Independent Study: Evaluating collectivist and individualist goals as engagement mechanisms in Course Agent

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Objective

This research project aims to identify factors that might affect the effectiveness of messages as engagement mechanisms in online communities. To do so, a study was designed, executed and replicated in order to evaluate the effect of messages in different kind of users. Levels of previous participation in the system and demographic data were used to identify factors that generate differences in the effectiveness of a message as engagement strategy.

Background

The term "online community" was first defined by Rheingold in 1994 [Rheingold,1994] as "cultural aggregations that emerge when enough people bump into each other often enough in cyberspace". Since then, the Web has enabled geographically distributed people to socially interact and create different kinds of communities. Discussion forums (e.g. BreastCancer Forum1), Question and Answers (Q&A) sites (e.g. Yahoo Answers2 and Aardvark3), sharing online social networks (e.g. Facebook, YouTube, Twitter and Flickr) and online citizen science projects (e.g. Wikipedia, ClickWorkers 4 and Open Source Software projects) are good examples of successful online communities that have been able to congregate thousands of active users. Collaboration among these (mainly volunteer) users has enabled fast world-wide information transfer of fun videos as well as breaking news, and produced high quality products as a well-known encyclopedia and a secure operative system (i.e. Linux).

Along with these well-known online communities, many others starting online communities were never able to take off. Only 10.3% of the Open Source projects that have been created in SourceForge5 have more than three members [Resnick,2010]. A third part of mailing lists get inactive over a four-month period [Butler,1999]. Researchers argues that these successful examples has been possible because of intuitive and insightful design decisions, but we still lack of evidence-based, scientific guidance in building and maintaining online communities [Kraut,2010]. Several problems challenge the survival of online communities: 1) the start paradox: there is few users that can create content, and there is little content to attract new users; and 2) managing the community: develop commitment, encourage contributions, reduce rate of user attrition, recruit and socialize newcomers, develop leaders, regulate behavior, manage coordination [Kraut,2010].

Several research groups have focused their efforts on finding out ways to maintain online communities alive longer. Several strands of work have been explored such as finding out how to socialize newcomers [Choi et al., 2010], how to encourage commitment to the community

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[1] http://community.breastcancer.org/forum/81

[2] http://answers.yahoo.com

[3] http://vark.com

[4] http://clickworkers.arc.nasa.gov/top

[5] http://sourceforge.net/

[Sassenberg, 2002; Ren et al., 2010, In press], how to encourage more contributions [Beenen et al., 2004; Kraut, Resnick, 2010, In press], and understanding people motives to be engaged in an online community [Wasko et al., 2005].

One of the main strands of research has focused on how to encourage contributions. The main goal is to create the required amount of content (e.g. videos in Youtube, pages in Wikipedia, code in Open Source systems) to provide benefits to the whole online community, including casual visitors. Simply asking by contributions is the most popular strategy. Even broadcasting an email asking for contribution [Beenen, 2004] or a list of needed contribution [Cosley et al., 2007] achieves a positive effect in increasing contributions. Asking to specific people to do specific tasks [Beenen, 2004; Choi, 2010], emphasizing uniqueness [Beenen, 2004; Ludford, 2004], ask people who is willing to contribute [Cosley, 2007], providing social information and feedback [Chen, 2008; Rashid, 2006], assigning people to groups [Beenen, 2004; Drenner, 2008] and setting goals [Beenen, 2004; Drenner, 2008; Mackie-Mason, 2009] helps to increase the positive effect. A more sophisticated way to reduce the effort required to know what needs to be done is task routing, which recommend possible tasks to users by matching users with tasks that they are more likely to want to do [Harper, 2007; Cosley, 2007].

This research project aims to build upon current knowledge about encouraging contributions through sending emails, and the main goal is to test the effectiveness of adapting the message content to user characteristics. The motivation is based in the idea that users may have different motivations to collaborate, so different strategies that match with these different motivations may generate more effective results. As starting point, this project tested if different text messages may have different results when tested with users with cultural backgrounds.

The rest of this document is organized as follows: Section 2 will describe related work and propose a conceptual framework to categorize previous work in using emails to encourage more contributions; Section 3 will present the study design and the system that was used as testbed; Section 4 will detail the results of the study; and Section 5 will include the discussion, future work and conclusion.

Related Work

In 2004, Beenen et al. [Beenen et al., 2004] reported an innovative study that used social psychology knowledge to create messages asking for more contributions in MovieLens, a movie recommender site. They run 2 experiments to test hypothesis borrowed from different psychological theories. The first experiment tested the effect of making salient user uniqueness and mentioning the benefits of collaborating in the community. The sample was 904 users who had rated at least 3 rarely-rated movies. The learned lessons are that sending a message asking for contribution boosts the number of contributions, at least during on week. Salience of uniqueness encouraged more contributions and the mention of benefit depressed ratings. The authors provided a discussion about why mention to benefits didn't work. They argue that reminding other reasons to contribute may undermine intrinsic motivations, for example user may like to rate because it is fun, but not to help others so mentioning that could have an negative effect. Other possible explanation is that the population was already committed, and the message undermined their commitment by contradicting their prior

beliefs regarding who get the benefits of each contribution. An additional feasible reason to the lower number of contributions was that the messages were too long, thus the effort required to understand the messages about benefits may have drawn users' attention away.

The second experiment tested the effect of assigning individual and group goals. The sample was 900 active users who have logged once in previous 5 months. In average, these uses have rated 8 movies per week. There were two conditions group assignment (i.e. achieve a goal in group or individually) and specificity of goals (i.e. do your best or rate an specific number of movies). The results showed that people who were assigned to a group contributed more than those who don't. Additionally, assigning specific goals, even the more challenging ones, generated more contributions compared to an unspecific goal such as "do your best".

Also in 2004, Ludford et al. [Ludford et al., 2004] published the results of another experimental study in MovieLens. The experimental design aimed to compare the effect of similarity and uniqueness. The experiment was executed with 230 subjects that have rated more than 50 movies. Subjects were assigned to a group. Groups' formation was manipulated to generate two conditions: similar and dissimilar groups. Similar groups included people with similar tastes regarding movies (i.e. similar ratings to the same movies), and dissimilar groups included people with different preferences (i.e. totally different ratings to the same movies). All the groups were asked to participate in forum discussions. The authors reported that uniqueness and dissimilarity encouraged contribution, and that people who rated more were not the most active contributors in discussions.

Another study in MovieLens [Rashid et al., 2006] tested the effect of displaying the value of contributions as a GUI message. The lessons were that showing the value helped to increase the contributions compared to not displaying any information about the value. They also tested the effect of different kind of value: value to self, to the whole community, to a group of similar people, and to a group of different people. The message describing the value to groups was more effective than the one mentioning the value for the whole community. People also contributed more if the benefits are for similar people than for dissimilar people.

A more recent article [Chen et al., 2008] also reported experimental studies in MovieLens. The experiments tested the effect of displaying different kinds of social information in users with different levels of participation and different competitiveness profiles. They displayed individual and community measure of contribution in the user interface. As community measures the median number of movie ratings in the community and the average value Net Benefit, which is a measure of the benefits that each user has received from the community. This social feedback encouraged different levels of contribution in users. The number of contributions was higher for above-median users.

MovieLens was also used as a tesbed for a task-routing algorithm [Harper et al., 2007]. A similar algorithm was later developed as a bot in Wikipedia [Cosley et al., 2007]. The task-routing algorithm goal was to reduce the effort to participate by suggesting tasks that are required and that might match with user interests. Both studies proved that task routing help to increase the number of contributions.

In 2010, Choi et al. [Choi et al., 2010] reported the results in a study on socialization tactics in Wikiprojects. They concluded that personalized messages from old users encourage newcomers to contribute more and in a more stable way.

A conceptual framework to describe a message can help to categorize research projects related to encourage contributions through sending emails. I will propose a conceptual framework based in the characteristics of a message as shown in Figure 1:
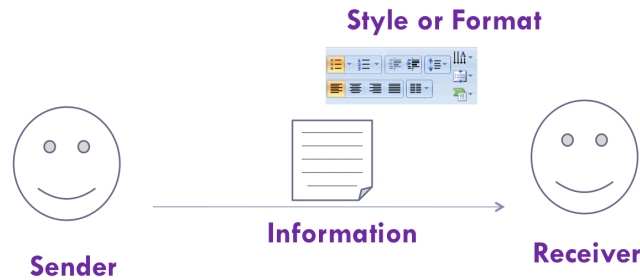
- **Sender**: The person or agent that sends the message.
- **Receiver**: The users who receive the message.
- **Information**: The content that is embedded in the message.
- **Style or format**: The way in which the content is displayed and the style in which the message is written.

Regarding the sender, there are four kind of sender:

- The **system**. For example, Wikipedia send a welcome message to each new user
- **Another user** (an old timer contributor). A research conducted in WikiProjects showed that messages written by an old timer contributor encourage more contributions than standardized messages sent by the system [Choi et al. 2010]
- An **authority**. Social theory states that people tend to comply authority requests, so it is expected that messages written by community leaders would be more effective. However, to my knowledge this effect has not been tested yet in online communities.
- A **bot** (e.g. recommender systems). Bots have been useful to increase contribution when people trust on its recommendations [Cosley et al., 2007, Harper et al., 2007].

Four main different kind of receiver have been identified:

- **High-level contributors**. Several articles present qualitative analysis of behavior of high-level contributors [Panciera et al., 2009, Bryant et al.,2005] or experiments with subjects that have a high rate of contributions. It has been demonstrated that some experimental interventions could undermine the motivation to contribute of high-level contributors [Beenen et al., 2004]
- **Active users, but low-level contributors**. Other projects have chosen subjects that are registered users, with a medium or low-level of contribution. Considering these subjects, the experimental studies have focused on finding out what kind of tasks, request styles and information allow to engage them in order to become more active contributors.

- **Newcomers**. New users have been subjects of several experimental designs because it has been shown that first experiences usually shape the contributor behavior [Burke et al., 2009, Drenner et al., 2008]. Moreover, it has been reported that newcomers are more receptive to social information [Chen et al., 2008]
- **Lurkers**. Most of the users of an online community are not contributors, they simply benefit from the community without adding any new content (e.g. users that read Wikipedia but not edit any article). These users are very important for online communities too, they usually make the community larger and more popular, thus they help to engage new users. Thus, it is accepted that it is also necessary to give lurkers information they are looking for. However, in most systems lurkers are not registered, so there it is hard to identify them and involve them in this kind of research.

Considering the style of the message, three main aspects:

- **Short messages vs. long messages**. In general, long messages are not recommended. Long messages make people to think about it, analyze costs and benefits, and finally can reduce contributions messages [Beenen et al., 2004].
- **Standard vs. personalized messages**. It has been proved that personalized messages for each user increase contributions of newcomers in comparison to standardized messages for all users [Choi et al. 2010].
- **E-mail, GUI message, pull request.** There are different ways to deliver a message. Electronic mail is one of them, and it has been shown that they boost number of contributions; however, emails asking for contributions do not change the long-term behavior of level of contribution [Beenen et al., 2004]. However, successful communities such as Facebook and LinkedIn use periodic emails to keep people around the online community, and eventually to contribute. Another way to deliver information is adding the message in the user interface, which is less disruptive but the audience is people who has already logged to the system only. Alternatively, some messages are only delivered after a user's pull request. This approach worked better for high-level contributors in Wikipedia [Cosley et al., 2007].

The information that is embedded in the message is the main variable in the previous experimental designs. Several different kind of information has been tested:

- **Salience of uniqueness and dissimilarity vs. commonality.** Telling users that contributions are unique and/or different from other users' contribution encourages more contributions [Beenen et al., 2004, Ludford et al. 2004]
- **Salience of benefit.** Previous experimental studies have tested the effect of showing current or future value of users' contribution, and adding information about benefit for the user (self-benefit), groups within the community and the community as a whole. Contradictory results have been found. Explaining benefits reduced the amount of contributions in [Beenen et al., 2004], but several hypotheses were raised to explain that situation: the long paragraphs of the message could negatively affect contributions and partial information about the benefit (only the user get benefits or only the community gets value) could undermine motivation to contribute of highly

committed users. On the other hand, [Rashid et al., 2006] found out that showing value encourages more contribution

- **Adding social information.** Comparative feedback encourages contribution if the highest scores are not seen as impossible [Chen et al., 2008], and personal and community feedback generates social influence that can lead to more commitment and contributions [Rashid et al., 2006, Farzan et al., 2010, unpublished].
- **Setting goals.** Defining deadlines, assigning hard tasks as entry barriers and asking a minimum amount of contribution per user [Beenen et al., 2004, Drenner et al., 2008, Wash, MacKie-Mason, 2009] has been proposed. It has been proved that even challenging goals has helped to get more contributions when subjects are low-level contributors or newcomers (high entry barries) in already successful communities.
- **Encouraging socialization.** Assigning users to groups (even when the group is only a name) has helped to increase the number of contribution per user [Beenen et al., 2004, Drenner et al., 2008, Rashid et al., 2006]
- **Reducing the cost of contributing.** Showing tasks that need to be done, asking specific people to do it and recommend tasks that could fit user´s interests also help to get more contributions [Harper et al., 2007, Cosley et al., 2007].

Study Design

Building upon current knowledge in the effectiveness of messages to encourage contributions, this study tested the effect of sending emails with different information to users with different cultural background and different levels of participation.

The system

We used Course Agent[6] system and its users as testbed of our studies. Course Agent is a community of graduate students of the School of Information (iSchool) at the University of Pittsburgh in which students comment, recommend, and evaluate courses that they have taken. Students also plan courses they want to take in the future and align the courses to their career goals. The main idea is to create a source of knowledge about the quality of the IS courses and their suitability to specific career goals in order to advise current and future students to plan their careers.

Membership is closed to the iSchool students only, and a new account is created for each new student who is enrolled in an academic program of the iSchool. Recently, the system has started to record when the students get their degree. So, there is partial knowledge about the student status. When we started the studies there were 1256 registered users. 123 users have graduated according to the data in the system, 517 user had unknown student status and 616 were current students.

Out of 1256 registered users, 175 users have added a course to their career plans (13,9% of users) at least once. This is the most successful contribution feature, others features have engaged a shorter number of users. Regarding the number of contributions, the most successful feature is adding goal evaluations. There were 1085 contributions corresponding to this feature. These numbers show that CourseAgent is a community that is in its early stages,

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[6] http://www.sis.pitt.edu/~cagent/

and that is has not achieved a high number of contributions yet. The analysis of the current data about contributions is summarized in Table 1.

Table 1: Users and level of contribution in CourseAgent

Activity	# Database edits	# Users	Kind of users
Registered		1256	(G[7]:123,C:616,U:517)
Advice	608	65	(G:34,C:9,U:40)
Evaluation	344	83	(G:34,C:9,U:40)
Goal evaluation	1085	60	(G:29,N:4,U:27)
Goal result	595		
Schedule	1377		
User plan	719	175	(G:48,C:49,U:78)
User interest	572	141	(G:45,C:36,CU:60)
Course taken	784	163	(G:50,C:36,C:77)
Course result[8]	66		

Study design and execution

The study was designed to test the effect of messages asking for contributions and appealing to community benefit versus messages appealing to a personal benefit. The sample was a subset of current iSchool students whose demographic information was available.

Given that the system has a tracking mechanism, the level of previous users activity in the system was also available, even in the case that they haven't contributed in a way that was stored as an edition in the system database.

Thus, the study manipulated the kind of message and the cohorts that received each message. A user only received one message during the study, and the users' activities before and after the message was received was tracked and analyzed. Cohorts were defined according an equally distributed users' home country and the level of participation in the system before the message was sent.

The first execution of the study was run during Fall 2010, when the Spring term registration period begun. The message asked users to rate 3 courses in they have taken before Fall 2010, thus all the users who have started their programs in Fall 2010 were removed from the subjects' sample. The study was run in three steps. The first batch of emails was sent to users who have never used the system, the second batch was sent to the rest of users who has never used the system and most of lurkers (i.e. people who has visited the system but not contributed), and the last batch of emails were broadcasted to some lurkers and contributors.

The study was replicated later with newcomers. Students whose start term was Spring 2011 received a welcome email that mentioned community or personal benefit of contribution. Another replication of the study was run before Spring 2011 registration finished. The same kind of emails was sent to users who had started their programs in Fall 2010, so they were able now to rate courses they took in their first term. The messages for each version of the experiment are shown in Table 1, and the difference between two messages is highlighted.

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[7] G: graduated, N: current student, U: undefined student status
[8] Few oa_rate

Table 1. Messages in each study execution

Messages in each experiment execution
1st Execution. Sample: Current students with starting term before that Fall 2010

1st batch: November 13th, 5.04 pm
2nd batch: November 15th, 7.06 pm
3rd batch: November 18th, 8.09 pm

Community benefit message. Subject: Course Agent: Spring term is coming

Dear $name,

CourseAgent is a course recommender and planning system. CourseAgent enables the students to receive recommendations from other students, as well as advice from faculty, regarding their course of study, workload, and relevance of courses. The usefulness of CourseAgent recommendations for the student community increases as users provide more information including courses they have taken, their career goals, and their ratings of courses.

We are trying to enhance the utility of CourseAgent before Spring registration starts. Please help your fellow students by adding and **rating three courses** you have taken and completed in the past by **November 22th**. Your contribution will empower the system to better recommend courses to all of the iSchool students just in time for their Spring registration. Note that you need to select your career goals to be able to rate taken courses. Your feedback is very valuable to the iSchool community as it will help other students to choose their courses wisely.

As every iSchool student, you have a confidential account for you on the CourseAgent system, so it will be quick and easy to contribute. If you do not remember your password or user name, please, use the password reminder functionality.

If you have any questions about this system, feel free to contact us: courseagent.adm@gmail.com

CourseAgent Team.

Personal benefit message. Subject: Course Agent: Spring term is coming

Dear $name,

CourseAgent is a course recommender and planning system. CourseAgent helps you to plan your course of study wiser by keeping track of your progress towards selected career goals and by offering advice from faculty and peer students about workload and relevance of courses. The usefulness of CourseAgent increases as you provide more information about courses taken, career goals, and your ratings of courses.

We are trying to provide the best support for you before you start your Spring registration. To help us with that, please add and **rate three courses** you have taken and completed in the past **by November 22th**. Providing three course ratings by November 22th will help the system to present you a more complete picture of your progress (through the Career Scope tab) and better recommend you relevant courses just in time for your Spring registration. Note that you need to select your career goals to be able to rate taken courses. Your feedback is very valuable for CourseAgent to better help you in planning your study in order to best meet your career goals.

As every iSchool student, you have a confidential account for you on the CourseAgent system, so it will be quick and easy to contribute. If you do not remember your password or user name, please, use the password reminder functionality password reminder functionality.

If you have any questions about this system, feel free to contact us: courseagent.adm@gmail.com

CourseAgent Team.

2nd Execution. Sample: New students with starting term Spring 2011

4rd batch: January 12th, 10 59 pm

Community benefit message. Subject: Welcome to Course Agent

Welcome to the School of Information Sciences, you have just been added to the CourseAgent system.

CourseAgent is a course recommender and planning system. CourseAgent enables the students to receive recommendations from other students, as well as advice from faculty, regarding their course of study, workload, and relevance of courses. The usefulness of CourseAgent recommendations for the student community increases as users provide more information including courses they have taken, their career goals, and their ratings of courses. We are trying to enhance the utility of CourseAgent. Please help your fellow students by **adding your career goals and the courses you are going to take** this term by **January 15th**. Your contribution is very valuable to the iSchool community as it will help other students to choose their courses wisely.

As every iSchool student, you have a confidential account for you on the CourseAgent system, so it will be quick and easy to contribute. Your ID is $username and your temporary password is $password (case sensitive). You may access this system online at http://www.sis.pitt.edu/~cagent/v2/login.html. Please change your password to a more personal one as soon as possible. If you have any questions about this system, feel free to contact us (courseagent.adm@gmail.com)

CourseAgent Team.

Private benefit message. Subject: Welcome to Course Agent

CourseAgent is a course recommender and planning system. CourseAgent helps you to plan your course of study wiser by keeping track of your progress towards selected career goals and by offering advice from faculty and peer students about workload and relevance of courses. The usefulness of CourseAgent increases as you provide more information about courses taken, career goals, and your ratings of courses.

We are trying to provide the best support for you before Spring registration finishes. To help us with that, please **add your career goals and the courses you are going to take** this term by **January 15th**. This will help the system to present you a more complete picture of your progress (through the Career Scope tab) and better recommend you relevant courses. Your contribution is very valuable for CourseAgent to better help you in planning your study in order to best meet your career goals.

As every iSchool student, you have a confidential account for you on the CourseAgent system, so it will be quick and easy to contribute. Your ID is $username and your temporary password is $password (case sensitive). You may access this system online at http://www.sis.pitt.edu/~cagent/v2/login.html. Please change your password to a more personal one as soon as possible. If you have any questions about this system, feel free to contact us (courseagent.adm@gmail.com)

CourseAgent Team.

3nd Execution. Sample: Students with starting term Fall 2011 (They had just finished their first term)

5th email: January 17th, 9.47 pm (spring is finishing)

Community benefit message. Subject: Spring Registration is finishing.

Dear $name,

CourseAgent is a course recommender and planning system. CourseAgent enables the students to receive recommendations from other students, as well as advice from faculty, regarding their course of study, workload, and relevance of courses. The usefulness of CourseAgent recommendations for the student community increases as users provide more information including courses they have taken, their career goals, and their ratings of courses.

We are trying to enhance the utility of CourseAgent before Spring registration finishes. Please help your fellow students by **adding and rating three courses** you have taken and completed in the last term by **January 18th**. Your contribution will empower the system to better recommend courses to all of the iSchool students just in time for their Spring registration. Note that you need to select your career goals to be able to rate taken courses. Your feedback is very valuable to the iSchool community as it will help other students to choose their courses wisely.

As every iSchool student, you have a confidential account for you on the CourseAgent system, so it will be quick and easy to contribute. If you do not remember your password or user name, please, use the password reminder functionality.

If you have any questions about this system, feel free to contact us: courseagent.adm@gmail.com

CourseAgent Team.

Personal benefit message. Subject: Spring Registration is finishing.

Dear $name,

CourseAgent is a course recommender and planning system. CourseAgent helps you to plan your course of study wiser by keeping track of your progress towards selected career goals and by offering advice from faculty and peer students about workload and relevance of courses. The usefulness of CourseAgent increases as you provide more information about courses taken, career goals, and your ratings of courses.

We are trying to provide the best support for you before you finish your Spring registration. To help us with that, please **add and rate three courses you have taken** and completed in the last term by **January 18th**. Providing three course ratings by January 18th will help the system to present you a more complete picture of your progress (through the Career Scope tab) and better recommend you relevant courses just in time for your Spring registration. Note that you need to select your career goals to be able to rate taken courses. Your feedback is very valuable for CourseAgent to better help you in planning your study in order to best meet your career goals.

As every iSchool student, you have a confidential account for you on the CourseAgent system, so it will be quick and easy to contribute. If you do not remember your password or user name, please, use the password reminder functionality password reminder functionality.

If you have any questions about this system, feel free to contact us: courseagent.adm@gmail.com

CourseAgent Team.

In total, an email was sent to 574 users. Few subjects received duplicated emails because they were students in the iSchool before, but started a new program in Fall 2010 or Spring 2011 so they were considered twice in the selection of subjects in different executions of the system. These 6 users were removed from the analysis. Table 2 shows the number of users who received each kind of email in each step of the first study and the study replications.

Table 2. Number of messages for each study execution

| | | Kind of message | | |
| | | Community | Private | Total |
		Count	Count	Count
# study/step execution	1	16	19	35
	2	36	36	72
	3	81	80	161
	4	28	24	52
	5	123	125	248
	T	**284**	**284**	**568**

The students who received these messages came from different countries to pursue their degrees in the iSchool. In this study their demographic data was used to assign them to different cohorts, so an analysis of the effect in users with different cultural backgrounds would be possible. The iSchool hosts students from 30 different countries. For this study, 6 categories of countries were defined considering their geographic and cultural similarities, and the amount of student who came from those countries. The categories were defined as follows:

- Undefined: Students whose home country was not available at the moment of the study.
- United States: Students whose home country is United States.
- Asia: Students whose home country is China (PRC), Taiwan, Republic of Korea, Japan, or Thailand.
- India: Students whose home country is India.
- Middle East: Students whose home country is Islamic Republic of Iran, Turkey, Saudi Arabia, Kuwait, or Egypt.
- Others: Students whose home country is Mexico, Libyan Arab Jamahiriya, Trinidad y Tobago, Puerto Rico, Slovakia, Singapore, Nepal, Viet Nam, Canada, Chile, Russian Federation, Poland, Ukraine, Afghanistan, Uganda, Niger, Netherlands, Bangladesh, or Yugoslavia.

Table 3 shows the amount of people in each category that got each kind of message.

Table 3. Number of messages that were sent to each category of home countries

| | | Kind of Message | | |
| | | Community | Private | Total |
		Count	Count	Count
Country Category	Unknown	53	40	93
	US	184	186	370
	Asia	27	38	65
	India	9	8	17
	Middle East	6	5	11
	Other	5	7	12

The results

As a result, the study encouraged 48 out of 568 message receivers to use the system (0.085%) . Among them, 24 users were completely newcomers who have never visited the system before, and 24 were users who have contributed or at least visited Course Agent before. Table 4 shows these figures.

Table 4. Number of engaged users

| | | Did they use the system after the messages? | |
| | | No | Yes |
		Count	Count
Were they users before?	No	403	24
	Yes	123	24

Table 5 shows the number of engaged users and the number of message receivers who didn't use the system after getting the message categorized by the country code.

Table 5. Number of engaged users

| | | # message receiver who used the system after receiving the message | | | |
| | | No | | Yes | |
		Count	%	Count	Row N %
Country category	Unknown	84	88.4%	11	11.6%
	US	348	94.1%	22	5.9%
	Asia	59	85.5%	10	14.5%
	India	15	88.2%	2	11.8%
	Middle East	8	72.7%	3	27.3%
	Other	12	100.0%	0	.0%

During the analysis, several hypotheses were tested regarding the characteristics of users that have a statistically significant correlation with the number and type of actions that each user

executed in the system after they got the message. The rest of this section focuses on describing these findings.

Regarding the kind of message the users received, the number of actions executed for users who received the community benefit message is twice the number of actions done by those who received private value. Figure 1 show the histograms of the amount of activity per user. Table 6 shows the descriptive statistics of activity level after the messages were sent.

Figure 1. Histograms of number of action for each kind of message.
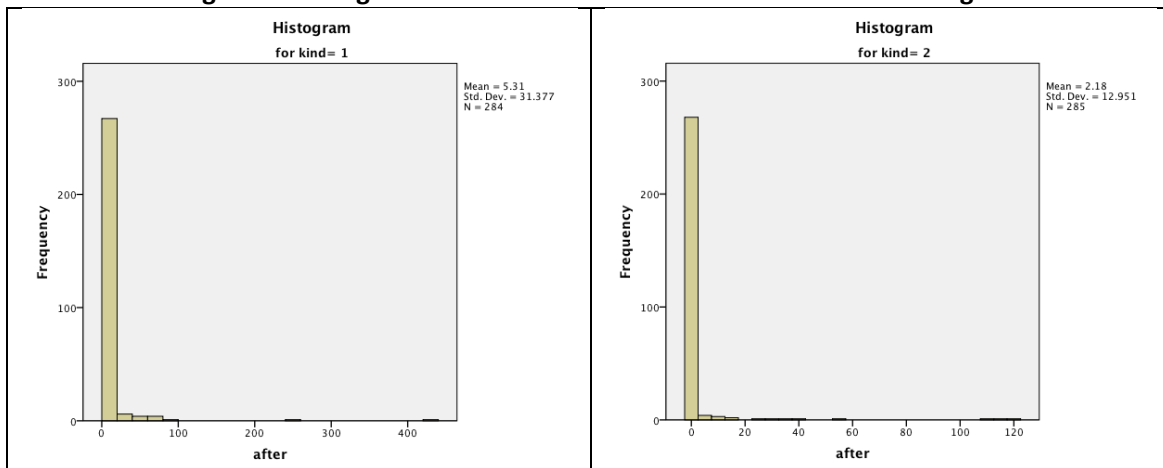
Given than the number of contributions doesn't behave normally, a non-parametric test was used to assess the significance of this difference. Table 7 and 8 shows the non-parametric test results and the normality tests results. The difference in activity level of those who received the community message compared to privacy message was slightly significant with p = 0.064. Then, the community benefit message was more effective considering the whole sample of users.

Table 9 shows the mean number of contribution considering different user variables, and the significance. The difference in number of actions post-message is statistically significant among different cohorts. Regarding the activity level of engaged users was significantly different when considering whether the user have visited or contributed to the system before, the country category, the program they are enrolled in and their gender.

Users who had visited the system before did more actions in the system after getting the message than newcomers. This difference is higher if the users contributed before. Country category also turned out to be a factor in the level of activity. People from US used the system less than students from other countries. Men contributed more than women, and people who are enrolled in IST program participated more in the systems than students of other programs.

Table 10 shows the differences of level of activity in the system for students who received the community benefit message. In this case, only the previous fact of lurking or contributing to the system in the system, and the academic program were factors with a statistically significant difference in the level of activity. The difference among users who were enrolled in the IST program was higher than the difference seen in the activity level for any kind of

message. The same phenomenon happens considering the variable of whether the student had visited and contributed before.

Table 6. Number of engaged users

kind				Statistic	Std. Error
after	1	Mean		**5.31**	**1.862**
		95% Confidence Interval for Mean	Lower Bound	1.64	
			Upper Bound	8.97	
		5% Trimmed Mean		.77	
		Median		.00	
		Variance		984.540	
		Std. Deviation		31.377	
		Minimum		0	
		Maximum		434	
		Range		434	
		Interquartile Range		0	
		Skewness		10.777	.145
		Kurtosis		134.462	.288
	2	Mean		**2.18**	**.767**
		95% Confidence Interval for Mean	Lower Bound	.67	
			Upper Bound	3.69	
		5% Trimmed Mean		.05	
		Median		.00	
		Variance		167.718	
		Std. Deviation		12.951	
		Minimum		0	
		Maximum		121	
		Range		121	
		Interquartile Range		0	
		Skewness		7.747	.144
		Kurtosis		63.952	.288

Table 7: Test Statistics[a]

	after
Mann-Whitney U	38717.000
Wilcoxon W	79472.000
Z	-1.855
Asymp. Sig. (2-tailed)	.064

a. Grouping Variable: kind

Table 8: Tests of Normality

	kind	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
after	community	.462	284	.000	.157	284	.000
	private	.504	284	.000	.150	284	.000

Table 11 shows the analogous analysis for students who received the personal benefit message. The same variables are still significant in this case. However, the size of the difference is smaller. Interestingly, the difference regarding the country category is significant when receiving the personal benefit emails. People from Asia did significantly more actions that people from other country categories. The difference is still significant if we test the difference between people from US and Asia.

One of the goals of the study was to test if the same message could be more effective in people with different cultural background, and the other one more effective in other cohorts. A factorial logistic regression was run considering country category and kind of message as factors, and the fact of visiting the site as the dependent variable. However, the predictor model using these factors didn't fit significantly better than the null model.

The number of editions in the database was also analyzed. Table 8 shows the number of editions in the database after the message, and it also shows the number of editions than the same users had done before the message. The number of new edition provided by the 5 lurkers that were engaged by the emails was 129 (293 – 164). The number of contributions of the 19 old contributors was 282. The 24 newcomers contributed 164 editions.

Table 9: Difference in user activity according to different user variables

		Mean	St. Error	N-P Test Statistics	
User has used the system before **[9]	No	1.82	.681		
	Yes	9.03	3.344		after
				Chi-square	17.195
				df	1
				Asymp. Sig.	.000
User has contributed before (not only visited the site) **	No	2.06	.641		after
	Yes	13.21	5.745	Chi-square	27.593
				df	1
				Asymp. Sig.	.000
Country Category *	Unknown	1.05	.331	US, Asia, India, Middle East	
	US	2.54	1.232		after
	Asia	11.54	4.590	Chi-square	14.217
	India	5.82	3.998	df	4
	Middle East	14.73	9.373	Asymp. Sig.	.007
Program **	Unknown	1.96	.590	TELCOM, LIS, IST	after
	TELCOM	1.04	.838	Chi-square	25.337
	LIS	.92	.413	df	2
	IST	11.18	3.708	Asymp. Sig.	.000
Gender **	Unknown	1.03	.325	Female, Male	after
	Female	2.89	1.119	Chi-square	4.427
	Male	6.11	2.458	df	1
				Asymp. Sig.	.035
Part vs Full Time	Unknown	1.05	.331		
	Full-Time	4.20	1.234	Part or Full Time	after
	Partial-Time	4.14	2.355	Chi-square	.002
				df	1
				Asymp. Sig.	.966
Degree	Unknown	2.56	.831		
	Master	4.13	1.187	Master, PhD	after
	PhD	.20	.195	Chi-square	1.451
				df	1
				Asymp. Sig.	.228

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[9] Highly significant

Table 10: Difference in user activity for community message

		Mean	St. Error	N-P Test Statistics	
User has used the system before **	No	2.94	.1260		after
	Yes	12.29	6.3	Chi-square	4.325
				df	1
				Asymp. Sig.	.038
User has contributed before (not only visited the site) **	No	3.20	1.188		after
	Yes	17.12	10.253	Chi-square	9.091
				df	1
				Asymp. Sig.	.003
Country Category	Unknown	1.38	.498		
	US	4.71	2.456	US, Asia, India, Middle East	After
	Asia	13.63	9.211		
	India	5.11	5.111	Chi-square	6.607
	Middle East	25.67	16.364	df	4
				Asymp. Sig.	.158
				US, Asia	after
				Chi-square	1.431
				df	1
				Asymp. Sig.	.232
Program **	Unknown	2.61	.887	TELCOM, LIS, IST	after
	TELCOM	1.39	1.387		
	LIS	1.08	.457	Chi-square	17.361
	IST	17.74	7.402	df	2
				Asymp. Sig.	.000
Gender	Unknown	1.35	.490	Female, Male	after
	Female	3.92	1.914	Chi-square	2.692
	Male	9.91	5.087	df	1
				Asymp. Sig.	.101
Part vs Full Time	Unknown	1.38	.498	Full Time, Partial Time	after
	Full-Time	5.43	2.162		
	Partial-Time	7.25	4.494	Chi-square	.034
				df	1
				Asymp. Sig.	.853
Degree	Unknown	2.61	.887		
	Master	6.00	2.208		after
	PhD	constant	-	Chi-square	1.701
				df	1
				Asymp. Sig.	.192

Table 11: Difference in user activity for personal benefit message

		Mean	St. Error	N-P Test Statistics	
User has used the system before **[10]	No	.74	.542		after
	Yes	5.85	2.448	Chi-square	16.491
				df	1
				Asymp. Sig.	.000
User has contributed before (not only visited the site) **	No	.98	.527		after
	Yes	8.90	4.344	Chi-square	21.146
				df	1
				Asymp. Sig.	.000
Country Category**	Unknown	.68	.424	US, Asia, India, Middle East	after
	US	.39	.191	Chi-square	10.754
	Asia	10.97	5.114	df	4
	India	6.63	6.625	Asymp. Sig.	.029
	Middle East	1.60	1.600		
				US vs Asia	after
				Chi-square	8.529
				df	1
				Asymp. Sig.	.003
Program **	Unknown	1.17	.727	TELCOM, LIS, IST	after
	TELCOM	.60	.600	Chi-square	8.842
	LIS	.79	.691	df	2
	IST	5.38	2.326	Asymp. Sig.	.012
Gender	Unknown	.66	.414	Female, Male	after
	Female	1.89	1.186	Chi-square	2.049
	Male	2.88	1.340	df	1
				Asymp. Sig.	.152
Part vs Full Time	Unknown	.68	.424	Partial, Full Time	after
	Full-Time	3.22	1.387	Chi-square	.023
	Partial-Time	.75	.383	df	1
				Asymp. Sig.	.879
Degree	Unknown	1.17	.727		
	Master	2.33	.909		after
	PhD	.33	.333	Chi-square	.089
				df	1
				Asymp. Sig.	.766

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[10] Highly significant

Table 12: Number of editions in the database

		Visited the site after message		Actions after message	# editions after message	# editions before message
		No	Yes			
		Count	Count	Sum	Sum	Sum
Contributors and lurkers before	No	403	24	778	164	0
	Yes	123	24	1351	411	777
Contributors before	No	462	29	1013	293	0
	Yes	64	19	1116	282	777

Discussion and future work

This study allowed identifying statistically significant differences in the level of contribution after an engagement massive email of different groups of users in Course Agent. The motivation related to community value encouraged users to do more actions in the system. This effect might be explained because Course Agent aims to serve students in the same school. And the students might have a strong sense of being part of that community. Other factors that generated statistically significant differences were gender, program, the country category, and whether the user has visited the system before or no. However, this effect did not interact with the cultural background of the students as hypothesized at the initial stages of the research.

Future work will be focused in evaluating the survival rates of these users considering factors as the kind of message they received, and qualitative analysis of their navigation patterns. Another venue of research would be send new messages according to the level of participation in the system.

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