

Free/Open Source Software—The Indian Context

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Abstract—Free/Libre and Open Source Software (F/LOSS) has become a key component of today’s Information and Communication Technology stack. Unfortunately, despite its well-documented tangible and intangible benefits, India continues to be a laggard in the adoption and contribution to F/LOSS. In this paper we give a brief overview of F/LOSS and its relevance to India. We try to understand why F/LOSS adoption in the country is low and propose a “Foundation and Four Pillars” strategy to circumvent these challenges.

Index Terms—foss, floss, opensource, linux, free software, india, challenges, adoption

I. INTRODUCTION

INFORMATION and Communication Technologies have become pervasive and indispensable to our society today. Coupled with the rise of the Internet, and almost simultaneously, there has been a drastic change in the way software is developed, sold, given away and used. The Internet has made collaborative software development across time and distance possible. Both individuals and companies have started seeing value in software whose source is available and that can be modified to suit their needs. This has resulted in changing the traditional paradigms of the software industry as to how software is developed and sold. The notion of selling software as a product is fast taking a beating and vendors are increasingly realising the need to sell services around software, rather than the bits themselves [1], [2].

Free/Libre and Open Source Software (FLOSS) is the umbrella term used to describe software whose source code is readily available and modifiable under several liberal licenses. F/LOSS has become a model for collaborative work and other allied concepts. There are some subtle philosophical differences between the concept of “Free/Libre Software” and “Open Source Software”, but our purpose, we can safely assume them to be essentially the same. The interested reader is pointed to the GNU (GNU’s Not Unix) Project <<http://www.gnu.org>> and also [3], [4].

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Today, FLOSS has matured to the point where it is a viable alternative to commercial, closed source software.

A. The Rise of FLOSS

Industry has taken to FLOSS in a big way and today almost all the big corporations — IBM, HP, Oracle, Yahoo!, Google etc. have put their weight behind Open Source [5]. The FLOSS phenomenon has been widely studied and written about. Eric S. Raymond has chronicled reasons about why Open Source happens in his seminal work - *The Cathedral and The Bazaar* [1]. Bruce Perens has distinguished between *key business differentiators* and *enabling technologies* [2]. He argues that businesses would be better off either open-sourcing or using FLOSS as *enablers*, while they *may* keep their *differentiators* proprietary. Business differentiators are *not* just software, and software may possibly be an implementation of a business process that is *differentiating* per se.

Robert Young, co-founder and former CEO of Red Hat talks about the *strategic appeal* of the FLOSS model [6] :

To escape the confines of this model, ISVs need an OS model where the vendor of that OS (Linux) does not control the OS; where the supplier of the OS is responsible for the maintenance of the OS only and where the ISV can sell his application secure in the knowledge that the OS vendor is not his biggest competitive threat. The appeal of this OS model has begun to take hold in the software world.

Rapid proliferation of the Internet has been a significant contributor to the increased FLOSS mind-share and phenomenal growth since it has allowed the marginal cost of software distribution to go down to zero. Organisations like the Free Software Foundation (FSF) <<http://www.fsf.org>> and the Open Source Initiative (OSI) <<http://www.opensource.org>> have also contributed significantly to the rise, increased usage and institutionalisation of FLOSS.

B. Why FLOSS?

The question should rather be framed as “Why *not* FLOSS?” There are a number of great reasons to use open source software—the myriad benefits relating to customer choice, a distributed development model, self-motivated developers, low distribution costs and marketing overheads along with the fact that such software is totally free of license cost, there are no restrictions to how often one can copy and install the software and one gains access to the software technology. In pure financial terms, the usage of FLOSS results in significant¹ cost-savings that can be ploughed back into the business. These are making FLOSS a very *attractive* option for corporates today. Some of these reasons can be listed as:

- 1) Saving money - all the software is totally free of charge
- 2) Ability to tailor to fit local needs or customization
- 3) Save time on license administration- one can install it on as many systems as one wants
- 4) Legally copy and distribute software as many times as one likes — one can make copies of it for colleagues
- 5) Reduce licensing liabilities— there is no possibility of piracy problems when one uses open source.
- 6) Upgrades are free and open source software generally has a very long life spans and is rarely ever made obsolete.

C. What FLOSS?

An oft-asked question by would-be FLOSS adopters is — “Is there a FLOSS that fits my needs?” Oftentimes, everyone thinks that their needs are unique and need special treatment. Today, there is a wide range of open source software available for almost *any* conceivable need. Some of the most widely used software at the core of the Internet includes

¹David A. Wheeler has pointed out the very convincing facts and figures behind FLOSS adoption in his paper [7]. In [8], he analyses the Red Hat Linux 7.1 distribution and “It would cost over \$1 billion (a Gigabuck) to develop this Linux distribution by conventional proprietary means in the U.S. (in year 2000 U.S. dollars).” He has also calculated that to re-develop the Linux 2.6 kernel would cost USD 612 million [9]. These figures by themselves point out the cost-saving economics of FLOSS and why it should be preferred over proprietary technologies *at least* for non-differentiating technology enablers.

BIND², the APACHE web server³, the SENDMAIL⁴ e-mail utility and the GNU/Linux Operating System⁵. LAMP is a term used for a web-serving stack comprising of the GNU/Linux Operating System, Apache web server, MySQL database management system and PHP programming language. Other open source programming languages include Perl and Python, while PostgreSQL is another widely used Database Management system. Widely used graphics and office productivity software includes the GIMP⁶, Inkscape⁷ and OpenOffice.org⁸. On the business front softwares include the Apache OFBiz (<http://ofbiz.apache.org/>), and others like OpenERP, SugarCRM, Pentaho. Asterisk is a well known open source software for voice communications⁹.

II. FLOSS IN INDIA

Over the last three decades and more, the Indian IT Services sector has matured to be a major world player¹⁰.

Despite this and the various tangible benefits that a shift to FLOSS brings, it is surprising to note that FLOSS activities by industries in India is substantially lesser than in China as shown in a study by Red Hat Inc. [5]. According to Singapore based IT services company METAPARADIGM’s study [11], India ranks 34th, after Brazil, Romania and Venezuela.

A study [12] says that Open Source is “*split by a digital divide*”, with almost no contributions

²The Berkeley Internet Name Domain System (<http://www.isc.org/software/bind>) is the software responsible for translating names to IP addresses. This runs the Domain Name Server (DNS) system at the core of the Internet.

³The Apache Web Server (<http://www.apache.org>) runs almost 2/3 of the top 1 million websites (<http://trends.builtwith.com/Server/Apache>) as of November 2010.

⁴<http://en.wikipedia.org/wiki/Sendmail>

⁵<http://en.wikipedia.org/wiki/Linux>

⁶<http://www.gimp.org>

⁷<http://www.inkscape.org>

⁸<http://www.OpenOffice.org>

⁹http://en.wikipedia.org/wiki/Asterisk_%28PBX%29

¹⁰FY '09 estimates [10] put the IT-BPO services sector to account for almost USD 60 billion in revenues. As a proportion of national GDP, the sector revenues have grown from 1.2 per cent in FY1998 to an estimated 5.8 per cent in FY2009. Net value-added by this sector, to the economy, is estimated at 3.5-4.1 per cent for FY2009. The sector’s share of total Indian exports (merchandise plus services) has increased from less than 4 per cent in 1998 to almost 16 per cent in 2008.

coming from places like India. The United Nations University (UNU)'s International Institute for Software Technology (UNU-IIST) <<http://www.iist.unu.edu>> has studied the data and concluded that “as few developers in open source projects are from the developing world this means that these countries have little influence on the direction the project is going” [12]. Mr. Scott McNeil, General Manager of the open computing initiative at UNU-IIST at a UNU conference on free software in New York in March 2006 said:

It is a problem, as local needs are not being met and developing countries are consumers *not creators* of open source software [12].

In a keynote, the then President of India, Dr. APJ Abdul Kalam said, “The most unfortunate thing is that India still seems to believe in proprietary solutions. In India, open source code software will have to come and stay in a big way for the benefit of our billion people”¹¹.

Garg et al. in [13] have done a SWOT analysis of the Indian IT industry and postulated that the newer opportunities that could come business’ ways are in areas where the companies could leapfrog the competition and try to sell their products and services to the “Bottom of the Pyramid” consumers in the emerging economies. This means that FLOSS is going to be an important component in providing versatile and economical solutions to new smart, savvy customers who are not locked into legacy systems and more importantly, do *not* want lock-in.

A. Economic Benefits of FLOSS

There have been multiple studies behind the economics of Open Source Software. David Wheeler’s studies [7],[8] and [9] along with Bruce Perens’ study [2] have talked about the cost saving aspects of FLOSS in general. Dirk Riehle [14] has talked about the importance of FLOSS from the perspective of Software vendors and System Integrators and why supporting FLOSS makes sense for them and how something free could actually help them make more money.

Prof. Rahul Dé in an India specific study on FLOSS [15] has pointed out some of the ways in which FLOSS could and is helping save money for

¹¹Dr. A P J Abdul Kalam, President of India while dedicating the International Institute of Information Technology, Pune, in May 2003. See: <http://news.cnet.com/India-leader-advocates-open-source/2100-1016-3-1011255.html>.

Indian corporations. According to this study, simply replacing just half of the proprietary desktop OS and productivity tools with FLOSS can save almost Rs. 10,000 crores in software costs. Some of the real-life examples from this study are:

- The IT@School project of Kerala replaced Microsoft Windows software with FOSS on 50,000 desktops in schools across the state. Tangible benefits amounted to Rs. 49 crores.
- Life Insurance Corporation (LIC), one of the largest insurers in India, with an IT infrastructure of 3500 servers and 30,000 desktops, saved about Rs. 42 crores by adopting FOSS.
- The New India Assurance company, a general insurance firm, having 1100 offices, and an IT infrastructure of 1500 servers and 7000 desktops saved about Rs. 80 crores in tangible and intangible costs.

The study also pointed out the importance of FLOSS to small, medium and micro enterprises, as well as for NGOs. It also points out the importance of the intangible benefits like increased security, scalability, stability and access to state-of-the-art technology that FLOSS brings.

III. CHALLENGES TO FLOSS

From §II-A, we see that adopting FLOSS results in significant tangible and intangible benefits. This begs the question that if FLOSS is such a panacea, why is it not being adopted more widely? In this context, it is important to understand what could be some of the reasons behind the slow adoption of FLOSS. The most common reasons floating around include:

Lack of awareness: FLOSS has still not penetrated to the level of the average or above-average computer user, and is still considered as something in the domain of geeks. This lack of awareness is accentuated by a lack of easily-accessible user level documentation and the the large amount of information floating about which makes searching for relevance difficult.

Fear, Uncertainty and Doubt: or FUD is something that the proprietary software makers whose business models are predicated upon selling expensive software and even expensive upgrades, while locking-in consumers and consumer data keep spreading to prevent the spread of FLOSS. An example is the October, 2010 video

advertisement released by Microsoft trashing OpenOffice.org¹².

Learning Curve: FLOSS, like any other new piece of software or hardware has a learning curve. Unfortunately, due to the abundance of FUD coupled with the lack of awareness and the fact that a lot of FLOSS is developed by programmers for programmers makes this curve steeper than for others. Couple this with the fact that people expect feature-for-feature parity as evidenced by the Microsoft video.

Lack of Major Players: though organisations like IBM, HP etc. have thrown their weight behind FLOSS especially GNU/Linux in the server market, there are few players in the desktop market. Thanks to certain marketing strategies and licensing policies, it is still difficult to get a pre-installed GNU/Linux desktop/laptop system. Canonical, the company behind the popular Ubuntu Linux distribution is one of those that is supporting alternative Operating Systems on the desktop.

Licensing and IPR: FLOSS has licensing conditions that aims to provide users and developers alike with certain freedoms. There are multiple licenses that attempt to balance various competing interests. Some of these licenses are also incompatible with each other, leading to somewhat complex issues while picking and choosing FLOSS to use together. Also, FLOSS licensing is something that not many are aware of.

To obviate some of these issues we propose a strategy—Foundation and Four Pillars (4Ps). This strategy takes into account the needs for FLOSS deployment and development by the adopters.

IV. PROPOSED 4Ps STRATEGY

The basic structure of this strategy is outlined in Figure 1. We identify a foundation that comprises:

- A strong legal support and understanding of Intellectual Property Rights issues,
- sensitise employees to issues relating to Intellectual Property Rights and Computer Ethics,
- Compliance related to Intellectual Property and Information Systems management

¹²http://www.pcworld.com/businesscenter/article/207841/microsoft_ad_trashes_openofficeorg.html

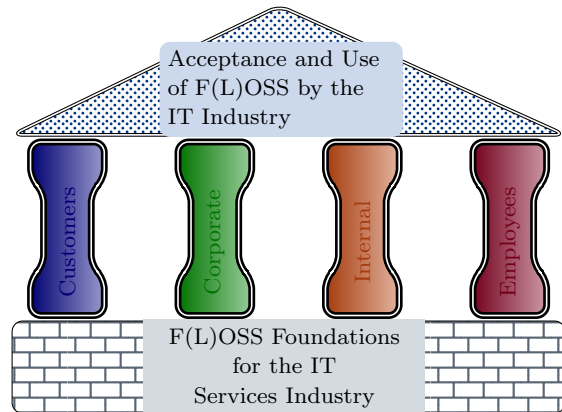


Figure 1. The Foundation and Four Pillars for a Successful FLOSS Strategy

This foundation is built to support our Four Pillars which are:

- Pillar of Customers
- Pillar of Corporate Sponsor
- Pillar of Internal Use
- Pillar of Employee

A fuller treatment of this strategy is given in [16].

A. Pillar of Customers

Many customers approach IT services companies, asking for either

- 1) to use the service company and its engineers as an extended part of their organisation to develop/extend FLOSS, or
- 2) to use the service company to extend their offering(s) using FLOSS.

Both of these are distinct problems and need specific solutions and strategies to ensure that:

- adequate recognition is given to both the service company and its engineers, or they are able to let others know about the contribution. This is because making recognised contributions to certain high-profile FLOSS projects like the Linux kernel is a matter of prestige to all
- ensure that all licensing requirements are met so that
 - the company is not open to litigation, and
 - can claim to have had a hand in the work product

B. Pillar of Corporate Sponsor

The IT companies need to be visible in the FLOSS community as vibrant and important contributors, because the FLOSS meritocracy is built

on a foundation of trust and the only way to earn respect is to be a valued contributor. In order to leverage FLOSS for all-round development of our businesses, communities and nation, it is important to influence the direction of projects in ways that have a positive impact. Some of the ways these could be done is by way of

- providing sponsorship to FLOSS projects, events and organisations
- providing infrastructural support like test-beds, web-hosting, software mirrors
- building excellence around open source that will result in the development of new business models around FLOSS, as well as
 - allowing employees to contribute to FLOSS thereby challenging them and keeping them engaged
 - building internal excellence and technology leadership. This will also help in creating knowledge repositories and allow for a robust knowledge management system
 - innovations around FLOSS
 - help in steering FLOSS projects, creating visibility leading to respect in the community

C. Pillar of Internal Use

Currently, though FLOSS is being used internally within organisations in certain areas, the use is not as widely disseminated as one would like to. It is at times when growth is slow and the *infinite bench*¹³ starts to hurt, that organisations wish to convert it into the *infinite productive bench*. FLOSS provides a perpetual mechanism to keep the bench productive—in good times, as well as bad. FLOSS projects for internal use multiply the benefits many times over.

Organisations need to strengthen the internal use of and support for FLOSS in the organisation and build a comprehensive policy for the same. We highlight a couple of areas where organisations could leverage FLOSS internally are

- Software Tools — organisations need to invest in software tools and some of the FLOSS tools are excellent platforms to build on

¹³The “infinite bench” is treated as an asset to the Indian software service companies because it gives them a flying start in terms of manpower resources when projects are taken up. The concept of how it could be converted to a “productive enterprise” using FLOSS was discussed by the one of the authors with Dr. Rahul Dé of IIM, Bangalore on the sidelines of FOSS.in/2006.

- Alternatives to proprietary systems—FLOSS provides many alternatives to proprietary systems, alternatives built upon open standards and virtually free.

D. Pillar of Employee

Indian Software Service companies have a huge talent pool which many times does not feel challenged enough and needs other avenues like FLOSS for intellectual sustenance. In this day and age with the increased penetration of the Internet and residential broadband, the infrastructural barriers to Open Source contribution by individuals have been made practically non-existent resulting in private contributions to Open Source by many individuals.

Unfortunately, the lack of a comprehensive policy and sometimes, the employment agreement(s) preclude employees from contributing to FLOSS projects of their interest. Conversely, it may also prevent many FLOSS enthusiasts from considering these companies as an employer of choice. In order to attract and retain talent it is imperative that a comprehensive FLOSS policy which balances the mutual interests of both employer and employees be developed.

Allowing private contribution to FLOSS projects by interested individuals has other advantages like:

- Gives employees a chance to work on projects close to their hearts
- Employees hone their skills while not on the job
- Employees learn to participate in communities and community building

There are risks like potential leakage of clients’ Intellectual Property held in trust. This means that there needs to be a policy and a set of measures that minimises the possibility of such events without putting a blanket ban on the activity itself.

V. CONCLUSIONS

Many experts publicly acknowledge the value of open source in supporting future of IT industries. Open source has an important role as the missing link in conditioning markets for software interoperability. Proprietary software systems intrinsically create barriers to future product development that departs from the original purpose of the system. Using open source software also offers various advantages, such as the ability to reduce costs and development time, or to avoid being dependent on a single vendor.

We note that the Indian companies are net users of FLOSS and there is very little contribution to

FLOSS from the country. Given that most IT companies are in the service sector and will need to embrace FLOSS sooner than later, we feel that they need to have a comprehensive FLOSS strategy on lines similar to the 4Ps model. In addition to the measures outlined, the companies also need to have an “Open Source Office” that serves as a nodal centre and clearing house for all things related to FLOSS. Such an agency should function at the highest level and be tasked with the job of overseeing all FLOSS related activities in the organisation, across all dimensions.

REFERENCES

- [1] E. S. Raymond, *Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary*. O’Reilly Media, 2001. [Online]. Available: <http://www.catb.org/~esr/writings/cathedral-bazaar/cathedral-bazaar/index.html>
- [2] B. Perens, “The Emerging Economic Paradigm of Open Source,” *First Monday*, vol. 10, no. 2, October 2005. [Online]. Available: http://www.firstmonday.org/issues/special10_10/perens/index.html
- [3] Wikibooks, “FLOSS Concept Booklet,” Available Online, http://en.wikibooks.org/wiki/FLOSS_Concept_Booklet
- [4] —, *Open Source Wikibook*. Wikimedia, available as: http://en.wikibooks.org/wiki/Open_Source. [Online]. Available: http://en.wikibooks.org/wiki/Open_Source
- [5] Red Hat, Inc., “Red Hat Publishes Study on Worldwide Open Source Activity and Growth,” Online, April 2009. [Online]. Available: <http://www.redhat.com/about/news/prarchive/2009/open-source-index.html>
- [6] B. Young, *Giving It Away: A capitalist entrepreneur’s view of Open Source*. Lulu.com, April 2003. [Online]. Available: <http://www.lulu.com/content/29611>
- [7] D. A. Wheeler, “Why Open Source Software/Free Software (OSS/FS, FLOSS, or FOSS)? Look at the Numbers!” [Online]. Available: http://www.dwheeler.com/oss_fs_why.html
- [8] —, “More than a Gigabuck: Estimating GNU/Linux’s Size,” Online Paper, 2001. [Online]. Available: <http://dwheeler.com/sloc/redhat71-v1/redhat71sloc.html>
- [9] —, “Linux Kernel 2.6: It’s Worth More!” Online article, January 2006. [Online]. Available: <http://www.dwheeler.com/essays/linux-kernel-cost.html>
- [10] NASSCOM, “Strategic Review 2009,” Online. [Online]. Available: http://www.nasscom.org/upload/60452/Executive_summary.pdf
- [11] Metaparadigm, “OSS Activity Study,” Online Article, July 2005. [Online]. Available: <http://oss.metaparadigm.com/oss-activity/>
- [12] ZDNet, “Open source ‘split by digital divide.’” [Online]. Available: <http://www.zdnetindia.com/news/software/stories/135384.html>
- [13] S. Garg, R. Sarita, and L. V., “Indian Information Technology Services Sector and the Domestic User Industry - An Uneasy Partnership?” in *International Conference on Emergent Business Models and Strategies for the Knowledge Economy: Impact on Business, Government and Society*, November 2009. [Online]. Available: <http://bit.ly/911pnf>
- [14] D. Riehle, “The Economic Motivation of Open Source Software: Stakeholder Perspectives,” *Computer*, vol. 40, no. 4, pp. 25–32, 2007. [Online]. Available: <http://dx.doi.org/10.1109/MC.2007.147>
- [15] R. Dé. (2009, September) Economic impact of free and open source software—a study in india. Online. IIM, Bangalore. [Online]. Available: http://www.iimb.ernet.in/~rahulde/RD_FOSSRep2009.pdf
- [16] S. Garg, “Road to the Future: How Software Service Companies can benefit from Free and Open Source Software,” NavankurIT, Tech. Rep., 2009.

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