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## 1. Abstract

**Abstract.** *This paper seeks to look at open/free source software and how it can be used in Africa. We will be discussing how African communities can benefit from using, collaborating and participating in open source software projects. We will show how public enterprises and governments can benefit from using open source software. We also discuss how the principle of ubuntu if used to software development will benefit society.*

**Keywords:** Community, Open Source, Free Software.

## 2. Introduction

According to Desmond Thuthu ubuntu

" A person with Ubuntu is open and available to others, affirming of others, does not feel threatened that others are able and good, based from a proper self-assurance that comes from knowing that he or she belongs in a greater whole and is diminished when others are humiliated or diminished, when others are tortured or oppressed"

Sharing is a fundamental aspect of the ubuntu philosophy.

Software is an organized collection of computer instructions and related data. All software is written with source code. With open source software, the code is protected by a license that ensures everyone has access to that code. That means no one company/individual/country can fully own it. On the other hand proprietary software is protected by a license that ensures no one or just a selected few have access to the source code. Freedom means choice. Choice means power. Applying ubuntu phylosophy on software development leads to public collaboration on a software project.

**Free Software**

Software which guarantees that the following user's freedoms are guaranteed

According to the Free Software Foundation a program is free software if the program's users have the four essential freedoms:

- The freedom to run the program, for any purpose (freedom 0).
- The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbor (freedom 2).
- The freedom to distribute copies of your modified versions to others (freedom 3). [19]

By giving users the above freedoms, the developer gives the whole community a chance to benefit from his/her changes as he also benefits from the changes made by the community. For everyone to benefit from the free software , access to the source code is a precondition. A program is free software if users have all of these freedoms. Thus, everyone should be free to redistribute copies, either with or without modifications, either gratis or charging a fee for distribution, to anyone anywhere. Being free to do these things means (among other things) that you do not have to ask or pay for permission to do so.[19]

OSI defines open Source as software with the following characteristics

- *No royalty or other fee imposed upon redistribution.*
- - Availability of the source code.
- - Right to create modifications and derivative works.
- - May require modified versions to be distributed as the original version plus patches.
- - No discrimination against persons or groups.
- - No discrimination against fields of endeavour.
- - All rights granted must flow through to/with redistributed versions.
- - The license applies to the program as a whole and each of its components.
- - The license must not restrict other software, thus permitting the distribution of open source and closed source software together.[17]

**Proprietary  Software**

These are the type of software that will take away one or more of the user's freedoms. I.e. the software may not allow redistribution or modification of the source code e.g. Windows. Nonfree software is any software that is not free. Its use, redistribution or modification is prohibited, or requires permission to be granted by the developer, or is restricted so much that you effectively can't do it freely. The source code for proprietary software is generally kept secret. A user purchases only the compiled version of proprietary software and has no choice but to use the software 'as is'. In the proprietary model, development occurs within one company. Programmers write code, hide it behind binaries, and charge customers to use the software--then charge users more to fix the software when it breaks. The problem worsens when you become tied to a company's architecture, protocols, and file formats. Bruce Perens calls this the addiction model of software procurement.

3. **Literature Review –**

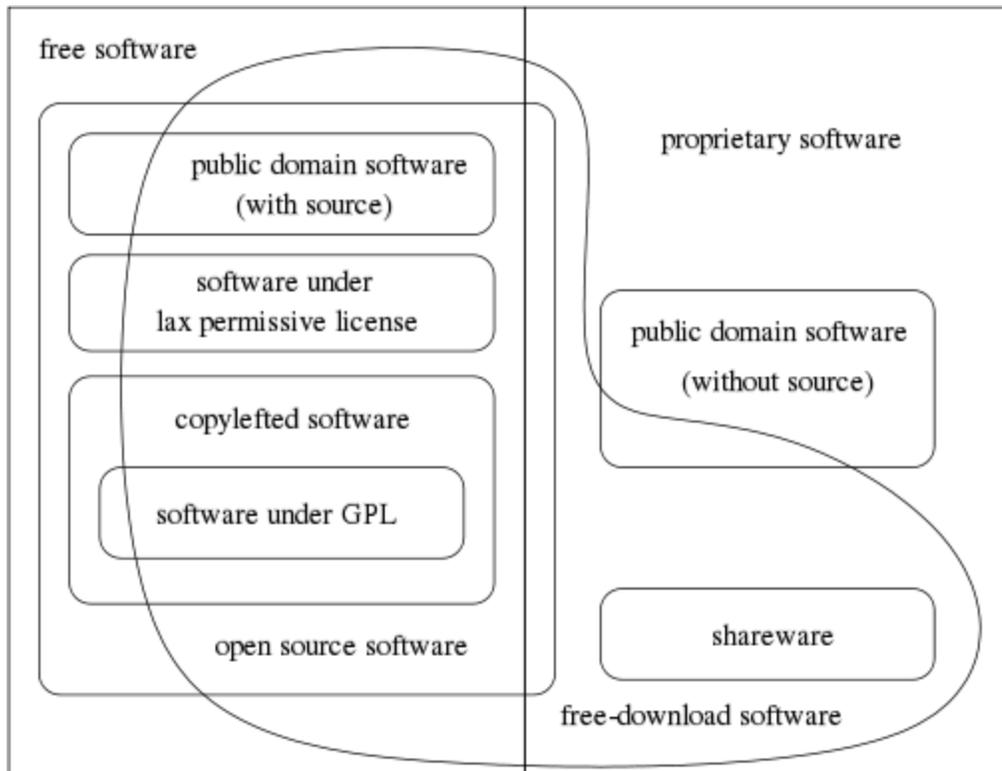**Open Source Development Models**

**Fig 1 Showing Types of Licenses and compatibility**

Sir Isaac Newton is famously quoted as saying: If I have seen further it is only by standing on the shoulders of giants. Open source software development embraces this principle. Open source is a community-centric development model, which encourages the free flow of knowledge and insight between all members. [2]The open source model does away with organizations and central control, replacing them with open networks of individuals. Every individual can build on the work that has been done by others in the network; no time is spent reinventing the wheel. As redhat puts it  The concept behind open source is not new. For centuries, universities and research communities have shared their work. Monks copied books by hand. Scientists publish new discoveries in journals. Mathematical formulas are distributed, improved, redistributed. Imagine if all of this past knowledge was kept hidden or its use was restricted to only those who are willing to pay for it. Yet this is the mentality behind the proprietary software model. In the same way shared knowledge propels the whole of society forward, open technology development can drive innovation for an entire industry".[3]
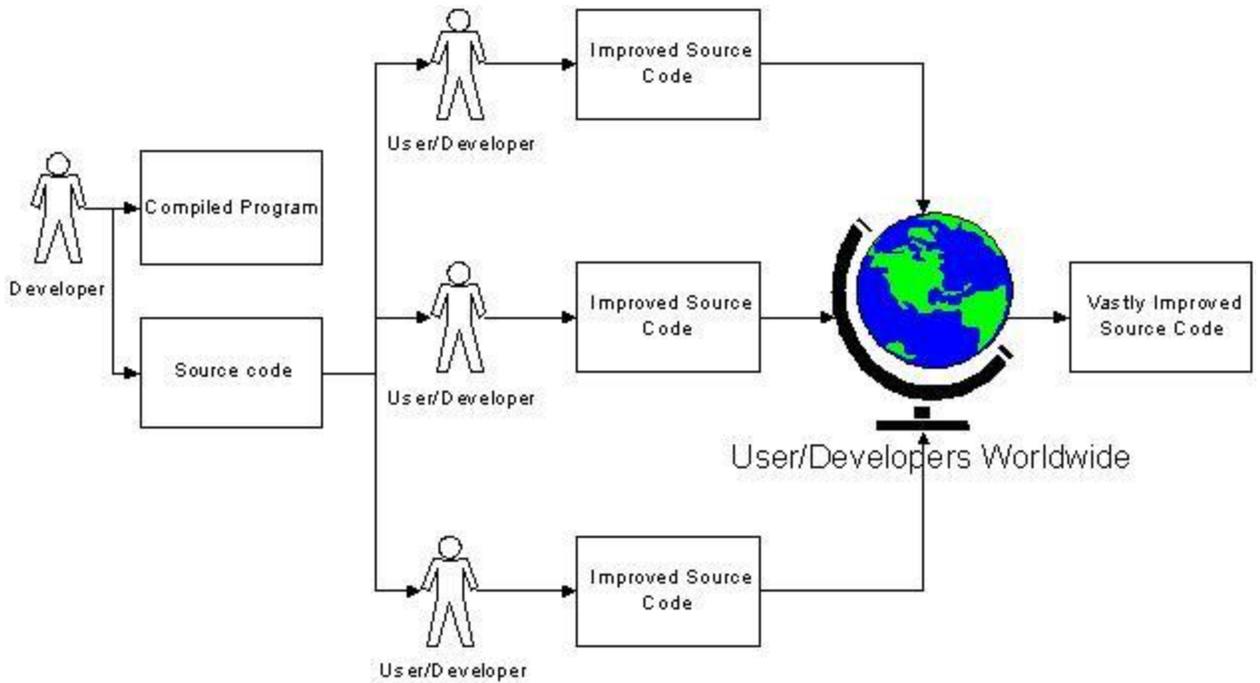
Figure 2: The Open Source Model: Source code is available to public. The public is free to make improvements.
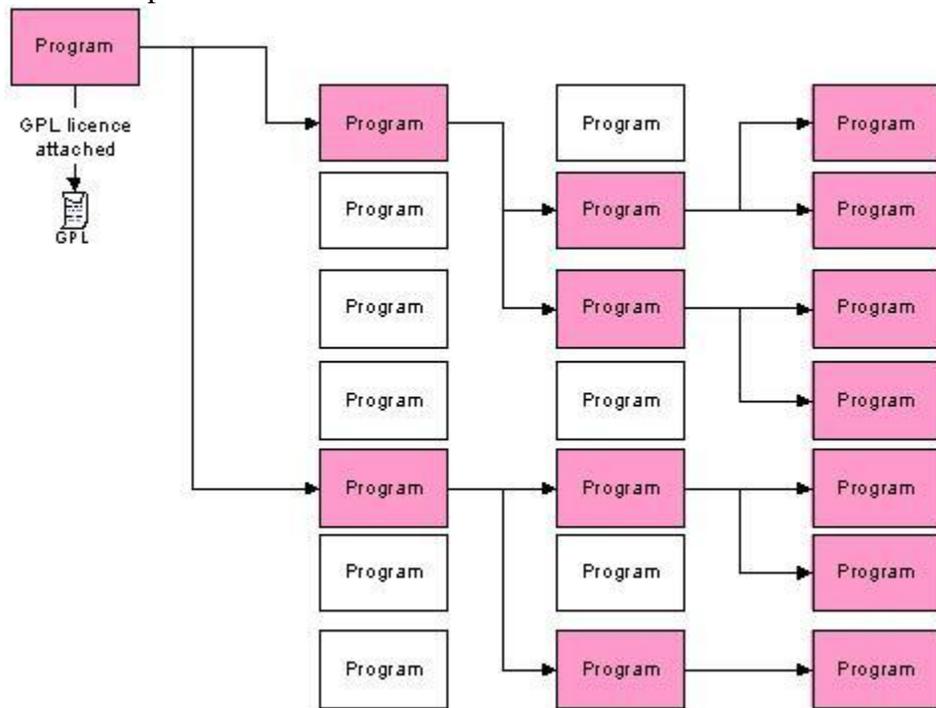


Figure 3: Copyleft licencing: an open source licence (like the GPL) becomes attached to every program that incorporates open source code or code derived from open source code. Pink programs have come under the jurisdiction of the GPL.

Fig 4

While mandating that 'sharing-alike' is advantageous to the free software community because it ensures that no one can build upon the community's code base without contributing their own modifications back to the public commons, it is also important that people be given the choice to use non-copy left licenses

**Methodology**

Data were collected between 16-October 2012 and 15 November 2012 using the internet. The data were collected from www.StartCounter.com and www.netcraft.com. We were interested in software usage we looked at the following

- Global web server usage,
- Browser usage (Africa)
- Operating system (Zimbabwe)

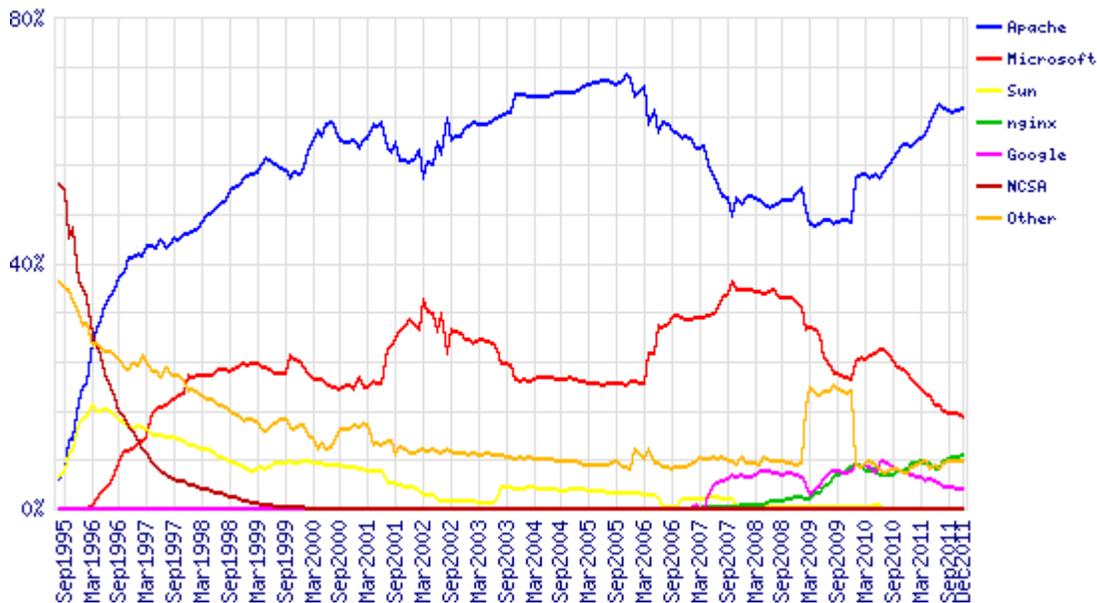**4. Findings/Case Study/Results**
**Web Server Usage Statistics**



Fig 5 Web server Usage Statistics[17]
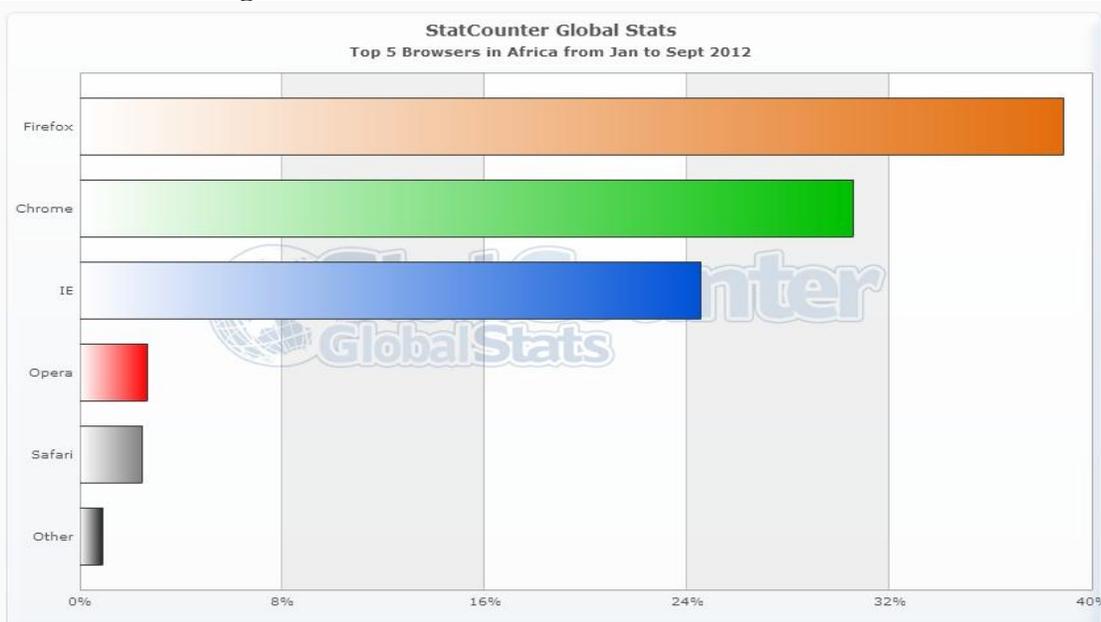**Graph showing**

## Web Browser Usage Statistics



Fig 6 Search engine usage statistics
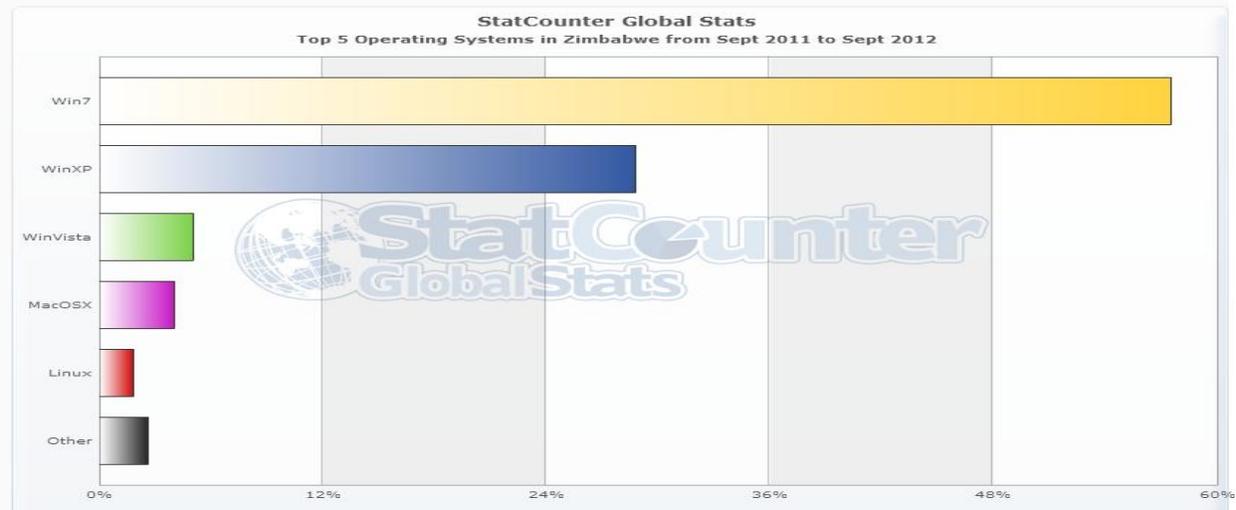
## OS Usage Statistics in Zimbabwe

Fig 7 showing Operating System Usage in Zimbabwe[4]

## 5. Discussion/Critical Analysis

Governments being the largest I.T consumers in Africa. Governments have the ability to promote the widespread use and continued development of free and open source software. Many government departments would benefit from the added reliability and security which free and open source software products bring. When governments subcontract independent software developers they can negotiate a software license that would enable use in other sectors.

Collaboration between government and universities would involve creating a repository of open source libraries or completed software projects that other smaller companies or independent developers can reuse in creating customized software. An example of this is the apache software foundation which created more than 100 projects. The most popular apache project is the Apache Web Server which powers about 60% of all websites. [12]

From the graphs above open source has gained popularity on the internet where people want security and internet users are more likely to choose their own browser. In this regard I.T departments may have to be made aware of other open source projects which provide comparable benefits and is more flexible. The browsers are developed to enable user to. Open source protects against over deployment and it reduces cost by over deployment we mean paying for what you really do not need or what you will never use. In my opinion a strong partnership between government parastatals and universities will reduce high dependency on proprietary software.

According to '2011 bsa global software piracy study' Africa and the Middle East have piracy rates of 87%. With Zimbabwe having piracy levels of more than 90% one way to deal with the offenders is to prosecute them alternatively. The other option is to introduce technologies where sharing with your neighbor is not a criminal activity. Thus open source software should be viewed by African countries as a solution to the problem posed by pirated software.

State Universities, colleges and state owned companies should work together and create a partnership that would foster open development. If students are exposed to open source and

encouraged to create open source based projects that could be a good starting point. Students create the next generation of expertise so we need to make sure the future generation is exposed to a lot of possibilities. Projects such as the One laptop per child are aimed at empowering the world's least advantaged children of which Africa is home to many who fall in this category. Rwanda is started deploying such laptops since 2007, if other nations would follow suit that would enable access to education to millions of people who would never had access.

The other advantage of open source software that African communities can benefit from using open and free software is that of portable take Linux for example it has been ported to many platforms which include, super computers, servers, desktops, laptops, tablets, pervasive systems (T.Vs, micro waves). T.V sets such as the Sony Bravia has Linux components in them. Linux has become so versatile that even watches and cameras are running Linux operating system.[20] Having said that it is imperative that, computer science laboratories should be equipped with several architectures not computing devices from one vendor. Universities should at least look at alternative architectures so that students are exposed to many facets of I.T. thus we can benefit from their creativity

The android platform brings quite an interesting platform and the flexibility of open source Samsung, Sony , HTC, LG and other mobile phone vendors take the android source code each one of them will customize the software according to their needs.  Without Android these large hardware manufactures could not have collaborated, If each of the companies would have tried to develop separately it would have been a duplication of effort. [12]

**Resistance to Open Source Software**

Companies that are likely to lose as a result of open source technology will try to protect their market by employing all sorts of tactics. The approach that has been used is that of marketing hiding behind technical papers or white papers. There is also the introduction of different versions of software with student editions meant for students to be addicted to proprietary software. Zero priced software with reduced functionality and capacity, some vendors will fund research that is meant to prove their products are superior. A another way that is being employed by large software vendors is that of  comparing open source products with their low end thus giving an impression that open source software is not suitable for large scale computing

**CONCLUSION**

As software becomes a part of our everyday life we ought to also be aware of the development processes that promote our culture and way of doing things. It is only open source development model which fits well with the spirit of ubuntu which is prevalent within the African communities. Adoption of open source will lower overall cost of running businesses. The ability of our users to customize a given software and run it without any restrictions benefits the whole of society and not just a few individual companies. As we adopt open source software prices of proprietary software is likely to go down. By adopting open source software we create opportunities within our communities. The adoption of open source software has many advantages for African communities than proprietary model. Open source development is the way we are used to doing business.

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