allowing for explanations and justifications that clarify the position of the reviewer.
- *To provide a way of evaluating user opinions and recommendations*, by looking at their associated reasoning patterns, with critical questions as a way to show weaknesses and possible attacks.
- *To provide a formal structure to the dialogue as a whole*, clarifying the dynamics of each individual contribution in terms of the overall argument.

To illustrate these advantages, consider for example the conversation extract (inspired by real posts on Amazon) shown in figure 7 review-

<sup>12</sup><http://pages.ebay.com/help/feedback/>

## Customer Review

255 of 282 people found the following review helpful:



A must in your Argumentation bibliography, September 18, 2009

By User1

New Reviewer Rank: 2,525,408

...

...this book is an excellent reading. It's the third book that I've read from this author and it's as good or better than the last two. Any student or researcher on Argumentation in AI will enjoy the reading, which starts with some introductory chapters in the area and nicely flows to more specific topics. As a scholar in AI, I strongly recommend it...

...

[Permalink](#) | Was this review helpful to you?   ([Report this](#))

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Showing 1-2 of 2 posts in this discussion

User2 says:

New Reviewer Rank: 1,326,523

...so I'm still not sure about the quality of the book, since I read the 2nd of this series and I found it quite difficult to follow. What confuses me the most are what you (*i.e. User1*) said on your review of this 2nd book, where you wrote a hard criticism and strongly discourage the reading. Up to my knowledge, this could be a hard reading...

...

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10 of 17 people think this post adds to the discussion. Do you?

User3 says:

New Reviewer Rank: 15,782

...I totally agree with User1. I haven't read other books on the series, but looking to this one, I guess they are also good. Moreover, although User1 discourage the reading of the 2nd book of the series for the non-scholars, he does so because its contents assume previous expertise on the area. This does not necessarily mean that the 2nd book is a bad reading...

...

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5 of 6 people think this post adds to the discussion. Do you?

Figure 7. An example on Amazon reviews

ing book *B*. The argumentation can be summarised as:

- *User1* provides an argument in favour of the book:

**A1:** I am a scholar in the area of AI; I strongly recommend the reading of the book; THEREFORE this is a good reading

- *User2* replies with two arguments: an opinion about the topic and an attack to A1:

**A2:** I have read the 2nd book of the series of *B*; This wasn't a good reading; THEREFORE book *B* couldn't be a good reading either.

**A3:** *User1* says that book *B* and its series are good; *User1* posted a hard criticism and discouraged the reading of the book *B* in a previous review; THEREFORE the review of *User1* is inconsistent with what he said previously

- Finally, *User3* replies to *User2* with an argument that supports the argument of *User1*:

**A4:** *User1* is a scholar in the area of AI; *User1* discourages the reading for non-scholars of the 2nd book of the series of *B*; THEREFORE the 2nd book of the series of *B* isn't a good reading for non-scholars

Following [19], these arguments could be translated into argumentation schemes as:

#### **A1: Argument From Expert Opinion**

**Major Premise:** Source *User1* is an expert in subject domain *AI* containing proposition *book B is a good reading*

**Minor Premise:** *User1* asserts that *book B is a good reading* is true

**Conclusion:** *book B is a good reading* is true

**CQ1:** How credible is *User1* as an expert source?

**CQ2:** Is *User1* an expert in the field *AI* for which *book B is a good reading*?

**CQ3:** What did *User1* assert that implies that *book B is a good reading*?

**CQ4:** Is *User1* personally reliable as a source?

**CQ5:** Is the proposition *book B is a good reading* consistent with other experts assert?

**CQ6:** Is *User1's* assertion based on evidence?

#### **A2: Argument From Position to Know**

**Major Premise:** Source *User2* is in position to know about things in a certain subject domain *books on B series* containing proposition *book B is a good reading*

**Minor Premise:** *User2* asserts that *book B is a good reading* is false

**Conclusion:** *book B is a good reading* is false

**CQ1:** Is *User2* in position to know whether *book B is a good reading* is true of false?

**CQ2:** Is *User2* an honest source?

**CQ3:** Did *User2* assert that the *book B is a good reading* is true or false?

#### **A3: Argument From Inconsistent Commitment**

**Initial Commitment Premise:** *User1* has claimed that he is committed to proposition *book B and its series are a good reading*

**Opposed Commitment Premise:** Other evidence shows that *User1* is not committed to proposition *book B and its series are a good reading* since he discouraged the reading of the book *B* in a previous review

**Conclusion:** *User1's* commitments are inconsistent

**CQ1:** What is the evidence supposedly showing that *User1* is committed to proposition *book B and its series are a good reading*?

**CQ2:** What further evidence in the case is alleged to show that *User1* is not committed to proposition *book B and its series are a good reading*?

**CQ3:** How does the evidence from premise 1 and premise 2 prove that there is a conflict of commitments?

#### **A4: Argument From Expert Opinion**

**Major Premise:** Source *User1* is an expert in subject domain *AI* containing proposition *book B is a good reading*

**Minor Premise:** *User1* asserts that *the 2nd book of the series isn't a good reading for non-scholars* is true

**Conclusion:** *the 2nd book of the series isn't a good reading for non-scholars* is true

(CQs as in A1)

By associating a scheme to each argument, opinions are given, obviously enough, a formal structure, which makes the pattern of reasoning explicit. Users could be asked to explain their arguments by using the critical questions of a schema. For instance, in the example above, A3 attacks A1 in fact by instantiating its CQ4. Or, A4 attacks

A3 instantiating its CQ2. Moreover, users could be encouraged to clarify their position better: we have often found negative ratings of a product where the free text reveals that the bad experience was in fact related to the transaction (e.g. late shipment, item broken, etc.).

Of course for this situation to be realistic, users need to find the use of argumentation natural enough not to be discouraged to use it. Currently, there are several argumentation tools that offer support for on-line debates, with varying degrees of structure given to the arguments. Some examples are Debategraph (<http://debategraph.org/>), an evolution of DebateMapper that includes it as a view to comment, build, edit and rate debates; Debatepedia (<http://wiki.idebate.org/>), a new free wiki encyclopedia of arguments and debates and the tool for evaluate debate TruthMapping (<http://truthmapping.com/>). Recent developments have introduced Web 2.0 standards to support on-line debate. Some contributions of this type are Cope\_it! [10], which encourages collaboration by sharing opinions and resources; the semantic web-based argumentation system ArgDF [15]; Cohere [3], a web tool for social bookmarking, idea-linking and argument visualisation; the Argument Blogging project [20], which intends to harvest textual resources from the Web and organise them into distributed argumentative dialogues and the On-line Visualisation of Argument (OVA at ARG:dundee: [www.arg.dundee.ac.uk](http://www.arg.dundee.ac.uk)) tools, which facilitate argument analysis and manipulation in on-line environments. Some examples of tools that are of a more formal and structured nature include the Parmenides system [4] and the Carneades system [8]. Despite the proliferation of these tools, their uptake by business oriented websites like Amazon or eBay is questionable, as their main interest is not to alienate users from their site by providing a seamless and natural interaction.

## **4 Conclusions: Desiderata for Argumentation enhanced Social Networks**

In this work we showed how argumentation theory can provide valuable insights in formalising and structuring on-line discussions and user opinions in business oriented websites. We gave a model of social network, and we provided two case studies of commercial websites, Amazon and eBay, fitting this model. Finally, we demonstrated how typical interactions in these environments could be seen as argumentation dialogues, and could in fact be enhanced by such features. Several conditions need to be verified before a more widespread uptake of argumentation techniques could be possible, however.

First, sites like Amazon or eBay should make each underlying social network explicit, so that users could exploit all information resources available in the website, in turn enhancing trust and reputation by providing public and transparent measures. Secondly, sites should provide easy-to-use tools for the quick and seamless identification of argumentation schemes in the line of reasoning that a user is following in a post. Although this aspect is more related to the advancement of the state of the art on argumentation and computation research, websites which decide for the uptake of a particular tool could grant some reward (e.g. positive feedback) to the users of these tools. Third, sites should provide tools to represent the dynamics of dialogues among users, so that attack and defense statements can be easily identified. Again, this comes at a considerable cost to the users (who would not necessarily be prepared to engage in a dialogue each time they want to leave a review for a product), so reward mechanisms should be used. Finally, sites should provide tools for summarising and analysing the information gathered from the schemes and attacks identification. A "summary" showing statistics and a graphical representation of debate on a product would repre-

sent a concrete added value for users, and an effective motivation to engage in argumentative activities. This it would allow, for instance, users to understand at a glance which is the most prominent view of a particular product they want to purchase, without having to read all reviews.

We believe that argumentation *can* make business driven social networking more rewarding, and we see this as one of the most promising application areas for research in argument and computation.

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