A Farm in Every Window: A Study into the Incentives for Participation in the Windowfarm Virtual Community

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ABSTRACT

Virtual communities have great potential in connecting people from different backgrounds and locations and giving them a common space to share, explore, and solve problems. A key factor into whether a virtual community will be successful is user participation. Insight into why users of virtual communities participate, and how to increase this participation is still poorly understood. There is no unifying model or consensus on incentives or incentivization in virtual communities and this makes studying them very difficult. In this paper we describe our study into the incentive structures for members of the Windowfarm virtual community and look into what ways the community could be improved. We explore user incentives using methodology and models from different disciplines and fields, trying to find which of these best explains the behaviors and interactions in the Windowfarm community. We present this as a case study so that other research groups and community leaders can look into and better understand incentives in virtual communities based on the recent work done in this space.

Categories and Subject Descriptors

H.1.2 [**User/machine systems**]: Human factors

General Terms

Human Factors

Keywords

Motivation, virtual communities, contribution, knowledge sharing

1. INTRODUCTION

Lack of participation is a serious problem that virtual communities face constantly. Virtual communities have great potential in being able to connect people around the world and help them share and work together for a greater purpose. The reality is that many virtual communities fail or die off due to users not contributing back to the community. Even very successful communities tend to have a large base of "free-riders" who use the resources and information of the community and do not contribute back[2]. It is usually a small group of active users who are responsible for the majority of the content in the virtual community[13]. While it is not the case that all members in a community need to contribute to the virtual community for it to be successful[15], communities with a large free-rider population may find it difficult to be sustainable overtime. In order to build better virtual communities in the future and to help keep current communities alive and well, we must have a better understanding on the motivations and incentives on contributing to virtual communities.

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While there is a common understanding for the need to study motivation and incentives in virtual communities, it has proved difficult to accurately model them. Disciplines in Psychology, Sociology, Mass media, Economics and Cognitive Science have all approached this issue with different models and methodologies[16]. Despite all these studies, there is no unifying model, consensus on incentives or incentivization in virtual communities and this makes studying them very difficult. What variables in a virtual community should we look at? What model best explains the behavior we see in a particular virtual community? How do we measure participation and incentive in a virtual community? These are difficult questions that need further research to explore. Many of the models used in these disciplines to study incentives come from research done in real-world communities. It is unclear exactly how these communities differ in terms of motivations and incentive from virtual communities, and what changes would be necessary to these models to adapt them.

In this paper we describe our study into the incentive structures for members of the Windowfarm virtual community and look into what ways the community could be improved. We explore user incentives using methodology and models from different disciplines and fields, trying to find which of these best explain the behaviors and interactions in the Windowfarm community. In doing this, we try to explore how exactly some the ideas from these different disciplines might be used together, and propose a methodology to tie motiva-

tions reported by community members to the actual activity they express in the virtual community.

In this paper, we describe, in detail, the history and structure of the Windowfarm community. We also discuss the different incentives models we looked into to help explain and predict the behaviors and incentives of the Windowfarm community. After this we describe the methodology we used and the different design considerations that went into building it. Later we discuss the results of our survey and analysis, followed by a discussion on how they relate to the incentives models we looked into. Using these results and analyses, we provide recommendations on how the community could improve and take better advantage of the incentives currently present. Lastly we end on a discussion of directions future research could take both inside and outside of this virtual community.

2. WINDOWFARM COMMUNITY

The Windowfarm virtual community[1] is a multi-user blogging platform that allows people to share, comment, ask questions and propose new designs for their Windowfarms. A Windowfarm is a vertical hydroponic farming system for year-round indoor growing of plants inside windows. This system allows people who live in areas without access to farmable land (i.e., people who live in urban environments) to grow their own food.The Windowfarm community distributes online instructions[2] on how to build a windowfarm using easily found materials and tools. These instructions get modified and changed over time by members of the community. This creates new versions or forks of the main version, similar to an open source project. The Windowfarm community calls this method R&D-I-Y (research and develop it yourself): A distributed network of individuals sharing information can implement a wide variety of designs that accommodate specific local needs and implement them locally. This allows anyone to bring innovative green ideas and popularize them quickly.

2.1 History

The community was started by artists Britta Riley and Rebecca Bray in February 2009. It began as an e-mail list for people interested in building and testing new designs for windowfarms and self made hydroponic farming systems. Since then, the community has contributed innovations from the perspective of end users that helped evolve the windowfarm designs through more than 12 subversions and iterations. The designs are constantly becoming more efficient, more nutritionally productive, easier to maintain, quieter, and better looking. The project has been featured on The Martha Stewart Show[3], NPRÕs Weekend Edition[4], the Whitney Museum of American Art[5], and in dozens of other publications.

[1] http://our.windowfarms.org/
[2] http://our.windowfarms.org/instructions_dev/
[3] http://www.marthastewart.com/265901/grow-it-yourself-hydroponic-gardening-in
[4] http://www.npr.org/templates/story/story.php?storyId=125504307
[5] http://whitney.org/Education/Families/FamilyBlog/WhitneyKidsBackToNature

2.2 User Base

The Windowfarm community currently has over 20,000 registered users. According to the visitation logs from the Windowfarm community portal, about 2,000 users visit the community portal at any given month. Of these 2,000 users, about 45 to 60 users actually contributes to the community in the form of writing a blog post or a comment. Currently about 10 users are responsible for over 80 percent of the content created in any given month. This is inline with the power laws we see in participation in virtual communities, such as Pareto distribution and Zipf's law[1].

2.3 Community Platform

As stated before, the Windowfarm Community Portal takes the form of a multi-blogging platform. Any user can create a blog post, and place it in different community defined categories, for other users to see. Users can also comment on any post. Comments in particular are where the majority of the discussion and content of the community take place. This platform allows users in the community to share ideas, ask questions, help troubleshoot problems, and promote new designs for windowfarms.

3. INCENTIVE/PARTICIPATION MODELS

It was important in this study to look at a wide view of the different models and theories of motivation for participation in virtual communities. Many disciplines have studied this problem and developed and tested different models, based on both physical and virtual communities[16]. There has not been much work, however, in finding ways to connect and view this problem across these different disciplines. While it is outside of the scope of this study to propose ways to connect and bridge these different models and theories together, we still wanted to examine our results in light of the research and work done before us.

One of the first classical distinctions in motivation was in the difference of intrinsic and extrinsic motivation. Self-determination theory defined the first as being a motivation that comes internally, dealing with self-improvement and challenge seeking[8]. Extrinsic motivation, on the other hand, deals with external awards in the form of monitory gain or peer recognition. Another interesting distinction we wish to look at comes from the work of Ciffolilli on the differences between individual and social motivations[6]. This individual motivation is similar in some respects to intrinsic motivation, but also involves efficacy and self satisfaction. Social motivation involves ideas in wanting to belong to a community, the need to both give and receive support from others, and the want to help contribute to a community effort.

The area of Functional Psychology also has many interesting models in looking into the motivations of individuals. Snyder and Cantor's work in this area defined four categories: Value-expressive, Social adjustive, Utilitarian, and Knowledge[17]. Value-expressive involves the motivation to share and express one's altruistic values with others. Social adjustive involves engaging in behavior in the hopes of being able to better fit into a group or community. Utilitarian is similar to extrinsic motivation: It deals with the motivations to do something for an external reward. Lastly

Knowledge involves the motivation to learning new skills and gain knowledge in new areas.

Another interesting model from functional psychology is Clary et al.'s six motivational categories for volunteering[7]. These six motivational categories are Values (sharing one's value system), Social (social engagement), Understanding (exercising and learning new skills and abilities), Career(enhancing one's skills to help in current or future career goals), Protective (protecting one's ego), and Enhancement (enhancing one's ego by helping and sharing with others). In a study by Nov, this model had two additional categories added to it to better study the motivations of the Wikipedia community[14]. These two categories were Fun (doing something for the enjoy it brings to a user) and Ideology (doing something due to an alignment with a particular ideology). The fun category comes from Stephenson's Ludenic theory of newsreading[18], and the ideology category comes from Hars & Ou's study into the open source communities[9].

The sociologist Kollock also studied motivations in virtual communities[11]. His findings showed that sense of efficacy, commitment and anticipated reciprocity were among the motivations reported in virtual communities. Kollock also mentions that the social psychology model of Sense of Community could be a motivator for contribution in a virtual community. Sense of Community is a model that deals with the feelings, attitudes and experiences of being in a community, rather than looking at the structure or organization of a community[5]. Sense of Community is usually defined in four areas: Membership, Influence, Integration and Fulfillment of Needs, and Shared Emotion Connection. Memberships includes ideas into personal investment, emotional safety, boundaries that separate the community from other potential communities, and a common sense of identification. Influence deals with whether members of the community feel that they can affect the community as a whole, and that the community has some influence on the individual as well. Integration and Fulfillment of Needs includes whether members feel that the community can help them with their own needs, and that they feel a part of the rewards from the community. Shared Emotional Connection deals with the history of the community, and if strong ties are found between members of the community. There has also been some interesting research in tying the Sense of Community model, which was developed for physical communities, into the virtual community environment[10][4]. These studies have proposed a new look into what they call Sense of Virtual Community to help explore the differences and similarities between physical and virtual communities.

In the Windowfarm community, participation is not rewarded with monetary or other tangible goods. In this respect models and theories in traditional economics are difficult to apply to this community in terms of motivation and incentive. This is primarily why we did not focus on such models or theories in this study.

4. METHODOLOGY

We discuss the goals we want to achieve and the methodology (at the design and implementation levels) used in our research.

4.1 Design Goals

One of the major goals of our of methodology was to find the top reported motivations for contribution in the Windowfarm community and see if any of these motivations were positively correlated with higher contribution levels. In doing this we realize that there will be different motivations for different types of behavior. This is why we wish to tie the results from our survey, where the users report the motivations behind their different behavior, to the actual behavior seen in the community. This would allow us to get a deeper look at the different participation levels in the community and allow us to see if the motivations reported actually lead to increasing these participation levels.

We also wanted to see if there existed motivations for behaviors not seen in the community because the community portal has no features to support them. In other words, we want to see if users want to do something that was not currently supported by the interface of the community portal. This would allow us to find if there are missing features that could be added to the community portal to help user engage and participate in the community better.

Also by comparing the motivations reported by the Windowfarm community to studies done in other communities, we wanted to see what type of community the Windowfarm community fits best into. Successful communities of a similar type have found features and ideas that best utilize the motivations of their users to help increase and sustain participation. This would allow us to see what best practices of these communities might be helpful to add to the Windowfarm community.

4.2 Methodology Design and Implementation

In our study we used two main methods to obtain information. The first was a survey where users could report their motivations. The second was a classification and analysis of the behavior seen in the community which was available in the Windowfarms database.

4.2.1 Survey

The first set in our methodology was to send out a survey to all 20,000 registered users in the Windowfarm community. This survey asked questions modeled after the incentive models we mentioned in the previous section. The survey asked for some basic demographic information about the user, along with how many hours a week they spend using the Windowfarm community portal. This would give us a base level of overall participationl.

The survey also asked for users to rate on a scale between 1 to 7 (7 being the highest) on how much they agreed with certain statements about the community and their participation in it. Most of these statements were models from the different categories in the Sense of Community model mentioned in Section 3. In this survey we wanted to see which categories of the Sense of Community model would be reported back. The survey also asked questions on how well the users understood the rules and the interface of the community portal. We wanted to see if user who understood how to contribute would actually contribute more than user who did not[3].

As stated earlier, an important goal in this study was to tie motivations to particular behaviors found in the community. In this end we defined three broad behaviors we observed and classified: asking questions, answering questions, and sharing information and designs. For each of these behavior categories, the survey asked what the amount of time they spend doing this in the community, and to report the top three motivations (from a list) for engaging in this behavior.

In our design goals we stated that we wanted to see if there were any behaviors or activity that users would want to engage in, but are unable to do so due to lack of functionality in the community portal. We noticed that many users had complaints on the organization of content and information. The survey asked users if this was indeed a problem they have noticed, and if there were a way to help with organizing the content and information, would they actually do it. The survey also asked what their motivation would be in helping out with this task.

Finally, the survey gave the option of allowing the participant of the survey to disclose the username they use in the Windowfarm community. This would allow us to actual view and analyze their actions in the community, and tie this to their responses in the survey. With this information we could actually see the effect their reported motivations had on their activity in the community and observe trends and effects these motivations had as a whole.

4.2.2 Classification of Behavior in Community

In our effort to see the effect motivation had on certain behaviors in the community, we needed a way to actually classify the contributions (comments and posts) of the members. These posts and comments found in the community are all in free-text, making it very difficult to run any automatic analyses. Each post in the multi-blogging community platform did have tags and categories of which they belonged, but we found these to be poor metrics for the actual behaviors seen inside them. Also these tags did not help with understanding what behaviors were found in the comments, which contained a majority of the content and discussion found in the community. We also tried using different Natural Language Processing tools and automated classifiers, but found that the accuracy of such systems to be too low to gain any useful results. In the end, we built a web interface that allowed us to categorize the behavior of posts and comments by hand.

In our classification scheme, we assigned each comment and post with an attitude category (Positive, Neutral, or Negative). We also define a behavior classification scheme and annotated each comments or post with one or more of these categories. Our categories were Social, Question, Answer, Sharing and Other.

The social category deals with behavior that was more social in nature, and exhibited signs of social grooming and connection. Example of this would be comments that congratulated another user on their success, or thanking a user for help with a problem. The question category was used in any comment or post that asked a question to ether the community as a whole, or to a particular user. We typically saw this in cases where a user would ask for help in troubleshooting a problem with their windowfarm, or asking a user to clarify a point made in an earlier comment or post. The answer category was used in the case of when a user answered a particular question posed by a user in a previous post or comment. This is different in context to the sharing category; The sharing category was used when a user, on their own initiative, shared information, ideas, or designs to the community as a whole. While on the surface the answer and sharing category could be seen as the same, it is in this contextual view that we see the clear distinction between the two. Answers only arise in response to a particular question, where as sharing comes from the internal initiative of the actual user. We made this distinction more explicit to see if there are different motivations between these two contexts.

5. RESULTS

Based on the data collected from the survey, database records and our behavior classification, we found the following results.

5.1 Sense of Community

The first half of our survey focused on the four areas of Sense of Community: Membership, Influence, Shared Emotional Connection and Integration and Fulfillment of Needs[5]. Questions in the Integration and Fulfillment of Needs area had the most positive responses in the Sense of Community section of the survey. Users reported that they trusted the community to be able and willing to help them with their problems and goals (Figure 1). They also felt connected to the successes of the community as a whole (Figure 2). Membership was the next highest reported area: Users felt that the Windowfarm community was an activity community that they enjoyed being a part of and that they had personally invested in the community in the form of actual building a windowfarm. However they did not feel that there were clear boundaries inside the community to separate it from other similar communities. Shared emotional connection came in third: User felt that members of the community were positive and friendly overall, but they did not feel that they had any real emotional connection or strong ties to these other members. The influence area came in last. Users did not feel that they had influence on the community as a whole, nor did they feel that their actions were being influenced by the community. Over all these responses tell us that these users felt that the Windowfarm community is a real community that they can trust for helping them, but they are weakly tied to other members and do not feel as if they can influence the community as a whole.

5.2 Overall Motivation

As stated before, an important aspect we wished to capture was why people want to participate. We found in terms of the overall motivation that when asked about what the most rewarding part of windowfarming is, the majority of the users indicated “Growing their own food” and “Learning new skills”. This can be seen in Figure 3. We can see a connection here to Ciffolilli’s individual motivation category[6]. This motivation involved self satisfaction and self-improvement. Snyder and Cantor’s Knowledge motivation is also in play here[17]. This motivation deals with learning new skills and gaining new knowledge.

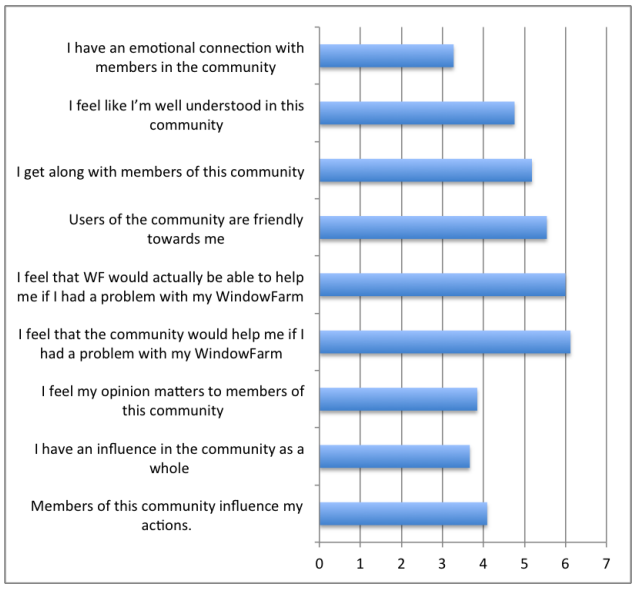

Figure 1: Questions related to influence, shared emotional connection, fulfillment of needs in Windowfarms (self reported).

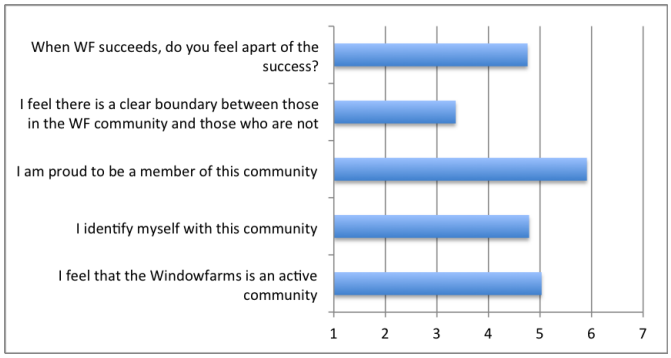

Figure 2: Questions related to community identity in Windowfarms (self reported).

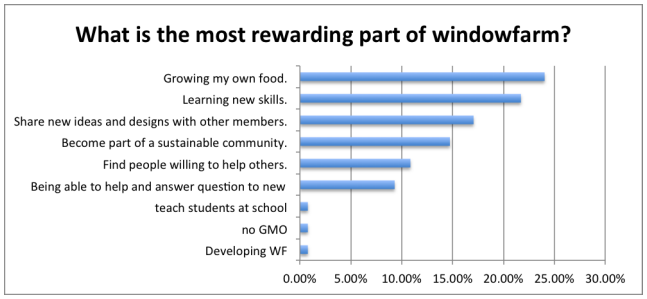

Figure 3: Opinions on what the most rewarding part of Windowfarming is (self reported).

5.3 Motivations for Answering Questions

The survey also asked what were the top motivations for answering questions in the community. The top three responses, in order of most responded to least, were "I feel its the right thing to do", "It is fun to answer questions" and "I feel I owe it to the community for answering my own questions". This can be seen in Figure 4.

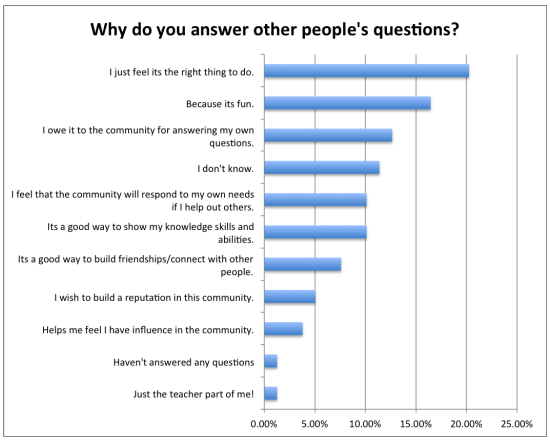

Figure 4: Motivations on answering other members questions (self reported).

5.3.1 Right Thing to Do

The first response, "I feel its the right thing to do" echoes some of the finding in Hars & Ou's study into open source communities[9]. As stated before, members of the Windowfarm community are not paid for their contribution and there does not seem to be a market for building or testing windowfarms, as opposed to the open source communities where these markets and external rewards structures exists. This is why we think the community best fits into the student and hobby demographic defined in the Hars & Ou's study . Here we see the highest levels of the Altruism and Intrinsic motivation categories. The "I feel its the right thing to do" response fits well with this aspect of the study. This same response is also connected to the values motivation category in Clary et al.'s six motivational categories for volunteering[7]. This category deals with participation as a way to express one's value system and altruistic feelings for others. Nov's study in Wikipedia users' motivations, which used this volunteering model, also confirms this result.

Also users who reported this motivation were more likely to answer questions in the community than those who did not. This shows us that this motivation seems to be positively correlated with answer questions in the community. This result was also seen in the Nov study as well as the "Values" category was positively correlated to activity in Wikipedia [14].

5.3.2 Fun to Do

The second highest response from the survey was "It is fun to do". This result can be tied to Stephenson's Ludenic Theory of Newsreading [18]. Here Stephenson explains that people actually read the newspaper for entertainment and fun, and not because they just want to be informed and educated on

what is happening around them. In Nov's study of motivation in Wikipedia, he included a fun motivational category that involves this idea and connects well with this survey response [14]. In this study Nov found that the "Fun" category was one of the top reported motivations for contributing to Wikipedia. When we look to see if this survey response is tied to answering more questions, we find that it is in fact not. In other words, people who report this "Fun" motivation for answering questions actually answer less questions in the community than those who did not report it. Users who do answer a lot of questions might find this activity not fun at all because they understand better the difficult of this task. This result may also be coming from new users who have not had much experience in the community yet and have not had any unpleasant situations come up when answering questions. We feel this is an area that would need to be explored further.

5.3.3 *Obligation to Community*

The third highest motivation from the survey was "I feel I owe it to the community for answering my own questions". This speaks to an obligation that the users feels to contribute back to the community for helping with their own needs. We can see signs of this in Snyder and Cantor's Social adjustive motivation category [17]. This deals with doing things to fit in better with a group. This obligation to the community may come from a social guilt and participation may help easy this and allow the individual to better fit in with the group as a whole. This also ties into Clary et al.'s Protective category in the volunteering motivational model in that answering questions reduce ones guilt over having the community help them before[7]. An interesting results we see from this motivation is that users who reported it were not more likely to answer questions than those who did not report this motivation. It seems that feeling obligated to contribute back may not be enough of a motivation to actual contribute back to the community.

5.4 Motivations for Sharing

We also explored the motivation for sharing information and ideas to the community. The top three reported responses in this category were "I wish to get feedback on my ideas and designs", "It is fun. I enjoy testing and creating designs", and"I feel its the right thing to do".

Both the "It is fun. I enjoy testing and creating designs" and "I feel its the right thing to do" results were discussed in the previous subsections. When linking these motivations reported from the survey to the actual behavior seen in the community we notice that users who reported the "It is fun" motivation were less likely to share ideas than those who did not list this motivation. Also users who listed that they share ideas with others because they owe it to the community were also less likely to share ideas in the community than those who did not list this reason. It is interesting to note that this is the same results that we see in the motivations for answering question. This also may be for similar reason as stated in Section 5.3.

5.4.1 *Feedback on Ideas and Designs*

Getting feedback on ideas and designs was the top reported motivation from the survey for sharing ideas in the community. This is an interesting case of Kollock's anticipated reciprocity. Users are participating in the hopes that others will respond and provide feedback[11]. Users who reported this motivation were more likely to share ideas in the community than those who did not report it.

5.5 Understanding How to Contribute

Another area we asked in our survey was to see if users understood how to contribute to the community and if they understood how to use the interface of the community portal. There has been studies that show that the more users understand how to contribute to a given virtual community, the more they will contribute back [3]. This shows that there are users who want to contribute back but cannot do so because they do not understand the rules and the interfaces. The results from the survey (Figure 5) showed that many of the user do not understand how the tagging and category system in the community portal works, and feel that overall they have difficulty using the portal to share ideas and ask questions. The users who did understand how to use the system better contributed much more on average than those who did not. This result is consistent with previous studies.

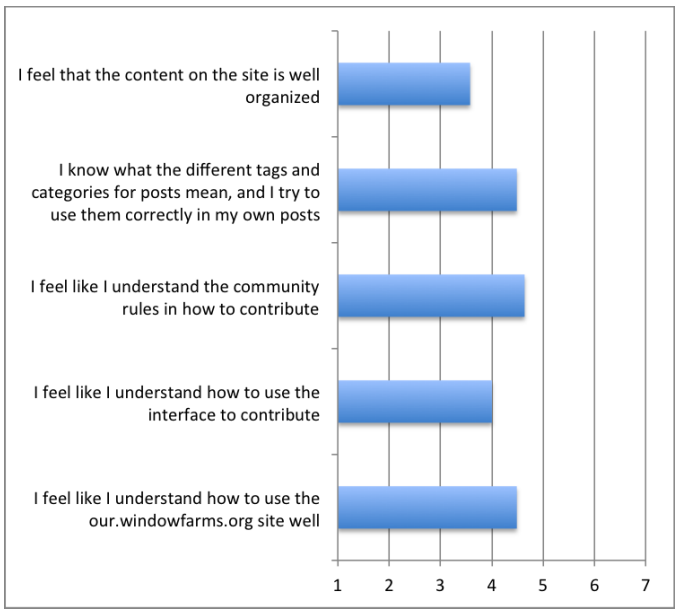

Figure 5: Questions related to the usability of the site (self reported)

6. DISCUSSION

In this section we look the results shown in Section 5 and recommend changes the community could take to increase participation. We also discuss areas in which future research could take place.

6.1 Improvements to Community

The community portal as a whole has valuable content for a specific audience and is very active, but organization and context is sorely lacking. We know that the value of information is found in its content, organization and context. It seems that the blogging paradigm does a poor job of organizing the content found in this community and is not deep

enough to fulfill all of the major goals of this community. For example the current system uses tags in blogs to help categorize the content found inside them. These tags are not used in a very controlled manner, and are used too often at the same time, rendering them useless. Likewise, from the results of our survey, users have a poor understanding of how exactly to use the tagging and category features of the community portal, and they don't fully understand the semantics of the different tags and categories. Users also noticed that organization is indeed a problem that they face when using the community portal. Users reported that they would help out with organizations of content if there were better features and interfaces to do so. The organizer of the portal needs to find a way to allow the community as a whole to participate, create, understand and enforce an organization strategy. Depending on the case, this would imply making the navigation menu more visible, adding a search engine or a complete redesign of the site ad even a change of platform.

Also from the top reported motivations on the survey, it seems that the community is closest to take in terms of motivation to a knowledge repository type community like Wikipedia. Fun and ideology were the top reported motivations listed, and this is very similar to the results seen in Nov's study of motivations in the Wikipedia community[14]. It would be interesting to study these similar communities and find best practices that they use to engage and enhance user participation. Finding ways to translate and implement these features would be an interesting addition to this community.

6.2 Further research

This study has opened up many different avenues in which further research could take place both in and outside of the Windowfarm community. In this paper we explored some areas in which the community could change to better engage and use the motivations of their user base. It would be interesting to further explore what other features and interfaces could be used and to run this study again after these features have been implemented to see the effect they have had on the community.

One of the problems with our study was engaging the community to participate in our survey and analyzing the behavior of the site. This was a difficult task due to the small size of the active user base. This is an important issue as there are many successful virtual communities that are of similar size or smaller, and we need to find ways to study and analyze them better. Many of the studies into virtual communities focus on the larger communities, and we need to test our assumptions, theories and ideas in the realm of these smaller virtual communities as well.

Another area we would like to explore is different methodologies in studying motivations and improving participation levels in virtual communities. We would like to run tests and experiments on features built using the different incentive and motivational models. There has been a few interesting studies this experimental type model [12].

As we explore more into these mixed motivational models, and find the holes in these traditional ones, we have to take into account and adjust for the difference between virtual and actual communities. The answers to these questions and the models that will be developed in the future will not come from one disciplines or background, but it will be an intersection of both the social sciences, economics, network theory, computer science and more. We have to find the bridges between these ideas and models to better understand, predict and build the virtual communities of tomorrow. Further research is needed in testing, linking and creating these new models from these different disciplines to help build a more common and unified picture of incentive and motivation in virtual communities.

7. CONCLUSIONS

As we have seen, virtual communities have great potential and promise, but face serious issues in sustainability due to low levels of contribution by their members. Research and studies into the motivations for user participation are needed to help address this issue, but this task if very difficult with the many models and methodologies currently in place. More attention is needed connecting and understanding these different incentive theories and models to guide researchers and community leaders in building and maintaing virtual communities. Our project was a case study to explore how one might try to mix and understand a single virtual community given the different models and theories in this area of incentives and motivation.

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