FREE AND OPEN SOURCE SOFTWARE COMMUNITIES AS A SUPPORT MECHANISM

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Abstract

Free and Open Source software (FOSS) as an ideology has always been intrinsically based around the concept of community. Within FOSS this community existed through, and to support the exchange of software code, ideas, opinions, advice and what could be loosely defined as knowledge. These communities exist online in the form of bulletin boards, chat rooms, mailing lists and discussion forums and are in most cases completely open to anyone who is interested.

Since FOSS began to receive widespread recognition these communities have flourished and have become extremely valuable portals to resources for many people involved with FOSS. These communities serve a variety of purposes and are highly complex interactive systems. One of their most important functions is to provide support and it is this function which is the focus of this paper. Members of a FOSS community need support on a variety of different issues from software development, to installation and the use of the software. Thus far, research in this area has acknowledged the existence of FOSS communities and to some extent charted how they may function as a development methodology. There has however been little research conducted into the communication structure of these communities and how they provide support to their members.

This paper analyses the structure and mechanics of FOSS communities from the support perspective. It will also study how the various elements of community support are perceived by its members. This is achieved by conducting case study analysis of FOSS communities and analysing their operation. Empirical research collected from interviews and surveys of community members is also analysed to provide a rich overview of FOSS community support from the general and individual member perspectives. The paper concludes by proposing a model of FOSS community support mechanisms. It is the intention of the paper to contribute to the understanding of FOSS communities, how they function, and their effectiveness, in the hope that it will assist in future development of this area.

Introduction

Free and Open Source software (FOSS) can not be considered a recent development in the Information Technology and Computer Science fields. In the early days of computer development there was no distinction between FOSS and any other sort of software. Software development was done in teams, often a number of connected teams between which flowed ideas, experience, suggestions, and bug fixes and other software fragments. It was not until the growth of the proprietary software industry that FOSS began to be seen as a separate development method. (Raymond 2000a; Stallman 1999).

Around this software being developed grew a community based around contribution to development and satisfying mutual software development needs. These communities later evolved to include provision for help and support to the users of the software after initial development. This element of community has endured throughout the lifetime of FOSS and is one it's most distinguishing features. It is argued by many (Hertel et al, 2003; Lakhani & Wolf, 2003; Moody 2001; Vixie 1999; Raymond 1999), that FOSS software is often of a higher quality than many of the alternative types of software. A frequently suggested reason for this is the participation of the self-selected, volunteer members of the FOSS community.

Due to the rapid growth and wide spread acceptance of the Internet, communities now in the virtual world, socialising, chatting or working together over the World Wide Web. In many cases, these people will probably never actually meet or speak in the physical world (cf. Gattiker 2001; Rheingold 2000). These virtual communities are facilitated by Information Communication Technology (ICT) deployment in the form of e-mailing lists, discussion boards, bulletin boards, chat rooms and online forums, all of which are based around the simple premise of many people communicating through a single point.

FOSS Community-based development projects usually start in a very similar way to other types of software development such as the techniques used in most proprietary software. In the case of proprietary software, applications are usually written by a small production team, and in the case of some small programs, by individual programmers. Due to the commercial nature of proprietary software, the development team works in isolation and must keep the design and development work secret from competitors. For different reasons, FOSS projects usually start in a similar way, with individuals or a small team working on the first stages of an application's development. Once a prototype is created however, the software is released into the FOSS community. Members of the community may then use the software with no restriction and at no cost, and subsequently may wish to participate with its development. This participation could be in the form of bug reports, fixes, modification suggestions and/or code development contributions. It is this focused co-development, usage support and the management of these interactions that is the topic for this paper.

The Community Elements of FOSS

Development Support Communities

Trends have demonstrated that a typical FOSS development model consists of the initial development by a core development team, the releasing of the initial version of the software into the community and a subsequent inter-communication of knowledge and code. Figure 1 presents a model of such as project described above.

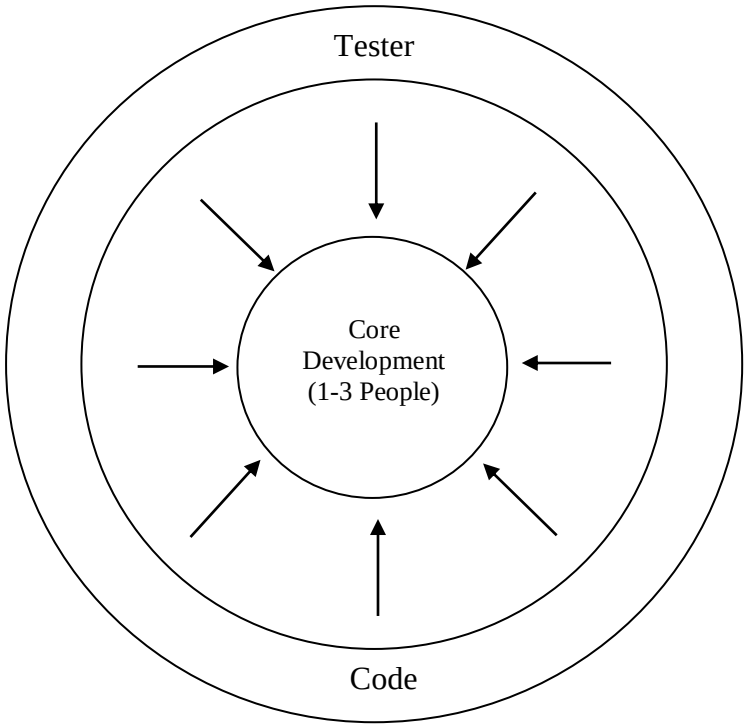

Figure 1: Typical community-based software development project

In the implementation of such a model, it is extremely rare for people within the outer community ring to communicate with each other directly in terms of actual code development and resource sharing. Instead the communications are almost always directed inwards towards the core development team. In this model, the core development team is the focal point of all communication. It is here that the project decisions are made and the progress and direction of the project is supervised. Communication consists of knowledge in the form of ideas and suggestion, tips for development etc. and also software code fragments intended as bug fixes or modifications that may be added to the master application at the core development team's discretion (Raymond 2000b; Pavlicek 2000). It is acknowledged that there are multiple understandings and definitions for the term knowledge. In this subject domain however, the term is used to describe the 'know how' of developers and users i.e. the information acquired by individuals on how to perform a certain tasks. Knowledge may be explicit, for example the command used to perform a function in an application, or tacit, for example manifesting itself inside a fragment of code reflecting the style of the developer.

User Support Communities

The role of the FOSS community is not exclusively in the area of development. Many communities exist to help people with the usage of software. These communities exist as the development communities in the form of electronic forums, e-mail, discussion boards etc. The difference between these community types is in the way they are structured. As there are no development activities there is consequently no core development team. Instead the mere existence of the forum, mailing list, discussion board or equivalent service, provides a focal point. This then acts a form of knowledge, resource and communication exchange hub. However as figure 2 demonstrates, communication is less directed and does not necessarily always flow through the central point.

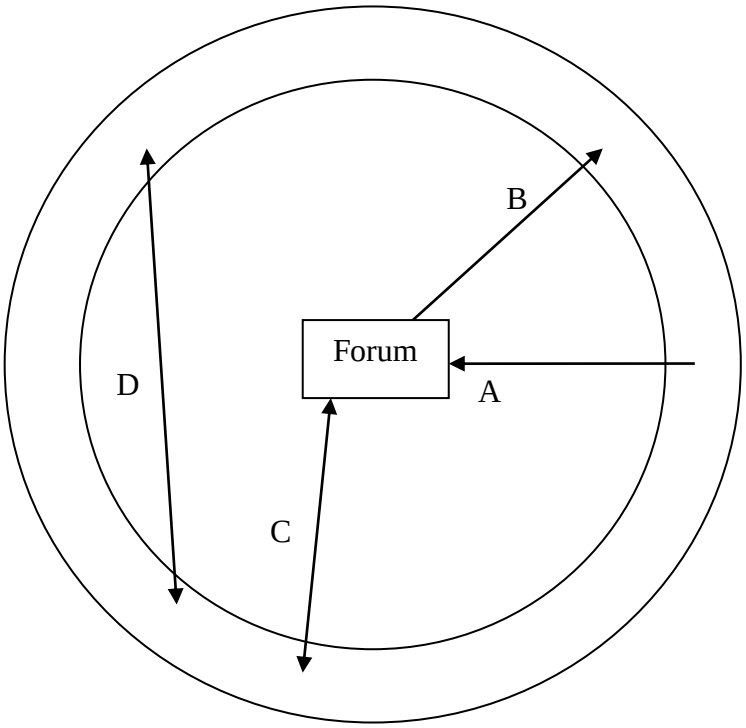

Figure 2: Typical community-based software support

Analysis of communication types

The lines marked by letters in figure 2 represent the different types of communication which take place in this model. The types are defined as:

[A]: Forum facilitated asynchronous push communication: Information, answers to questions, or questions themselves are posted by a community member to a forum, discussion board or bulletin board.

[B]: Forum facilitated asynchronous pull communication: Information is extracted from a forum, chat room, bulletin board by a user in the community. This maybe information previously submitted by another community member or that which has been generated by the forum itself.

[C]: Forum facilitated synchronous communication: Technologies such as chat rooms are used to allow members of the community to communicate in real time through the forum.

[D]: Forum independent communication: Members of the community communicate with each other directly. This may result from contact information acquired from the forum.

Through this brief analysis it is evident that the role of the central hub, is essential for these communities to exist. Where as the traditional definitions of community demonstrate people gathering around a specific geographic location or meeting at a designated point, FOSS communities seem to exist at specific points in the virtual world and still require a location at which to meet. At the very least some focal point for community is required for it to form and function properly. So far we have described two facets of FOSS communities, based on development and support activities. This does not necessarily mean however that the two types exist in isolation, in fact research has demonstrated quite the opposite. In almost all cases the focal point for FOSS communities is a piece of software itself. Figure 3 shows an abstract representation of communities existing around the application-based concept. It is intended to show these individual communities may overlap in their interactions and that some large-scale applications may have large communities with sub-communities within them.

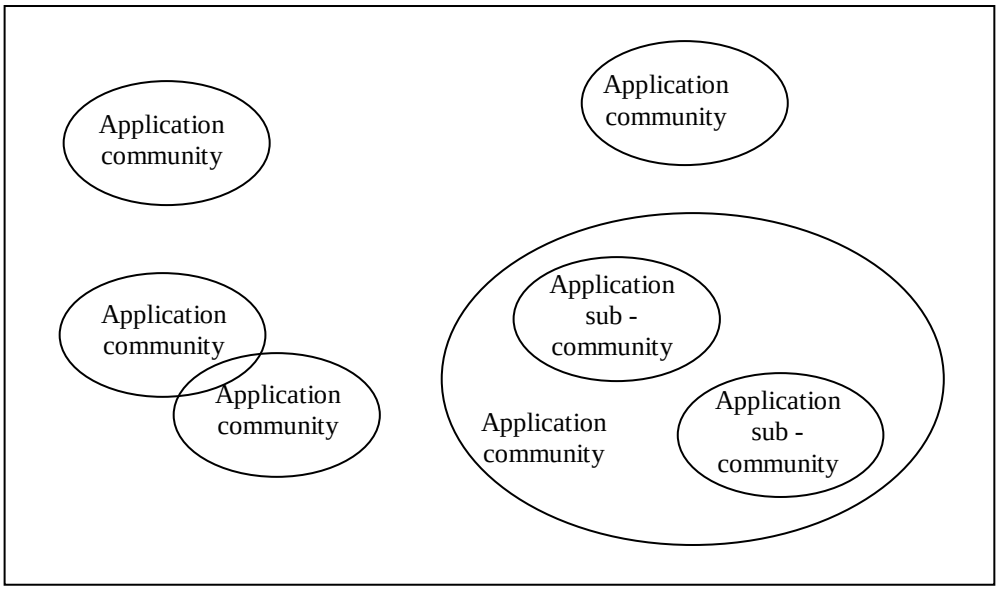

Figure 3: FOSS Community Relationships

FOSS communities intrinsically exist because of the software, therefore it is individual pieces of the software to which these communities attach themselves. It is suggested that support, in its various forms is one of the most important, if not *the* key driver behind FOSS community formation and continuation.

Communities as Support mechanisms

The vast majority of FOSS software is available for download from the Internet without charge. It was this very fact that motivated a group of the original 'free software' movement to break away and derive the term 'open source'. It was felt that the 'free software' description promoted an image that was not appealing to businesses and as such, would act as a deterrent to the adoption of the software for commercially based organisations (Perens, 1999). It is the opinion of many authors (Franklin, 2001; Lakhani & Wolf, 2003; Prasad, 2001; Proffitt, 2003; Pavlicek, 2000) that the real benefits of FOSS software is not that it is available free of charge but that it is flexible and versatile. Despite this, one of major concerns that many potential users have is that there is an insufficient amount of support available if they run into problems. In many cases this concern may not be fully justifiable, as more and more companies are starting to offer FOSS solutions and/or provide support for them. However, when given the choice between paying for FOSS systems and paying for proprietary systems, companies may choose proprietary solutions, simply because it is generally seen as the done thing.

There are conditions where no guaranteed support is provided. Organisations developing their own system in-house using FOSS applications and operating systems will have no contracts stipulating guaranteed maintenance. The same is true of many individuals and small groups of users making use of freely acquired FOSS applications. In these cases, the only alternatives are to outsource it from a support provider, or attempt to make use of the FOSS community as a support mechanism. (c.f. Fitzgerald & Kenny 2003). To explore the use of these communities, it is first necessary to demonstrate how this is accomplished. We have already seen that FOSS communities tend to be based around individual applications. Presented below are case studies of web sites providing a resource sharing and communication hubs for communities. Presented below are examples of some fairly well known applications as it is felt that these are a typical representation of the FOSS community.

Case Study Analysis

GNOME: The GNOME project is a desktop environment and development platform that is in widespread use, particularly with the Linux operating system. The project is of a significant size and under a constant state of development. The GNOME web site (www.gnome.org) provides many links detailing various aspects of the GNOME project and the organisation. There are two sections of the site that are particularly interesting, one concerned with the development of GNOME and one providing services for its users. These are treated as two distinct sections, have different functions and provide different services.

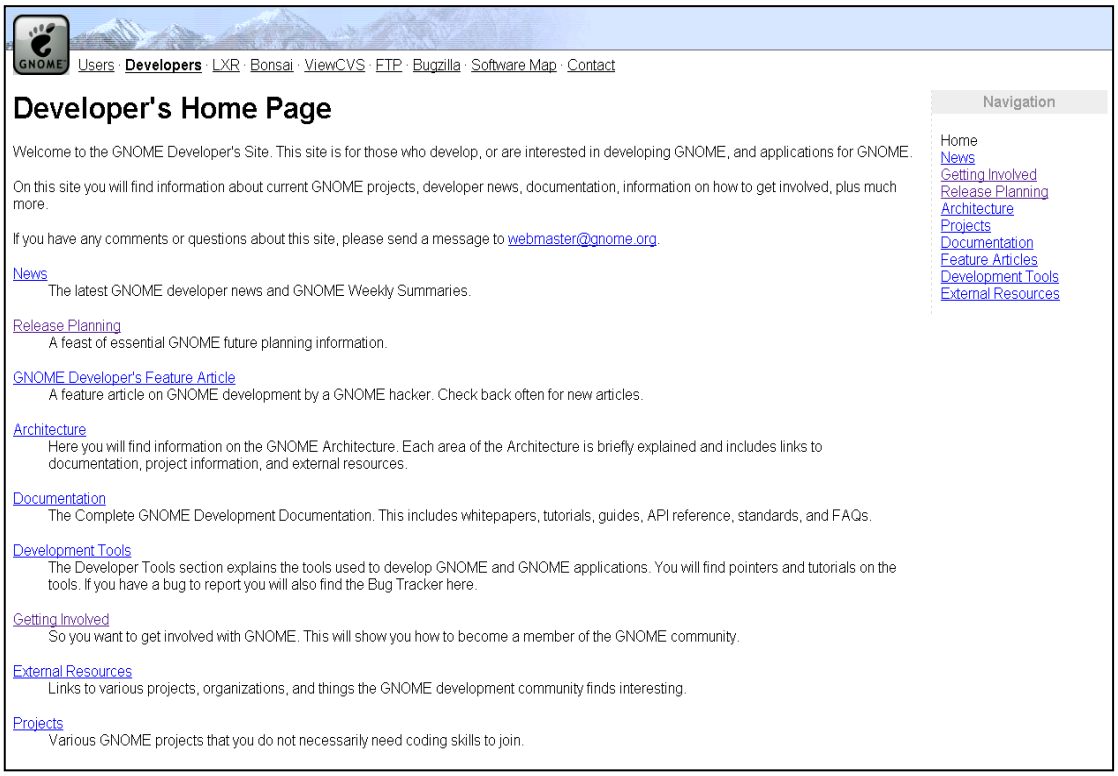

Figure 4: Gnome Development Area Source: http://developer.gnome.org/

Figure 4 shows the main page of the developers section of the GNOME web site. An analysis of the page demonstrates the kind of activities that development communities are involved in. The site as can been seen from Figure 4, includes section concerned with providing developers with information about the status of the various development sub-projects, information on how to contribute, development software and other software related information.

Further analysis of the site revealed that there was a significant of information regarding the different sections and phases of the project. Some of these sections included the use of mailing lists, in this case used as a technique of keeping people informed of sub-projects progress. All services and functions on the developer section of the site are mostly geared towards providing information in a push, rather than pull method. Community facilitation through resource sharing and communication services is provided only through the use of mailing lists, and through the use of the CVS (Concurrent Versions System), which is a tool used to manage the parallel development of a piece of software. Considering figure 1 of page 3, and viewing this GNOME developer web site as the central hub, this demonstrates that in the case of GNOME, most of the communication in the development community does indeed flow towards the hub in a unidirectional and predominantly asynchronous manner.

The mailing list directory (a sample of which is given in table 1 below) provides the web site visitor with the option of subscribing to a list, some of which are concerned with development as well as usage of the software. Again it is clear that a push technique is being employed here.

List	Description
balsa-list	Balsa email client
beast	Bedevilled Audio System
boston-social	discussions of social events in the Boston area
bugzilla-devel-list	Discussions about the local gnome.org Bugzilla code
calendar-list	gnomecal development
coaster-devel-list	Development list for Coaster
cvs-commits-list	CVS Logs
cvs-po-commits-list	CVS logs for PO file commits
Dashboard-hackers	*[no description available]*
desktop-devel-list	GNOME Desktop Development List
devel-announce-list	Developer-related announcements and information
Dia-list	discussions about usage and development of dia
divifund-list	Discussion of the Divifund personal finance project
Eog-list	Development of the Eye of Gnome application
epiphany-list	For developers and users of the Epiphany web browser
Eufoundation-list	List for discussing the European GNOME Foundation
Evince-list	*[no description available]*
F-spot-list	*[no description available]*
Fonts	Free fonts for open source systems
foundation-announce	Official GNOME Foundation announcements
foundation-list	Discussion relating to the GNOME Foundation

Table 1: Sample of GNOME mailing list directory

Source: http://mail.gnome.org/mailman/listinfo/

In comparison the GNOME user section is quite different containing links to mailing lists and discussion boards. The forum link provided in this section of the site leads to a menu that displays the available discussion forums by group, the two main groups being GNOME Help, and Discussion. Help contains sub groups providing support with using the desktop system, installing the GNOME software, help with individual applications, and general tips and tricks. The Discussion section, as well as providing the opportunity for users to socially interact, facilitates the discussion of future developments in a basic abstract style and provides help for those wishing to get involved in development activities.

The majority of this section however consists of the help forums. Table 2 below shows a sample of one of these discussions. It clearly shows the interactive nature of this type of forum.

Author	Message
****** Guest	Posted: Sun Feb 06, 2005 8:25 pm Post subject: Missing icons for one user only I'm running Fedora Core 2 (2.6.10-1,12_FC2) using the gnome desktop. The special desktop and file manager icons seem to be missing - all files and folders are represented by an icon that looks like a blank sheet of paper with one corner folded over. The start menu icons seem unaffected. This is for one user login only and started shortly after experimenting with VNC. I may have caused it when I incorrectly logged out of a VNC session by choosing "Log Out" from the panel menu rather than just closing the VNC window on the remote computer. The problem computer (VNC server) locked up at that point and I had to reboot it. Since then the icons have been missing when I log on locally. Oddly enough, when I VNC back into it, the icons are as they should be. So I figure the icons are there, but the mechanism that points to them was damaged. Can anyone tell me what configuration files I might have to repair to restore the icons for the local logon? **Back to top**
******* Guest	Posted: Sun Feb 06, 2005 11:38 pm Post subject: Shut down VNC service and icons came back After spending the entire afternoon trying to figure this out, I finally asked the question,"What's changed?'" The answer is that I now have the VNC server service set to run every time I boot the machine. The user profile with which I've been having trouble is set up to work with the VNC server in the file /etc/sysconfig/vncservers. Another file, ~/.vnc/xstartup, also has some configuration settings in it that pertain to the environment. I wondered what would happen if I shut down the VNC service. I ran the services control applet as root and shut down the VNC service and as soon as I did the icons popped up on the desktop. Looks like I'll either have to leave the service off or perhaps make some modifications to the xstartup configuration file. **Back to top**
****** Newbie Joined: 09 Jul 2004 Posts: 6	Posted: Mon Feb 07, 2005 3:42 pm Post subject: I'm having the same exact problem after a fresh install of Slack 10.1..... Let me know if you come up with anything. I get a window that pops up as soon as I hit the desktop stating that: The Gnome setting daemon has failed to start.. Blah, Blah, It has restarted too many times.. Blah. Some applications and setting may refuse to work properly, Blah.... Sucks..... **Back to top**

****
Newbie
 	
Joined: 09 Jul 2004
Posts: 6
	Posted: Sun Feb 20, 2005 6:29 pm Post subject:
	
	My problem was with a gstreamer plugin seg faulting on me. I removed it and everything works great now.
	
	Code:
	
	`cd /usr/lib/gstreamer-0.8`
	`mv libgstxine.so libgstxine.so.null`

Table 2: Sample of discussion from GNOME Project. Source: http://gnomesupport.org/forums/

This comes in sharp contrast to the development sections of the site which are dominated by mailing lists. Instead the discussion forums show the pattern of communication that is shown in figure 2 on page 4. Communication is bi-directional between users in the community although still passing through the central hub of the forum. Also in contrast is the fact that these discussions make use of a pull mechanism. Once created, the forums are passive and simply accept posts from external sources with no intervention from the hub or affiliated organisation.

OpenOffice.org: Open Office is one of the most popular FOSS office suites available. It is now included in many of the Linux distributions and is a large and well known project. The web site (www.openoffice.org), like GNOME, has a developer and user section. The web site's development areas are extremely complex and there is a great deal of information available to both potential and initiated developers. A large section of the material is geared towards giving developers the information they need to develop Open Office. This is in the form of tutorials, examples and software development tool downloads. There is a large list of sub-projects which also includes links to contacts and mailing lists. There is also information about using CVS and a "to do list". As with GNOME, all of this developer information uses push techniques such as the mailing lists used to keep developers informed of news. Broadly speaking, the developer section is a large library of information, software and links to services which allow developers to subscribe to mostly unidirectional and asynchronous communication facilities.

The other main section of the site is labelled "support". This is the user based section of the site and interestingly the word community appears many times on the main page. A knowledge base facility is available in the form of a sorted FAQ (Frequently Asked Questions) list. This allows users to find an answer to a question and solve their own problems without the need for any interactivity with other users. There is also a mailing list which in fact seems to act more as a general discussion board with people posting comments and others replying to the thread. In addition to this a separate section is provided entitles OpenOffice.org forum. This contains pre-defined threads on many different topics to which users are entitled to start discussion threads and post to existing ones. This is clearly a much more interactive section and again as with the GNOME example, makes use of pull rather than push technology.

One very interesting aspect of the OpenOffice forums is how they are organised into groups. In the developer section, each project is allocated its own mailing list. This in itself is forming a community around that particular project and suggests that communities which are based around software applications, also consist of sub-communities based around individual tasks and/or projects. It seems logical to conclude that these sub-communites have a relatively short life span and that once a particular project has ended, the community would break up and disperse into other areas.

Opinions on FOSS Communities: Empirical Research Analysis

Apart from the case study analysis shown above, interviews and surveys were conducted to gain an insight into the general perceptions and practices of FOSS users and developers. The interviews provided a rich qualitative view of the social dimensions of FOSS and how users and developers feel about FOSS communities as a support mechanism. It was felt that this should also be backed up with some more quantitatively based research on views and usage statistics. This was provided from the surveys. The sample set used for this research was the University of Salford Students' Union Linux Society (http://linsoc.ussu.salford.ac.uk). The members of this society have a complete mix of skills and experience with FOSS and so represent the general FOSS community quite well.

A point that came across from all the subjects examined was that they felt that there was a general feeling of community that was very strong in FOSS circles. However, many pointed out that these communities exist not just for FOSS software, but also for proprietary and other types of software. Nevertheless, those questioned perceived the FOSS community as a very useful resource which is easily accessible. Despite this attitude however, the research demonstrated that most people tended to go to the manuals to try and solve their problems before trying anything else. Help files, electronic manuals, books and online manuals were ranked as the most used support sources. Less popular were the discussion boards, mailing lists and forums making up the FOSS community on the Internet. Interestingly, the least popular form of support was that which came from direct contact with colleagues. This suggests that real-world communities are not perceived as being particularly useful in FOSS usage and development. The author's own experience however would suggest that this is a useful source of information and that physical interaction can be a source of inspiration as well as simple information. The results also indicate a trend that shows mailing lists as being more useful that discussion boards. There were many comments made during interviews about the fact that discussion board posts often receive no or few responses and that in the majority of cases, these responses were not ultimately useful.

It was clear from the study that in general, those questioned found application specific web resources much more useful than those claiming to provide general support. However a resource that was mentioned by many of the research subjects was SourceForge.net. The SourceForge website introduces itself as *"the world's largest Open Source software development website, with the largest repository of Open Source code and applications available on the Internet."* (www.sourceforge.net, 2005). What differentiates this site to many others is the way in which the information is organised. All support material is organised into sections by development project, each with its own information and resources usually including mailing lists and discussion forums as well as links to the projects homepage. Essentially the SourceForce site is a large database of development projects which again demonstrates the division of large development communities into smaller sub-communities and also the use of individual applications as anchor points for these groups

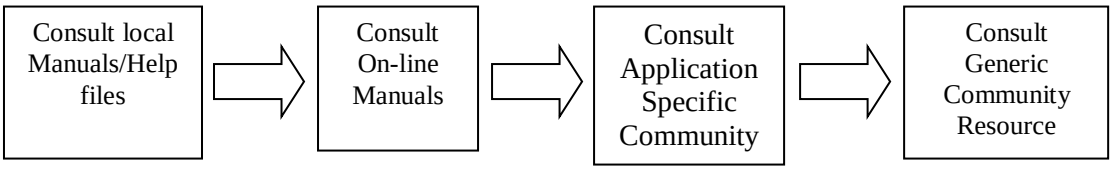

Figure 5: Steps to Support

Figure 5 shows the general steps towards support attainment as suggested by the results of this study. The research suggests that this model would seem to apply more to the users of FOSS software rather than its developers, however there will be similarities in the approach taken.

Community Support Model

The case studies, questionnaires and interviews conducted for this paper have revealed some interesting facts about how FOSS communities are structured and how they function as support mechanisms. The first important point is that FOSS communities are clearly divisible into two major groups, development communities and support communities. Secondly, it has been demonstrated that these two types of community function in very different ways in terms of their resource sharing and communication methods. Thirdly, despite these differences the crucial role of the central hub in FOSS communities has been identified and it has been recognized that

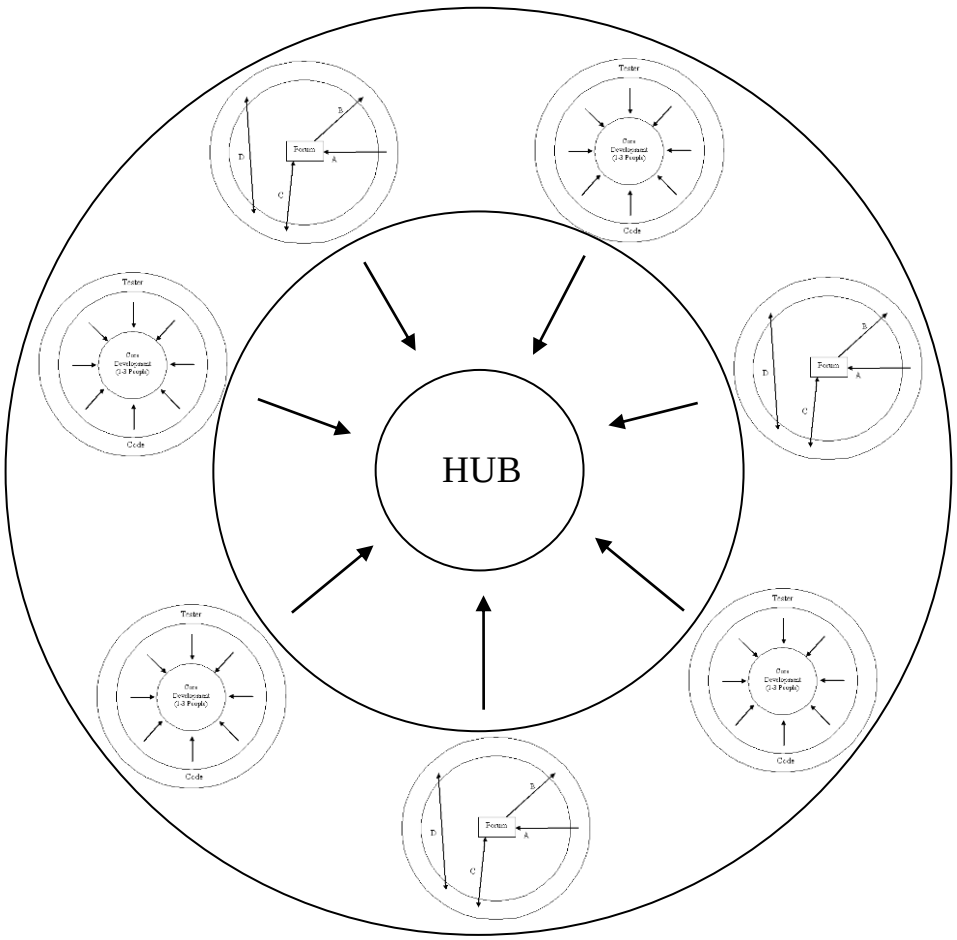

Figure 6: Abstract Representation of FOSS Community

this hub functions differently depending on whether it is used for development or user support purposes. Finally the concept of FOSS sub-communities has been defined. It has been established that FOSS communities gather around specific software resources. Within these groups are sub-groups that gather around specific elements of the software e.g. a development project working on a specific section of an application. Figure 6 above, depicts this model.

Conclusions

This paper has investigated the issue of support provision in FOSS communities. Using predominantly qualitative and some quantitative empirical data collection and analysis, along with case study research, the paper defines the various elements of FOSS support communities and combines them into a general classifications. It analyses the various types of communication techniques which are prevalent in the different community classifications and has proposed a model of FOSS community support structures.

Support for FOSS is a contentious issue in the IS world. Individuals, groups and organisations of all sizes are often apprehensive about using FOSS because they feel there is an insufficient amount of liability and responsibility in terms of assistance when things go wrong. The findings of this paper however suggest that there is an extensive amount of potential support available. Although FOSS communities may not be the first choice for some people it may simply be a transitional hurdle that needs to be jumped before the benefits become apparent.

As with all communities however, there is a cultural aspect which cannot be overlooked. FOSS communities, especially those designed to support development, are often tailored towards those who know what they're doing. This means that they may not be suitable for the uninitiated beginner who is unfortunately the most likely to need support.

In conclusion, the FOSS communities and their many sub-sections are an extremely large source of resources and knowledge which function as communication nodes to facilitate communal development and support. It seems likely that future development will elevate FOSS communities to a level where they can easily be accessed by all and could become just as viable support solution as the more traditional and currently relied on techniques.

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FOSS Resources

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HTTP://WWW.OPENOFFICE.ORG

HTTP://WWW.SOURCEFORGE.NET

HTTP://LINSOC.USSU.SALFORD.AC.UK