Do Non-Monetary Incentive Systems Matter? - Evidence From The Restructuring Of A Non-Monetary Incentive System In An Online Community

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DO NON-MONETARY INCENTIVE SYSTEMS MATTER? – EVIDENCE FROM THE RESTRUCTURING OF A NON-MONETARY INCENTIVE SYSTEM IN AN ONLINE COMMUNITY

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Abstract

Many operators of online communities severely struggle with overcoming the nonparticipation of users and with persuading users to contribute to their platform’s online activities. However, a critical mass of active members who are willing to contribute is necessary in order to make an online community interesting and appealing to existing and potential new users. In this research, we investigate how the fundamental restructuring of a non-monetary incentive system of a popular German Question & Answer community affects user participation levels. We answer our research question by analyzing a unique dataset provided by the community’s operator. We find that especially recently acquired users place a greater value on non-monetary incentive systems and reduce their participation level due to restructuring. With increasing length of membership, the effect of non-monetary incentive systems weakens. The post-event participation level of experienced users is not affected by the event.

Keywords: Online community, Question & Answer community, incentive system, restructuring of incentive system, motivation, field observation
1 Introduction

The World Wide Web has become one of the most popular sources for the search for information. Besides search engines (e.g., Google or Bing) Question & Answer communities (Q&A communities) have evolved into an important source for the search of information which allow people to ask questions directly to a large audience (Shah et al., 2009). The rise in popularity and relevance of these websites are reflected in the rapidly growing number of users (Rosenbaum and Shachaf, 2010). Around the world, millions of users each day ask over ten thousands of questions in various fields of interest and get – most of them publicly available – answers to their questions (Harper et al., 2008).

Still, operators of many Q&A communities severely struggle with overcoming nonparticipation and persuading enough users to become active and contributing members (e.g. willing to ask and answer questions) (e.g., Harper and Raban, 2008). Empirical analysis has shown that only a very small group of registered users is responsible for the majority of the activities on these websites (e.g., Raban, 2008). But to keep an online community interesting and appealing to existing and potentially new members a critical mass of active users is necessary (e.g., Markus, 1987). Therefore, it is important for providers of online communities to know (1) how to keep and sustain active users and (2) how to motivate and encourage inactive users to become active contributors (e.g., Chen et al., 2010).

In the context of Q&A communities Harper and Raban (2008) distinguish between intrinsic and extrinsic user motivation. Intrinsic motivation refers to motivation stemming mainly from factors inside an individual like (1) altruism – the gained utility from helping others (e.g., answering a question of another user), (2) learning – opportunity to gain knowledge and to learn due to asking and answering questions and (3) social role – commitment to a social role within the community (e.g., expert for a specific topic). The authors define extrinsic motivation as the motivation stemming from factors mainly outside an individual. Users could be extrinsically motivated by (1) monetary rewards for user activities (e.g., for answering questions) and (2) non-monetary rewards for user activities – like status points and badges which also reflect the reputation of users within a community or social information to create competition among users (e.g., through the publication of a list with the top 50 users).

There have been a number of field experiments analyzing user contribution in online communities. For example, Ling et al. (2005) use social psychology theories of social loafing and goal setting to explain user contribution in an online movie recommender community. The authors find that users on the platform contribute more if they are reminded of their uniqueness and when they get specific and challenging goals. In the same research environment Chen et al. (2010) use personalized social information to analyze the influence of social comparison between users of the community and figure out that social comparison leads to an increase in contribution of users who are less active than the median user and to a decrease in contribution of users who are more active than the median user. Empirical research on the effectiveness of extrinsic incentives in the context of the Q&A community Google Answers shows that the amount of monetary reward has an effect on the quality of the answer received (e.g., Edelman, 2012). Interestingly, social incentives also play an important role (e.g., like chats between users and rating opportunities) especially to keep members active on the platform (Raban, 2008; Rafaeli et al., 2007). Based on these findings, Harper and Raban (2008) suggest that extrinsic incentives are in particularly helpful in the early stages of membership to encourage new users to contribute but that in the long run social factors become more important for binding users to the platform.

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1 This problem is not limited to Q&A communities. For example, in the year 2005 1% of the users in the P2P file-sharing network Gnutella were responsible for 50% of the offered content and 85% of the users did not share any content (Hughes et al., 2005).
With this research-in-progress paper, we want to add to this literature by analyzing how the fundamental restructuring of a non-monetary incentive system on a popular German Q&A community affects user contribution behavior. In particular, we answer the following research question: How does the restructuring of a non-monetary incentive system affect the participation level of users in a Q&A community? We answer our research question by analyzing the contribution behavior of 1,015 users four weeks before and four weeks after the restructuring of the incentive system. Our preliminary results indicate that especially new users reduce their level of participation after the restructuring and that the contribution behavior of experienced users is not affected by the event.

This research-in-progress paper has the potential to make novel and significant contributions to research for three reasons. (1) The preliminary results provide first evidence for the relevance of non-monetary incentive systems in online communities whereby users earn points as a reward for activities they perform and with these points being used to determine a user’s reputation in the community. (2) Our preliminary results support the findings by Raban (2008) and Rafaeli et al. (2007) that extrinsic incentives are helpful in the beginning of a membership to encourage new users to contribute but that in the long run social incentives play a more important role to keep members active on the platform. (3) Our preliminary results indicate that the findings are valid not only for monetary but also for non-monetary incentive systems.

Our preliminary results might also have important managerial implications. Online community providers should be aware that especially newly acquired users place a greater value on non-monetary incentive systems and that these systems influence their subsequent participation behavior. But, over time, with increasing length of membership, the relevance of non-monetary incentive systems weakens for existing members.

2 Research Environment

2.1 The Q&A community

The website we analyzed was founded in January 2006. The platform offers registered and non-registered-users the opportunity to ask questions to other members of the community. All registered users automatically participate in the non-monetary reward system of the community. For almost all of the activities they perform, registered users receive an incentive in the form of so-called status points. These represent a detailed ranking system displayed in their personal profile and indicate a user’s reputation within the community. The following main activities earn users status points:

- Asking questions
- Rating answers for questions asked
- Answering questions
- Adding or copying links
- Adding friends to their network of friends
- Observing other users

2.2 The Restructuring of the Non-Monetary Incentive System

In February 2007 the operator of this Q&A community fundamentally restructured its non-monetary incentive system. The objective of the reform was to improve the incentive system and thereby to increase the average participation level of the users for the core activities asking and answering questions. The restructuring was repeatedly announced prior to the implementation. The first

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2 The operator of the website has requested to remain anonymous.
3 There are a few more activities that we do not consider here for reasons of simplification. Until the event users earned more than 95% of their status points with the listed main activities.
announcement was 5 months before the event. The restructuring reduced the number of status points that could be earned for certain types of activities, namely those that do not contribute to the overall quality of the community. These activities include adding and copying links, adding friends, and observing other users. Core activities of the community like asking and answering questions and rating questions and answers were not affected by the restructuring.

Based on the new point scheme the total number of status points each user had already earned since the first day of membership was recalculated and adjusted. Importantly for the subsequent research analysis is that the recalculation and the deduction of status points were not known to the users in advance. Thus, we assume that the extent of the point-adjustment was exogeneously determined for each registered user and that the users had not already adjusted their contribution behavior for the core activities in the four weeks prior to the event.

### 2.3 Dataset

Our dataset consists of 15,152 registered users. For our analysis, we restrict the dataset to users who contribute frequently until the day of the event. In particular, we limit our dataset to observed actions for which users received a minimum of 50 status points and in which they asked or answered at least one question during the four weeks before the event. This leaves us with a final dataset of 1,015 observations. For each user we have information about the following main variables: total number of questions asked & answers given (4 weeks before event), total number of questions asked & answers given (4 weeks after event), total number of earned status points (up to the event), number of status points deducted (absolute), amount of status points deducted (relative) and length of membership in weeks. Table 1 gives an overview of the summary statistics.

<table>
<thead>
<tr>
<th>Main Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Q25</th>
<th>Q50</th>
<th>Q75</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questions asked &amp; answers given (4 weeks before event)</td>
<td>40</td>
<td>83</td>
<td>1</td>
<td>3</td>
<td>13</td>
<td>40</td>
<td>971</td>
</tr>
<tr>
<td>Questions asked &amp; answers given (4 weeks after event)</td>
<td>40</td>
<td>105</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>26</td>
<td>1,221</td>
</tr>
<tr>
<td>Earned status points (up to the event)</td>
<td>1,197</td>
<td>2,751</td>
<td>50</td>
<td>142</td>
<td>370</td>
<td>1,079</td>
<td>36,079</td>
</tr>
<tr>
<td>Status points deducted (absolute)</td>
<td>238</td>
<td>481</td>
<td>0</td>
<td>40</td>
<td>92</td>
<td>230</td>
<td>6,164</td>
</tr>
<tr>
<td>Status points deducted (relative)</td>
<td>28%</td>
<td>19%</td>
<td>0%</td>
<td>13%</td>
<td>25%</td>
<td>41%</td>
<td>96%</td>
</tr>
<tr>
<td>Length of membership</td>
<td>26</td>
<td>18</td>
<td>4</td>
<td>11</td>
<td>20</td>
<td>43</td>
<td>61</td>
</tr>
</tbody>
</table>

**Table 1. Summary statistics for main variables (N = 1,015)**

On average the total number of questions asked & answers given remained unchanged in the four weeks preceding and following the event. Of interest to note is the drop at the first three quartiles of the distribution and the increase in the standard deviation (SD) from 83 to 105. More than 75% of the users reduced their participation level after the restructuring. Before the event, the users in our sample earned on average 1,197 status points and were registered for 26 weeks. With the recalculation of the status points on the event day, the users lost on average 238 or 28% of their status points earned prior to the event. Only a few users did not lose any points. More than 75% lost at least 10% of points, 25% lost more than 40% and the maximum of 96% indicates that some users lost almost all of their points.

### 3 Model

To analyze if the restructuring negatively affects user participation levels, we estimate the model in the equation (1). We use the natural logarithm of the total number of questions asked & answers given (4 weeks after event) as dependent variable $y_i$ for each user $i$, because the variable covers the core

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[4] E.g., before the event, users received on average 1 status point for adding or copying one link and 5 status points for answering one question.
activities determining the overall quality of the platform. Users received on average 67% of their totally earned status points (up to the event) with these activities.\(^5\)

\[
y_i = \beta_0 + \beta_1 x_{1,i} + \beta_2 x_{2,i} + \beta_3 x_{1,i} \times x_{2,i} + \beta_4 x_{2,i}^2 + \beta_5 y_i + \epsilon_i \quad (1)
\]

The variable \(x_{1,i}\) is the number of status points deducted (relative) from the user’s total of status points earned. Variable \(x_{2,i}\) is the length of membership. Further, we add an interaction effect between the status points deducted (relative) \(x_{1,i}\) and the length of membership \(x_{2,i}\), because we want to analyze if the effect of status points deducted (relative) changes over the length of membership. To account for a possible quadratic relationship between the participation behavior and the length of membership, we also include the length of membership squared as additional variable.

In vector \(y_i\) we put the following control variables: (1) According to Harper and Raban (2008) the participation level of the users depends on intrinsic and extrinsic motivation. We assume the ratio of intrinsic and extrinsic motivation to vary from user to user. To account for user heterogeneity we calculate for each main activity (see section 2.1) the cumulated number of activities performed by each user before the event and use these variables as control variables. (2) We take the total number of questions asked & answers given (4 weeks before event) as a proxy for the user participation level in the four weeks before the event, because we want to model the adjustment in the participation level due to the deduction of status points (relative). (3) We add further control variables that are related to the restructuring, because these variables are correlated with the deduction of status points (relative) and omitting these variables could result in biased estimates. These variables are the number of lost ranks and the relative number of required status points to reach the next higher ranking after the event. After the restructuring, users needed approximately the double number of status points to reach the same ranking. This resulted for almost all users in an additional drop in rank. Further, it might be that users who are closer to the next ranking than other users were less demotivated by the event.

4 Preliminary Results

We estimate equation (1) with a standard OLS regression. To account for heteroskedasticity we use robust standard errors. The preliminary results of the regression are listed in Table 2.

The coefficient of the treatment variable status points deducted (relative) has a negative sign and is significant on a 5% level. The coefficient of the variable length of membership is positive and significant on a 10% level. The interaction effect between the variables status points deducted (relative) and length of membership has a positive sign and is significant on a 10% level. However, it is not allowed to interpret the strength and the significance of the two coefficients separately (Brambor et al., 2006). Therefore, we need first to calculate the marginal effect and the standard error of the full effect of the treatment. The strength and significance of the full effect depend on the length of membership. The standard error for the full effect is significantly different from zero on the 5% level up from week 1 until week 14.\(^6\) Furthermore, the effect decreases with the length of membership. The shortest length of membership is 4 weeks and 40% of the users are registered for less than 14 weeks. The marginal effect of the treatment drops from –0.8765 in the 4th week to –0.6827 in the 14th week. Because the dependent variable is log-transformed and the treatment variable is measured in per cent, the marginal effect of the treatment is interpreted as the percentage change in the dependent variable, when the treatment is increased by one percentage point (PPT) while the length of membership stays constant. E.g., for a user who is registered for 4 weeks a status points deducted (relative) of 10 percentage points results in a decrease in the participation level by approximately 8.765%. Figure 1 illustrates how the effect of the treatment decreases with the length of membership. We have chosen

\(^5\) We log-transform all variables that are related to user-activities, because the data are heavily right-skewed. Since the log of zero is not defined, we add a one to all these variables. See Raban and Rabin (2009) for further explanations.

\(^6\) The covariance between the direct and interaction effect of the treatment is Cov(\(\hat{\beta}_1, \hat{\beta}_2\)) = - 0.0028.
the values on the first three quartiles of the distribution of the variable status points deducted (relative) (see Table 1) and plotted the corresponding weakening of the treatment effect against the length of membership from week 4 to week 14.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status points deducted (relative)</td>
<td>-0.9540** (0.4121)</td>
</tr>
<tr>
<td>Length of membership</td>
<td>0.0253* (0.0134)</td>
</tr>
<tr>
<td>Status points deducted (relative)*</td>
<td>0.0194* (0.0101)</td>
</tr>
<tr>
<td>Length of membership</td>
<td>-0.0004** (0.0002)</td>
</tr>
<tr>
<td>Length of membership * Length of membership</td>
<td></td>
</tr>
</tbody>
</table>

Control Variables

\( N = 1,015 \)

Adjusted R-squared = 0.5490

* \( p<0.1 \), ** \( p<0.05 \)

Robust standard errors in parentheses

Table 2. Main results

According to these preliminary results the deduction of status points is especially significant for recently acquired users for whom there is a strong negative correlation with their participation level. Interesting is the weakening of the treatment effect with increasing length of membership. The preliminary results illustrate that experienced users are not affected by the deduction of status points.

5 Conclusion & Further Research

To keep an online community interesting and appealing to existing and potentially new members a critical mass of active users is necessary (e.g., Markus, 1987). Therefore, it is important for providers of online communities to know (1) how to keep and sustain active users and (2) how to motivate and encourage inactive users to become active users (Chen et al., 2010). Empirical research on the effectiveness of extrinsic incentives in the context of the Q&A community Google Answers has shown that these incentives are effective in the beginning of a membership to encourage new users to contribute but that in the long run social factors play a more important role keeping members active on the platform (Raban, 2008; Rafaeli et al., 2007).

With this research-in-progress paper we contribute to this literature. Our preliminary results provide first evidence for the relevance of non-monetary incentive systems in online communities where users earn points as a reward for the activities they performed. Our preliminary results support the findings of Raban (2008) and Rafaeli et al. (2007) and additionally indicate, that the findings are not only valid for monetary but also for non-monetary incentive systems. Our findings might also have important managerial implications. Online community provider should be aware of that especially recently acquired users place a greater value on non-monetary incentive systems and that these influence their participation level. But with length of membership, the relevance of non-monetary incentive systems decreases.

There might be two explanations for that. (1) It could be that new users need to build up a reputation on the platform and reputation is connected to the number of status points earned and the resultant ranking. Thus, new users try to earn status points and value these higher than experienced users. (2) It

\[ \text{if we run the regression separately either for the total number of questions asked or the total number of answers given remain the preliminary results qualitatively the same.} \]
might be that the restructuring was more of a surprise to new than to experienced users. The event was announced 4 times prior to the implementation and the first announcement was 5 months before the event. Maybe the experienced users were better informed about the restructuring and more convinced by the necessity and the need for these measures.

To foster the validity of our preliminary results we will conduct further robustness checks to rule out competing explanations. This comprises analysis of the event in a panel data setting to examine fixed effects estimation to account for unobserved individual heterogeneity and time specific fixed effects.

In addition, we plan to extend this research in the following major directions. (1) The number of deducted status points may not be completely exogeneous. In this case, especially those users who are strongly extrinsically motivated get the highest treatment. This could result in an overestimation of the treatment effect. Even if we control for different ratios of intrinsic and extrinsic motivation, there may be some bias left. In future research, we plan to address this issue in more detail and to establish a causal relationship between the change in the non-monetary incentive system and the adjustment of user behavior. (2) We plan to extend the theoretical basis of our empirical analysis. This should result in a theoretical model of determinants of the adjustment of user behavior due to the change in the non-monetary incentive system. (3) We want to extend our analysis by investigating the long term effect of the restructuring. For example, it is not clear yet whether the adjustment in the user participation level is restricted to a certain time period or if it is an enduring negative effect.

References