

Social Comparisons to Motivate Contributions to an Online Community

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Abstract. It is increasingly common for online communities to rely on members rather than editors to contribute and moderate content. To motivate members to perform these tasks, some sites display social comparisons, information designed to show members how they compare to others in the system. For example, Amazon, an online book store, shows a list of top reviewers. In this study, we investigate the effect of email newsletters that tell members of an online community that their contributions are above, below, or about average. We find that these comparisons focus members' energy on the system features we highlight, but do not increase overall interest in the site. We also find that men and women perceive the comparisons very differently.

Keywords: Social influence, social comparison, persuasion, online community.

1 Introduction

In December, 2006, Time Magazine awarded its annual Person of the Year award to “You” [8] in a nod to the changing nature of the Internet. No longer are Web sites exclusively created by editors and read by everyone else; increasingly, they allow content to be contributed by anyone who so wishes. Wikipedia, MySpace, and YouTube have become some of the top-visited sites on the Web², based entirely on content contributed by their members. As a case in point, the Web page displaying the Person of the Year article contains several buttons that make it easy for readers to recommend the article to others via Web sites such as Facebook.

What motivates people to edit encyclopedia entries at Wikipedia, write movie reviews at Rotten Tomatoes, or share Time Magazine articles at Facebook? On the surface, many of these types of contributions have little personal benefit – editing an

¹ CommunityLab is a collaborative project of the University of Minnesota, University of Michigan, and Carnegie Mellon University. <http://www.communitylab.org>

² As measured by Alexa Traffic Rankings (<http://alexa.com>)

article in Wikipedia may help other users, but takes one's own time. Therefore, people must be motivated by intrinsic factors – for example, a desire to achieve status within a community [2], or a desire to reciprocate the efforts of other users [13].

We may think of Web sites built on member contributions as public goods, subject to the problems of free-riding. We know from economics research that the environment in which decisions are made affects contributions [11]. Thus, designers of Web sites can hope to affect the volume of user contributions through design. They might take action to change the costs of the contribution by making contributions easier to make. For example, social networking sites such as LinkedIn provide tools for members to import their contact lists, to save them the effort of entering contact information manually. Other sites attempt to increase the benefit to contributors. For example, the technology news-oriented site Slashdot allows members to unlock extra features after they have provided high-quality contributions to the site.

Previous research on the voluntary provision of public goods has shown that information about social norms can affect contributions. For example, people recycled more materials when they were provided with information about how much other people had recycled [15]. Can a similar comparison make a Wikipedia member edit more articles or a Rotten Tomatoes member write more movie reviews?

1.1 Background: Social Influence and Comparison

To evaluate our abilities, actions, and opinions, we compare ourselves to others [16]. In some cases, we make these comparisons because we are presented with information about others' actions or information revealing hidden social norms. Social influence and comparison has been the subject of much study in the social sciences; we use this work to inform our research on comparisons in an online system.

It matters who we compare ourselves to. Festinger, in his classic work on social comparison [6], theorized that we compare ourselves to others who are better off for guidance, while we compare ourselves to others who are worse off to increase our self-esteem. Subsequent research, however, has found conflicting results regarding so-called upwards and downwards comparisons [16]. Wheeler and Miyake found that upward comparison decreased subjects' feelings of well-being, while downward comparison increased feelings of well-being [17]. However, Lockwood et al. found that upward comparisons can inspire people if success seems attainable [12], and Buunk et al. found that downward comparisons actually make individuals feel worse about themselves in some contexts [3]. Thus, we are left with little guidance about how comparisons made in an online system will make users feel – it is apparently highly dependant on the context and the individual.

We can be more hopeful that social comparisons can be used to motivate individuals to increase contributions to a public good. Several studies have shown that making social norms visible can increase pro-social behavior. Frey and Meier conducted a study in which subjects were given information on the percentage of people donating to a social fund. They found that showing a percentage reflecting greater participation led subjects to participate more themselves [7], but only for those subjects who had not already participated in the past. Croson and Shang found a similar result in testing social influence on donations to a public radio station. In this

study, first-time donors who were told that another member had contributed \$300 gave 29% more than first-time donors who were not given that information [5]. However, a meta-analysis of studies such as these shows that so-called feedback interventions often lead to negative effects on performance [10].

There is beginning to emerge research on the effect of social information in online systems. Cheng and Vassileva examined the effect of making reputation visible in an online system for sharing information about research papers. They found that while the display of reputation increased contributions, some users contributed low-quality content simply to achieve higher reputation [4]. Beenen et al. emailed members of a movie recommendation system with individual and group goals. They found that setting specific goals led members to rate more movies than setting non-specific goals [1]. They propose in discussion that performance goals may actually become less effective when they are not realistic for users to accomplish.

1.2 Research Questions

In this research, we use email to deliver a feedback intervention to make the norms of an online community of users salient. We extend prior work in several ways. First, we investigate the effect of leveraging social influence in an anonymous online system. Second, we investigate the effect of upwards, downwards, and no-difference comparisons. Our goal is to determine methods for eliciting additional contributions from these members. We investigate the following research questions:

RQ Activity. *How does social comparison in an online community affect members' propensity to visit and contribute?*

RQ Perception. *To what extent do members of an online community believe themselves to be motivated by social comparison?*

In subsequent sections, we describe a field study designed to answer these research questions. In this study, we find: (1) that messages containing comparison information focus members' energy to improve their relative standing, but do not increase overall interest in the community, and (2) that men and women believe themselves to be motivated by comparison information in very different ways.

2 Research Context

To evaluate the effects of comparative messages, we ran a field study in MovieLens, an online movie recommendation Web site (<http://movielens.org>) where members rate movies and receive personalized movie recommendations (see Figure 1 for a screenshot). MovieLens uses a collaborative filtering algorithm [14] to predict how well members will like movies in its database. Because collaborative filtering works based on finding statistical correlations between users or items in the database, MovieLens relies on member-contributed ratings data. Newly-released movies and rarely-viewed movies are especially difficult to recommend due to a scarcity of ratings. 6.8% of the movies in MovieLens's database have fewer than 10 ratings,

below the threshold required by the collaborative filtering algorithm to make predictions. Thus, one of the goals of this study is to find ways to encourage members to rate more of the movies they have seen.

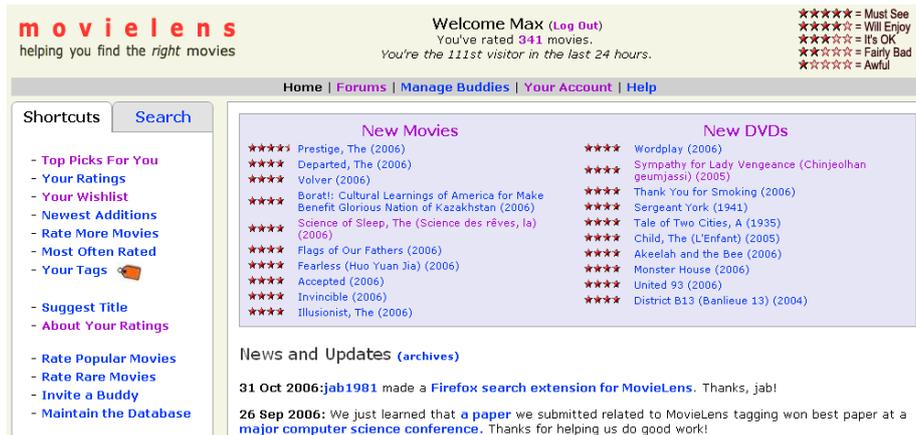


Figure 1. Screenshot of the MovieLens home page.

At the time of this study, MovieLens did not contain exhortations to rate movies. Also, members had no way to see one another’s ratings, activity, or opinions. When members joined the system, they were told that by rating more movies, they would receive more accurate recommendations. In addition to this information, a number at the top of each page reminded members of how many movies they had rated; this was hyperlinked to a page with statistics about those ratings.

So why do MovieLens members rate? A survey of MovieLens members showed that different members were motivated to rate movies in different ways: most rated to improve their recommendations, some rated for the fun of it, and others rated to help the system or for other reasons [9]. This survey also revealed that MovieLens members did not often think about one another. Few members claimed to rate movies to voice their opinion or to influence others.

2.1 Injecting Social Comparisons: Personalized Email Newsletters

To deliver our intervention, we designed two personalized email newsletters to send to MovieLens members. The experimental version contained a message about how many movies the recipient of the email had rated compared with other members in the system. The control version contained information about the member’s ratings without comparison to other members.

Both the experimental and the control newsletter were similar in design. Each was formatted in html, although members with text-only email clients received a text-only version. Each contained a header with the MovieLens logo and some non-personalized statistics about the site. Below the header was a section with personalized information according to the subject’s experimental group, as described below. Following this was a section containing a short news item about recent feature

additions to MovieLens, and finally a section containing a reminder that this newsletter was sent as part of an experiment. Part of a sample email newsletter is shown in Figure 2.



Figure 2. One version of the email newsletter, sent to above average members.

To deliver the social comparison, the experimental newsletter contained the following text at the top of the message:

Ever wondered how many movies you've rated compared with other users like you? You have rated [num_ratings] movies. Compared with other users who joined MovieLens around the same time as you, you've rated [more, fewer, about as many] movies than the median (the median number of ratings is [median_ratings]).

In contrast, the control newsletter contained a personalized message about members' participation in MovieLens without any comparison to other members:

Here are some statistics about your ratings behavior for one popular movie genre. About [percent] of the movies that you've rated are comedies. Your average rating in this genre is [average_rating].

Values for items in brackets were personalized based on the member's usage history or experimental group assignment, as described in the methods section.

The newsletter followed this personalized message with five links: (1) rate popular movies, (2) rate rare movies, (3) invite a buddy to use MovieLens, (4) help us update the MovieLens database, and (5) just visit MovieLens. These links were clarified by neighboring text that explained the benefit of these actions. For example, the link "rate rare movies" was followed by the text "rating rare movies will help others get more movie recommendations".

Because our results rely on members understanding and acting on the email newsletter that we sent, we pre-tested the usability of the newsletter via 14 phone

interviews with MovieLens members. We found that, in general, members were able to understand the contents. 10 of the 14 subjects understood the concept of a median, while the remaining 4 interpreted the word as “average”. 11 out of 14 subjects, after being asked to look away from the newsletter, were able to recall whether the newsletter had said they were above, below, or about average.

3 Methods

To solicit volunteers for the study, we emailed 1,966 MovieLens members, chosen randomly from those who had logged in during the past year, who had rated at least 30 movies, and who had given us permission to send them email. This email contained a link to a MovieLens Web page with a consent form describing the study³. 629 members clicked on the email link, of whom 398 consented to participate in the study. The methods described in this paper are part of a larger study, unpublished, extending our work in [9]; we report on the results of 268 of these subjects and a subset of our experimental manipulations in this paper. The other 130 subjects were used to test an economic theory of inequality aversion.

We randomly assigned half of the 268 subjects to an experimental group and half to a control group. Subjects in the experimental group would receive an email newsletter with ratings comparison information, while subjects in the control group would receive a newsletter without comparisons, as described above. Since we were comparing members based on how many movies they had rated, we wished to ensure that new members to the system were not being (unfairly) compared with long-time members. Thus, we further divided subjects into three equal-sized groups based on their seniority in MovieLens (see Table 1). Within each of these seniority-based groups, we call the one-third of subjects with the most ratings “above average”, the one-third with the fewest ratings “below average”, and the final one-third “average”. These labels correspond to whether the subject was told that he or she had rated more, fewer, or about the same number of movies as the median member in their age group.

Table 1. Number of subjects and average activity prior to the study by treatment. By definition, members with more seniority had belonged to the site longer on average. As expected, members with more seniority had rated and logged in more often on average.

Treatment	Seniority	N	Avg # Weeks Member	Avg # Logins	Avg # Ratings
Control	New	45	12.5	8.6	287.0
	Mid	45	50.3	42.8	431.0
	Old	44	214.6	153.9	747.5
Comparison	New	45	15.2	12.9	399.1
	Mid	45	63.5	63.2	502.4
	Old	44	233.0	225.8	898.5

³ This study was approved by the Institutional Review Board at the University of Minnesota.

Members who consented to participate in this study were immediately redirected to an online survey. This survey was designed to collect subjects' perceptions of the benefits and costs of using MovieLens, using questions drawn from our earlier study [9], as well as to discover how they believed they compared with other members in the study in terms of ratings. Two weeks after sending the initial invitation to participate in the study, we personalized and sent the email newsletter manipulation. We logged when subjects clicked on links in the newsletter as well as their actions in MovieLens following the email. Finally, one month after sending the email newsletter, we emailed subjects one final time asking them to take another survey. This survey asked members how well they liked the newsletter, and which links they thought were valuable. Subjects in the experimental condition were reminded of the comparison they saw in the newsletter and were asked how it made them feel.

4 Results

Upon sending the email newsletter manipulation, subjects immediately began to visit MovieLens and rate movies. In the week following the manipulation, 49.3% (132/268) of subjects clicked one or more links in the email message, 60.4% (162/268) of subjects logged in, and 48.5% (130/268) of subjects rated one or more movies. The five links displayed in the email newsletter were not clicked or acted on with equal likelihood; see Table 2 for a summary.

Table 2. Response to the five suggested actions in the email newsletter across all experimental conditions, including the number of users who clicked each link in the newsletter, and the number of users who performed the suggested action in the week following the manipulation.

Suggested Action	# Users to Click	# Users to Act
rate popular movies	54	120
rate rare movies	79	78
invite a buddy to use MovieLens	7	2
help us update the MovieLens database	23	22
just visit MovieLens	19	162

4.1 Effect of Social Comparisons on User Activity

Propensity to Click. Subjects who received the social comparison manipulation were no more or less likely to click on a link in the email newsletter. 48.5% (65/134) of subjects in the control condition clicked on one or more links, as compared with 50% (67/134) of subjects in the comparison condition (ChiSquare=0.06, df=1, p=0.80). Also, there was no significant variation between the comparison directions in terms of subjects' propensity to click (ChiSquare=0.91, df=3, p=0.82) – subjects told they had rated fewer movies than other users clicked the least (44.4%), while subjects told they had rated more movies than others clicked the most (53.3%).

However, there was some variation in the links that subjects chose to click, as summarized in Table 3. For example, members told they had rated about the same number of movies as other members were nearly twice as likely to click on the link *just visit MovieLens* as other members, although this effect is not statistically significant (ChiSquare=1.29, df=1, p=0.26). Subjects told they had rated more movies than other members were most likely to click the two links under the heading “try new features”: *invite a buddy to use MovieLens* and *help us update the MovieLens database* (ChiSquare=7.26, df=1, p<0.01). And finally, subjects told they had rated fewer movies than other members were most likely to click *rate popular movies*, although the effect is not statistically significant (ChiSquare=2.39, df=1, p=0.12).

Table 3. Percentage of subjects clicking on each of the five links in the email newsletter by social comparison condition. Although there were no significant differences between overall click rates based on the direction of the comparison, there were differences in which links subjects chose to click.

Comparison	Click Target				
	Rate Pop.	Rate Rare	Invite Buddy	Maintain DB	Just Visit
No Comparison	16.4%	33.6%	0.7%	9.7%	6.0%
Rated Fewer	28.9%	15.6%	2.2%	6.7%	6.7%
Same	25.0%	34.1%	0.0%	0.0%	11.4%
Rated More	17.8%	26.7%	11.1%	15.6%	6.7%

Propensity to Act. Subjects receiving the social comparison manipulation rated significantly more movies the week after the email than subjects in the control group (means 13.15 vs. 6.66, $F=4.70$, $p=0.03$). As shown in Table 4, subjects receiving any of the three comparison directions averaged more movies rated than subjects in the control group receiving no comparison. Subjects that were told they had rated fewer movies than other members rated significantly more movies in the week following the manipulation than other subjects (means 19.1 vs. 8.0, $F=7.68$, $p<0.01$). This group was also the only one to rate more movies in the week following the manipulation than their lifetime per week average.

Table 4. Average activity in the week after the email newsletter, and the average difference between this activity and members’ lifetime per week activity. Members told they had rated fewer movies than others saw the largest increase in ratings, while members told they had rated about the same number of movies as others saw the largest increase in login activity.

Comparison	Ratings	Ratings/Week Change	Logins	Logins/Week Change
No Comparison	6.66	-7.08	1.36	0.45
Rated Fewer	19.09	11.06	0.78	0.46
Same	8.20	-1.71	1.52	0.87
Rated More	12.04	-17.95	2.02	0.32

There was no significant difference in number of logins in the week following the manipulation between the control group (mean 1.36) and the experimental group

(mean 1.44) ($F=0.07$, $p=0.79$). As shown in Table 4, subjects in all conditions averaged more logins in the week following the email newsletter than their lifetime per week login average. Subjects told they had rated fewer movies than other members logged in the fewest times (mean 0.8) in the week following the manipulation ($F=3.43$, $p=0.07$), although their rate of logging in increased at approximately the same rate as subjects in the control group.

4.2 User Perceptions of the Social Comparisons

78.7% of subjects (211/268) participated in the survey that we launched one month after the email newsletter, including 104/134 subjects in the control group and 107/134 subjects in the experimental group. 50 women and 152 men took the survey (9 participants declined to identify their gender).

When asked if they liked receiving the email newsletter, subjects averaged 2.2 on a 5 point Likert scale ranging from strongly agree (1) to strongly disagree (5). There was no difference in responding to this question between the control and experimental subjects or between subjects with different comparison directions.

Subjects were asked to agree or disagree that “I didn’t care” about the comparison in the newsletter. Overall, 48.1% of subjects agreed; there were no significant differences between the experimental groups or the directions of comparison. However, men were less likely to agree than women (40.3% vs. 68.2%, $\text{ChiSquare}=5.33$, $df=1$, $p=0.02$).

Subjects were asked if they agreed that “I wanted to do something to help increase my score”. Subjects told they had rated fewer movies than others were the most likely to agree (53.8%), followed by those told they had rated about the same number as others (48.5%), or more than others (28.9%).

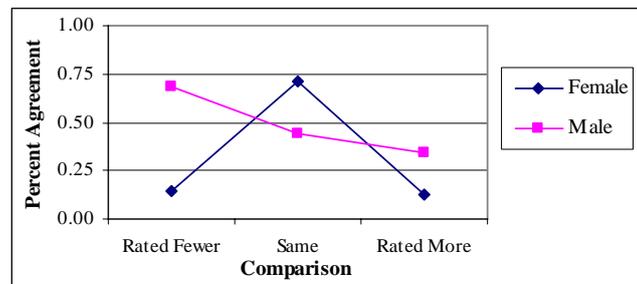


Figure 3. Percent of subjects agreeing that “I wanted to do something to help increase my score” by comparison condition and gender. While gender is not a statistically significant predictor of response, comparison condition and the interaction between condition and gender are both significant.

There were differences between men and women in how much they agreed that they wanted to do something to increase their score. Women were most motivated to agree when they were told they were the same as others (71.4%), while men were most motivated to agree when they were told they had rated fewer movies than others

(68.4%). In a logistic regression model to predict whether a subject wanted to do something to increase his or her score, both the experimental group ($p=0.05$) and the interaction between experimental group and gender ($p=0.02$) were significant. Gender was not significant ($p=0.13$), although there is a trend that men (43.1%) were more motivated to agree than women (28.9%). See Figure 3 for a graph of the interaction between comparison condition and gender.

Those members who agreed that the newsletter made them want to do something to increase their score actually used the system more than those who disagreed. They had rated more movies in the week after the manipulation (means 19.9 vs. 8.8, $F=4.30$, $p=0.04$). They also logged in slightly more in the week after the manipulation (means 1.80 vs. 1.50), but that difference is not statistically significant ($F=.27$, $p=.60$).

5 Discussion

RQ Activity. *How does social comparison in an online community affect members' propensity to visit and contribute?* While subjects who received an email message with the comparison manipulation were no more likely to click on one of the links or log in to the system, they were more likely to rate movies. Thus, we find that a comparison makes no difference to a member's interest in using the system, but that it changes their focus within the system.

One important question this raises is whether or not shifting members' attention towards rating might cause them to do less in other areas of the system. We cannot answer this question definitively in our study, but we can give some preliminary data. Subjects receiving the comparison manipulation contributed fewer edits to the MovieLens database (editing 48 entries) compared to the control group (editing 118 movies). This is, however, not a statistically significant difference ($F=2.37$, $p=0.12$). Future work should look at whether the effects of social comparisons or other non-monetary incentives are inherently zero-sum, or if these features can instead boost overall levels of member activity.

We also found that subjects who were told they had rated fewer movies than others rated the most movies and changed their rating behavior the most in the week following the newsletter. One potential caveat to this result is that the marginal cost of providing ratings increases over time, as members find it increasingly difficult to find seen but unrated movies in the system [9]. However, we note that members who were told they had contributed fewer ratings didn't just rate popular movies. In fact, in the week following the manipulation, this group rated more rarely-rated movies⁴ per member (1.27) than any other group (the other three groups averaged 1.11). This difference is not statistically significant ($F=0.06$, $p=0.81$), but it does underscore the fact that these members were contributing ratings of value to the system.

RQ Perception. *To what extent do members of an online community believe themselves to be motivated by social comparison?* We see from the behavioral data that subjects from all conditions were approximately equally likely to click on a

⁴ Rated fewer than 250 times. By comparison, the top 100 movies average about 28,000 ratings.

newsletter link and visit MovieLens the week after the manipulation was made. Also, there was no difference across conditions in how well members claimed to like the newsletter. The interesting aspect of these data is that there was no apparent negative side-effect of telling below-average members how they compare. In fact, 44% of these subjects agreed that “I didn’t care” about the comparison, while only 8% agreed that they felt envious about other members. However, we remain cautious recommending our particular design for use in real systems; in a telephone interview before the study, one subject professed to feeling slighted that the newsletter said he was below average.

Men and women appeared to have interesting and significant differences in how they perceived the comparison information. In general, men were more likely to say they wanted to take action, and less likely to agree that “I didn’t care” about the comparison. Just as interesting, women appeared to be most motivated by a message that their contributions were average, a result that would not have been predicted by any theories we know of. In fact, conformity theory [2] would predict quite the opposite. We are unsure of the generality of this result, and we are hopeful that other researchers will investigate it further.

6 Conclusion

In this study, we used email newsletters to tell members of an online movie recommendation site how they compared with other members in terms of movie ratings. In so doing, we established a social norm in a community where such a norm had been absent. We found that this type of comparison is potentially a powerful way to redirect members’ attention – while members who received a comparison message rated more movies than members in a control condition, they were no more likely to click on links in the email newsletter or visit the site.

Online communities wishing to promote contributions of a certain kind may wish to display information that leads members to evaluate their level of contribution. While many Web sites display information about superstar users (such as with Amazon’s “Top Reviewers” list), it is also possible to compare users with their peers in the system. In this way, users may be motivated by the presence of more attainable goals [12]. However, since our results also provide support for the notion that upward comparisons are the most motivational, systems may wish to adopt a “carrot on a stick” approach to keep goals just out of reach.

Our study has limitations. We have only presented short-term data regarding the effect of social comparison. Additional work is needed to determine whether the continuing presence of such a feature can lead to long-term behavioral changes. Also, while we presented survey data that shows significant differences between men and women in terms of their perceptions of online social comparisons, further work is needed to translate this result into useful design principles.

In future work, we hope to continue to investigate the use of non-monetary incentives in online communities. We are especially interested in two common design features which facilitate social comparison: leaderboards and contribution-based status levels. We are also interested in developing and evaluating personalization

algorithms that find especially compelling comparisons for display by leveraging the system's knowledge of users' relationships, interests, and behavior. We hope that this research will lead to the development of tools that will help online communities improve, focus, or diversify contributions from their members.

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