

# Social Affordances and Implicit Ratings for Social Filtering on the Web

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## Introduction

The theme of this paper is exploring ways of extending web browsing environments to facilitate the sharing of information pertaining to document quality amongst communities of users on the Web. Amongst the issues it raises for discussion are:

- sources of rating and recommendation data,
- the context of ratings and recommendations,
- real and virtual groups, and
- privacy and accessibility.

Much of the current work on social filtering tools for the Web has focused on so-called explicit methods, i.e., where the rater annotates a document or (more simply) inputs a rating value (e.g., [12]). One drawback of this approach is that it calls for extra effort on the part of the rater, whilst failing to provide an equally immediate benefit [5]. In contrast, implicit methods require no extra effort on the part of the rater, but have the disadvantage that the rating information provided has lower value. Some tools have attempted to find some middle ground between explicit and implicit approaches [7]. Our interest here lies in exploring how implicit approaches might be improved to provide rating information and higher value and relevance.

## Social Filtering

Social, or collaborative filtering is an emerging technique for dealing with overload in information environments (i.e., systems for the production, dissemination and consumption of information). One widely explored technique for social filtering is based upon ratings and recommendations which are supplied by readers and disseminated for the guidance of new readers. One well-known example of this technique is the GroupLens system, which has been implemented for filtering Usenet news postings [10].

There are several major difficulties with any kind of reader ratings-based approach. These include:

- the cost to readers of generating ratings [7], and
- how readers become trusted (as raters) and learn to value and trust the ratings of others.

In the GroupLens project, this first issue is addressed by the empirically verified observation that the time spent reading a Usenet posting is itself an implicit measure of the reader's valuation of it [10]. In principle, therefore, Usenet ratings can be gathered cost-free.

In conventional communities, the issue of trust is resolved through community and social interaction: people learn of one another's interests and experiences and reputations develop which serve to establish the value of the ratings currency. Though Usenet's communities are virtual, it nevertheless has a strong strong community orientation [23]. However, in seeking

to determine the value of ratings, GroupLens side-steps the problem of trust as a social fact altogether. Instead, it uses a statistically-based predictive algorithm which establishes an historical match between news group readers' ratings and then uses this to determine the significance of ratings for new postings. In GroupLens, therefore, trust is merely a computed relationship between readers rather than a consciously evolved and acknowledged social fact.

Nowhere are the problems of information overload more evident than on the Web. People often have great difficulty in finding information of value. Already, commercial recommendation services have become widely available (e.g. Yahoo). Some services address broader measures of quality of service at the site level by collecting and publishing statistics of server response times, site maintenance standards (e.g., proportion of broken links), and also more subjective measures such as aesthetic design. These are all valuable resources for the information seeker, but they do not address all their needs. Probably one of the most common ways still of obtaining recommendations for Web pages is a URL in an email message from friend or colleague, or in a UseNet posting. Not surprisingly, therefore, tools of integrating email and UseNet with the Web have attracted some interest [2, 12].

In the following sections, we discuss ways in which Web users' behaviour may provide some of what is presently missing from Web rating and recommendations services.

## Social Filtering and the Web

Whilst GroupLens successfully achieves the goal of relevant implicit ratings, are numerous reasons why its approach cannot be simply transplanted to other environments such as the Web. As a genre, Usenet has a number of attributes which are essential for social filtering. First, Usenet is founded upon the concept of community: news groups are not just thematic devices for identifying content, they also provide users with the experience of group membership which is crucial to collaborative activity [3, 23]. Second, news groups are an interactive genre where information is both produced and consumed within the news group community. The news group provides both the context for matching ratings information and the experience of community which makes this information relevant and meaningful to recipients.

In contrast, the Web is founded upon an abstract information model, rather than upon community and collaboration. Though there is a sense of place in the Web, it is place as in Web site, rather than place as in community. Furthermore, the Web is inherently less interactive: processes of information production and consumption are more clearly separated. Unlike Usenet, the Web does not incorporate an explicit model of community and interaction. It is primarily intended as a vehicle for information distribution and foraging.

To summarise: Usenet's metaphor for information environments is the group discussion — i.e., it offers only minimal simple structuring devices (the newsgroup and thread), but compensates for this with richer interactivity. In contrast, the Web's metaphor is the library — i.e., it offers a relatively sophisticated structuring device for information, but only limited interactivity.

We now consider ways in which community and interactivity on the Web can be enhanced and how this may contribute to effective social filtering.

## Social Affordances and the Web

In user interface design, affordance is defined as making the potential for action visible "... a technical term that refers to the properties of objects — what sorts of manipulations and operations can be done to a particular object" [13]. Its application as a design principle is ubiquitous in the graphical user interface; for example, the rendering of screen button images as objects with depth, affords the action of pushing. By analogy, social affordance can be defined as the "... making the potential for social (inter)action visible".

Physical environments are rich in social affordances. Shared spaces afford knowledge about what activities are being performed and who are performing them. They also afford knowledge about how the activities are being performed and the artefacts employed. Physical environments afford social learning — i.e., the use of others as social tools.

Physical workspaces are rich in social affordances which help their occupants remain aware of others are doing. In turn, this awareness facilitates collaboration of both a formal and informal nature. For example, in the conventional library space library users may gain helpful clues about where to search for a particular item, or they may see a colleague who may be able to give assistance. Similarly, conventional information artifacts such as library books may be sources of useful rating and recommendation information: Twidale and Nichols, for example, cite the instance of the frequently borrowed, well-thumbed book [22]. The Web, like many other forms of digital information resources, lacks these social affordances. People's activities become less publically available through being screen-based, and network accessibility reduces the need for performing these activities in public places.

The different character and properties of digital information artifacts also has important implications for social affordances. Indeed, within in modern media as a whole, processes of social demassification — i.e., the disaggregation of large social units into smaller groups — are very much in evidence [1]. Traditional information artifacts like newspapers are useful not simply because they provide information to the individual reader, but also because this is 'social information' — i.e., common to a broad readership. Part of its value is that everyone is reading it [1]. In contrast, on the Web, no one knows just who is reading what.

The general question then is how social affordances can be incorporated into Web environments [16]. There are two specific questions:

1. how can readers' activities be made available to one another?
2. how can use of Web artefacts be made (more) public?

The use of readers' Web bookmarks is one way of exploiting information artefacts in social Web filtering [17]. Shareable page annotations are another [4, 18]. Both of these approaches have the disadvantage that they require readers to make a specific effort to record their preferences (though this effort is mitigated by the fact that the bookmarker or annotator is acting for their own benefit). However, surveys of Web users provides evidence that they typically bookmark fewer than 50% of the pages they find interesting; bookmarks tend to be evidence of strong, rather than marginal interest, so they set a high threshold for recommendations [17].

In contrast to these explicit approaches, we propose examining what kinds information about Web page ratings may be inferred of more informal or implicit evidence of users' browsing behaviour and how this might be shared within groups of Web users. The value of past browsing patterns as a predictor for a user's current and future information needs has already been demonstrated [15]. We are interested in the value that an individual's or a group's browsing behaviour may have for other web users.

## **Social affordances of the Web**

The Web provides its users with a shared information space. Typically, however, the sharing of the Web is experienced by its users as a problem rather than as an opportunity. Popular Web sites cause frustration when overloading creates excessive delays in page downloading. Also, compared with spaces such as Usenet, the Web is poorly structured: its boundaries and borders are not clearly defined.

As shareable artefacts, the anonymity of the process (both synchronously and asynchronously) of Web page sharing makes this unusable. The paradigm shift from one-to-many, broadcast information dissemination (e.g., Usenet) to one-to-one narrowcast dissemination (e.g., Web) is not only an inefficient use of network bandwidth, but undermines the sense of

community that broadcast methods engender [1]. As a medium of information dissemination and exchange, the Web lacks the features that are characteristic of community, including [14]:

1. social interaction,
2. clearly defined group boundaries; and
3. a capacity for members to monitor each others' behaviour.

## Explicit and Implicit Ratings

A problem with both explicit and implicit rating approaches is that of poverty of context: ratings should make their origins apparent [7]. Explicit approaches de-contextualise rating information — i.e., they assume that ratings have a value which is independent of the circumstances in which they were generated [11]. Implicit approaches, in contrast, might claim to be naturally contextual, but face significant problems in utilising this context in a way which is both informative and shareable.

### Contexts for implicit ratings

There are innumerable contexts of use, but the problem of contextualising Web users' behaviour can be simplified by considering ways in which the space of contexts may be partitioned. We suggest that the following three dimensions are of particular relevance for ratings systems:

1. people — who is doing the rating,
2. documents — the patterns of access, and
3. time — when the documents were read.

### People

Who is doing the rating is obviously important for assessing its value and relevance. Scientific journals take care to assemble editorial boards from recognised experts in the field and prominently display their names. Electronic journals have, in the past, suffered from credibility problems because they failed to convince their audience that their quality controls matched those of more conventional journals [6]. When searching for quality documents on the Web, a good strategy might be to copy the browsing patterns of an acknowledged expert in one's field:

“If I have identified a person or an institution who does excellent work in my area, it is advisable to follow the activities of the person or institution to the extent which is manageable to me.” [20]

To do thus, however, might be unacceptable to the expert. Indeed, there are a number of reasons why it would be preferable to tracking browsing behaviour at the group level, rather than at the level of the individual. Preferably, this group should consist of similar people [7]. The question for the Web is how might such groups identify themselves? In Usenet, group members define themselves through their domain of interest. This is often thematically-based, and such groups are virtual rather than real. However, there are newsgroups whose membership is defined through looser affiliations such as organisation or location.<sup>3</sup> One reason that groups defined by organisational affiliation have a locus of interest, is that it pays for members of an organisation to be informed about one another's activities.

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<sup>3</sup> This locality is often reinforced by restricted access.

## Documents

In most existing ratings systems, the unit of analysis is the single document. In GroupLens, for example, it is the individual posting which is rated. Yet the individual posting may appear in the context of a group of postings, i.e., a thread. In such cases, it is legitimate to ask whether the rating of an individual document is meaningful. If not, then the question is how might the document's context as one of a group of documents consulted in a sequence be taken into account.

Discourse analysis is an established technique for studying the conversational relationships between speakers' utterances [19]. Self-evidently, the significance of an individual utterance rests upon the context in which it occurs, rather than on its own content alone. A number of particular conversational relationships are cited by discourse analysis: coherent pairs, e.g., a question and answer pair, are said to be *sequentially accountable*; co-occurrent (but not adjacent) utterances, are said to be *distributionally accountable*; a conversation is said to have *topical coherence* if the sequence of utterances are consistent.

The use of discourse analysis as a tool for analysing Web users' behaviour has been proposed by Jasper et al. [8]. They argue that different objects and links within a Web page may be said to be sequentially accountable to that page. Likewise, a set of pages which are reachable from a given page may be said to be distributionally accountable. Finally, topical coherence may be related with the content match across sets of Web pages within a specific time frame. We might explore also the notion of site coherence — i.e., the relationship between in-site and out-site page accesses.

## Time

As a corollary of topical coherence, temporal coherence in Web access patterns may be defined as the degree of overlap between the page accesses amongst a group of Web users within a particular time frame — i.e., the synchronicity of page access patterns within the group. Time may be an important factor in determining the relevance of information about another group member's browsing behaviour. For example, it may serve as a cueing device for an event of collective interest. For example, the content of newspapers is determined largely by the criteria of timeliness.

## Extracting Implicit Ratings From Web User Behaviour

The most basic of implicit evidence of a Web page's value is simply the fact that it has been accessed. Of course, by itself, this may be unreliable, just as is the act of reading a Usenet posting. In the latter case, extra value can be extracted from the time that the reader spends reading the posting [10]. A similar approach to Web pages may also yield useful rating information.

Browsers can be configured to cache pages, so analysis of cache contents may provide not only information about the time spent reading a Web page, but also about page access patterns, which may be used to further enrich the raw page reading time data by adding document context. As an example, unlike Usenet postings, a particular Web page may become important as an anchor point in a sequence of linked page accesses. In this case, the important metric is not the time spent reading the page on a per visit basis, but the frequency of accesses [21]. This points to another important distinction between rating Usenet postings and Web pages: the latter may be rated not only for their nominal content, but also because of their navigational value — i.e., they serve as route markers for accessing other pages.

For reasons of page traffic reduction (amongst others), organisations which host multiple Web users often interpose a proxy machine between the user and external web sites. The proxy serves as a local cache of pages; new page requests are compared against the proxy

contents and if a match is found, the page is retrieved from the proxy cache. The proxy cache is therefore one potential source of data for tracking Web access patterns and generating recommendations within a particular community of users — i.e., within a group context. The typical proxy cache replacement policy is based upon frequency of access: the time a page spends in the cache is therefore a measure of its collective recommendation rating.

Implicit in systems like Sitemeter and proxy-based caches is the assumption that it is users' physical locality which establishes the natural boundaries of the recommending and filtering group. Providing Web users with virtual group proxies could provide an alternative approach to group membership definition which is more similar in concept to the Usenet newsgroup (WebCard adopts a similar approach (see [2])). Users could register with group proxies of their choice and so become members of virtual recommendation communities.

More sophisticated analysis of proxy page traffic could be used to establish document context information. Following the principles of discourse analysis, Web document ratings could be weighted according to:

- nominal rating — aggregate page viewing time;
- frequency — the number of times a page is requested;
- sequential accountability — the number of objects and links within a page;
- distributional accountability — common sequences of page accesses within the community;
- sources — the number of times the page is identified as the beginning of a distributionally accountable sequence;
- topical coherence as measured by inter-document text similarity [15]; and
- temporal coherence — the temporal distribution of page accesses.

Navigation is an extremely important issue for Web use. It follows, that not only may it be valuable for Web users to have access to ratings of *collections* of documents (and Web sites), but also to 'good' route maps for navigation within document collections, and within Web sites. Such maps can be determined from aggregated distributional accountability analysis.

## Issues in Making Web Browsing Public

The use of proxy caches as sources of recommendations raises several issues. One is how this information might be made available to group members. As the analogy here is the affordance of the shared workspace for observing what people in the group are doing; one strategy would be to make the proxy cache browsable. This in turn raises issues of privacy — people can take steps to limit the accessibility of their activities; and reciprocity — in the physical workplace, observers may themselves be observed.

By choosing the group as the unit of observability, rather than the individual, people's sensitivity over privacy may be reduced. People may nevertheless wish to retain some degree of control over what they make public and what they choose to keep private. The principle of the group provides the basis for applying access controls. At one extreme, people may choose not to be a member of such a group. Those that do join may be given a variety of control over privacy, which through the principle of reciprocity, establish not only what is made public to others, but also what they themselves are able to know about others.

## Conclusions and Further Work

In this way, it may be possible to incorporate richer and more relevant notions of group into the Web environment which may, in turn, make implicit approaches more effective as resources for ratings and recommendations. Much work needs to be done on techniques for extracting context, particularly discourse analysis, to develop them and empirically verify their value.

There are many issues that we have left explored. A major one is to how the rating and recommendation information is made available to the user. Some possibilities include incorporating it within browsing as “recommendation enhanced” links and menus [7]. Another would be to circulate regular (e.g., daily) summaries and digests of the community’s browsing. These, and many other issues, require further investigation and evaluation.

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