Online Technical Support: How it Works and Why it Fails?

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Abstract

Online communities and discussion forums have become focal points for recent research. The online communities exist in many disciplines, and the use of forums is increasing rapidly in education, the workplace, and pursuits such as online gaming. Research has shown that one ultimate goal of online communities is to help members solve software problems. This paper explores support forums in open source software (OSS) communities in an effort to determine just how the forums help solve problems – if they really do. By understanding problem-solving in online communities, members may be able to provide better support for their participants. Additionally, lessons learned may be used to further forum use in education and the workplace. Two qualitative studies became the basis for the examination of problem-solving in these communities. The results indicate that only about half of the problems presented in an open source forum are solved.

1. Introduction

In recent years, the value of online communities has been established by a multitude of researchers in different disciplines such as medical support communities, gaming communities, software development communities and software support communities. Online support communities are very popular and are heavily used by people in various situations for example health related communities are highly used by people with health issues and their caregivers, similarly, technical support communities are also widely used and are very active groups of people learning and working within the community related to the software product. Open Source Software communities have thrived on the internet and have provided a venue for people to contribute, learn and enhance their skills. In open source software communities, members of the community contribute to the support section of the website [11, 12]. These communities are equipped with multiple channels of technical support such as discussion forums, mailing lists, IRC chat, blogs, wikis, etc. Additionally, a variety of internal resources designed to help end users are developed on the website and consist of such materials as wikis, a knowledgebase, frequently asked questions, software documentation, etc. This paper examines the problem solving on these discussion forums and community-generated internal resources. The interactions on the forums are classified into solved, unsolved and incomplete interactions and the quality and usefulness of internal resources is explored. An in-depth evaluation of an open source software community, Firefox, was performed by examining a sample of 100 threads representing over 1000 messages; additionally, the problem-solving within the community was analyzed. To further corroborate the initial findings from the Firefox community, results from a separate study of questionnaires and interviews conducted from over 60 different forums were examined as they related to the Firefox study results. Results include an examination of how some problems are solved and others are not as well as how internal resources help or sometimes fail to help the users. Thus, this research gives a deeper understanding of the process of problem-solving in open source online communities and gives an insight into the quality of internal resources.

2. Related Work

In proprietary software development organizations [3], research suggests that software documentation is in practice poor, incomplete, and inconsistent. When documentation or resources are created, they tend to follow no defined standard and lack information that is crucial to make them understandable and usable by developers and maintainers. Other research [7] found that documentation is often perceived as too expensive and/or difficult to maintain under the time pressures of the software industry. Though most people think some form of documentation is necessary, there is usually little agreement on what is needed. Even more surprising, in everyday practice people actually use incomplete, obsolete documentation and find it useful. In open source software research, a post-question survey by Lakhani and von Hippel found that more than 75% of help-seekers at an Apache Usenet group consulted the Apache FAQs or Usenet Archives before posing their question [9]. Thus, literature demonstrates that website resources are being used and reused.

Research on Open Source Software online
communities have focused on understanding the social structure [4, 6, 14], the role in success of software [4], the developers’ behaviors and motivations [9], the innovations of these online communities [9], and the role in technical support [11].

This paper builds on these previous studies to evaluate OSS forum resources to see if they are always successful in helping help-seekers and if they fail, then why. Research [8] has also found that the primary reason people reuse a conversation is to find answers to specific questions. In previous work, research discovered that although threads often last for days, it is not uncommon for replies to be sent within minutes [12]. High reuse of threads that consist of multiple posts of help-givers and seekers comprise the problem-solving efforts of the communities. Crowston et al [5] in their review of empirical research on FLOSS development processes present a framework to classify the existing research about FLOSS and also project areas of research gap. One of the areas that the authors selected as an important area for future research is use of tools in FLOSSS communities, they claim that in virtual team research, technologies used by team members are often examined to see how they coordinate team members’ activities, but few such studies have been done in the FLOSS context.” They further state that “Future research could further our understanding of which tools people actually use in FLOSS development....etc.” This research is an initial step in the direction of the identified research gap, we start by looking at the collection of these tools (internal resources) in an online discussion forum and explore the use and quality of these tools. In addition to understanding the tools, this study is also an effort to understand how members integrate knowledge from different sources, another future research area identified in the review. Refer to [5] for a detailed literature review on open source software development process.

3. Research Design

This study is a qualitative analysis that is part of a larger study conducted to understand the landscape of technical support in open source software communities. The results in this paper focus on the reasons some problems are being solved while others not within the OSS communities. Also, the internal resources present in these online communities are examined for successes and failures with respect to problem-solving.

3.1 Data Collection

Data from two separate studies come together to add to the body of knowledge encompassing OSS communities. For the initial study, Mozilla Firefox discussion forums were chosen due to the large number of users and the active nature of the forums. One hundred random interactions were collected from the general technical support discussion forums based on the following criteria: a) the interaction should have received its last message prior to six months from the date of data collection, and b) each interaction had more than four messages. The interactions with more than four messages allowed this study to focus on the complex problems and not the problems that were solved in one link or question. The understanding of more complex problems gave an insight into the problem-solving process of the community. The messages that are solved in one or two responses with links to resources provide information about the retrieval aspect of resources, which was not the focus of this study. In these one hundred interactions, there were 1003 total messages with 242 people involved. The numbers of messages per interaction ranges from 5 to 55, and 75 percent of the interactions have 10 or fewer messages each. The overall average was 10 messages in an interaction.

The second study examined open source software forums from the participant perspective along with tools that were deemed important to the forum members. The data were collected from both questionnaires and one-on-one interviews of respondents from over 20 different open source forums. Many respondents to the questionnaires participated in more than one OSS forum including forums not directly queried in this study. For example, respondents may have participated in Debian, Ubuntu, Thunderbird, Mozilla, Moodle, etc. The questionnaire inquired as to why participants joined the forums, how the forums were used, and what was important for learning in the forums. The same themes were used for the detailed interviews.

223 forum members responded to the open-ended questionnaires. Additionally, 21 participants agreed to more in-depth interviews that were conducted in person, on phone or via chat. Of these respondents, 94.2% were male with 5.8% being female. The age range was from 18 to 79 with the average age being 41. Overwhelmingly, the ethnicity was Caucasian (76%). Additionally, 68.6% of the respondents were college graduates. Thus, the average respondent was an educated, white male in his mid-forties. Responses to these questionnaires and interviews are consistent with the findings within the initial study.

3.2 Data Analysis

Grounded Theory [13] was used as a basis for data
analysis and is an approach that has been used in other OSS and online content analysis studies [10, 11]. In the process of grounded theory development, theory generation and development is done inductively by studying the phenomenon it represents. Concepts are discovered, developed, and provisionally verified through systematic data collection and analysis. One does not begin with a theory and then prove it. Rather, one begins with an area of study, and what is relevant to that area is allowed to emerge.

In the initial sample from the Mozilla forums, referred to in this paper as Study 1, all the problem interactions were coded iteratively to develop some basic concepts. From these basic concepts, a list of categories for solved, unsolved, and incomplete interaction was developed. All messages were also coded for the use of internal resources. An internal resource refers to the resources of the community itself, such as documentation, FAQs, pervious threads, a knowledgebase, wiki, etc. Then the interactions were coded for the successful or unsuccessful use of the internal resources.

In the second investigation, referred to as Study 2, data were gathered approximately one year after the first study. The open-ended questions inquired as to why respondents participated in the open source forums, as well as about the tools and methods used within the forums. The open-ended questions and interviews were subsequently analyzed, and codes and themes were developed. When examining the two studies, overlapping codes and themes were identified, and the findings of this second study confirmed the observations of the initial in-depth Study 1.

3.3 Research Questions

- What are the characteristics of successful help seeking interactions?
- What are the characteristics of unsuccessful help seeking interactions?
- Why are internal resources being used in interactions?
- What are the reasons for failure of internal resources in some interactions?

4. Results from Study 1.

From the initial analysis of the Mozilla community, the chart below lays out the distribution of solved, unsolved, and incomplete interactions and interactions that are not questions. Out of the total interactions, 44% are solved interactions and 30% are unsolved. 20% of the interactions are incomplete. This chart in Figure 1 demonstrates that 6% of the interactions in this dataset were not questions but belong to other categories such as announcements, maintenance, software releases, etc. Solved, unsolved, and incomplete interactions are analyzed based on grounded theory in detail in the following three sections.

4.1 Solved Interactions

In this study, “solved” is operationalized in a very strict manner; only the interactions where the original help-seeker comes back and posts that the solution proposed by the help-givers worked or that he or she figured out the solution independently are coded as solved. This means that all the interactions that had no response from help-seekers confirming that the solutions worked were coded as incomplete. Using this very strict definition of solved interactions, it was found that 44% of the total interactions were solved. An example of the steps involved in a solved interaction is presented below. For this and all subsequent examples, only the parts of the responses necessary to understand the status of the problem are presented.

Help-Seeker Question
Help-Giver Response
Help-Seeker Thanks much ! Got it to work.

Characteristics of the Solved Interactions: Once the solved interactions were identified, they were analyzed for common characteristics in the interactions that were solved. The interactions were evaluated based on the responses from help-givers as well as the responses from help-seekers. All the solved interactions were broadly classified into the following three categories in the order of their percentage of occurrence in the dataset. These categories are based on the type of solution provided.

1. The problems solved most quickly occurred when Step-by-Step Instructions were provided for the solution and the help-giver was previously aware of the problem and hence able to give the solution from past experience and knowledge.

2. The second category of solved problems resulted through referencing an Internal Resource (Documentation, Previous Thread, wiki, knowledgebase, etc). In these types of solved interactions, the help-givers were able to point the help-seeker in the right direction of the resources, and the help-seeker was able to find a solution to his or her problem from these resources and subsequently post that the resource worked.

3. The third category of solved interactions was when the help-giver(s) were not aware of an exact solution to the problem but had previously identified a workaround. When the help-seeker was able to recreate these workarounds at his or her end, it was a
solved interaction. Some of the help-givers in these
cases were also help-seekers because they were saying,
“this does not work for me either, but this is the
workaround that I have found,” or “this is what works
for me.” This might not necessarily be the perfect
solution, but it gets the work done for the original
help-seeker. The next two sections of this paper
examine unsolved interactions and identify the reasons
for problems remaining unsolved.

4.2 Unsolved Interactions

The interactions in which suggestions to solve the
problem were provided by the community but
definitely did not solve the problem of the help-seeker
were coded as unsolved interactions. In these
interactions, a help-seeker posts that the proposed
solution did not work for him or her and that he or she
still has the problem. The help-seeker comes back and
confirms that the solution given by the community did
not work for him or her. In this dataset, 30% of the
interactions were coded as unsolved interactions. For
example, a typical scenario is as follows:

Help-Seeker Detailed Question
Help-Giver (providing suggestions): It could be ...
Help-Seeker i have re-downloaded and re-
installed
Help-Giver 2 (refers to external link):
See: http://kb.mozillazine.org/..
Help-Seeker That doesn't work either, have
rebooted .i've tried ...

In this case, the help-seeker provides the details of
a problem. The help-givers then offer options to try
and fix the problem. In this example, one help-giver
posts suggestions to solve the problem, while the
second help-giver refers to internal resources. The
help-seeker tries the options, comes back, and very
clearly mentions that none of the solutions work
for him or her. There are no messages after this message
from the help-seeker. All the unsolved interactions
were then analyzed for the reasons why the problem
was not being solved. In these 30% of unsolved
interactions, the reasons for the problem not being
solved are identified and explained below.

Characteristics of the Unsolved Interactions:

Multiple reasons for the failure of unsolved
interactions were documented during data analysis. In
total, 10 reasons were identified for unsolved problems.

1. The failure of the step-by-step instructions as
follows: a) The help-seeker cannot follow the
directions from the help-giver because the language
used is too technical for the help-seeker to be able to
execute the instructions.

Help-Seeker Question
Help-Giver Does you server serve the page
with the correct charset?

Help-Seeker um, I have absolutely no idea
what that means...

b) Sometimes, although the help-seeker
understands the steps, he or she is not able to carry
out the steps on his or her computer because of a
differing system configuration or some other computer
issue.

Help-Seeker Question
Help-Giver There is still the <meta
refresh> tag. . . . [Giver provides step-by-step
instructions]
Help-Seeker Actually STOP doesn't stop it.
So something else is causing it. Try it out -- you might like it! Or maybe not??

Even after carrying out the steps that the help-
giver has told them, the problem cannot be solved.
They try what was suggested and report back saying
that it did not solve their problem and that the solution
did not work.

2. A proposed workaround by the help-givers does
not solve the problem for the help-seeker; again, this
can be because of system specifications or any other
factor that influences the help-seeker’s computer.

Help-Seeker Question
Help-Giver just select open with
Utorrent,and make sure the use this
option every time is ticked ...
Help-Seeker well i save my torrents . . . .
so your way wont work. it just opens the
torrent in utorrent on my pc. how do i
get it to just open this window when i
click on a torrent to download.??

3. Identified Bug – When a user posts a question
about a problem and then later becomes aware that it is
a software bug, the interaction remains unsolved due
to being a problem with the software that may or may
not be solved in the future.

Help-Seeker ...Is there any way I can report
a bug about this extension?.

4. Solution Does Not Exist – Sometimes the user
wants a solution to something for which the solution
does not exist, meaning that the developers of Firefox
do not see it as a problem, and hence it is not solved.
This is the case when someone is asking for
functionality that Firefox does not provide.

5. Request for a New Feature - The developers
might accept the request or suggestion or they might
have deliberately avoided that functionality in the
software due to their preferences. Such interactions
end up being unsolved from the perspective of the
help-seeker.

Help Seeker I use only Firefox for all my
browsing for the past one year, ...Please
evaluate this and if already any
mechanism is there in Firefox, please
inform for all users' help.
6. Problem not Replicable by the Help-Givers – Sometimes the help-givers cannot replicate the problem in their environment and hence are not able to clarify the problem. In such cases, the help-seekers may need to provide more information as to their system configuration and problem details.

Help-Seeker On my website, there are certain pages where the menu links stop working . . .

Help-Giver hmm - it works fine with my firefox... maybe try to clear the browser cache (Tools -> Options -> Privacy -> Cache -> Clear)

7. In some cases, the interactions were unsolved because the problem was an identified problem with Firefox and was on the agenda for the developers to fix in the next version.

8. No Explanation - Sometimes the interactions remained unsolved because the help-givers provided a link to an Information Resource or Previous Thread as a solution but did not include any explanation for that resource or about the problem.

9. Failure of Internal Resource - The links to internal resources failed in many cases, and the reasons are discussed in detail in the next section.

10. Lack of Responses – These are the interactions where the discussion is left incomplete due to lack of response from the help-givers or the help-seekers. Examples for both kinds of lack of responses were available in the dataset and are discussed further in next section.

In summary, this section provides a list of reasons why problems were not solved in an online technical support community. One reason that is common to both the solved and unsolved interactions is the presence of internal resources – they succeed in some cases and fail in other cases. Based on this observation, further in-depth analysis of the internal resources and their utility and the results of that analysis are presented in section 4.4. The following section considers interactions that are neither solved nor unsolved.

4.3 Incomplete Interactions

Incomplete interactions are those where the interaction halts because of a lack of response from the help-seeker or the help-giver. About 20% of the interactions were labeled “Incomplete” as opposed to “Solved” or “Unsolved.” These interactions did not fall in the other two categories because it could not be determined by the interaction whether the solutions that were given had worked or whether more information was needed either by the-help seeker or by the help-giver.

Characteristics of the Incomplete Interactions: 6 reasons were identified for these interactions being incomplete and are listed below:

1. The interaction had a question, some responses, and a proposed solution, but the help-seeker never replied back to say whether it worked for him or her or if it did not work.

2. When the help-seeker posted a question, help-givers posted a response asking for more information about the problem or the help-seeker’s computer or software, but the help-seeker did not provide the answers.

3. The interaction had a question and a response, and then there are no responses from the help-giver(s).

4. Sometimes the interactions were stopped in the middle because the last message from the help-giver was a suggested solution and they said, “Try this and lets us know,” but the help-seeker never returned back to post any message on this interaction.

5. The help-givers were not able to recreate the problem at their end, so the help-seeker is the only one who is having that particular problem and the help-givers are not able to see what the problem is.

6. The last message of the interaction was a link to an internal resource, and the help-seeker never returned back to post any message indicating whether he or she used it or whether it worked.

These reasons show that the messages could be incomplete because of a lack of responses from the help-seeker or help-givers. Because this section also demonstrated that internal resources play a role in the success and failure of problem-solving, the next section presents the findings on how those resources contribute to those successes and/or failures.

4.4 Internal Resources

Internal resources are the resources that are present on the same website as the support and are developed by the members of the community. In this case, the Firefox developers and user groups became the foundation for Study 1. As above, internal resources include the documentation, Frequently Asked Questions, manuals, and Mozilla Firefox Wiki (also known as the knowledgebase for Firefox). These internal resources were referred to often multiple times in an interaction. The resources contain generalized issues and solutions to them and also information on basic operations like installation, downloads, upgrades, extension downloads, etc. In this dataset, it was observed that 33% of the interactions referred to internal resources. As presented earlier, internal resources occurred in all the three types of interactions. This led to an inquiry into the ways in which these resources are being used. This section demonstrates that these resources are created to be useful to help-seekers yet they still fail, sometimes. The next section discusses ways in which internal resources are used in
interactions and presents reasons for their failure to solve problems.

4.4.1 Uses of Internal Resources. Each instance of internal resource occurrence was coded for the reason the resource was being used. The following themes emerged from those reasons. The ways in which internal resources were used in this dataset can be organized into the following categories:

1. To Improve the Knowledge Level of Newbies – These are the instances when the help-givers give the link to the internal resources to orient the new users to the features and functionalities of Mozilla Firefox and also to give them a basic understanding of the state of the browser.

2. To explain concepts behind certain behavior of software – These are the instances when a new user is making a statement about the software and asking why it does something, and then the help-givers point him or her to the resource that explains the behavior and the rationale behind the behavior.

3. Link to Recent Versions and Information about Them – These again include basic information about the browser, what version is current, what it supports, and what improvements there are over the last version.

4. To Solve a Problem – These are the instances when the knowledgebase dealt with the exact same problem that the help-seeker was having. The knowledgebase articles are written by users who want to help others in solving these problems, so if a problem is being asked over and over again in the forums, they will discuss that in detail on the knowledgebase.

5. For Partial Steps of the Solution – In some instances, the problem faced by the user has to be solved at multiple levels, and a few steps of the solution process can be understood from the resources, while the rest the help-giver explains to the help-seeker.

6. Standard Diagnostics – As the name suggests, these are the tools for Firefox users to determine some basic issues with the browser. Running these standard diagnostics can take care of some issues with the software, and that is why they are referred to the users who are facing very simple problems.

7. Extended Information on Functionality – These are the extensions that can be added to the browser for extended functionality and they are also found in the internal resources of the website. Some of these extensions are user-developed and some are released by Firefox developers.

8. For Checking Their System – These are the resources that help the users to look at their own system and check for possible obstructions like firewalls or other security issues that might cause the Firefox browser to function unexpectedly.

Within the reasons for using internal resources, not all of the uses are successful, and themes were developed for the times internal resource use was not able to achieve or help move toward a solution. The following section provides a discussion and examples of these themes.

4.4.2 Reasons for Failure of Internal Resources

1. Too much information in the resource / knowledgebase – These are the instances when the resource like the manual, documentation, or knowledgebase becomes too large for the user, causing him or her to be overwhelmed and not know where to look for the information. Therefore, in these cases the reference to the resource is not useful and fails to meet the needs of the help-seeker.

2. The User Cannot Find the Relevant Part – This issue also deals with the size and wording of the resources, which can make it difficult for the help-seeker to find the piece of information that is relevant to him or her at that time.

Help-Seeker I had the 'script run time' increased to 20 a week . . . I just wish to know how it relates to solving this issue. Thanks!

Help-Giver Read this Knowledge Base article about that particular entry: http://kb.mozillazine.org/Dom.max_script_run_time

Help-Seeker Thanks for the Knowledge Base article. It is going to take me a while to finally get the 'a-ha' from it but I'll try!!

3. The solution in the knowledgebase is too Vague – Sometimes the problems of the help-seeker are so specific that the solution in the knowledgebase is too vague / general for his or her situation, and hence he or she needs a person who can guide him or her through for the specific problem rather than a general resource.

Help-Seeker Just installed quicknote and really happy about it. I have a few questions, though:....

2. Again using this customization feature, how can I put a faded picture as background?

Help-Giver Perhaps this page will help: http://quicknote.mozdev.org/help.html

Help-Seeker No, it doesn't because it gives some general info and I need specific advice...

4. The User Does Not Understand the Article – The language of the resource can be a hindrance to new users because it relies heavily on technical terms with which they might not be familiar (specifically if it
is a new Firefox user and the terms they are used to differ).

Help-Giver  Now and again it helps if you RTFM

Help-Seeker  Rather, it helps if the "FM" was developed thoroughly by programmers and carefully proofread and edited in accordance with the language that us "non-nerds" speak. This way, users who install Firefox have a user manual

5. Multiple internal resources are given for the same problem solution, and the user gets confused – This was found many times in the interactions when a help-giver just provides a long list of links to the internal resources which have further links. That just becomes too much information for the help-seeker who is just trying to fix a small problem and does not want to read too much documentation. Also, it is difficult for the user to choose the relevant links if he or she does not know anything about the knowledgebase.

6. They have already tried the solution in the knowledgebase (KB), and that does not work for them – These are the instances when the help-seeker has gotten the relevant link, read through it, understood it, and done what the article in KB suggests, but that solution still does not work. Doing what the article suggests does not resolve his or her problem.

Help-Seeker  Help Firefox is becoming Non-responsive 9/10 times, when I try and go to a downloads page it stalls so can someone help

Help-Giver  http://kb.mozillazine.org/Firefox_hangs

Help-Seeker  It still keeps Hanging even when I go help menu or try and co to download addons so PLEASE HELP

Help-Giver  Did you have tried safe mode (http://kb.mozillazine.org/Safe_Mode) or a new profile (http://kb.mozillazine.org/Profile_Manager) ? Can you give links to sites where FF hangs? . . .

Help-Seeker  I tried that and still it still hangs. . . . so I am forced to use Internet explore so please help.

Help-Giver  Sounds like your profile is corrupted  http://kb.mozillazine.org/What_do_I_do_if_my_profile_is_corrupted.3F

No More Messages

7. The help-seeker says it is not relevant to me, but the help-giver says the name of article is misleading and it will solve your problem – These are the instances when the help-seeker looks at the link and says that that is not what he or she is asking and that is not the problem, but the help-giver replies back saying this will solve the problem and the name of the article is misleading!

Help-Seeker  I upgraded to 1.5 . . . . Anyone having the same problem and can tell me why?

Help-Giver  Try: Hang Downloading Files (KB)

Help-Seeker  thanks for the link, but it does not have anything to do with my problem. . . . Any help with that?

Help-Giver  The name of that article is misleading: your problem can also be solved that way. . . . (there is even an article about crashing with that same solution: Crash Downloading Files (KB))

Help-Seeker  thanks a lot for the clarification. You are a star, your advice was spot on. . . .

In summary, Section 4 presents information on solved, unsolved, and incomplete problems as well as the use of internal resources within the Firefox communities. In Section 5, the related results from Study 2 are combined with Study 1 as confirmation of the findings from Study 1.

5.0 Related Results from Study 2

In the analysis of the Mozilla community, some very important aspects of the process of problem-solving have been identified. The aspects are summarized and analyzed from the findings across the various OSS communities from Study 2.

a) Study 1: Since support is one of the main critiques that comes forward in arguments against the adoption of open source software, this study showed that almost half (44%) of the problems are solved in these forums. Some of the remaining unsolved problems and incomplete problems might actually be solved problems but are not counted as solved because of a lack of evidence proving the same. Shown in the study is that the more detail a help-seeker provided and the more detailed or step-by-step directions were given to the help-seeker, the more problems were reported back as solved.

Study 2: It should be noted here that the respondents to this study overwhelmingly identified problem-solving as the primary reason for visiting the OSS forums. Over 70% of the respondents indicated that this was the case, thus confirming the literature. The respondents from across the communities also identified the need to provide details for questions as necessary for problem-solving within the forums. For example, one respondent wrote, “if you have an issue and you describe that issue really
well and if you provide supporting information like maybe a screenshot or something, then that gets a lot more attention then if you go out there and say, “doesn’t work, help me fix it.”

b) Study 1: Multiple reasons were identified as being responsible for the failure of a problem to be solved. Among them are the following:

- help-givers or the internal resource use jargon that is too technical for the help seekers,
- a lack of responses from help-givers as well as help-seekers,
- a lack of information about the system of the help-seeker and hence the failure to identify any type of solution.

Study 2: As reported in the comments by a forum member, “Ok, so a good question should be specific. It should give as much information as the user can. For instance, telling that a specific, for instance you know let’s say for example say this particular video card didn’t work. So then, I would like to know what video card, what model, what operator system they have installed, which version, which release, and what is the, what exactly is the problem? Is it like a black screen or a blue screen or is it— can you give me specific output for which— can you tell me about what a certain commands which would help me to understand the problem better.” This quote demonstrates the need for details about the help-seeker’s problem as well as the need for the response to fit the experience of the help-seeker. The lack of response to solve a problem was found in this respondent’s comment: “The most common problem is simply not getting a response to your question.”

c) Study 1: Some of the reasons for failure do not have anything to do with the help-seeker or the help-giver but more the decision of the software developers. These include fixing a known bug, fixing a problem, or adding a functionality in next version. These cases indicate the failure of the internal resource, either because the resource fails in its intended use or because the resource is not sufficient in itself but needs some contextual information that can only be provided by the experienced help-givers.

Study 2: While no specific comment was made by the forum participants as to the responsibilities of the software developers in answering certain questions, the forum members did note the speed that changes in technologies occur makes it difficult to keep documentation current. For example, a respondent wrote, “that forum learning is, IMHO (in my humble opinion), the hands-down best way to learn open-source software available, since it changes too fast for printed publications to keep up.”

d) Study 1: An in-depth look at the internal resources to determine if they are being successfully used was taken. Internal resources are very useful in increasing the knowledge level of help-seekers/newcomers as they provide background information on problems and versions and explanations of concepts. Internal resources also work as a solution or partial solution to the problems posted by help-seekers and can be reused by help-givers. Also, internal resources inform help-seekers about standard issues, problems, system requirements, and existing functionalities.

Study 2: Forum members reference the fact that Frequently Asked Questions (FAQs) as well as instructions for forum rules are available along with being able to search the forums for problems previously solved. “It is much along the same lines as a FAQ - frequently asked questions - listing. (which, of course, the new user should also read for rules and guidelines for posts, and "netiquette" - or online etiquette),” wrote one respondent. The internal resources of FAQs, rules, and previous posts then help a seeker interpret and find information. The resource of the previous posts also provides much support and solutions to problems: “forums are a better source of support then you know, even what a human could provide because there’s too many people out there already solved, you know just about every problem that I’ve ever had in 13 years of experience,” commented a interviewee.

c) Study 1: Analysis of the data from Study 1 also found that internal resources are useful in solving problems and can also be improved for better effectiveness. The findings about the failure of internal resources reveal that they suffer from some of the same reasons that more standardized documentation fails. Additionally, it was found that the presence of too many internal resources is sometimes confusing to help-seekers, newcomers, and end users because the abundance of resources can be overwhelming. Also, if help-givers provide multiple internal resources for a solution, then that is also confusing for the help-seeker. In both of these cases, the internal resource by itself is not as useful and needs human intervention to make it useful for the help-seeker. In the response to the problem, the help-giver can provide context and specific uses to make these internal resources understood and useful. The problems with internal resources associated with failure can be summarized as
the use of technical jargon, misleading names, and vague or general descriptions. These are the qualities associated with the actual internal resources that lead to failure.

Study 2: The respondents from across the OSS forums also commented on the need to not have duplicates in forum posts to help find things amid the myriad of posts. Examples of responses from forum participants include “Forums are becoming so massive that it becomes more difficult to find the BEST answer to a question” and “I don’t have time to skim 100 pages of forum replies with 30 answers per page.”

Within the forums, a good moderator to help manage the resources of the forum is needed. One respondent wrote, “One of the most helpful tools of a forum is the moderator.” Moderators are capable of reorganizing threads and keeping discussions on topic. Additionally, moderators may keep answers to common questions newcomers have trouble finding answers to. One moderator noted, “I have a library of 200 screenshots that I use to choose to illustrate points I’m trying to make.” Still other respondents noted the need for clarity of answers and the need to provide detailed responses. Additionally, one respondent pointed out that while one ten-step solution might work, as a help-giver if he can find a better solution he will post it. He wrote, “there have been times when I try to solve a problem and somebody published you know 10 steps on how to do it and after a little research I find that all you had to do was this one step. You know, so I’ll go back through and say “Hey guys, you know, this is a good post, but there’s another way of doing this and it’s a lot simpler and it doesn’t take nearly the amount of time or the configuration. And so here’s where I found this information.”

Lastly, the forum participants stressed the importance of good searching techniques to be able to find problem solutions. For example, a respondent wrote, “With the ever increasing number of questions and replies that are not answers (or are obsolete answers) I need ways to really fine-tune searches” and “the important topics can be hidden in deep links.”

I) Study 1: Then there is the last category where the solution just does not work for the help-seeker due to his or her specific system configuration, incorrect interpretation, or incorrect implementation of a solution. These can be broadly divided into problems due to the resources, problems due to help-giver, problems that cannot be fixed by help-givers, and problems due to specific situation of help-seeker.

Study 2: Again, while this study does not specifically address reasons as above, there is evidence of agreement here. In some cases, if an answer to a problem happens to be a new release and is unstable and not ready for release to the general public, instead of ignoring the question some developers may send a private message to a help-seeker. For example, one respondent wrote about a reason for using an instant message: “To exchange information, e.g. problem solutions, which might not yet be ready to be posted (e.g. unstable).”

Thus, through these examples, the more vertical findings were consistent with the information gathered from forum users and moderators.

6. Limitation of the study

The results of this study are limited by only one community being included with the 100 threads being analyzed. In spite of this limitation, corroborating data were provided from a separate study. With the studies combined, at the very least future research of these findings should be examined further to help improve the use of online forums.

7. Discussion and Conclusion

The presence of solved, unsolved and incomplete interactions in the communities is something that can be expected, even with the strict definition for solved interactions we found that 44% problems were solved in the Firefox forums, which shows why these forums are so active and useful. Fifty percent of the interactions that were analyzed were a combination of incomplete and unsolved interactions. The thirty percent interactions that were unsolved show the back and forth between the help seeker(s) and help giver (s). Despite the interactivity in the process, not all problems can be solved, sometimes the help seekers do not understand the solution or are not able to carry it out, while at other times there is no solution for a problem that they encountered or the help givers are not able to recreate the problem that the help seekers is having. These instances show the complexity of the process of helping and learning in online communities. Better tools can be integrated into such communities to help the process and make it easy for help givers and help seekers to understand each other as well as to recreate the problems. For example, forums can be designed to integrate image sharing in an easy way, so that screenshots and other images could be used for the forum participants. The incomplete interactions are the responses where the conversation stopped in the middle and can be explained by either, the user never
coming back to the forums or using the information and never posting that they used it or if it was useful or not.

Also, it was found that there is a large interest in the community to use the internal resources; the number of times internal resources are referred to by the help-givers suggests there is much useful material available to users. However, sometimes the internal resources fail to solve problems because of poor representation and availability to users. With better presentation styles of internal resource material, the load of problems posted on the forums might be reduced. Good searching techniques to enable information retrieval are vital. The use of a description with the resource may in turn reduce failure to find a solution to a problem. Other researchers have shown that threads as well as other resources are reused for the purpose of learning or solving a problem. The wiki repository in [8] shows more benefits because of decontextualized, distilled content for reuse, but in this research it is argued that these decontextualized resources need to be contextualized by the help-givers in order to make these resources useful.

These results are more in line with Ackerman and Halverson, who based their findings on an ethnographic study of telephone hotline workers and said that individuals must decontextualize and re-contextualize knowledge [1], a complex process that is best performed by those engaged in a familiar routine and with little time lapse [2]. In [10] the researchers found that the main problems with documentation from the perspective of software engineers were out of date documentation, too much documentation, poorly written documentation, the difficulty of finding the relevant part, and creation costs outweighing benefits. The study examined users of proprietary software and the documentation created by paid employees.

The results from open source software communities demonstrate similar results with the exception of the context added value that was found in the Firefox community. The combined data from Study 1 and Study 2 demonstrate that documentation, as necessary as it is for new and expert users, is sometimes not designed or created in the ways that are useful. In the open source software communities, internal resources provide a myriad of uses, many of which have proven successful. The primary distinction that can be seen between proprietary and OSS community documentation is that in open source communities, the wikis, knowledgebase, et c. are created by the users themselves to address actual problems found. Overall, the results imply that new ways of creating or designing better documentation are needed. Interactive tools that would enable users to a) reduce the jargon, b) eliminate out of date information, and c) make easy pathways to access these resources would be useful.

8. References