# Stimulation of Activity in Online Communities: a framework based approach

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**ABSTRACT**
In this study, factors contributing to the development of active communities are identified and merged into a *Community Activity framework* that can be used to set up new or revitalize unsuccessful communities. Found factors include: displaying house rules during the membership registration procedure, informing members of new messages by e-mail and being able to add pictures to member profiles. During application of the framework to a community with low activity, changes have been made to privacy options, polls, activity notifications and other areas. Afterwards, significant positive effects have been found in the number of visits, posted messages and created topics. Also, interest of community members in both user profiles and the message board increased significantly. We conclude that the framework is able to contribute to developing successful online communities.

**Keywords**
Online communities, (inter)activity, Community Activity framework, community success

**PROBLEM DEFINITION**
Nowadays, digital communication is an important addition to face-to-face communication. By using the internet, people can form communities with members who are spread out all over the world. It is also easier than ever before to find people with equal interests, questions and goals. One of the ways in which people can communicate over the internet, is by using online communities. They allow people to share both information and feelings with one another. An example of an online community is a message board for people with a similar illness or medical problem. By sharing information and supporting one another, these online communities become valuable assets to the people that use them. However, many cases can be identified in which new online communities only receive a handful of both visitors and messages. As active visitors can be placed at the core of the success of an online community, many communities are unsuccessful.

The successful and unsuccessful online communities form the basis for this paper, in which we aim to increase the amount of active visitors in online communities. Therefore, our research question is as follows: "Which factors contribute to the development of an active and successful online community and how can we stimulate its activity?" The answer to these questions will be based on both a literature study and our own empirical research. First, from the literature, possible factors that contribute to the success of online communities have been identified. Next, the influence of these factors is examined by statistically comparing a set of online communities. From this set of factors, the *Community Activity (CA) framework* has been formed. This CA framework can be used as an aid in setting up new online communities, and enhancing the activity in current ones. The latter has been done in a case study, in which a community with low activity has been changed according to the CA framework, and activity in the resulting community has been compared with the original community. The final section contains conclusions and both implications for the application of the CA framework and ways to extend the framework.

**RELATED WORK**
Many different definitions of online communities may be found. The definition that is utilized in this paper, is that of [7]: "A virtual community [also known as an online community] consists of people who interact together socially on a technical platform. The community is built on a common interest, a common problem or a common task of its members that is pursued on the basis of implicit and explicit codes of behavior. The technical platform enables and supports the community's interaction and helps to build trust and a common feeling among the members." This definition was chosen for its combination of both social and technical aspects. On the one hand the definition includes the people that visit an online community, and the reasons for which they may do so. On the other hand, it includes a technical aspect, and the goal for which the technology is utilized within online communities. The combination of message boards (also known as forums or bulletin boards) and user profiles

are widely used as a technical platform for online communities. The message boards allow people to reply to, or start new, topics of discussion (also known as threads). The profile-section allows people to disclose personal information and pictures to other people within the community.

By incorporating interactive features into a website like message boards and user profiles, visitors are able to have an equal say in the content of the website. With static websites, all content is supplied by the webmaster. However, by adding interactive features, visitors are able to influence the content of a website and use this influence to fulfill informative needs [1].

### Community Success

As stated in the first section of this paper, many online communities are unsuccessful in acquiring and retaining both active members and consecutive posts. Even though many new online communities are formed each year, only a few turn out to be a viable platform for both discussion and support. [2] shows that this problem is widespread: over 50% of all e-mail based communities haven't received any message in the last four months. After installing one of the many online community software packages that are available (or building a platform from scratch), activity within the online community may be limited, even though the community manages to get a steady stream of visitors. [12] shows that only a small part of the people that visit an online community become active: 9% of all visitors become moderately active, and only 1% of all visitors becomes very active. This presents the danger that the small part of the visitors of an online community who post messages becomes demotivated by a shortage of replies to their messages [21] and cease to visit the community, as the community is not able to fulfill their needs [17]. To increase the success-rate of new online communities, it is important to both raise the amount of visitors that become active members and to let members discuss topics with each other.

### Inactive Members

As [12] has shown, up to 90% of the visitors of an online community do not open topics and do not post new messages: they are inactive. The only activity of this group within the community is reading the messages other people have posted. As this is a passive activity, this group has been defined as 'lurkers' by [6], because these people do not contribute to the community. [14] defines lurkers less negatively, as they say that while lurkers do not post now, they might posts messages in the future and convert to active members. Lurking is not necessarily bad behavior, as it might be used to learn the rules of participation within a community, or check if a community fulfills required needs [10, 20]. [13] shows that the amount of lurkers within a community depend on the theme of the community, and differ from 46% for health related communities to 82% for communities related to technology.

However, a certain number of active users is required in every community to be successful. People only want to invest in communities, for which they know that they are able to fulfill social and emotional needs [8]. So if the majority of a community lurks and only few people participate actively, the few active members may leave the community.

### Interactivity

Another way to describe the success of a community, is by measuring interactivity. [15] defines interactivity as the manner in which messages relate to one another. As face-to-face communication becomes interactive when people respond to their conversation partner, the same is true for online communication. On message boards, interactivity may be seen as the rate to which people reply to each other's messages. So in message boards with a high degree of interactivity, more replies can be found than in boards with a low degree of interactivity.

Interactivity is an essential part in the ability for online communities to fulfill the needs of its users. Without the possibility of getting answers to questions and replies to inquiries, users abandon the community and look for activities that are better able to fulfill their needs. Another reason for community abandonment also involves interactivity: if people do not receive a reply to their question or inquiry (i.e. a low degree of interactivity), they may feel ignored or ostracized [21].

An important factor in the development of a high degree of interactivity is the number of active members within a community. [11] refers to this construct as the 'Critical Mass Theory'. This theory states that as more members are available within a community, the chance that one of these members can answer the question of a fellow member is heightened. Upon receiving a helpful answer, members will invest more time and energy in the community, increasing the amount of knowledge that is available within the community. This is supported by [4], who found that newcomers to a community have a 12.4% higher chance to post a second message, when their first message was replied to.

Work by [1] shows that the degree of interactivity is not constant for a community as a whole, but that it differs from topic to topic, based upon differences between different topic starts (also known as first posts). They found that when topic starts contain a clear request or question, chances for a reply are increased by 6%. A short introduction with some elements of disclosure (e.g. age, history and current situation) increases the chance for a reply by 10%. The increase in chances for a reply upon disclosing background information is also supported by [3], who found that people get a more positive image of others when they have disclosed some information about themselves. The increase in chances for a reply upon posting a request or question are also supported by [4], who found an increase of 16.4% when posting a request or question, when compared to posting information, advice or opinions.

## METHODOLOGY OF FRAMEWORK DEVELOPMENT

As it is our goal to develop a framework with factors of online communities that lead to successful communities, two constructs need to be formed. At first, we need to define how community success can be measured, to be able to compare the success of different online communities. Secondly, the properties (or factors) of online communities that will be used in this study need to be defined.

After defining the metrics of community success and properties of online communities, the relations between these two constructs are discovered by comparing the metrics of success of 58 online communities in a statistical analysis. The communities that were used for this comparison had either Dutch of English as the official discussion language, and were all related to health. Furthermore, the communities could be labeled as social communities, placing focus on members and their feelings, problems and questions.

All of the properties that have been used in this study were binary. E.g. a community either does or does not have message board access for guests. For each property, the set of 58 communities were split up into two groups. The communities in the first group did not have the property; the communities in the second group did. Both groups were then compared with the Independent Samples Mann-Whitney U-Test for each metric of community success. If this test yielded a significant result, we can state that communities with and without the corresponding factor differ significantly from one another for a metric of community success.

### Community Success

Different metrics may be utilized to express community success. As we place our focus on the activity within a community, metrics related to activity have been selected. The selected metrics have been placed into four distinct categories, which can be found below. The metrics themselves are displayed in Table 1.

*Absolute community size:* the success of a community can be defined by its size. The bigger the community, the more successful it is. Three metrics have been selected to measure the size of a community [2, 18].

*Relative community size:* while these metrics provide an overview of the size of a community, they do not adjust for the age of a community. Older communities have had more time than younger communities to acquire their members, topics and messages. Therefore, normalized metrics also need to be considered.

*Interactivity:* with the metrics from the first two categories, a view can be generated of the overall activity within a community. To be able to acquire the activity per topic, a measure of interactivity needs to be used. This measure can be generated, by dividing the total number of messages by the total number of topics [15].

*Member activity:* next to the activity per topic, the activity per member can also be generated from the metrics above. Two metrics have been selected.

| Category | Variable |
|---|---|
| Absolute community size | Total number of members |
| | Total number of created topics |
| | Total number of posted messages |
| Relative community size | Number of new members per year |
| | Number of new topics per year |
| | Number of new messages per year |
| Interactivity | Average number of messages per topic |
| Member activity | Average number of topics per member |
| | Average number of messages per member |

**Table 1: Community size and activity metrics**

### Community properties

By defining a set of properties on online communities, we are able to compare communities to one another and identify the properties that relate to community success. These properties have been split up into three distinct groups: overall, topics and members. The properties of the first of these groups are defined below. Due to space restraints, we leave out a part on topics and members. Refer to [19] for these two parts.

The overall properties of communities that have been used in this study are split in several categories. Below, the definition of these categories can be found. Table 2 contains the corresponding properties and an explanation for each property.

*Accessibility of data:* how much of the (private) data within a community is visible to guests, who aren't members? Is it possible to see data about members? With the answers to these questions, insight in the 'openness' of a community can be found. Also, influence of openness on community activity may be determined [6].

*Registration:* on closed communities, a guest needs to register and become a member, before he or she is able to post messages. Registration forms are used to become a member. These forms may be a barrier, when they are not easy to use [14]. CAPTCHA's may also be a hindrance for registering guests [23].

*Profiles:* by adding user profiles to a community, members are able to learn more about their fellow members, without the need to browse all earlier posted messages [14]. The ability to add free text and photos to user profiles is also measured.

*Posts:* when a member posts a message within the community, additional information about that member may be displayed automatically (e.g., the total number of posts a member has made). This may increase liking [3]. Furthermore, a post may contain emoticons, which can increase member satisfaction and reduce miscommunication [16].

| Category | Variable | Explanation |
|---|---|---|
| Accessibility of data | Guest access to posts | Can guests read posts of members? |
| | Guest access to profiles | Can guests view the profiles of members? |
| | Posting as guest | Are guests able to post messages, without being a member? |
| Registration | Number of mandatory fields during registration | How many fields need to be filled to complete the registration procedure? |
| | Displaying house rules during registration | Are the house rules of a community presented to the user during the registration procedure? |
| | CAPTCHA during registration | Does a CAPTCHA need to be completed during the registration procedure? |
| | Validation of e-mail address | Are e-mail addresses verified by sending an activation link to the address supplied by the user? |
| | Account activation | Do new accounts need to be activated by a moderator? |
| Profiles | Profile functionality | Do community members get a profile, on which they can display information about themselves? |
| | Free text in profile | Are members able to display a text (about themselves) in their profiles? |
| | Photos in profiles | Are members able to add photos to their profiles? |
| Posts | Profile picture with post | Is the profile picture of a member placed next to the posts the member has made? |
| | Display of post count | Is the total number of posts a member has made placed next to the posts the member has made? |
| | Graphical emoticons in posts | Can users add graphical emoticons to their posts? |
| Connections with other applications | E-mail notifications | Can members be notified by e-mail, when other members reply to their messages? |
| | Connections with social networks | Is the community connected with social networks (e.g. Twitter and Facebook)? |
| Sideline activities | News section | Does the site have regularly posted news articles? |
| | Portal | Does the community website host a section with relevant information and/or links? |
| | Meetings | Are face-to-face meetings organized for members of the community? |
| | Advertising | Are advertisements displayed on the community website? |
| Member appreciation | Quantitative appreciation | Are members appreciated in a quantitative way for their contributions? |
| | Qualitative appreciation | Are members appreciated in a qualitative way for their contributions? |
| Supply of information | House rules after registration | Can members find the house rules of a community easily after the registration procedure has been completed? |
| | Frequently asked questions | Is a document with answers to frequently asked questions available to members? |
| Ownership and target group | Ownership | Is the community the initiative of an organization, or is it a personal initiative of members? |
| | Target group | Is the target group of the community clearly defined and displayed within the community? |
| Moderation | Message posting by moderators | Do moderators of a community post messages themselves within the community? |

**Table 2: Measured community properties**

*Connections with other applications:* the community may be connected with other applications, like e-mail and social networks. By adding e-mail functionality, members may be notified when other members reply to their messages. These e-mails also serve as an invitation to visit the community again [22].

*Sideline activities:* next to being used for textual communication, communities may act as a hub for other services towards members. Examples include posting of relevant news and providing links to other relevant websites [7].

*Member appreciation:* the commitment of active members may be appreciated by positive feedback [14]. This feedback may be quantitative or qualitative. Quantitative appreciation also provides a competitive element [9], which may increase the frequency with which users post messages.

*Supply of information:* within communities, house rules provide a guideline for member behavior and discussions. A document with frequently asked questions (also known a FAQ) may also be supplied to members. With these documents, members know what is and is not allowed within the community and may learn about community protocols [14].

*Ownership and target group:* people may set up communities to fulfill their own needs or those of others, or act on instruction of an organization. The amount of resources available to personally and organizationally backed initiatives can differ, bringing different degrees of success. Furthermore, when a community is set up, a target group may be chosen. Selecting a target group is advisable [14], as it reduces wrong expectations.

*Moderation:* next to members, another group of people is present within communities: the moderators. The main goal of moderators is to monitor the activity within a community and penalize people when they break the community's house rules. Furthermore, they may also take part in discussions by posting messages and opening new topics [14, 21].

## COMMUNITY ACTIVITY FRAMEWORK

The online community properties or factors that had a significant effect ($p < .05$) on measures of success have been combined into the Community Activity framework (Figure 1). This CA framework contains both positive and negative relations between community factors and measures of success, and can be used during the development of new communities and redesigning current ones. The depicted relations have to be interpreted with care, because there could be other unknown factors involved; explaining the relations that were found.

The framework is laid out in three columns of two different types: measures of success and community factors. Between these columns, lines are displayed, indicating a relation. Positive (+) and negative (-) signs

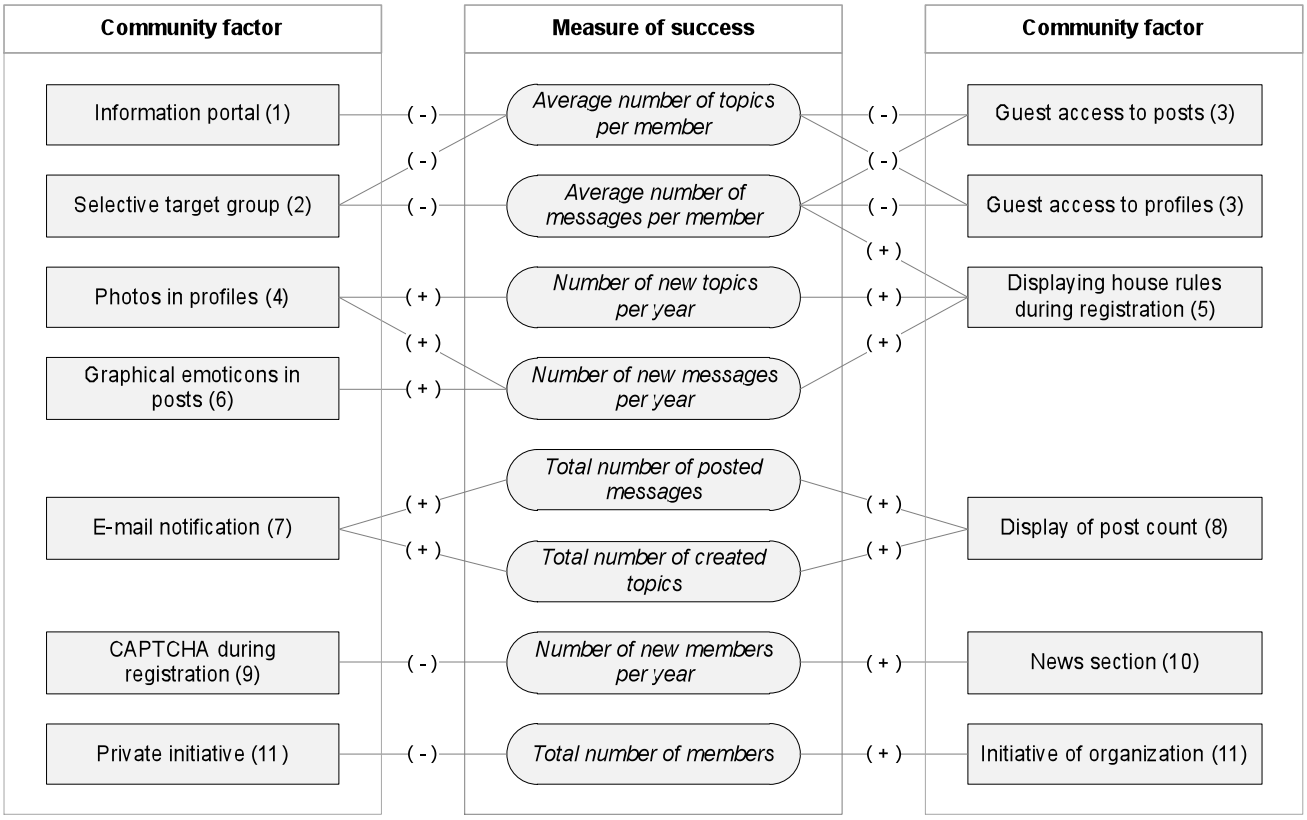


**Figure 1: Community Activity framework**

(Numbers in parentheses refer to the corresponding guideline)

are used to indicate the kind of relation. An example can be found in the upper right-hand corner of the CA framework, with the community factor 'Guest access to posts' and the measure of success 'Average number of topics per member'. Between these two items, a line with a negative sign (-) can be found, showing a negative relation. This means that as guests are allowed to have access to posts, the average number of topics per member decreases.

The relations found within the Community Activity framework have also be combined in a set of eleven guidelines, which can be used to increase community activity.

1. Create a document with frequently asked questions, but do not build a large information portal.
2. Do not be too selective when defining the target group of the community, so interested visitors won't be excluded.
3. Provide members of the community with a section that is not accessible to guests.
4. Provide members with the possibility to add one or more photo's to their user profile.
5. Create a set of house rules, and let new members read and accept these during the registration procedure.
6. Let members use graphical emoticons in the messages that they post.
7. Notify members by email of new posts in the topics they have subscribed to.
8. Give members insight in the activity of others by displaying the total number of posts next to their messages.
9. Add a CAPTCHA to the registration procedure. It helps to stop automated (fake) account creation, but won't influence the activity within a community.
10. Set up a section with periodical news postings. It may serve as a daily attractor of visitors.
11. Acquire organizational backing if possible, as this influences the total number of members positively.

## CASE STUDY

In the previous sections, the Community Activity framework has been introduced. The relations and guidelines of this framework will be used in this section to rejuvenate an inactive community on basis of the Community Activity framework and accompanying guidelines. By implementing guidelines 3, 4, 6, 7 and 8, we aim to increase member interest in the interactive parts of a community (message board and user profiles) and increase user visits and activity. The guidelines other than those mentioned above were already present within the community.

The community that has been selected for this case study is Leefwijzer (www.leefwijzer.nl), a Dutch community for people with a chronic illness and/or handicap. While the website of the community is actively visited because of the regular posting of news and articles by moderators, the message board got only a few messages per week. To enhance the activity in the interactive parts of the community, the Community Activity framework has been applied. The most important changes in the website have been described in the sections below.

### Methodology

Two methods were used to validate the changes made by the Community Activity framework: member surveys and usage statistics. The member surveys were used to get an insight in the member interest in the interactive parts of the community. Logs with usage statistics were used to track user visits and activity. Both methods have been used twice: one time before renewing the community on the 10th of August 2010, and one time afterwards.

*Member survey:* as stated, two surveys have been conducted with the members of the Leefwijzer community. Goal of this survey was to measure the interest users had in the interactive parts of the community. The first of these surveys was conducted before changes were made to the community, from the 2nd of February through the 8th of March 2010 and had 60 participants; the second survey was conducted after changes had been made, from the 27th through the 30th of August 2010 and had 46 participants.

In both surveys, respondents have been asked for their interest in both the user profiles and the messages board on a 7 point Likert-scale, where 1 equaled 'not interested' and 7 equaled 'very interested'.

*Usage statistics:* next to the surveys, a statistical analysis of the usage statistics has been conducted for both the old and renewed community, which have been retrieved from the Leefwijzer community. The data for this analysis has been acquired in two intervals of 91 days each. The interval before the community renewal lasted from the 10th of May through the 8th of August 2010. The interval after the renewal of the community lasted from the 16th of August through the 14th of November 2010.

Between the two intervals, the renewed community was launched. Data collection was paused for a week after the launch of the new community, to let the members acclimatize to the new design. Based on the data that was recorded in both the old and new website, four metrics have been constructed, which will be used in the comparison of both logs with usage statistics. These metrics will be used to compare the activity within both intervals. These metrics are: 'Number of visits per day', 'Number of new topics per week', 'Number of new messages per week' and 'Number of sent private messages'.

### Changes in the Leefwijzer Community

This section contains the most important changes that have been made to the Leefwijzer community, based on the Community Activity framework and the corresponding guidelines. With each change, a reference

is made to the guidelines of the CA framework in previous section.

*Profile access for guests (based on guideline 3):* the CA framework shows a negative relation between guest access and the average number of posted topics and messages per member. Therefore, a set of privacy controls have been implemented in the website. With these controls, users can open or close any part of their profile to guests and members. A part of the implemented privacy settings can be found in Figure 2. Each member can specify who has access to the different parts of their user profile, e.g. access to the real name, birthdate and pictures can be given to: everybody, members of the Leefwijzer community or nobody. This allows each member to adjust user profile access to personal needs.


**Figure 2: Some of the user controlled privacy settings**

*Displaying active members (based on guideline 4):* the homepage of the Leefwijzer community contained a bar with the names of recently active (logged in) members, without additional information (Figure 3). The CA framework shows however, that a positive relation exists between being able to add pictures to user profiles and the number of new topics and messages per year. Therefore, profile pictures have been added to the names shown in the bar with active members (Figure 3).


**Figure 3: Display of active members in the old (top) and new (bottom) community**

*Graphical emoticons (based on guideline 6):* the CA framework shows a positive relation between the ability to use graphical emoticons in messages and the number of new messages per year. However, the community only supported textual emoticons. Therefore, support for graphical emoticons has been added (Figure 4).


**Figure 4: Examples of posts with textual (top) and graphical (bottom) emoticons**

*E-mail notification (based on guideline 7):* the Leefwijzer community did not support the sending of e-mail based notifications on changes in topics. However, the CA framework shows that the total number of posted topics and messages within a community may profit from such notifications. Therefore, this functionality has been added to Leefwijzer. Now, users can subscribe to certain topics and receive updates by e-mail.

*Insight in member activity (based on guideline 8)*: on the old Leefwijzer community, little was known about the activity of other members. While user profiles were available, they did not contain information about past and current activity. This has been changed in the renewed community. Now, user profiles contain information about the total number of posts members have made (post count), the date of their last log-on and the date on which people became a member of the community (Figure 5). Furthermore, both the post count and joining-date are shown next to messages of members (Figure 5), giving members direct access to some measures of member activity.


**Figure 5: Part of user profiles (left) and posted messages (right)**

### Results of Changes in the Leefwijzer Community

As described above, both member surveys and analysis of usage statistics have been used to validate the effectiveness of the changes made in the website. The results of both methods can be found below.

*Member survey:* The results from these surveys can be found in Table 3. Statistical analysis of these results

shows that the interest among members for the user profiles and message boards had risen significantly. An Independent Samples Mann-Whitney U-test between the first and second survey shows a significant difference in both cases ($z = -2.836$, $p < .01$ and $z = -2.612$, $p < .01$ respectively).

| **Interest in …** | **Web-site** | **Average** (higher is better) | **Std. dev.** |
|---|---|---|---|
| User profiles ** | Old | 3.08 | 1.24 |
| | New | 3.65 | 1.48 |
| Message boards ** | Old | 3.22 | 1.12 |
| | New | 3.67 | 1.40 |

With ** for $p < .01$

**Table 3: Comparison of member surveys**

*Usage statistics:* after finding that each usage statistic on the old and new sites follows a normal distribution (by utilizing One-Sample Kolmogorov-Smirnov tests for both intervals), Independent Samples T-tests have been used to see if metrics differ significantly between both intervals. The results can be found in Table 4.

| **Metric** | **Web-site** | **N** | **Average** (higher is better) | **Std. dev.** |
|---|---|---|---|---|
| Number of visits per day ** | Old | 91 | 423.18 | 88.36 |
| | New | 91 | 477.81 | 112.72 |
| Number of new topics per week * | Old | 13 | 1.00 | 1.16 |
| | New | 13 | 5.69 | 5.20 |
| Number of new messages per week * | Old | 13 | 4.38 | 4.99 |
| | New | 13 | 22.46 | 10.38 |
| Number of sent private messages | Old | 13 | 43.62 | 16.73 |
| | New | 13 | 51.00 | 29.24 |

With * for $p < .05$ and ** for $p < .01$

**Table 4: Comparison of usage statistics**

From the results above, we can see that the number of visits per day differs significantly between both intervals ($t(180) = -3.447$, $p < .01$), from which we can conclude that the new website receives significantly more visits than the old site. A significant difference can also be found with the second metric, number of new topics per week, when comparing both intervals ($t(13.180) = -3.175$, $p < .01$). This shows that the number of new topics per week has increased significantly. A third significant effect can be found in the metric 'number of new messages per week': a comparison between both intervals shows significant results ($t(17.269) = -5.658$, $p < .01$), from which we can conclude that the number of new messages per week has increased significantly. The fourth metric, however, does not significantly differ between the two intervals ($t(24) = -0.790$, $p > .05$), from which we can conclude that the changes did not influence the number of sent private messages.

## CONCLUSION AND DISCUSSION

In this study, we have aimed to identify factors of online communities which had either a positive or negative relation within these communities. We have done so, in order to find a solution for the inactivity which occurs in many online communities.

To answer our research question, several steps have been taken. At first, a literature study has been done to identify possible factors that relate to activity in online communities. After comparing these factors within a set of online communities, the factors that related significantly with the community activity metrics have been incorporated into the Community Activity framework.

The CA framework currently consists of 13 factors and 8 measures of community activity. Factors include the positive effects of displaying house rules during registration, restricting community access for guests, notifying members about activity by e-mail and giving insight in member activity. Negative effects for private community initiatives, information portals and selective target groups have also been found.

Based on application of the CA framework to an inactive online community and using the eleven guidelines, several changes could be made in a directed way. These include the addition of access control for members, the ability to receive e-mail notifications, allowing the usage of graphical emoticons and the display of members and their activity. Based on the positive results of both the member surveys and community usage statistics, we found that both the interest in the interactive parts of the community and the actual usage of these parts have increased significantly, even after some delay. Therefore, we can state that the CA framework has been applied successfully to this community, giving it the potential to boost the success of other communities as well.

As stated, we have been able to apply the CA framework successfully in the case study. However, to validate this positive effect more robustly, the CA framework will need to be applied to other communities as well. During this validation, a distinction could be made between different kinds of communities (e.g. social and technical online communities), to see if the effectiveness of the framework depends on the kind of community.

Furthermore, the application of the CA framework does not guarantee community success. While the framework does provide positive changes, the importance of other factors does not decrease. Communities still need for instance effective moderators to moderate posts by members and post messages themselves.

The extension of the framework is also an opportunity for the future. An aspect not examined yet, because it is more difficult to analyze, concerns the value of a community for its members. One could think of measures like content quality and response time. While the framework currently harbors 13 different factors, as more may be identified in future research. As the number of factors grows, it may be beneficial to weigh them, to be able to find the factors that influence

community activity the most and to make a sensible decision to which guidelines to implement, when many are available.

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