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# **Usability of a GNU/Linux Distribution from Novice User's Perspective**

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**Abstract:**

The term Open Source Software (OSS) has been around for a long time in the world of computer science. Open source software development is a process by which we can manufacture economical and qualitative software and its source could be re-use in the improvement of the software. The success of OSS relies on several factors, e.g. usability, functionality, market focus etc. But in the end how popular the software will be measured by the number of users downloading the software and how much the software is usable to the users. Open Source Software achieve the status for stability, security and functionality. Most of this software has been utilized by expert level users of IT. But from the general users or the non-computer user's point of view the usability issues of Open source software has been faced the most criticism [25, 26, 27, 28, 29, and 30]. This factor i.e. the usability issues of general user is also responsible for the limited distribution of the open source software [24]. The development process should apply the "user-centered" methodology [25, 26, 27, 28, 29, and 30]. In this thesis paper the issues of usability in OSS development and how the usability of open source software can be improved will be discussed. Beside this I investigate the usability quality of free Open Source Linux-based operating system Ubuntu and try to find out the usability standards of this OSS.

**Keywords:** Usability, Open Source Software (OSS), Ubuntu.

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## **Introduction:**

In recent years, Open Source software has made a comeback and, in the form of software like Linux, Mozilla Firefox, MySQL and PHP, it is more visible than ever [2]. Even if Open source communities have successfully developed a great deal of software but the usability problems in many OSS user interfaces are well documented [31, 32, 33, 1, and 34]. Therefore, usability is becoming a relevant topic of research in the OSS context, though it has not been inspected much at present. In a study on usability issues of OSS the researcher has found only seven published OSS papers dealing with usability and User Centered Design (UCD) but among those papers none of them give any clear definition of usability or UCD [53]. Though user involvement has been emphasized as an important element of OSS development but the distinction between user and developer is hazy. It is a common conception in OSS community is that “open source soft wares are created by engineers for engineers” and there is no feedback cycle with real users because there are a small number of usability experts taking part in OSS development [31]. Despite the technological successes, OSS development faces a number of fundamental challenges. OSS systems have been criticized for a severe lack of usability for non-technical users compared to commercial software [3, 25, 26, 27, 28, 29, and 30].

In this thesis paper the issues of usability in OSS development and how the usability of open source software can be improved will be discussed. I will provide a report by investigating the usability of open source Linux-based operating system Ubuntu and try to find out its usability bugs and provide solutions for those bugs.

Open Source Software achieve the status for stability, security and functionality, which astonish many people of the world of information technology. Most of this software has been utilized by expert level users of IT. But from the general users point of view the poor usability of Open source software has been faced the most criticism. This factor is also responsible for the low distribution of the open source software. So OSS (open source software) developers and community should improve this lack of usability issues.

This report is about practical usability testing which will be performed with the free open source operating system Ubuntu. Before the practical work literature study of publications related to the usability and open source software will be performed. From the literature study the author try to gather information of various usability problems in open source software and proposed solutions for that. For usability testing on Ubuntu, different usability test case will be prepared and based upon those test cases usability testing will be conducted.

This report is structured into number of chapters sequentially. They are:

**Chapter 1** is about the background of the topic

**Chapter 2** is about the problem definition, aims and goals of my research.

**Chapter 3** discusses the methodology of my study.

**Chapter 4** discusses the literature review and theoretical work

**Chapter 5** is regarding the empirical work of my study.

**Chapter 6** is about the result based on the experiments and interviews.

**Chapter 7** is about the discussion and analysis from the derived results of the experiment.

# Chapter 1: Background

## 1.1 Usability and "user-friendly"

According to ISO 9241-11, usability is “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.”[8]

The product that was firstly made is becoming more complicated when those are being used broadly. No product can reach the highest achievement until it makes the product according to the end users demand. People want to use services as much easy way as they can. So manufacturers are advertising the products or services as the level-“user-friendly”. Usability builds on the older idea of user friendliness [36]. To my understanding the term “user friendly” explained as whether or not a system is easy for the user to operate. According to Barrie Sherman [35] “User friendly means adapting parts of the system to the operator rather than the operator having to adjust and probably not managing to do so efficiently; that is why it is such a desirable quality to build in, a quality moreover which generally only needs to provide patience, commonsense, and sense of humanity.” In the definition of “user friendly” it does not mention a system should be effective and efficient for the task that is being performed. A system may have user friendly interface but it did not support specific task which the system made for but still the system can be said user friendly system because of its good interface. In contrast usability refers that a product or system will be useful for the task for it has been designed for. Thus usability is playing the important role.

## 1.2 Why usability in software development

Usability technique is applied in software development for various and important reasons. The main reason is to increase user efficiency and satisfaction and subsequently productivity. As a result usability techniques can help any software system to reach its goal. More over usability is an important issue for those users who have less time to spend in learning how the system works and for those users who are less computer literate. Usability help to support the user task, to meet the user needs. For a software development organization, failure to address usability can lead to a loss of market share with other competitors that release a product of higher usability. User should not be force to adapt to software with poor usability because it can negatively influence efficiency, effectiveness and satisfaction. From this discussion we can define the most important quality components or attributes of usability are as follows [11]:

- **Learnability:** Learnability is how easy it for users to learn the main system functionality and gain proficiency to complete the task. This is access by measuring the time a user spends to complete certain tasks in the time it would take an expert to complete the same tasks.
- **Efficiency:** This is measure by the number of tasks per unit of time that the user can perform using the system. The faster the user can perform the task and complete the job, the higher the system usability.

- **User retention over time:** this attribute is -when users return to design after a period of not using the system, how easily can they re-establish proficiency? This attribute reflects how easy and well the user can remember how the system works after a period of nonuse.
- **Error rate:** this attribute does refer to the system errors, it address how many errors user make, show severe are these errors and how easily can they recover from the errors? Errors reduce efficiency and user satisfaction and finally may be seen as a failure to communicate to the user in the right way to do things. The good the usability the low error rate.
- **Satisfaction:** how pleasant is it to use the system? This shows a users specific subjective impression of the system.

### 1.3 Open source software

Open source initiates from the term "Free Software". Here the word "Free" does not mean that the software is without cost. The word "free" in this context is about freedom – meaning the freedom to copy, modify and distribute the software [5]. The term "open source" software is used by some people to mean more or less the same thing as free software. However, their criteria are somewhat lax; they accept some license restrictions that considered too restrictive [6]. The term Open Source Software (OSS) basically means the availability of the source code and which doesn't prohibit commercial deviations of OSS. But FOSS clearly states that the software has to be available for free.

### 1.4 OSS Community

At present each OSS project has its own or several communities. A community of open source consists of communities of developers and everyone who uses OSS. It may happen that the users are inactive customer; by the term "inactive customer" we mean that the users do not actively contribute to the evolution of OSS. People who have a common interest in developing and using a particular piece of software make an individual open source community. These people are maintain their communication through email, forums and instant messaging in order to cooperate with each other on the software they are jointly using and suggest for the improvement for the software. Eric S. Raymond has described the OSS development approach abuses many of the well established ideas in software engineering [7]. He launched the thought of the "cathedral" and the "bazaar". He links the traditional, corporate, closed source methods to the "cathedral" model and the open source development process to the "bazaar" model.

### 1.5 Ubuntu

The word Ubuntu comes from an African word which means 'Humanity to others'. But in reality it is a community developed GNU/Linux-based operating system, which one can use in his laptop, desktops and servers. More about Ubuntu will be discuss on chapter 4 later.

## Chapter 2: Problem Definition and Goals

### 2.1 Problem Definition

A lot of effort has been given in arguing on the issues of lack of usability in Open source software. If we look on the internet we will see several forums, blogs, articles has been opened regarding this issue. Some argument says that bad usability is common for the OSS community [37, 31, 24, and 34]. For example Fred Sampson has commented about his opinion about the usability of Ubuntu like this way “even a Linux distribution that claims to pay special attention to usability—such as Ubuntu—is still a challenge even for reasonably knowledgeable users like me, for instance” [54]. On contrast others saying that the usability is good but the problem is that the user who using the OSS is expecting that every OSS should follow the usability trend that closed source software follow [1, 37]. For example Star Office spreadsheet component, Calc, tested against Microsoft Excel. It was intentionally developed to provide a similar interface in order to make transfer learning easier [32]. As a result it had to follow the interface design ideas of Excel regardless of whether or not they could have been improved upon.

In this thesis the author gives an effort to understand the usability issues of OSS community and the author research existing literatures and also some practical work. The author chooses Open Source Linux-based operating system Ubuntu 8.04 and test appropriate usability test cases among the novice user to judge the usability standards of this OSS. The main reason behind choosing novice user for the testing purpose is that it is very crucial for the novice user to adopt an alternative OSS system for use. Another reason is to carry out this testing with the novice user is that according to author’s knowledge there are not so many study document is available on usability evaluation on academic level on Ubuntu specially judging Ubuntu usability from the novice user’s perspective. For this reason the author makes an effort to conduct this study which helps the participants and other readers as well who wants to work with the usability of Ubuntu. After the usability testing to validate the usability test results the author take interviews from OSS developers who are actively working with OSS and to solve the usability problems of Ubuntu that I find during testing, reported to the Ubuntu bug reporting web site.

### 2.2 Challenges

During the study I tried to answer the following research questions:

- Does Open-Source Software fall down on usability?
- How can we improve the usability of open source software?
- How the novice user judge Ubuntu from the usability perspective?
- How usability features of Ubuntu can be improved for the novice users?

### 2.3 Expected Outcomes

The expected outcome of my thesis will be a report recommending the solution for better usability of open source software. Investigation of poor usability of open source software will be provided in this thesis, presumably useful for the open source developers and community.

The results of Ubuntu usability testing will also be provided with the report. In short the goals of my thesis are:

- Study the usability of Open Source Software.
- Find out the reasons for usability issues in OSS.
- Recommend some steps to improve the usability of OSS.
- Usability test on Ubuntu 8.04
- Bug reporting of Ubuntu to solve usability issues
- Structured interview
- Validate the usability of Ubuntu 8.04

## Chapter 3: Methodology

### 3.1 Research Methodology

According to B.Jhonson and L.Christensen there are three kinds of research methodology they are quantitative research, qualitative research, and mixed research [12]. In this thesis the author has chosen the mixed method research approach to perform different levels of task. In the preliminary stage a literature study was performed to know the definition of usability, HCI, importance of usability in FOSS, basic idea about Ubuntu, different method for usability testing and different kind of evolution process. After performing the literature study and gaining the proper knowledge the author designed usability test cases for usability testing on Ubuntu 8.04 and conducted the usability testing among 7 new users, these 7 participants are general students. For the usability testing the author chose the Think Aloud technique. The author has chosen the Think Aloud technique because of the following benefits of this technique

1. This technique engages participants use the system while incessantly thinking out loud [38].
2. Through this technique participants of the testing get an opportunity to express their judgment, from which it's easy to understand what the participants think about the specified system and what their major delusions about the system.[13]

In later stage of project work interview was taken among two different groups of people for validating the usability testing results. The first group was the experts of OSS community and the second group was the different levels of users of Ubuntu. The research methodology is present in a graphical format in figure-1.

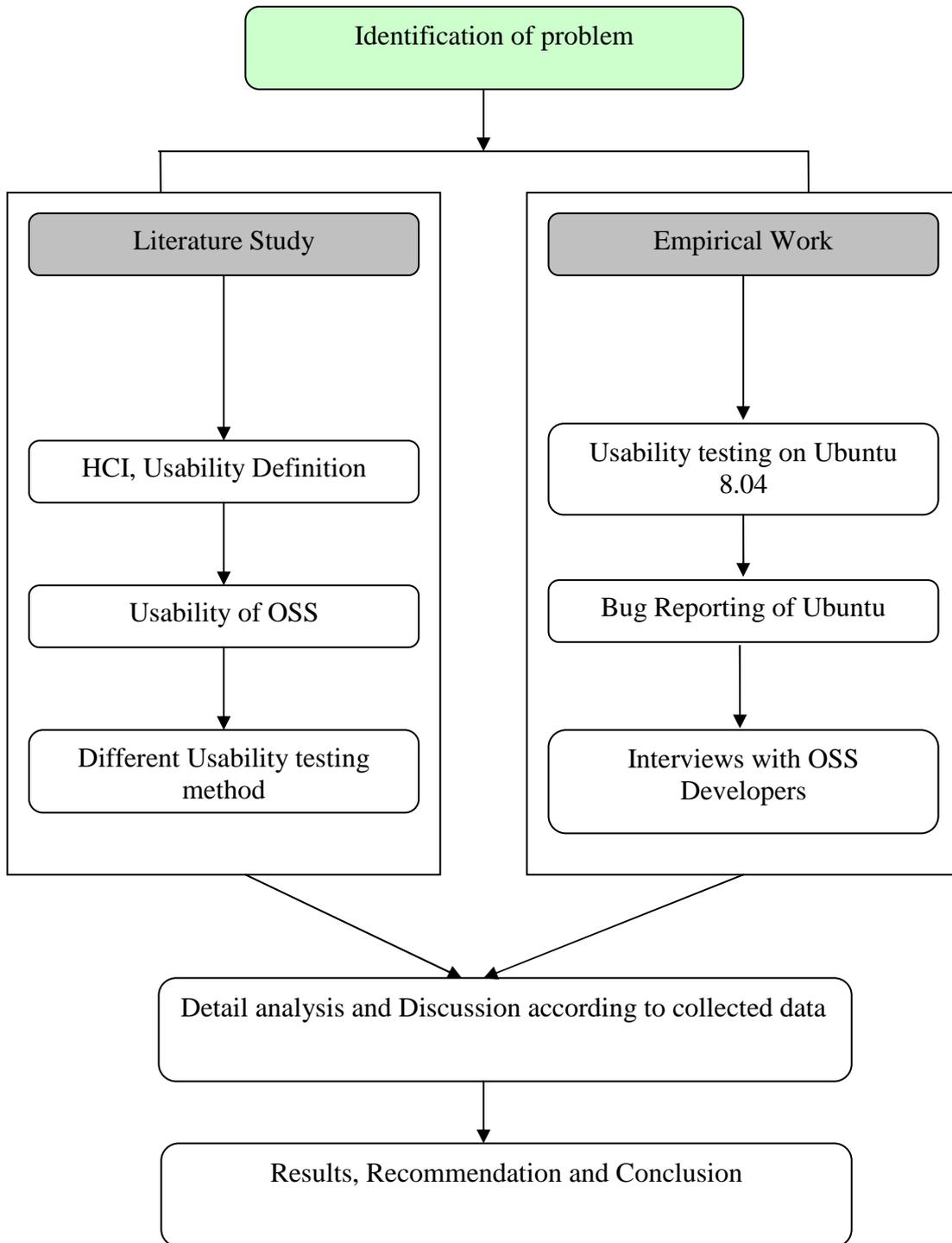


Figure: 1

### 3.2 Literature Study

As discussed earlier a literature study has been performed to gain proper knowledge about different terms like usability definition, HCI, importance of usability in F/OSS community etc. To perform this literature study the author adopts an organized

approach. The author has studied different books which are mainly borrowed through University libraries. The author retrieved books, journals, articles and research papers. All those journals, articles are taken from IEEE, ACM portal and other reliable sources. For searching those journals articles, eBooks the author used the most renowned search engines Google Scholar, BTH Electronic Library Information Navigator (ELIN), official Ubuntu web site and different other F/OSS portals.

### **3.3 Conducting Usability Testing**

After the literature study the author conducted a usability test to judge the usability level of Ubuntu 8.04. The author chooses Ubuntu 8.04 because this was the latest version available when the author was start working with his thesis. Another reason of choosing Ubuntu was that it was the most popular GNU/Linux distribution at that time [55].

For the testing with Ubuntu the author has designed 7 usability test cases. In the usability testing 7 new user of Ubuntu were participated. Think aloud technique was selected for the testing. The author performs the role of an observer during the testing. The participant's time spent on each task, success/error rate of each task and other data are collected by the author during the testing.

### **3.4 Preparing for interview**

After performing the usability testing the author take interview from the developers of OSS community. Both Questionnaires and interviews are very functional techniques for studying how user use systems and what they like or dislike about the system [13]. For the interview purpose the author choose open-ended question format. Because open-ended question enables participants to react in which way they fill comfort. Open-ended questions take into the natural language and worlds of our research participants and therefore open-ended questions provide primarily qualitative data [12]. The question was designed into two segments, the first segment contains question regarding the Usability issues of OSS community and the other part is based on the usability testing.

### **3.5 Conducting Interview**

The author has taken interviews of two developers from OSS community for validating his testing on Ubuntu and investigating the usability issues of OSS. The first interviewee was Mr. Henrik Sandklef who is currently working as a teacher at IT University of Goteborg, Sweden. Beside this he works for Free Software Foundation Europe (FSFE) and GNU projects. He involves in developing free open source software like GNU Xnee (recorder/re-player, sniffer, event distributor for X Window System which is part of the GNU project) and Swinput (Linux module to fake mouse and keyboard through software) [56]. The second interviewee was Mr. Andreas Nilsson who is a free lancer illustrator and icon designer. He involves in several OSS software like designing gnome-icon-theme and various icons for different GNOME sub projects like Epiphany, Gossip, Evince, Last-exit etc [57]. The interview was made face to face and through emails. Beside this the author conducts informal discussions, meetings with those developers.

## **Chapter 4: Theoretical Work**

### **4.1 Definition of HCI**

Human Computer Interaction (HCI) came into view as a field of research that task is to study the interaction between the user and computer technology. It is a very vast field which cover different subject with different matters related with computer development. In computer science it is concerned mainly with designing of different computer application and engineering the graphical user interface (GUI). It combines both embedded systems as well as desktop systems. HCI is the interaction between one or more humans and one or more computational machines [14]. One key factor of HCI is that different users form different ideas about their interactions and they have different ways of learning and keeping knowledge and skills. Beside this national and cultural differences play a vital role as well. Another thing about designing HCI is that UI technology changes very quickly over time, so offering new possibilities of interactions on which previous research findings may not apply.

### **4.2 Summary from different usability definitions**

In figure-2 the author has summarize the definition of usability described by Nielsen, Preece et al and ISO. In this segment the author will discuss which usability attributes are the most important from the author's point of view. Beside this the author discuss about the similarities and differences among the definitions of usability.

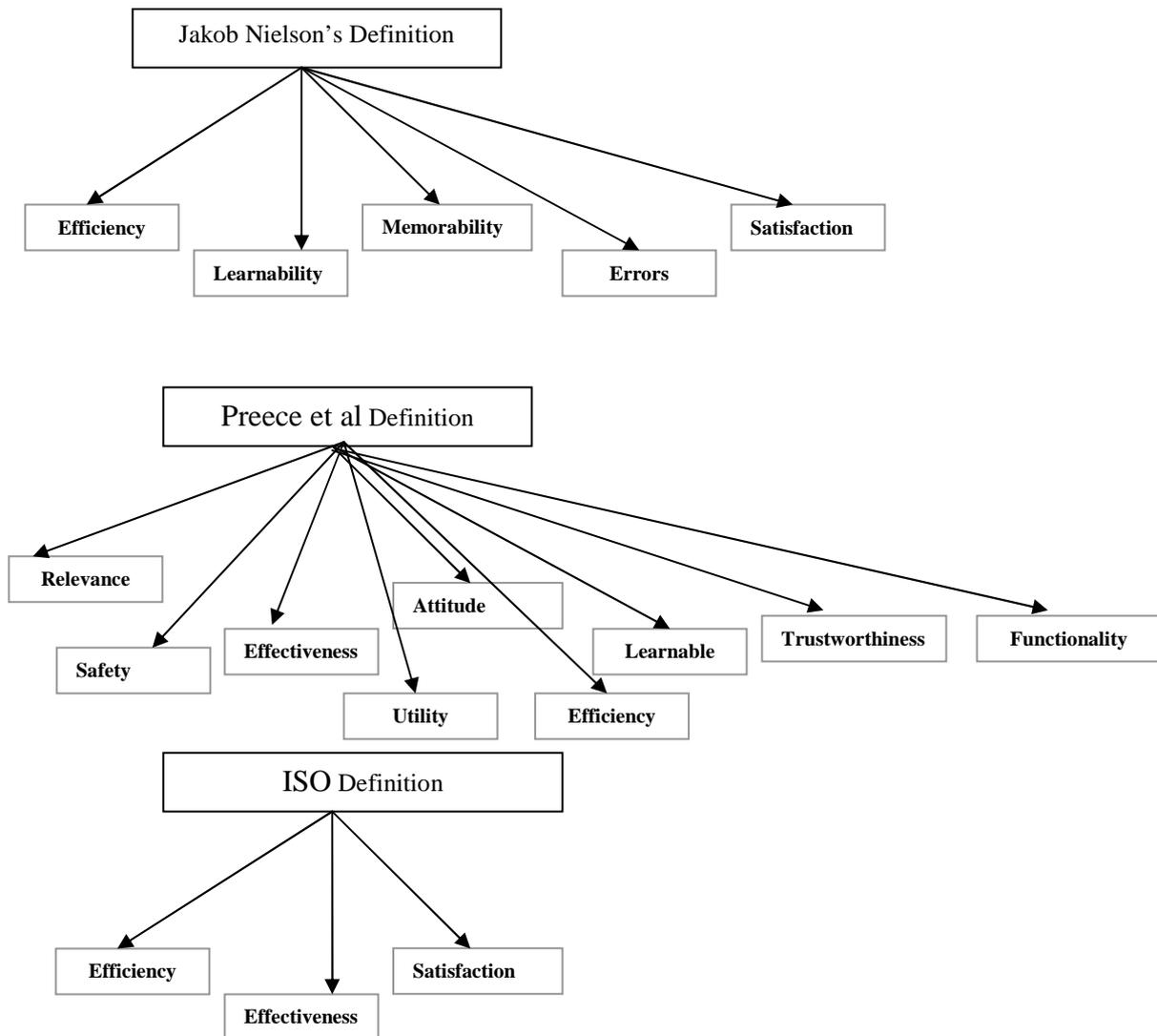


Figure: 2

After studying several definition of usability by Nielsen, Preece and ISO (see figure no 2) that is discussed in the above figure the author noticed that the attributes of usability are in the similar name or in different name but they have the similar definitions. For an example the attribute satisfaction defined by Nielsen and ISO standard, both definition deals with the user understanding of the system. The attribute error defined by Nielsen is the same attribute as Preece's et al. safety because in both the attributes they mean the system should minimize the error that a user could make. On the other hand it's also true that the term usability is also used with different meanings and that's why it is very much confusing for the software developers. As a software quality attribute, usability has not been defined consistently by either the researchers and the standardization organizations or the software development industry. [40] Different views and aspect of usability has made different definitions by several researchers and usability experts but unfortunately each group developed its own model without inputs from other groups. For that reason different terms are used to refer to the same usability characteristics, or different terms are randomly used to define similar characteristics. For example, "learnability" is defined in ISO 9241-11 as a simple sub-attribute of "time of learning," whereas ISO 9126

defines it as an independent quality factor that can be decomposed into several attributes such as comprehensible input and output, instruction and message readiness. [40] So it is really hard for the software developer to treat usability without having an ideal standard of it.

From the author's point of view the term "Usability" is combination of efficiency, effectiveness and satisfaction. Though there are many other attributes exist for usability but the above mentioned attributes are must. From the authors point of view other attributes of usability that are defined above are mainly depend on this three attributes because if user find a system effective, efficient and satisfactory it will automatically reduce the error rate, increase the user's learnability and memorability because if the user's find the system satisfactory to use then they will learn and memorize the system quickly. In this thesis I have tried with the help of usability testing on Ubuntu 8.04 and taking interview with developers from OSS community to judge those above mentioned three attributes of usability.

### **4.3 Free/Open Source Software**

The concept of Open Source Software and Free Open Source Software has the same meanings in some extents but they have some difference in basics. OSS focuses more on realistic matters of generating and distributing software with no political allegations in contrast FOSS highlights on freedom and privileges of the user-developer. So it can be concluded that the dissimilarity or equality of the two depends on the context

According to the definition OSS software distributed with free/open source licenses. That's why it is very essential to give a short outline of the OSS licenses. There are basically two types of licenses exist for OSS. They are

**GNU General Public license (GPL):** It is a "copyleft" license for soft wares which means that the license has the authority to modify copy and redistributes any copied version, under the same GPL license. [17]

**Berkeley Software Distribution (BSD) license:** This license is little flexible than GPL in terms of distribution. The main criteria are for this license is that the name of the original author must be used in the documentation and the time when the program is used had to be mentioned [18]. Publishing under another license and modified versions are also allowed in this license [18].

### **4.4 Importance of usability in Open Source Software**

There are some usability concerns that are typical for OSS. In this segment the author will discuss about the importance of usability in open source software. Why we give importance about usability in Open Source Software? The answer is that at present the open source software is used by the general user. It is no more the software written for the computer-adepts to computer-adepts. So when the factor of general user comes in the scenario then the usability factor must be considered in OSS.

The main barrier for escalating the focus on users in OSS development is that the greater parts of contributors are software developers with a strong programming background that's why they do not understand the problems of general users [51]. Another study shows that lack of usability expertise and resources are the key problem for the usability issues in OSS community [46]. Eric Raymond one of the pioneer in the OSS society has also commented in the same issue "OSS community needs a big player with a lot of money, which is doing systematic user interface end user testing. We're not very good at that yet; we need to find a way to be good at it" [52]. It was found in the survey (by

Morten Sieker Andreasen, Henrik Villemann Nielsen, Simon Ormholt Schrøder, Jan Stage) that the OSS contributors are very young in age most of them are between 19 and 40 and the contributors to OSS are highly ideological. In that survey they find the main motivation for contributing to OSS both developers and usability experts are ideology. [19]

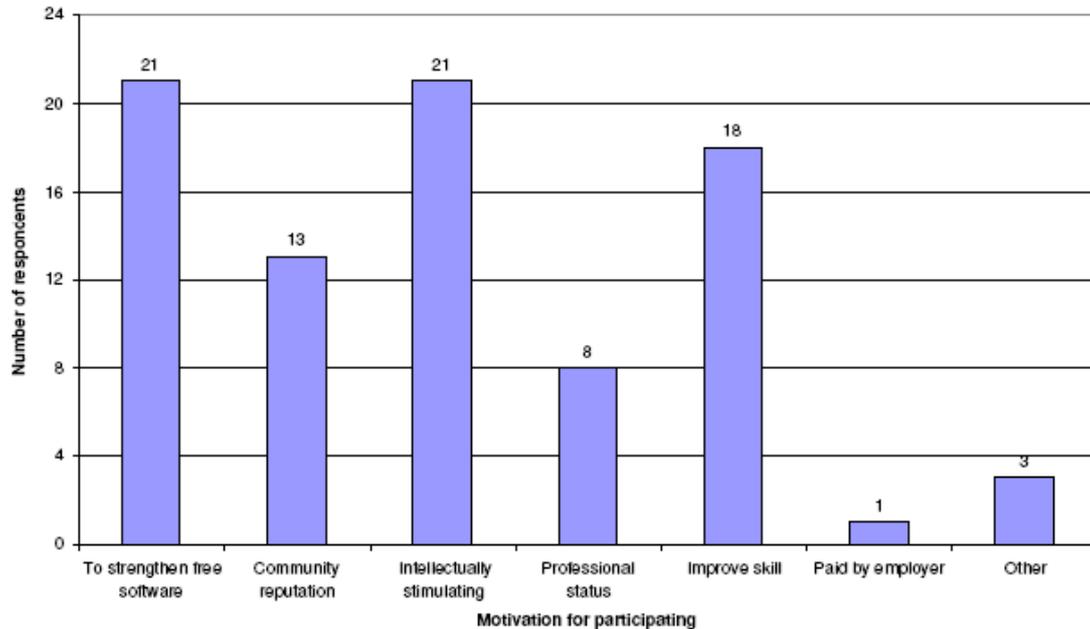


Figure-3

Figure-3 shows that 88% of the developers chose ‘To strengthen free soft-ware’ as their motivation, and 54% of them chose ‘Community reputation’ as a motivation. Contributors to OSS want challenges. 75% of the developers contribute to OSS in order to improve their skills and 88% wanted to be intellectually stimulated. [19]. Now I focus on what the contributors of the OSS think about Usability and involving the usability experts to their projects. Till now many investigation has done about the hybrid form of developing and implementing OSS software and recognized several key issues determining the group effort among developers in a community and defined success measures of OSS projects[48,49] but none of them consider the usability experts participation in OSS development. Lack of HCI experts have always been a delaying factor of usability paradigm in F/OSS projects and the reason why usability experts face problems while taking an active part in F/OSS development can be identified below [46]:

1. With usability experts taking an active part in the project, the time-to-market is slowed down.
  2. A developer should cope with other roles – now he is not the only decision maker.
  3. The developer without knowing its user base assumes that the requirements for the new application are the same as the requirements in all other applications.
  4. The necessity of a user interface developer is questioned after introduction, adoption and exploitation of interface design software by non-designers.
- Most OSS contributors wanted a higher degree of usability in their software; they were hesitant to include usability experts directly in the development process. OSS contributors clearly stated that they were afraid that direct involvement of a usability

expert, especially in decision making, would take precedence the democratic nature of OSS development. [19]

From the above discussion it is identified that there are several reasons responsible for lack of usability in open source software. The first reason is that the contributors of OSS community are coming from strong programming background that's why they did not understand the general user's requirement. The second reason is the lack of usability experts in OSS community, though the developers of OSS community want to achieve higher degree of usability in their projects but they are not welcoming them because they are scared to lose their self ruled nature in the case of decision making. The third reason is lack of resources OSS development. Except some of the big companies like IBM, Sun Microsystems, Canonical etc. can only effort a big budget on usability issue for their projects. But other small OSS projects can't effort such a big budget only for usability purpose. Since Open Source Software is used more extensively usability is becoming an increasingly significant part. The focus now required to transfer more towards user interface consistency and bringing usability experts into Open Source.

#### **4.5 Overview of Ubuntu**

In this thesis the author tested 7 appropriate usability test cases on Ubuntu 8.04 to find out the usability quality of Ubuntu. In this segment the author will discuss about Ubuntu.

The word Ubuntu comes from Zulu word "Ubuntu", which means "I am what I am because of who we all are". [20] In the OSS community Ubuntu is a well known community developed operating system [20]. Its goal is to offer general user an up to date, steady operating system with a strong focus on usability. In 2007 Ubuntu has been rated as the most popular Linux distribution for the desktop, 30.3% of Linux user use Ubuntu as their main operating system. [21]

Ubuntu is the combination of various free and open source soft wares and it is distributed under GNU GPL license, that's why the users are allowed to copy, run, and change for the improvement of the software. Ubuntu is owned by Canonical Ltd. Since Ubuntu is free open source software so Canonical generates revenue by selling technical support.

#### **4.6 Usability testing procedure**

The author has performed usability testing of Ubuntu 8.04 on novice users of Linux to judge the usability standard of this OSS. According to J. Nielsen there are three kinds of usability evolution method exists they are Usability testing, Usability inspection and Usability inquiry. The main intention of the usability evolution is to test a product and to know how a user fills when he or she interacts with it. Since testing involves real time communications of users with a specific system that's why usability testing is used to evaluate the Usability of Ubuntu in this study.

For designing the test cases the author install Ubuntu 8.04 in his personal laptop. The author tries to design the test cases as simple as possible because the participants are all novice level users of Linux. After that for designing appropriate test cases the author started use the built in application of Ubuntu and take notes where the author find himself problematic to use the application. Since the author is also a novice user on Linux platform that's why whatever problem the author faces is also the problem for other novice users. Beside this the author also studied Ubuntu Forum, Ubuntu

brain storming web site and many other sites for finding out the problems that the novice user is facing. After this the author has finally designed 7 test cases. At first the author tries alone with those 7 test cases and calculates the total and average time. The author takes 123.5 minutes in total to finish with all the tasks and the average time was 17.64 minutes. The author feels that the timing of those tasks are reasonable and the author can perform the testing with other participants around the time frame then he goes for the final usability testing.

#### **4.7 Think Aloud Protocol**

For the usability evolution purposes there are many procedures exist but among them the Think Aloud technique is widely used and it is very effective too [22]. This technique was first use by Ericsson and Simon in 1984 as a psychological research method [42, 23]. But after that this technique is progressively more used for practical evaluation for human-computer interfaces [23]. In think aloud technique the participants are asked to perform several tasks with a given system and express their thoughts and from this interaction it's possible to identify the success and failure of the user's. Not only the users misunderstanding but also the lacking of the system can also be identified by think aloud technique. This technique has some advantages and some drawbacks as well. The major drawback of this method is that it does not lend itself very well to most types of performance measurement [13]. On the other hand the advantage of this procedure is that qualitative data can be collected with a small number of user's and the way of expression the participants use in the testing that include into the products designing and into documentation for improvements [41, 13]. Because of this opportunity the author choose this method for the usability testing of Ubuntu 8.04.

## Chapter 5: Empirical Work

### 5.1 Usability testing on Ubuntu 8.04

To evaluate the usability issues of Free Open source software the author did usability test on the GNU/Linux based operating system Ubuntu 8.04. For this test 7 appropriate usability test cases has been designed and it has been tested among 7 participants. Actually the author has find out and described 9 usability problems of Ubuntu 8.04 where 7 of them was tested with the usability testing and other 2 problems are faced by the author when he was using Ubuntu for his routine work. This usability testing is done in different kind of personal laptops with Ubuntu 8.04 installed with its default setting i.e. no extra package or components were installed. All the test cases are designed for the novice level of users, that's why the task that are selected for the usability testing are very simple and no expertise knowledge is needed to accomplish those task. From this testing I try to find out the lacking of usability of the components of Ubuntu 8.04 and in some cases I also propose some suggestion on how to improve those components. To solve the problems of Ubuntu the author reported in Ubuntu bug reporting web site. About bug reporting we discuss in details in this chapter.

### 5.2 Participant's description and selection Procedure

The participants for the usability tests are students. Some of them are doing masters and some of them are doing their bachelor degree. Among the 7 participants 1 is female and rests of the 6 are male. These 7 participants have good knowledge in operating system like Windows XP, Vista but none of them are experience user in Ubuntu operating system. These 7 participants are very interested to participate in this usability test and learn a new operating system Ubuntu. Author give a practical overview on Ubuntu by running it one of the laptop to the participant so that they could have an idea of Ubuntu. After that the author discussed about the Think Aloud protocol technique and what is the purpose of this usability testing to each participants.

### 5.3 Testing environment and Testing Equipment

The testing has been done at Chalmers University, Goteborg because the author and all the participants are from Goteborg. The author fixed a study room of Chalmers University where the other participants are invited. The author provided 2 laptops and rest of the 5 laptop are from the participants personal laptop. The author installed Ubuntu 8.04 in each machine; it takes near about 1.5 hour. During that time the participants are provided the Usability test cases which they have to perform. The laptops that are used during the testing are described below with their technical specification

Name	Technical Specification
HP Dv600 (3 Laptops)	Pentium Dual Core, 1GB Ram, 120 GB HDD
Toshiba	Intel Pentium Celeron, 512 MB Ram, 120 GB HDD

ThinkPad X61s ( 2 Laptops)	Intel Pentium Core 2 Duo,2 GB Ram, 120 GB HDD
Dell	Intel Centrino, 1 GB Ram, 80 GB HDD.

#### 5.4 Description of Usability Test Cases

There are total 7 usability test cases that are performed among the 7 participants. Another thesis has been done by another student of BTH earlier where usability testing with Ubuntu has been done [43]. In that thesis they have tried 6 usability test cases with Ubuntu.

In this thesis the author has designed 7 new usability test cases and after conducting the usability testing I try to find out the bugs among them. The author founded three bugs and reported them to the bug reporting site of Ubuntu. The usability test cases are described below.

**Usability Test Case 1:** In this test we provide mixed content CD to each participant. The CD contained some audio files in .mp3 format and some text file and video files and the participants asked to access the audio file and the data parts.

**Usability Test Case 2:** In this test the participant asked to play audio files with the help of Ubuntu default music player Rhythmbox in .mp3 format. The .mp3 audio files are provided by the author.

**Usability Test Case 3:** In this test the participants are asked to attach an external monitor with their laptop and then the participant should activate the external monitor while the laptop's LCD monitor is deactivated.

**Usability Test Case 4:** In this testing we ask the participants to find some file from the hard drive with the help of Ubuntu's application "Tracker".

**Usability Test Case 5:** In this test participants are asked to login in Yahoo, MSN and Google talk with the "Pidgin Instant Messenger".

**Usability Test Case 6:** In the sixth test the participants are asked to take the screen shot of the desktop and save it in the hard drive.

**Usability Test Case 7:** Draw a picture using the image editing software of Ubuntu and save it in at least two different formats.

#### 5.5 Conducting Usability Test

The testing was done in a quite environment of Chalmers University. The participants were present at the testing place on scheduled time. Before starting the usability testing the author discuss about the usability test case and give a short description and some fundamental points about Ubuntu. Then the author describes the Think Aloud technique to the participants. When the author feels that every participant understand their usability task and they understand the Think aloud protocol then author go for the usability testing. During the testing the author act as an observer and no help is provided to the participants. The author collected data of participant's successful/unsuccessful task, time spent on each task and participant's opinion and suggestion about Ubuntu. The author marks a task successfully complete when a

participant done it without any help or with little hints from the author. On the other hand if the participants have done a task with the authors help or he quite his task in middle then that task is marked as incomplete by the author.

### **5.6 Conducting Interview**

After usability testing and the bug reporting the author conducted interview to validate the usability testing. The author takes interview of two OSS developers who is actively involved with the OSS community. These people are interviewed to know what is the reason behind the lack of usability in OSS and how this problem can be solved. The interviews were conducted face to face and in some cases through electronic mail.

## Chapter 6: Results

### 6.1 Usability testing results

In the usability testing 7 participants has joined and they try to perform 7 usability test cases. During the testing the author observes the participants and gathers the time that each participant has spent on each task, which task is complete and which one is

P		TASK#1	TASK#2	TASK#3	TASK#4	TASK#5	TASK#6	TASK#7	TOTAL TIME (MINUTE S)	AVG.TIME (MINUTES)
P #1	Minutes	16.5	13.4	25	10	21	17	19	121.9	17.41
	Compltete/Incomplete	I	I	I	I	I	C	C		
P#2	Minutes	18	14.5	29	15	22	19	24	141.5	20.21
	Compltete/Incomplete	I	C	I	I	I	C	C		
P #3	Minutes	15	16	23	18	19	21	26	138	19.71
	Compltete/Incomplete	I	I	I	I	C	C	C		
P #4	Minutes	12	14	20	11	20	14	18	109	15.57
	Compltete/Incomplete	I	C	I	I	C	I	C		
P #5	Minutes	13.6	12	21.5	12	15	17	15	106.1	15.15
	Compltete/Incomplete	I	C	I	I	C	I	C		
P #6	Minutes	12.5	13.5	20.5	13	15.5	18.5	16.4	109.9	15.7
	Compltete/Incomplete	I	I	I	I	I	C	C		
P #7	Minutes	11.7	14.6	21	14	17	19	17	114.3	16.32
	Compltete/Incomplete	I	I	I	I	C	C	C		

incomplete. All the data during the testing has shown on the above table. In the above table the author represents “I” for incomplete task and “C” for each completed task and “P” for participants and in the right most column the total time and average time spent by each participant has mentioned.

In the following graph author represents the percentage of complete /incomplete tasks. Task#1, 3, 4 and 7 has not completed by any of the participants. Task#2, 5 and 6 has completed by 57.14%, 47.85% and 28.57% of the participants.

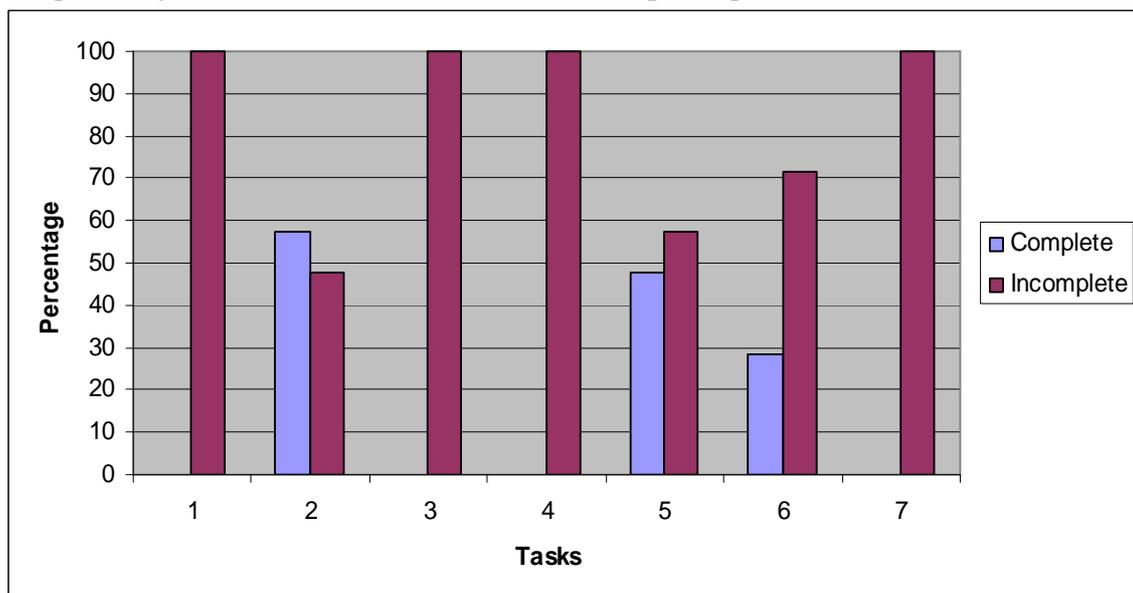


Figure-4

## 6.2 Observations from usability testing

To evaluate the usability issues of Free Open source software the author did usability test on the GNU/Linux based operating system Ubuntu 8.04. This usability testing is done in different kind of personal laptops with Ubuntu 8.04 installed with its default setting i.e. no extra package or components were not installed. From this testing I try to find out the lacking of usability of the components of Ubuntu 8.04 and I also propose some suggestion on how to improve those components. Below I describe my usability testing and my findings and my suggestions as well.

### 1. Problem in mounting mixed content CD.

**Test Scenario:** In this test we provide CD to each participant contained some audio files in .mp3 format and some text file and video files and ask them to access the audio file and the data parts.

**Problem identified from testing:** In this test none of them could not get mount through the data part because when the CD is inserted Ubuntu auto mount its audio part but for mounting to the data part you should go to the terminal and mount it. But most of the participants were not familiar with this that's why they failed to mount the data part from the mixed content CD.

This problem can be easily solved by giving the choice to the user. When any mixed content CD is inserted Ubuntu should give option to the user whether he wants to mount the data part or the audio part.

### 2. Problem in playing music files with Rhythmbox

**Test Scenario:** In this test we give some audio file in .mp3 format to our participants and ask them to play those audio files.

**Problem identified from testing:** Every participant able to find the appropriate application for playing the files after a little hint from us and that was Ubuntu default multimedia application Rhythmbox. But none of them able to play those audio files because the proper codec for .mp3 files are not installed by default in Rhythmbox. So it is a big draw back of Rhythmbox that it could not play the most common audio (i.e. .mp3) file in its default settings and it has been found from our test that it is hard to find a solution for the novice Ubuntu user to find the proper codec to play the .mp3 files properly.

### 3. Problem in Switching external monitors in laptops

**Test Scenario:** In this test the participants are asked to attach an external monitor with their laptop and then the participant should activate the external monitor while the laptop's LCD monitor is deactivated.

**Problem identified from testing:** In this test an external monitor is attached with the laptop and the bios of the laptop is set to appropriate option for activating the external monitor. But the external monitor and the laptops monitor is activated simultaneously, we didn't find any way to turn off the laptop's LCD monitor while the external monitor is used. For example in our testing we used a Toshiba laptop which is single booting into Ubuntu 8.04 attached to an external monitor with the laptop. The laptop BIOS has 2 options "Auto select" and "Simultaneous". When option 1 is selected it should turn off the laptop's LCD monitor when an external monitor is detected and when option 2 is selected both external and laptop's screen are activated. Now

when I boot up the laptop with selected the option 1, first the external monitor is ON and the laptops screen is off but when the login GUI appears the LCD screen of the laptop is activated automatically even if the option “Auto select” is selected.

4. Problem with the application “Tracker”

**Test Scenario:** In this testing we ask the participants to find some file from the hard drive with the help of Ubuntu’s application “Tracker”.

**Problem identified from testing:** But none of the participants get their desired file searching with tracker. The problems with Tracker identified as follows:

- Tracker doesn’t work properly to find any file within the hard drive.
- Another problem is that there is no help or any details information about tracker is provided regarding how to use this application and in what purpose one should use this application. So it is very difficult for the novice user to identify how and for which purposes “Tracker” will fulfill. Even when we prepare the Use case for our usability test we have to search in Google how and why we should use “Tracker”, but Ubuntu should provide the information not only for Tracker but also every application inside Ubuntu.

5. Problem with “Pidgin Instant Messenger”

**Test Scenario:** In this test participants are asked to login in Yahoo, MSN and Google talk with the “Pidgin Instant Messenger”.

**Problem identified from testing:** The interface of “Pidgin” is very confusing for the participants. First of all when they opened the “Pidgin” they asked for add their account, well in this step only one of the participant could get through it but others are really confused whether adding the account by clicking “Add” button is creating a new account or anything else otherwise.



Figure-5

Secondly when they entered into the main window where actually they put there username and password for login they are more confused then before. When one of the users goes to login in yahoo he fined 3 options to fill “Screen Name”, “Password” and “Local Alias”. Usually when we login into yahoo we fill only 2 options “Username” and “Password” and in pidgin there is no hint of “Username”. So this thing is really confusing for the user.

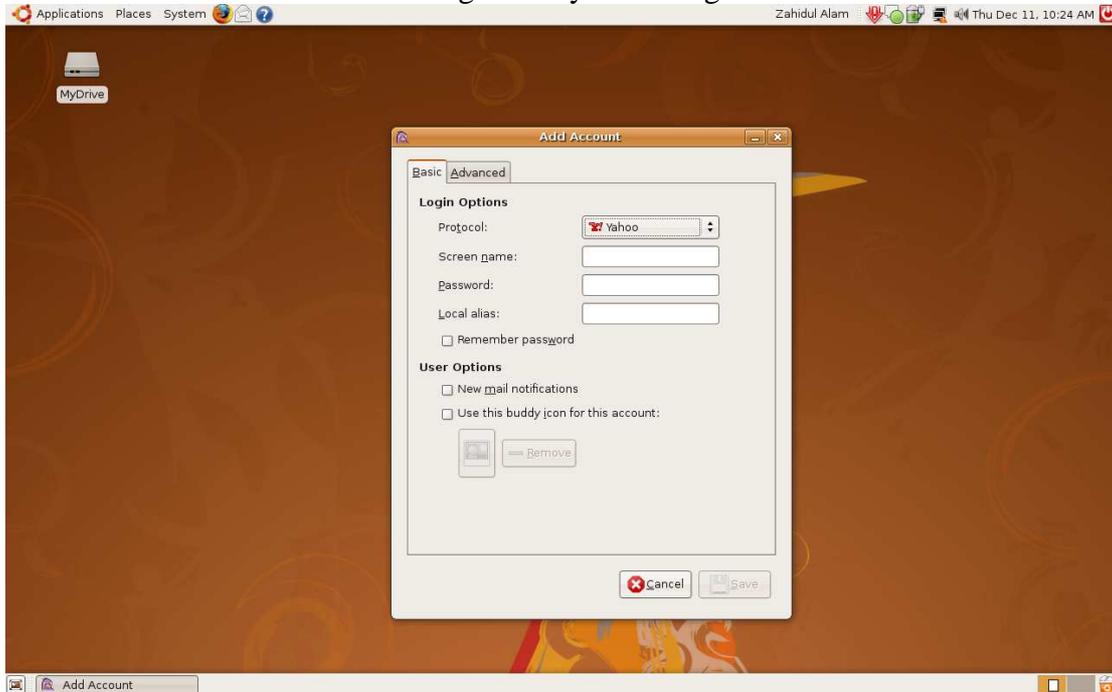


Figure-6

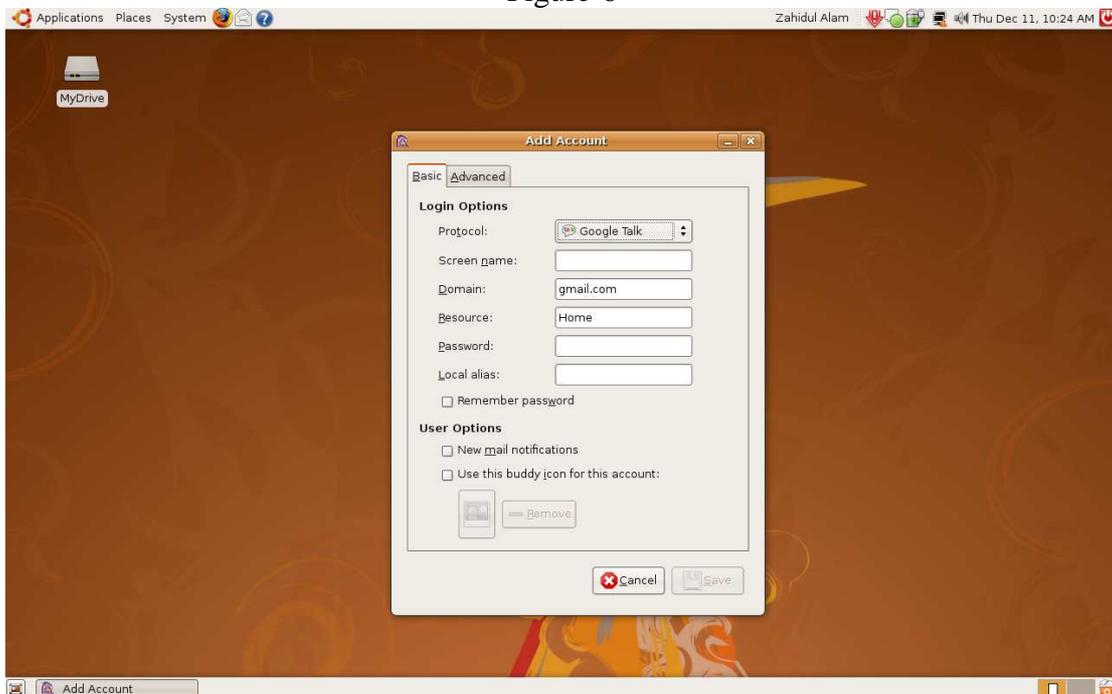


Figure-7

Well another user who try to sign in "Google talk" she faced more confusion because it asked for 5 options to fill from which "Domain" and "Resource" are

already filled with “gmail.com” and “Home”. But it’s really difficult to understand the purpose of those fields.

This problem could be easily solved by a Demo tour of “Pidgin” where it visually describes each and every field’s purpose and how to fill each of those fields with example.

6. **Test Scenario:** In the sixth test the participants are asked to take the screen shot of the desktop and save it in the hard drive.

**Problem identified from testing:** When the participants press the print screen button Ubuntu gives an error message “The folder contents could not be displayed.” All the participants press the ok button of the error message and save it under their hard drive. But later on when they are looking for their saved screenshot they find nothing, though when they save their screenshot in .png format it seems to save properly. Actually the problem is that when the participants taking their screenshot none of the hard drive partitions are mounted so when they save their screenshot image file they are actually not saving anything. But in this situation Ubuntu does not provide any suitable message so that one could understand that his or her file doesn’t saving for drawing properly without mounting any drive first.

7. **Test Scenario:** In the 7<sup>th</sup> test we asked participants to draw a picture using the image editing software of Ubuntu and save it in at least two different formats.

**Problem identified from testing:** For doing this task most of the participants choose “OpenOffice.org Drawing” from the Application menu. But the participants find the program very difficult for drawing, however they managed to draw some thing but when they try to save their drawing they find very unfamiliar format such as .odg, .otg etc. Most of the participant demands for the most common format like .jpeg, .gif etc.

Beside this problem I want to discuss some other problems regarding Ubuntu which I face during the usability testing and in my personal user experience.

➤ The “Network Manager” of Ubuntu is not work properly in all the laptops properly. In some laptop the network manager identify the wireless adapter automatically but in most of the laptop it unable to do that though it could recognize the wireless adapter but failed to install it (I have tried this in 2 different laptops HP Pavilion dv6000 and ThinkPad X61s).

Another thing I like to mention is that the Network Manager takes so long time to connect with WPA Enterprise network and if I get disconnected once then it again asks me for the username and password again, which is not logical at all.

➤ Another problem is with the resolution of Ubuntu. The problem is that when the resolution is changed to bigger size for example in my laptop when I change 1280 X 800 to 640 X 480 the real problem arises. To understand the problem look at the following screenshot

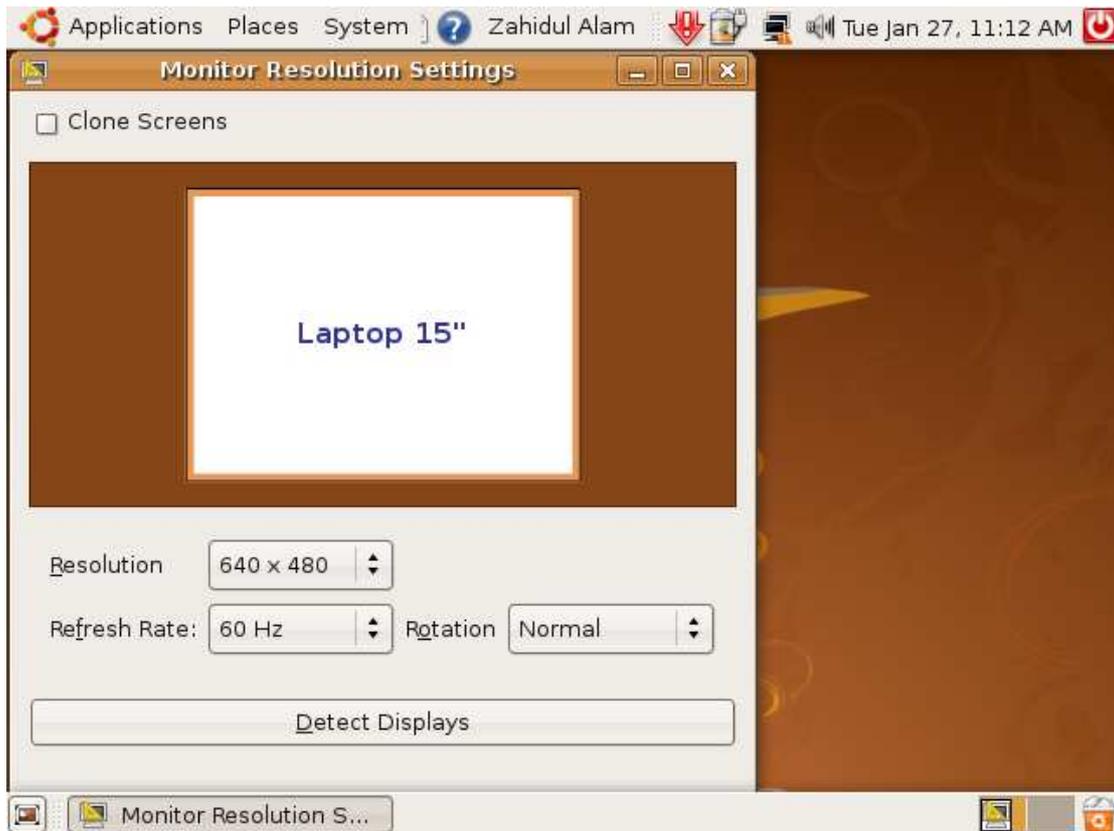


Figure-8

In the screenshot you can see if we want keep the current setting we have press the apply button of the application but that part is completely out of the window, the only way we can do that by pressing the “Tab” button and guessing where the apply button could be pressed.

This screen resolution problem is a well known problem for Ubuntu. Several bugs have been submitted regarding this problem (Bug# 138920, Bug #194760, Bug #359057 and many other bug has submitted on <https://bugs.launchpad.net/ubuntu> so far). But this problem is still remaining unsolved. The main reason behind this problem is current XORG that comes with Ubuntu 8.04 generally auto detects monitor, its resolution etc. this information can be retrieved because the latest monitors can queried EDID (Extended Display Information Data) data which returns every necessary information to configure things appropriately. But in some cases monitors can't retrieve EDID and for that reason variety of resolution problem occur. There are several reasons for EDID fail reads; one reason could be if some one using old monitor from when the EDID has invented. Another reason is that if video extension cable or other piece of equipment connected between the monitor and the video card that lacks the EDID wire. By observing these two reasons it can be identified that these problems are related with mainly hardware issues and there's little software can do. So to solve these screen resolution related problem either we have to change the hardware or make change in our XORG.conf file but for that you must have to know the proper syntax for it.

### 6.3 Bug Reporting

After conducting the usability test cases the author reported 3 different bugs to the Ubuntu bug reporting web site (<https://bugs.launchpad.net/ubuntu>). Below is the description of the bugs

Bug Id	Title	Link of Bug	Feed Back
Bug # 338939	Hard drive mounting problem	<a href="https://bugs.launchpad.net/bugs/338939">https://bugs.launchpad.net/bugs/338939</a>	This bug is still remaining as a bug and it is not solved yet.
Bug #338940	Problem in switching external monitors in laptops	<a href="https://bugs.launchpad.net/bugs/338940">https://bugs.launchpad.net/bugs/338940</a>	This bug is still remaining as a bug and it is not solved yet.
Bug #318049	Mixed Content CD mounting problem	<a href="https://bugs.launchpad.net/bugs/318049">https://bugs.launchpad.net/bugs/318049</a>	This bug is changed in to a question by one of the administrator (Mr. Chris Crisafulli [44]) of the bug reporting site. Following is the comment that he gave about this bug “Thank you for taking the time to report this issue and helping to make Ubuntu better. Examining the information you have given us, this does not appear to be a bug report so we are closing it and converting it to a question in the support tracker. We appreciate the difficulties you are facing, but it would make more sense to raise problems you are having in the support tracker at <a href="https://answers.launchpad.net/ubuntu">https://answers.launchpad.net/ubuntu</a> if you are uncertain if they are bugs. For help on reporting bugs, see <a href="https://help.ubuntu.com/community/ReportingBugs">https://help.ubuntu.com/community/ReportingBugs</a> .”

In the bug reporting site every bug has a specific importance and status. Each of above mentioned bug has the status of “New” and the importance is “Undecided” till now.

#### **6.4 Feedback from Ubuntu Forum**

The author has posted the usability test cases into the Ubuntu forum and from that forum user gets valuable feedback from the other Ubuntu user.

According to one of the user comment in the forum about the Usability Test Case-1 which is the Mixed Content CD's are only mounting problem; he faced this problem since Ubuntu 5.10 and the same problem is still remain in Ubuntu 8.04.

Another user comments about the application “Tracker” is this application never works properly for him, he thinks it is only wastage of CPU cycles for the computer.

#### **6.5 Results from the Interviews**

The author takes interviews of two experts from the OSS developer community. The questioner was prepared in two segments. The first question segment is based on usability issues of OSS community and the second segment is based on the usability testing of Ubuntu. The first interview was conducted with Mr. Henrik Sandklef (who is a teacher of IT University of Goteborg and involve in developing different software in OSS community).

#### **6.6 Interview with Mr. Henrik Sandklef**

According to Mr. Henrik the F/OSS community faces a lot of criticism about their usability issue in the past but at present OSS community is more caring about the usability issue then before. In response of another question he agree that their is some gap between the Usability experts and the OSS developers but he also told that the same problem also exist in the proprietary software community. Mr. Henrik believes that there is no need of a central authority who can guide the usability issues of OSS. According to him if any organization tries to pretend the authority that organization could be discarded from the OSS community.

In the second phase of the interview about Ubuntu Mr. Henrik answers in a short format, he believes that the response that the author gets from the participants during the testing is because of lack of experience of using Ubuntu before. If we did the same experiment with an expert Ubuntu user with a windows system the result would be same for the windows as well.

#### **6.7 Interview with Mr. Andreas Nilsson**

The second interview was done with Mr. Andreas Nilsson (he is a developer from OSS community). In the response of a question he replied two things are responsible for lacking of usability in OSS community, this two reasons are

*Vision:* one should know properly about their vision for particular software. When a project is developing the developer must know what the application should do and what it shouldn't do. So, if someone proposes some features it can be judge whether it fits the vision or not.

*Trust:* According to Mr. Andreas there are not enough people on OSS community who has good knowledge about UI design and whose opinion could be trusted. Beside the above reason he identifies one more reason behind the lack of usability of OSS that is OSS developers are more interested to add new functionality to their software which makes the software more complex.

To solve the lack of usability he describes the following steps:

- Acknowledge in your group that your piece of software is not for everybody, because a design for everybody is a design for nobody (and there will be other software projects that fill the gaps you're not dealing with). Get someone with a good sense of design involved in your group and make sure you trust the decisions of that persons. Make sure to test the software on other people than yourselves.
- There is a need of good experts who have good knowledge in UI designing and who concentrate only in UI designing not in coding of the software.

On the second phase of the interview regarding the usability testing of Ubuntu he express his thoughts as below:

**Usability test Case 1:** According to him mixed content CD should be treated by Nautilus and Rhythmbox. If users have to go to terminal and type appropriate command then it is surely a failure of the UI.

**Usability test Case 2:** The current approach of Rhythmbox for not playing .mp3 format file by default is ok but the dialog for installing new codec's could be better designed.

**Usability test case 3:** The external monitor switching problem could be solved by having proper usability test cases and it needs lots of testing.

**Usability test case 4:** He never been able to find his desired file using the application tracker. He is still looking forward for improvement of this application

**Usability test case 5:** He has no problem of using "Pidgin Instant messenger" because he can talk to all of his friends (regardless of IM network).

**Usability test case 6:** He never used "OpenOffice.org drawing" but he is interested to know what format the participants asked for.

## Chapter 7: Discussion and Analysis

In this chapter the author will discuss and analyze the findings from the usability testing of Ubuntu and interviews taken with the experts. The discussion is divided into two parts. The first part contains discussion about the OSS usability i.e. why OSS has lack in usability and how to improve this usability issue and the second part contains discussion about the usability testing on Ubuntu and recommendation for improvement of Ubuntu which was founded from the testing.

### 7.1 Discussion and Analysis

From the interviews with the experts the author has identified several reasons behind lack of usability in OSS development, these reasons are described below:

In the OSS community there is a lacking of trust and vision. The term “Vision” means the developer team should know exactly what the application should do, what it not supposed to do and which level of user it is targeted to. So if someone proposes feature X for the application then it should be judged first whether it fits the vision or not. The term “trust” means that in the OSS developer community there is not enough people who has a good knowledge on UI designing and whose opinion can be trusted among others.

Another obstacle is that the hacker community tends to threat new functions (features) as a good thing but sometime this tendency ends up making the software more complex then before. From the interview it has been found that there are a low number of experts in the OSS community. According to Mr. Andreas Nilsson “though a programmer with the right knowledge can work in a lot of situations as well. I think we need experts so that one person can focus on just the UI and not the code.” This statement describes that a developer with proper knowledge can design and develop the software at the same time but with this way better performance can not be expected. That’s why it needs some extra care on user interface designing above all it needs special care making the software usable and for that reason OSS community needs specialist or HCI experts who will only focus on the UI design not in the coding of the software.

Usability problems are not always straight forward. Sometime one design is usable for a group of user but the same design leads other group of user in an unusable situation. A change in design for the reason of poor usability is not beneficial all the time. For example from my own usability testing with “Pidgin Instant Messenger” which is Ubuntu’s instant messaging service for MSN/Yahoo/Google Talk etc. The interface of” Pidgin” is very confusing. I try this usability testing with four users but none of them could successfully login into Yahoo/Msn or Google talk. This problem could be easily solved by introducing an assistant to guide people but if we think those people who already know how to use pidgin it will surely make unusable to go through the assistants. So it proves that it is some time difficult to understand the usability issues.

According to Eric S. Raymond OSS project are started as “scratch a personal itch” [7]. One of the obvious things about OSS is that it is mounting its functionality then its usability. The probable reason behind that developer involves themselves in those projects which they are interested so they are interested in developing the software

more functional rather than more usable. The software may be functional as well as usable to other experts but not for the general user.

The discussion above points out some usability issues of OSS development. Now I like to discuss about some suggestion that should apply on OSS development for better results on usability.

The first problem from my point of view is lack of HCI experts in OSS development. Though there are some HCI experts are involved in the leading free software vendors like Canonical, Sun, and Mozilla. But the numbers are really low (according to Canonical designer Matthew Paul Thomas). [11] Though there could be an option that the developer gain knowledge of HCI besides their development but they shouldn't be think as a replacement for the HCI experts. Another thing I like to mention is that though the OSS developers saying that they highly recommend usability in their development but they didn't welcome the usability experts directly in their decision making. So this approach should be changed by the OSS developer.

Another problem is that OSS development process is very much distributed. For example if we talk about Ubuntu which is developed by Canonical uses OpenOffice developed by Sun, Firefox by Mozilla etc. Now my point is that each of this services developed by separate development team. Lacking of communication among each of this development team could lead the lack of usability towards the main software which all those are embedded. So for better usability each of this development team should have internal connection to each other while combining to single software.

The most fundamental step should be the involvement of the general user to OSS development process. End users opinion is valuable for making the software more usable. Though the big contributors to the free software have taken steps towards this option but rest of the OSS world hasn't done that yet. For example Canonical has launched several options for end users to express their opinion to the developers by opening Ubuntu forums (<http://ubunuforums.org>), Ubuntu brainstorm (<http://brainstorm.ubuntu.com>) is another example of it where users can express their opinion or promote ideas about Ubuntu. So other OSS contributors should follow the steps like this to encourage the general users by launching innovative steps.

According to Canonical designer Matthew Paul Thomas "The common practice of release early release often can cause poor design to accumulate" [45]. But I have some opposite opinion about this issue. OSS development process is fragmented in short iterative cycles. [19] So releasing the software in a quick interval will promote new concepts, new solution of the problems to the previous versions and new test design hypothesis. If we think from the general user point of view the quick releases of OSS is much easier for adjustment to them because if one product is releasing after a long gap and saying it has solved thousands of problem at a glance then it's really very difficult for the end user to make adjustment with the new release. For example if we take Ubuntu developer, they release this Operating System after every six months and the result is quite good though they have some usability bugs still exist but the approach is appreciable.

Now I will discuss about my usability testing on Ubuntu. Ubuntu has gained quite good reputation to become a feasible desktop environment. However it has room for

improvement in showing appropriate error message, easy hardware installation; start up help and Proper user guide and documentation to guide the novice user.

From the usability testing I have found that some of Ubuntu applications need to be improved from the satisfaction, efficiency and effectiveness which are the main attributes of usability. Though the testing is done with the participants those doesn't have prior knowledge of using Ubuntu and it is also true that if the same testing is done on Windows with the novice windows user the result may be the same. In the interview Mr. Henrik commented on this issue that if it take a long time to install or how to use a program in windows that doesn't prove that the person or windows is stupid yes it may be a sign of bad usability but it is the case that the person is not using the system as default.

From the testing the author has found that the application "Tracker" (task# 4) doesn't work properly to find the file within the hard disk which reduces its effectiveness. Beside this it doesn't have any guide line or helping information about how to use the application. Without which it is very much difficult for the novice user to use this application. In task#1 and 2 the author also found lack of effectiveness in Rhythmbox application because from the testing it has founded that this application doesn't support .mp3 files by default that's why participants during the testing couldn't play the audio file. In task#3 the author found lack of satisfaction and efficiency because when participants try to switch the external monitor it doesn't work properly, participants get stuck when they change the bios properly but the monitor doesn't behave accordingly. So this leads participants to dissatisfaction and makes the system inefficient. In the 5<sup>th</sup> task the author observes that the participants have a lot of confusion using "Pidgin" because of its unfamiliar user interface. The general users are very familiar with default instant messaging service like Yahoo, MSN, Google Talk etc but when the participants using Pidgin they find an unfamiliar interface which has no match with the original UI. So this makes the application ineffective and inefficient as well.

Beside this the author also takes interview with the experts regarding the testing. According to one of the experts he is not satisfies about the application "Tracker" and he recommends better design of the dialogue box for installing codec's in Rhythmbox. He recommends proper usability testing regarding the external monitor switching problem.

After the above discussion the author make some recommendation for better usability of Ubuntu. They are as follows:

To solve the mixed content CD problem the user should prompt a choice whether they want to access the data part or the audio part. Nautilus should handle this issue. Beside this other solution could be when Ubuntu gets any mixed content CD it should let the user know that there is commands through which a user can access the audio and data part separately through the terminal. But the second option is not the feasible one of course.

The application "Tracker" should be tested properly to work and it should provide a helping assistant regarding how to use the application and what its different features are.

“Pidgin Instant Messenger” should have simple UI design and it should have similar UI with the original messengers.

“OpenOffice.org Drawing” should include more formats for saving the images. Currently there are some unfamiliar formats available (.odg, .otg etc.) but from the testing it was found that most of the participants demand for the common format like .jpeg, .gif etc.

From the above discussion we find out some suggestion for better usability of OSS and also discussed some factors that are responsible for poor usability of OSS development. Now I like to conclude my discussion with some suggestion to the OSS contributors. The primary task for the OSS contributor should be they change their mentality towards the general user and towards the usability experts. Both groups should be equally invited with their opinion by the contributors for improved usability. Another thing is that it may be true that every OSS projects can not effort huge budget on Usability testing but I believe the usability testing could be done among your family and friends who are not the developers but a normal user and which doesn't need big budget as well. And at the end I like to appreciate the approach of <http://www.openusability.org/> where contributors, usability professional and students of Usability meets together, so if you are a developer and confused with your product then submit it to openusability.org and then you will get the feedback from the usability experts on your project. So this trend will definitely help towards better usability and also encourage the OSS developers. Though at present big companies like Canonical, Sun paying more attention on usability with their products but still there is a plenty of room for improvement. In this thesis the author has found 3 bugs of Ubuntu and there is several other bugs still exist. So the developer team of Ubuntu and other distros of GNU/Linux should take proper care and responsibility to improve the usability of each and every application they include in their operating system.

## **7.2 Answer to research Questions**

In this segment the author will discuss about the research question (which is also discussed in section 2.2 earlier) and its answer. The research questions that I attempt to answer are as follows

- Does Open-Source Software fall down on usability?
- How can we improve the usability of open source software?
- How the novice user judge Ubuntu from the usability perspective?
- How usability features of Ubuntu can be improved for the novice users?

From the discussion of section 7.1 it can be said that at present OSS community producing more functional software but from the usability perspective it has still a lot of option to improve. That means Open source software is still not up to the mark from usability perspective. So OSS needs improvement in many sections to produce software with perfect usability. For the improvement of OSS usability the author provide some guideline such as involving more HCI experts into OSS development, involving the general user to the OSS development for testing etc. in section 7.1. So this gives the answer to my first and second research question.

From the usability testing with the novice user of Ubuntu it has been found that the user's are not satisfied some of the applications such as "Tracker", "Pidgin" etc. This is also discussed in section 7.1. For improved usability of Ubuntu the author recommend some suggestions also in section 7.1. Therefore this gives the answer to my third and forth research question.

### **7.3 Validity Assessment**

Validation is a very important part of a study. The author has done validation for his research also. The author used a step by step and structured approach to accomplish the usability testing. To validate the test results interview has taken from two OSS developers. The two developers have given their opinion on each and every test case that has been conducted in this study. The results from the interviews have been provided in appendix 1. After conducting the interview the author also send email the two developers to re-check his writing, which he has written based on the interviewees opinion in this thesis. The two interviewees respond through email and confirmed the author that the writing is expressing their thoughts correctly. So the results from the interviews validate the reliability of this study.

The study approach is also designed in a reasonable way. Think aloud technique has been applied for usability testing. Beside this on sight observation, response from the Ubuntu community is used to evaluate and validate the results of this study. Each stage of this study has properly analyzed and documented.

The participants of this study are all students. Since Ubuntu also follows same gnome guidelines of GNU/Linux used by other distros. So the results and recommendation from this study can be generalized with other contexts as well. But there could be one possible risk that all the participants in this study are students and inexperience user. So if the participants are chosen from the experts then the results could be change in other direction.

In this study the author tries to explore the lack of usability in OSS and Ubuntu as well. The author suggested some recommendation of those lacking of usability as well in this study. Through the usability testing with the novice users the author tries to focus on the three basic attributes (i.e. efficiency, effectiveness and satisfaction) of usability.

## **Conclusion**

The use of Open Source Software and GNU/Linux distribution noticeably increased by the general level of user in recent times. Though the usability issue of OSS still is a struggling factor for the general user perspective. In this study the author explored opinions about usability among developers involved with OSS. The author found that OSS developers welcome usability evaluations performed by professionals, as long as these professionals are not interfering in decision-making about changes and priorities. Beside this there are other problems exist in OSS community like involvement of low numbers HCI experts, lack of resources and the contributors of OSS are coming from strong programming background who doesn't realize the problems of the general user perspective. The author also evaluates the usability of Ubuntu 8.04. Usability evaluation is done by involving a number of novice user of Linux in the usability test. All the test cases are designed for the novice level of users because the aim of this study is to identify the usability of GNU/Linux (Ubuntu 8.04) from the novice user's point of view. From the usability test results and interviews from the developers of OSS community, it can be said that Ubuntu has the capability to be used as substitute system software in usability perspective. However it has room for improvement in showing appropriate error message, easy hardware installation; start up help and Proper user guide and documentation to guide the novice user.

## **Future Work**

There are lots of opportunities for further work in this field. Future work can be done by choosing the expert level of users of Ubuntu. At present Ubuntu 9.04 has released so usability testing can be done on that version with new test cases. Another option could be included by involving proper usability testing equipment for collecting better results. Beside this the usability testing can be done with other GNU/Linux distribution as well.

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## Appendix 1: Interviews

### Interview with Mr. Andreas Nilsson

**Question 1:** Do you think there is lack of usability in Open Source Software? If yes, then what are the main reasons responsible for this lacking?

**Answer:** In a lot of cases, we lack trust and vision.

Vision: If you don't know a way forward with your software, it's easy to disagree on new designs for your software. I find it important for a the success for a project to know what the application is supposed to do, what's it's not supposed to do, for whom it's targeted, whom it's not targeted for etc, so if someone proposes feature X, it can be judged on whenever it fits the vision or not.

Trust: We don't have enough people in the community that we know have the knowledge about good UI design and whose opinions we trust. A lot of people blame the open form in which the software is developed. A public form where it's easy for anyone with an Internet connection and a bit of time can dominate a discussion on how they dislike a improvement to a piece of software, leaving the lead maintainer and developer group in doubt on how good the change really is. If there is a UI designer within the group who have trust among the other developers, his or her opinion can out weight ideas that don't fit the vision. You should be able to say no.

**Question 2:** What kind of complication F/OSS developer community face regarding the usability issue to there software?

**Answer:** We tend to threat new functions (features) as a good thing, always, even though they might end up making the software one step more complex. This is something that is hard to get away from.

**Question 3:** One of the obvious things about OSS is that it is mounting its functionality than its Usability. Do you agree that there is a need of usability experts or HCI experts in the OSS developer community to make the usability level up to the mark?

**Answer:** Yes, even though a programmer with the right knowledge can work in a lot of situations as well. I think we need experts so that one person can focus on just the UI and not the code.

**Question 4:** According to [Ferre, Juristo, Juristo, Windl, Constantine], X. Ferre, N. Juristo, H. Windl, and L. Constantine. "Usability Basics for Software Developers", IEEE Software, Vol. 18, no. 1, January/February 2001, pp. 22-29. The term usability is used with different meanings and that's why it is very much confusing for the software developers. . For example, "learnability" is defined in ISO 9241-11 as a simple sub-attribute of "time of learning," whereas ISO 9126 defines it as an independent quality factor that can be decomposed into several attributes such as comprehensible input and output, instruction and message readiness. Do you think this factor i.e. different meanings of usability are confusing for the developers and also responsible for the lacking of usability in F/OSS software?

**Answer:** I don't think it really matters what you call it, as long as you end up with great software in the end. Maybe a better word could be "design". I don't want it to be merely usable; I want it to be great!

**Question 5:** Another obstacle of involving usability in F/OSS is that a software developer does not have depth knowledge about the usability factors and on the other hand a usability expert doesn't have depth knowledge about the programming or software development environment. So it is very difficult to communicate to meet the requirement for both software developers and the usability experts. Do you agree with this statement? Do you think there is a gap between software developers and the usability experts? If yes, then what you suggest to fill this gap between these two community.

**Answer:** Not from what I have seen. As I mentioned earlier, a programmer can be a great UI designer as well. The UI designers I know are knowledgeable enough about how programming and software development that they are able to communicate with the programmers, so I don't think it's a problem.

**Question 6:** What is your opinion regarding the solution of the lacking of usability in F/OSS development?

**Answer:** Acknowledge in your group that your piece software is not for everybody, because a design for everybody is a design for nobody (and there will be other software projects that fill the gaps you're not dealing with). Get someone with a good sense of design involved in your group and make sure you trust the decisions of those persons. Make sure to test the software on other people than yourselves.

**Question 7:** Do you feel the need of a centralized forum or authority should be introduced to guide the usability issues of OSS soft wares and take step as a referencing point?

**Answer:** Sounds centralized, ineffective boring.

### **Question Regarding Usability testing on Ubuntu**

**Question-1** In our usability testing we have found that Ubuntu can't handle the mixed content CD (CD that contains both audio file and data file). By default it has been treated as an audio CD. For accessing the data part one have to go to terminal and write proper command which is hard for novice user. What is your opinion about this issue?

**Answer:** If you have to go to the terminal to type a command, I consider that a failure of the UI. My phone has mixed content as well (photos and music) and my computer deals with that fine. I think Nautilus should take care of the files and Rhythmbox should take care of the music.

**Question-2** What is your experience of using Rhythmbox for playing audio files? In our testing participants find difficulties playing .mp3 files because the proper codec's

for .mp3 format was not installed in Rhythm box by default. What is your opinion in this matter?

**Answer:** The ideal case would be for them to play out of the box, but because this isn't possible for legal reasons, I think the current approach is ok. That said, the dialog for installing new codecs could probably be better designed (like not mentioning the word codecs for example). If I have understood correctly, this is being worked on.

**Question-3** In our testing we observe that Ubuntu does not support external switching of monitors i.e. if we attach an external monitor with laptop then we activate the laptop both monitors are active simultaneously while the laptop is set to activate the external monitor only. What is your opinion in this issue?

**Answer:** This is one of those things that should just work (by defining a set of clear use cases). Just needs lots and lots and lots of testing.

**Question-4** What is your experience of using “Tracker” for finding files on Ubuntu?

**Answer:** I have never been able to find a file I was looking for using Tracker. I look forward to the day it will work though.

**Question-5** What is your opinion about “Pidgin Messenger” of Ubuntu?

**Answer:** I can talk to all my friends (regardless of IM network). That makes me happy.

**Question-6** What is your opinion about the “[OpenOffice.org](http://OpenOffice.org) Drawing” application? In our testing we find participants facing problem saving their image file in unknown formats like odg, otg, sxg. What is your opinion in this matter?

**Answer:** I have never used Open Office draw. What format did they expect?

### **Interview with Mr. Henrik Sandklef**

**Question 1:** Do you think there is lacking of usability in Free Open Source Software? If yes, then what are the main reasons responsible for this lacking?

**Answer:** Time has changed. It used to be an issue but we've seen a lot of projects and companies dealing with these issues. This also depends on what application you're looking at. If you compare a small application from 1999 with the latest version of proprietary program from company X chances are the FOSS program looks crappy. But on the other hand if you compare an old program from company X with the latest Gnome release you'd come to the conclusion that FOSS is the only thing with usability in mind. When comparing, or being asked to compare, I would like to know more about what applications. If we look at Firefox for example, I think Firefox is leading parts of the new development in the browsers (think about the tabs for example).

Short answer.... no I don't think there is a lack of usability. If you're comparing the same type of programs in the FOSS field with the proprietary companies' program.

**Question 2:** What kind of complication F/OSS developer community face regarding the usability issue to there software?

**Answer:** She/he as to know where to ask for input. That's the biggest problem I'd say. But that should be easy to find out pretty quick. There are people doing nothing but this.

**Question 3:** One of the obvious things about OSS is that it is mounting its functionality than its Usability. Do you agree that there is a need of usability experts or HCI experts in the OSS developer community to make the usability level up to the mark?

**Answer:** I don't think this is obvious at all. It may have been true, but I am not sure it's true anymore. I think there are experts out there willing to take part in the development. It's however easier to get started with hacking since all you have to do is download the code and, well, hack. If you're a HCI expert you would need to ask on mailing lists where you could help out. But that should be easy to do.

**Question 4:** According to [Ferre, Juristo, Juristo, Windl, Constantine], X. Ferre, N. Juristo, H. Windl, and L. Constantine. "Usability Basics for Software Developers", IEEE Software, Vol. 18, no. 1, January/February 2001, pp. 22-29. The term usability is used with different meanings and that's why it is very much confusing for the software developers. . For example, "learnability" is defined in ISO 9241-11 as a simple sub-attribute of "time of learning," whereas ISO 9126 defines it as an independent quality factor that can be decomposed into several attributes such as comprehensible input and output, instruction and message readiness. Do you think this factor i.e. different meanings of usability are confusing for the developers and also responsible for the lacking of usability in F/OSS software?

**Answer:** I don't think it matters so much. If tons of people say a program has a crappy interface, chances are that it has and it's about to time redesign. Regardless of the definitions above.

**Question 5:** Another obstacle of involving usability in F/OSS is that a software developer does not have depth knowledge about the usability factors and on the other hand a usability expert doesn't have depth knowledge about the programming or software development environment. So it is very difficult to communicate to meet the requirement for both software developers and the usability experts. Do you agree with this statement? Do you think there is a gap between software developers and the usability experts? If yes, then what you suggest to fill this gap between these two community.

**Answer:** Is this a problem in the FOSS community only? I don't think so. Also you're assuming hackers don't have knowledge about usability. I am not sure about that. To answer your question, I do believe this to be true to some extent for development, regardless of FOSS or proprietary. I think there may be gap. To solve this FOSS

community needs to keep on bringing these people in to their projects. This is not a wish. This is already happening.

**Question 6:** What is your opinion regarding the solution of the lacking of usability in F/OSS development?

**Answer:** You're assuming there is a lack. I don't think there is. Some years ago, this was (perhaps) an issue. I don't think it is anymore.

**Question 7:** Do you feel the need of a centralized forum or authority should be introduced to guide the usability issues of OSS soft wares and take step as a referencing point?

**Answer:** There is a place where some discussion are taking place, e g [freedesktop.org](http://freedesktop.org), and they are usually meritocratic. If anyone tried to state they are \*THE AUTHORITY\* on this issue chances are high that they'll be discarded by everyone. If some kind of usability team offer good help, nice guidelines and are willing to answer questions etc they will have a pretty good chance to become some kind of de facto std on this. One of the beautiful things about FOSS is that we are seeing a variety of programs with different looks. This stimulates "competition" between projects.

**Question on Ubuntu Usability testing:**

Mr. Henrik Answered all the questions in the following sentences only. How did the test persons answers differ when trying the same thing in Windows. Windows is not known to have tons of codecs shipped with the default install. It would take me a long time to find out how to install a program in Windows. This does not mean I or Windows are bad/stupid, it probably means that I am unused to the environment, which may be a sign a bad usability but it may simple be the case of me being to trap in old behavioral patterns. If you ask a MS Office use what he thinks about not being able to read/write an ODF document, what would he say?