Open Source Software-Its Impact on Software Industry in India

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Abstract
The numbers of open source (OS) projects are increasing day by day and are increasingly funded by commercial sector that wish to make profits from their investments. This is made possible by bundling OS software with proprietary products like cell phones and services such as technical support. The need of the hour is to acclimatize traditional OS institutions by private industry in its commercial setting. But, as far as OS software development is concerned there is a big difference in development conditions prevailing in developed and developing countries. It is a common belief that developing country means high level of illiteracy, poor standards of living, limited infrastructure and a low gross domestic product. Also, the information and communication technology (ICT) infrastructure in developing countries is not comparable to the one found in developed countries in most of the cases. This is often called "digital divide". Being a developing country India also faces such problems. But, in spite of all these challenges OS technologies are emerging at quite a fast pace. A good number of OS softwares are already running in various government institutions and private sector. To conclude this development is going on and influencing the software industry significantly.

Keywords
Open Source Software (OSS)\Free and Open Source Software (FOSS), OSS in Developing Countries, OSS in India, OSS Influence on Software Technology.

I. Introduction

A. Background and Motivation

The FOSS (Free and Open Source Software)/OSS (Open Source Software) Story is the longest among all the stories related to software. Infect it can be said that in the beginning there were only free software that existed. Proprietary software was born later on but very quickly it started dominating the software industry.
In late 1970s and early 1980s two different groups were laying down the foundations for the so called OSS movement.
Richard Stallman (on the US east coast), programmer at the MIT AI lab, resigned from his job and started GNU project and also a free software foundation. The main motive behind this Project was to design a free operating system.
On the other hand UNIX system was being improved by the Computer Science Research Group (CSRG) of the University of California at Berkeley (on the US west coast) and a number of applications were also being built which collectively became "BSD Unix" (Berkeley Software Distribution).

B. Research Objectives

The aim of this paper is to throw light on the situation pertaining to the implementation of OSS in government and business sector in India in the present scenario, focusing on different applications/ areas. The current expectations as well as the experience from the previous implementations in the recent years are taken into account. Also, the future prospects for the developments are presented and discussed. To understand and examine the value of OSS and its influence on the professional world the various government bodies like public administrations, education sectors etc. and different companies across the country are taken as subjects for analysis.

II. Open Source Software

A. Definition

Open-source software is computer software with its source code made available with a license in which the copyright holder provides the rights to study change and distribute the software to anyone and for any purpose (Laurent and Andrew, 2008).
The counterpart of OSS is CSS (Closed Source Software). It is simply called proprietary software e.g. Microsoft Windows and MS-Office. It is not necessary for OSS to be with zero price tag because the proprietary components and services may be charged for with monetary fees.

B. Licenses

An OSS license may be defined as a license that attempts to bestow the type of rights, privileges, and obligations related to the definition of OSS. The FOSS licence ensures that the software is free for all the users by ensuring your freedom to change and share the software (Lee, 1999).
There are four general categories in which software licenses may be grouped into (Table 1). Terms of Service (TOS) and End-User License Agreement (EULA) are proprietary and do not provide the rights of source code availability, copying, modification, and distribution (Alspaugh et al., 2012).

Table 1: Types of Software Licenses

License Type	Also known As	Examples
Permissive	Academic	Apache, BSD, MIT
Reciprocal	Copyleft	MPL, LGPL
Propagating	Strong Copyleft	GPL, AGPL
Proprietary		CTL, EULAs, TOSs

Source: (Alspaugh et al., 2012)

C. OSS Examples

The OSS has extended its roots deep into the different areas in the software industry offering a variety of software solutions. The following is the list showing a few relevant to the corporate use.

1. Linux

It was the year 1991 when the history of Linux commenced with initial release of its source code. It was the result of a personal project by Finnish student Linus Torvalds to develop a free operating system kernel. Since then the Linux kernel has seen a continuous growth throughout its history. Starting with a source code with small number of C files under a licence that prohibits its commercial distribution it has grown to a source code containing millions of lines (over 16 million) under GNU General Public Licence.

There are number of factors that have lead to the popularity and success of Linux. The very first is the "freedom!" enjoyed by its users. Most of the Linux distros are free of cost. They can be downloaded and installed without any cost. They can be customised as per the requirement or even can be developed by the user for having added functionality for Linux. Also, Linux is very stable. It rarely crashes and when it happens the whole system generally does not go down. As far as security aspect is concerned Linux is more resistant to computer malware. It is less vulnerable to computer virus. The same holds true for worms, Trojans and spyware. This is not because Linux malware does not exist but because they are relatively fewer in number and none of them have become widespread till now. Since Linux is more secure to such attacks so it does not slows down over time. Such malware slow down the system speed considerably as it happens with computers having Windows operating system. Since there is number of distros available, so Linux provides a wide variety of choices. Linux comes in all choices and flavours allowing choosing a best distros that suits our needs. Linux presents a superior method for updating software by making use of central package management system provided by the distro. The various Linux distros available are Ubuntu, Fedora, PCLinuxOS, OpenSUSE. Linux enables you to breathe a new life in your old computer by improving your system to operate at faster speed and allowing you to have games, internet, e-mail, document editing, presentation making and spreadsheet manipulation.

With so many advantages associated with Linux there are some problems also those need to be dealt with. One of the main problems is that many Window programs fail to run natively on Linux e.g. MS-Office, iTunes and internet explorer to name a few. Another matter of concern in case of Linux is that there exists smaller section of peripheral hardware drivers for scanners, printers etc as compared to Windows, although new drivers are being developed and added to the existing database of the drivers.

2. Other Applications

When we talk about a normal office job there are numerous applications that are there that can be considered to accomplish a particular office task such as an office suite which is capable of doing word processing, database handling, presentation making, spreadsheet manipulation and having a web browser for doing various surfing activities and e-mails. To carry out all such activities or to accomplish each of the above mentioned tasks the open source solutions are there. The most promising example of one such OSS solution is OpenOffice.org. Open Office is capable of doing all such activities like text processing, database handling and manipulation, preparation of presentations, vector graphics editing and implementation of mathematical formulas and other such tools using spreadsheets. Other advantages include its availability on different platforms for zero prices (LGPL Licensed) and its compatibility with MS-Office products (Wikipedia, 2008). It follows the OASIS Open Document standard which is one of the major advantages it offers because when the documents are saved using this format/standard, they follow an open international standard.

In terms of security features a very reliable and platform independent web browser is there which is known as Mozilla Firefox. It is the product of Mozilla Corporation. It is considered as one of the best known web browsers and is consistently attaining market share (XiTi Monitor, 2008). Among its various useful features there exists a feature which is called open extension system that enables the development of number of useful plug-ins by the users. Using this feature/system a lot of add-ons and extensions were developed which improved and enhanced the functionality of the browser in a variety of ways. Further, it has a powerful JavaScript engine and fully supports Cascading Style Sheets 3 (CSS3). All these features make it a very powerful web browser which is capable of giving a tough competition to its proprietary competitors and market leader, Internet Explorer. Apart from this, it also includes a rich featured e-mail facility and a news client known as Thunderbird.

In case of existing OSS desktop environments, two such platforms known as K Desktop Environment (KDE) and GNOME are there which have become very prominent and are providing wide variety of a number of applications. A number of different tools are supported by both the platforms that include graphical frontends for system configuration and administrative software which are capable of combination with each other.

There exist numerous other popular Open Source projects such as PHP, Python, Perl, PostgreSQL, MySQL, Apache, TYPO3, Mplayer, VLC, Amarok, Audacity, Inkscape, GIMP, Enlightenment, OpenLDAP, Samba and many more. Moreover, there exist virtual environments such as VMware and emulators like wine which can be used to mount one platform over the other such as Windows applications can be run on Linux if needed.

3. Switching to OSS

Switching from the conventional proprietary/closed source software to OSS is not that easy especially when people are used to their routine software applications (proprietary) which provide extensive support and documentation. The change-over to OSS is greatly influenced by human and technological factors. Due to the kind of change involved resistance from the people/employees is quite obvious and needs to be dealt with and overcome. Rather than compelling people to change to new software, they should be encouraged instead to adapt to the awaiting changes for the betterment of the environment they belong to. This leads to the increased acceptance level and decreases the problems which may be the result of outcome of this expected migration. It needs a proper communication and able leadership among the two sides i.e. between technocrats and commercial sector for a successful shift. If we talk of the factors which are on technology side then two terms emerge as successful candidates, these are reliability and usability. When we think of replacing software, such as e-mail and office applications/programs the features which are similar on two sides i.e. closed source software and open source software, help in strengthening the same thinking as an employer/entrepreneur and increases the confidence level as an employee/user. In the present scenario OSS is capable of providing a strong foundation to any organization/business provided it is led by a strongly managed well organized migration project.

III. Research Methodology

This study examines the multiple cases of OSS impact on software industry and its adoption in government and private sector in India. The scope is limited to this country and its government bodies and various companies/concerns/enterprises. The data collection is done mainly from existing surveys, OSS studies and internet articles in a mixed fashion. The research methodology/method used in the present study is explanatory (Tellis, 1997). The study is conducted in explanatory fashion because of the nature of data collection used in the present study.

IV. Results and Findings

Estimation of use of OSS is a difficult task. Whether we are talking in terms of international or national context this determination remains an uphill task. The reason behind this bitter pill is that OSS is generally free of cost and secondly, downloads from the internet are not the only source for getting such kind of software and hence its use. If we look into the OSS market we come across two such products which are very popular in present times. These are Linux (as far as the operating systems are concerned) and Mozilla's Firefox (in case of web browsers). There are two such softwares in their respective category which are to some extent traceable. Mozilla's Firefox has proved to be a dark horse among web browsers. It has become a major competitor of its proprietary counterpart Microsoft's Internet Explorer. On the other hand, Linux, in spite of being quite popular is still not very widespread operating system. As far as the market share is concerned the estimations range from 1.11% to 5.4% as compared to the market leader Microsoft Windows which has the market share ranging from 75.61 to 80.2% (Market Share, 2014; W3Counter, 2014; W3Schools, 2014). The comparison clearly signifies that Windows are far ahead as compared to its open source competitor. But this comparison does not mean that Elvis has left the building. Linux is gaining popularity slowly and staidly.

A. OSS in India

1. Government Sector

A worth talking example of use of OSS in India is Tamil Nadu (Richter et al., 2009). It is the federal state of India which is located in the south of the country.

The Government of Tamil Nadu uses a customized version of Linux popularly known as BOSS (Bharat Operating System Solution) for official use (DIT, 2011; "The Hindu", March 18, 2014) instead of the conventional operating system MS-Windows. It has some special features: It includes well known OSS programs; all the tools that are available as a part of software are in Indian languages with software supported in both Tamil and Hindi languages. These features are very important because if we look at facts and figures we find that among 22 constitutionally recognized Indian languages only 10.35% of the total population of the country is familiar with English (Wikipedia, 2015).

2. Education Sector

In 2007 through a very renowned project known as IT@School (IIT, 2014) that was a very innovative effort from the education department of the Tamil Nadu state, around 2800 schools were provided with the customized version of Linux. Apart from this, numerous OSS tools were developed for online testing, self paced learning and many other applications were also developed.

After the state government's IT department another example include the state government's IT Company called Electronics Corporation of Tamil Nadu Limited (ELCOT). ELCOT is a state government promotional agency for IT industries. It is a South Indian, public sector undertaking, established on 21 March 1977. In an attempt in the same year 2007 the agency was able to shift 30,000 computers and another 2,000 servers to Linux that were owned by the different state schools. It made it one of the largest migrations to Linux in the country of that time.

In case of the IT@School (Parthasarathy, 2008) project of Kerala windows software was replaced with FOSS on 50,000 desktops in the various schools across the state. From this remarkable project the tangible benefits amounting to Rs 490 million ($ 10.2 million) were realized.

Another institution named IIC Delhi (affiliated with Delhi University) which is associated with providing higher education has also changed to FOSS. As far as the tangible and intangible benefits are concerned, for an infrastructure of 100 desktops and 5 servers, it is about Rs 1.75 million ($ 36 thousand).

3. Industrial Sector

ELCOT in Tamil Nadu is one of the strongest promoters of OSS in the state that mainly works for its promotion within the state. In 2006 the corporation took a very important and crucial decision of shifting from proprietary environment to a very important open source platform i.e. Linux and within few weeks it started shifting from full sale closed source platform to much awaited SUSE Linux (SUSE was a German company that was acquired by Novell enterprises in 2004). The cost savings pertaining to the license fees amounted to Rs. 5 crore equivalents to $1.16 million (according to the conversion rate of that time) on 20 servers. But, these were not the only cost savings that were realized. Due to the flexibility of the Linux it became possible to drop 25% of the hardware purchases and also acquisition of 90% of the high end servers were considered unnecessary.

Other well-known example includes Indian Canara Bank. When Canara Bank looked for open source solutions then it found Red Hat Linux. In a drive to shift to open source platform Linux was installed and implemented on 1,000 servers and 100,000 desktop computers.

One of the large e-commerce firms named Great Market (name change), implemented FOSS for servers, for desktops, document management and for MIS development. Only desktops (with FOSS implementation) savings alone amounted to Rs 3 million ($ 63 thousand).

One of the India's largest insurers, Life Insurance Corporation (LIC), which has an IT infrastructure of 3500 servers and has 30,000 desktops, managed to save about Rs 420 million ($ 8.75 million) just by switching to FOSS.

The New India Assurance company is a general insurance firm which has 1100 offices across the country and its IT infrastructure includes 1500 servers & 7000 desktops could save about Rs 800 million ($ 16.67 million) in terms of tangible and intangible costs.

Another firm, named GGG (name changed) is a medium-sized IT organization. It provides e-commerce solutions and relies heavily on FOSS. It was able to save about Rs 3.6 million ($ 75 thousand) just by having FOSS for its desktops applications.

The firm, IT for change, which is actually an NGO, has about 30 employees. It is an organization which relies heavily on FOSS. It uses FOSS on all the servers and desktops. Due to this it manages the estimated tangible savings of about Rs 0.12 million ($ 2.5 thousand) per annum (on an IT budget of Rs 2.1 million ($ 44 thousand)) (Rahul De', 2009).

B. Discussion

If we look at the motivation for implementation of OSS in the country we find that the cost/expense in terms of licence fees is one of the most common factor or the driving force behind this change. In general, in the developing countries like India the license fees are normally higher and wages are lower, comparatively.

One of the main reasons (apart from the cost issues) for the adoption of OSS is the liberty i.e. independence from software manufacturers/ proprietary issues and self governance. Also, in case of education sector in India the switch is due to the reason so

that more and more computers can be provided to the students by saving costs. As OSS can easily be customized to support different languages so, it is proved to be a motivating factor for migration to OSS in the country. In spite of all such positive points still the government has not accepted and openly declared it as its favourite in the country as a whole.

V. Conclusion

It can be said that OSS seems to have attained maturity during the recent years as evident from its level of development in the past few years. Various state governments and public and private sector companies have chosen it as a possible alternative to closed source software due to different and varying reasons. Now, we can say that this success is not only limited to servers and supercomputers any longer but also includes desktop environments and applications used by masses for their routine use.

A. Limitations

Due to the fact that data is collected using mixed approach so the information cannot be considered as always accurate. Most of the data and information that was collected as a part of this research was based on articles, news reports and other such means which may be considered as unsatisfactory means of providing unbiased, authentic and accurate information. The scope is further limited by the fact that out of large pool of activities in the OSS field only few of them were considered and included in the study. Apart from this, in this study only the success stories have been included. But, there were failures also leading to the rejection of OSS. These stories of failure have not been mentioned here in the study undertaken.

B. Scope for Future Research

The facts those were cited in support of the success stories may not be fully accurate and unbiased due to the nature of data collection involved. Also, not all the success stories were included in the current study. So, this is also one of the important points which can be considered for carrying out further research in this regard. Last but not the least, the cases of failure of implementation of various open source projects are not included in the current study. Those cases can be taken up to have complete analysis of impact of OSS on software industry in India.

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