Is the Future of Software Development in Open Source?  
Proprietary vs Open Source Software: A Cross Country Analysis

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Many argue that the open source software is ‘free’ and free from intellectual property protection clutches. This paper argues that this notion is a myth when taking into account the percentage of proprietary software usage all over the world. The governmental policies and decision to support or adopt one model or the other will have a large impact on the software industry. This study substantiates that the neutrality of government promotes innovation and development rather than supporting a particular model through a cross-country analysis of Europe, Brazil, China and India. The analysis shows that more governments are making laws and policies in support of open source softwares.

Keywords: Open Source Software (OSS), proprietary software, intellectual property rights

In a globalized economy, technological revolution helped the developing countries in reaching higher levels of economic development. During the last twenty years, information technologies in general, and software in particular, have played an important role in the growth of modern economies. The velocity of change has accelerated at a seemingly exponential rate, serving constantly as an engine of growth for the global economy. Governments around the world are now promoting OSS for many reasons. The discussion on whether the open source software (OSS) or proprietary softwares (PSs) and intellectual property rights (IPR) protection will contribute to the economic development of developing countries is a hot topic not only among the industry but also at the governmental level. IPR protection has never been more economically and politically sensitive and controversial than today. It is also indispensable for making policies in any human development subject in the developing countries. The adoption of any model, OSS or PSs by governments has wide repercussions in the development of a particular technology and developmental model of that country. IPR protection of softwares in developing countries is another concern of the inventors. The objective of this study is to look into the link between governmental policies on OSS and PSs development across the world by a cross-country analysis of Europe, Brazil, China and India.

The first part of this study introduces the concept of OSS and PSs. the second part analyses the positive and negative aspects of OSS and PSs and concluded that PSs are more reliable as more innovations are taking place to PSs in a time bound manner than OSS. Third part examines the general IPR protection laws of softwares. The role of government in adopting policies in support of one or the other type of software in procurement is important for the development of any model. In the fourth part there is a cross country analysis of OSS initiatives and market situation in Europe, Brazil, China and India. The concluding part makes some observations and suggests neutrality of governments and strict implementation of IPR protection promotes innovations in technology and thus promotes development.

Concept of OSS and PS

There is an intense debate in the world of software and information technology concerning the future of OSS, its practicability, and the other kind of software, namely, the PSs. In many countries; such as in US, OSS and PSs have co-existed for quite some time.

There is lot of confusion about the definition of OSS. In general, open source software refers to any program whose source code (the text of all software programs is written in languages such as C, C++ etc.) is made available for use or modification by anyone. It is not only the source code must be free; the distribution of an OSS should not restrict any party

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from selling or giving away from software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale. There should not be any discrimination against persons or groups from accessing the source code. On the other hand, the makers of proprietary software never made the source code public. The meaning of OSS and ‘free software’ cannot be mixed. The authors of software in the ‘public domain’ have no right under copyright law to put restrictions on copying, distribution and modification. On the other hand, the authors of OSS can impose licensing for distribution, reuse or modification of the software which is open to all.

Open source proponents argue that property rights in the software industry are inimical to it, as they do not enable equitable distribution and development of the industry all over the world. What is to be noted however is that the distribution of open source software is also not completely free of any regulations? The GNU General Public License (GPL), the Berkeley Software Distribution (BSD), the Apple Public Service License (APSL) and the Mozilla Public License (MPL) govern their distribution. The GNU GPL is said to be stricter with respect to distribution, as opposed to the BSD which allows for the user to use the source code freely without any significant restrictions. The existence of different licensing regimes, therefore, creates confusion and incompatibilities.

An open source license must:

- grant the licensee the right to distribute the program themselves, including the right to charge money for it;
- grant access to the program’s source code;
- grant the right to modify the program;
- grant the right to distribute modified versions of the program;
- allow use of the program by all persons or groups in all fields of endeavour;
- apply to everyone who receives the program, without the need for any additional agreements;
- apply to the program it licenses whether the program is obtained as part of a group of programs, or on its own;
- allow distribution with any other software; and
- allow distribution in any form.

Proprietary vs Open Source

Computer programing takes long time of research and constant effort of many people or firms. Monetary benefit out of the successful developing is the main attraction for companies established mainly for profit making. The proprietary software is marketed under strict and different conditions throughout the world. A proprietary license prohibits modification, copying, or redistribution without the provider’s permission. Thus, it permitted only the proprietary owner to further modify or do developmental works on the software like the Microsoft do. For all the companies developing proprietary software, the source code becomes the company’s intellectual property and asset.

The drawbacks of PSs would be: once a consumer purchases proprietary software, they must pay for updates and customer service support. In PSs, only one or a small group of peoples those who have pecuniary interest in the project will work on the software and develop it. It is highly centralized and decisions of cost allocation and resource usage is decided by few people for maximum efficiency and thus lowering transaction cost. Quick decision making and response timing is short in PSs development. On the other hand, OSS is developed by a single person or mostly by a group of people in different parts of the world with same interest collates and collaborates together for developing an OSS. Even companies interested in developing OSS may appoint people to work and release it in the market without any motive of pecuniary compensation.

For several years now, open source software products have been gaining prominence and market share. During the 1950s and 60s softwares were freely distributed. The idea of proprietorship emerged in the 1970s. In 1984, Richard M Stallman established ‘Free Software Foundation’ and created ‘General Public License’. In the 1990s, the availability of Internet made coordination between the free developers all over the world easier. In 1997, Eric Raymond’s ‘Cathedral & the Bazaar’ explained new approaches and termed the new development software as ‘Open Source Software’. In 2005, OSS dominated in web serving.

An example of this sort of informal coordination can be seen in the Linux operating system: Though a large group of developers contribute to new versions, Linus Torvalds’ Linux’s original creator has final say over what code is included. Similarly, the Apache
web server is overseen by the Apache Group, a self-selected group of programmers. Red Hat Software has become a fast-growing and profitable company selling boxed versions of the Linux operating system with a customer base of some 7.5 million, chose to pay about $50 for the added value which the company provides to Linux users. A study by Nicholas Petreley reveals that Windows vulnerabilities are 50% on the other hand, Red Hat vulnerability is only 10%.

The ownership retains the copyright of PSs sold in the market. In the OSS, software is free and the source code is distributed with the software. The holder can modify it and further distribute it. Any modification to the OSS will fall under the same category and cannot be made proprietary. The economic part of the development of an OSS can be recovered from subsidiary additional services such as software training, supply of complementary proprietary programs that run on the open source program. However, under whatever the policies adopted by OSS companies the sustainability is always uncertain. Red Hat is perhaps the best example of this. After raising $13 million from venture capitalists and strategic investors in 1998 and early 1999, Red Hat raised $84 million in August 1999 IPO. In 2002, the company offered a long term service which ultimately ends with the company made profits for the first time in 2004.

The popular argument in favour of promoting OSS is its lesser cost. There are no licensing fees and the initial investment is minimal. The low cost investment is attractive to most of the developing and less developed world to enter into technological changes in their domestic market. However, actual cost involved in training and support service is not clear. The argument of economic development through OSS is not proved by empirical data. It is a common fact that any industry development needs proper investment and development of a product with proper services. The sustainable profit making is absent in the OSS set up. This is evidenced by the closure of many OSS companies in the US. It was argued that the entry level barriers are less in the OSS. Due to protections like copyright, patents and licensing, working with a PSs is much more cumbersome than OSS. The OSS can be converted and further developed for local need and in local languages. The PSs never allow governments for experimenting with it.

Another argument in favour of OSS is about the low training cost. The training methodologies and packages are supplied with the software itself. The students or professionals can contact each other for getting more and more information without any cost. Most of the PSs companies are located in a small number of countries all over the world. The developing countries have to spend a lot of foreign exchange for purchasing these technologies even these companies opened their offices all over the world. The famous ‘NSA key’incident made lot of suspicion and concerns among the governments using Microsoft Windows on security reasons. It is very difficult to determine any backdoors within the PSs unless it is determined by the owner. Mistrust is one of the main reasons for developing OSS in China and other governments are working on developing their own version of OSSs. From the past experience in the industry, some of the concerns are genuine from the part of governments. The unauthorized duplication can be avoided in OSS, which is readily available in the market.

The certification to the effectiveness of OSS comes improbably from one of its opponents, the Microsoft Corporation. An internal Microsoft memo now known as the ‘Halloween Document,’ which was leaked to Eric Raymond and subsequently posted on the Internet, says following about the OSS:

‘The ability of the OSS process to collect and harness the collective IQ of thousands of individuals across the Internet is simply amazing. More importantly, OSS evangelization scales with the size of the Internet much faster than our own evangelization efforts appear to scale.’

Software cannot be sold like other goods in the market. It needs further services and developments from time to time. Presently, there is not much market for the skilled workers in the OSS industry. On the other hand, India is sending a good number of work forces all over the world in the PSs industry and they are well paid also.

In the development of OSS, there are little specific projects and timeframe for its development. It is mainly concentrated on a single person who has the core idea. Its manpower is mainly depending on volunteers and this made it difficult to maintain deadlines. The developers rarely meet each other and
discuss the project. The absence of incentives for innovation in the OSS programs affects its quality.

**Intellectual Property Protection of Software**

The proprietary software is protected under the intellectual property regime internationally in accordance with international treaties and under the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement of the World Trade Organization (WTO) since 1995. Protections, which come under this category, include copyright, patents, trademarks and trade secrets. Earlier patenting of software was excluded all over the world from patent regimes. The European Patent Convention 1978 explicitly excluded software patenting. In 1978, the US National Commission on New Technological Uses of Copyrighted Works (CONTU) recommended to apply only copyright to software protection. Eventually, the US became the first country to legislate on software copyright protection under the Software Copyright Act in 1980. The American position on the patentability of software has always been more permissive. Software was never excluded, and it was therefore never required to demonstrate a technical effect beyond the standard operation of a software program in order to qualify for consideration for patentability. Even it is a monopoly right granted to the developer for a fixed period of time, certain countries like UK permitted reverse-engineering of software to make back-up copies of software. These are the limited exceptions permitted under the US law.

In most of the countries, computer programs are eligible for copyright protection. Copyright protection serves to encourage, support and reward creative work - it ensures that creators secure rights to their inventions and receive remuneration for the products of their work. Copyright protection is thus important to the creation of new and original work in an industry where creative processes and the flourishing of ideas have brought about revolutions not only in technology but society at large. In India, copyright protection is granted to proprietary software.

The history of OSS movement can be traced back to the formation of Free Software Foundation (FSF) in 1983. FSF was formed with the objective of creating a free version of the UNIX operating system. FSF released a series of software with source code in the name of Gnus Not Unix (GNU). However, the released operating system was not fully free. The version of license followed by the GNU software was General Public License (GPL) or ‘copyleft’ license. This was considered as revolutionary at one point of time where all the softwares were protected by IPR. The controversy of whether proprietorship can be awarded to any new invention was an old but continuing discussion. The law grants property rights because society has decided that doing so makes us better off than we would otherwise be.

The opposition to IPR mainly is two-pronged, one with an ethical talk on the subject, and the other from an economic perspective. The economic perspective is that granting a patent and the like is giving the inventor/creator a monopoly, which enables him to get high profits, charge a price suitable to him, and in effect creates a barrier to entry. The ethical arguments against IPR are that knowledge should be shared, and IPR cause the mercantilism of intellectual capital.

On the other hand, support for property rights is more vociferous, with the view that there shall not be enough incentive to produce and invent new things, unless there is some kind of gain to the inventor. IPR is said to cultivate competition, thus making it more pertinent to invest in research and development, rather than act as a typical ‘free rider’ who finds it easier to copy existing designs and processes. IPR are extremely relevant today, especially in a world where most research and development involves a large-scale corporate effort, with hundreds of scientists and expensive research equipment, thus creating the need for commercial benefits.

**Software Protection in India**

An industry which is rapidly increasing its market size would invest more and more in R&D so as to continuously innovate and provide better services to its expanding customers. Thus, a need for protection increases, as is clear in the example of the Indian film industry, where the last decade has seen a massive increase in its market, ranging from the UAE to US and Europe. The film industry has now actively started campaigning against piracy and for copyright protection. The Indian software Industry is another example. According to the revised NASSCOM-MCKINSEY study in 2002, by 2008 the industry would employ 4 million people, which would account to 7% of India’s GDP and 30% of India’s foreign exchange inflows.

The software industry is prone to high costs of research and development. Adding to its woes is the
extremely low cost of reproduction. While the development of a typical program might take years and run into millions of dollars in terms of costs, the copy takes possibly a floppy disk or two and two minutes of inexpensive computer time.

The market for proprietary source software remains disproportionately large, compared to other alternatives. Microsoft dominates the office suite market, with 95% of the overall share and more than 300 million users worldwide. Windows systems (taken cumulatively) are said to hold more than 92% of the market share in Client Operating Systems sold. Globally, Windows overtook Unix in 2005 to claim the top spot in server sales, according to IDC. Computer makers sold $17.7 billion worth of Windows servers worldwide in 2005 compared with $17.5 billion in Unix servers. Linux came third. The demand for proprietary software is extremely high, and thus the importance of a valid and strong patenting and copyright regime is necessitated.

In India, computer software is protected under the provisions of Indian Copyright Act, 1957. Major changes to Indian Law were introduced in 1994 and came into effect from 10 May 1995. These changes made the Indian Copyright Law one of the toughest in the world.

When developing computer software, the creator of the software usually wishes to ensure that the time and effort expended is somehow protected against misappropriation by, for example, a competitor. By the same token, the software developer not only wants to prevent others from making verbatim copies of the software, but also from copying as much of the innovation that went into the software as possible. Software operating on a computer causes the computer to perform a process, and the process can usually be represented by any one of a multitude of different (even if functionally equivalent) sequences of software code. Thus, a software developer does not merely wish to rely on the prevention of verbatim copying of the software, since a competitor may observe the functions performed by the software, and without knowing the details of the software code underlying the functions, write equivalent code. Most software programmers therefore wish to maintain a hold over their creations so as to prevent misappropriation of the functionality of the software.

As with any other literary work, the copyright in software is infringed when a copy of it or a substantial part of it is made without the copyright owner’s permission. According to Section 14 of the Copyright Act, it is illegal to make or distribute copies of copyrighted software without proper or specific authorization. The only exception is provided by Section 52 of the Act which allows a back up copy purely as a temporary protection against loss, distribution or damage to the original copy. The 1994 amendment to the Copyright Act also prohibits the sale or to give on hire, or offer for sale or hire, any copy of the computer program without specific authorization of the copyright holder.

Software creates unique problems because it is so easy to duplicate and the copy is usually as good as the original (although many a times plagued with computer virus). The fact, that the copy is as good as original however, does not legitimate piracy. The copyright law makes no distinction between duplicating software for sales or for free distribution. A civil and criminal action may be instituted for injunction, actual damages (including infringer’s profits), or statutory damages per infringement etc. Moreover, with the amendments to Indian Copyright Act in 1994, even the criminal penalties have substantially increased. According to Section 63, now there is a minimum jail term of not less than 7 days, but which may extend to 3 years and fine which shall not be less than Rs 50,000 which shall be extended up to Rs 2,00,000.

The piracy rates in fig.1 show poor implementation of the laws available not only in India, but other emerging economies also. Copyright protection, which extends to the fixed expression of an idea and prevents others from copying the work, does not prohibit another from independently developing a similar work. Also, generally copyright protection does not prevent a competitor from reverse engineering a code.

The Copyright (Amendment) Act, 1994 has, however, enlarged the scope of protection of computer programs. The Amendment Act confers the
copyright holder with an additional exclusive right to sell, give on hire or offer for sale or hire any copy of the computer program regardless of whether such a copy has been sold or given on will on earlier occasions. In other words, even the legitimate owner (e.g. purchaser) of a copyrighted work cannot sell or rent his copy of the work.

The importance of this Act can be seen from the fact that India lost $151,300,000 in the year 2002 due to software piracy. Regionally, Latin America tops in piracy with 66% of share followed by Europe (61%), Middle East (58%), Asia Pacific (53%) and North America with least contribution of 22%. In terms of money, the European Union has the highest level of piracy worth $512,151 millions followed by Asia Pacific ($57,897 millions), North America ($57,549 millions), Rest of Europe ($52,313 millions), Latin America ($51,546 millions) and Middle East ($51,239). These amount losses to the industry show the urgency of stringent laws and its implementation to counter piracy.

An individual author who writes a program initially is the owner of copyright. A program developed by several individuals, in which the contribution of one author is not distinct from the contribution of the others i.e. a work of joint authorship, all the individuals are joint authors and own the copyright jointly. Similarly, in the case of a program made in the course of author’s employment under a contract of service or apprenticeship, the employer shall, in the absence of any agreement to the contrary, be the first owner of the copyright. Works created by third parties on commission do not automatically vest the copyright in the commissioning party. If the third party is an independent contractor, it is essential for the commissioning party to obtain the copyright through a written deed of assignment. It is a common misconception that the copyright automatically belongs to the commissioning party. Thus it is only where the developer is an employee creating the work under a contract of service that the rights belong to the employer.

**Government Procurement and Development Models**

The software industry today generates yearly $300 billion all over the world. The packaged software alone contributes $189 billion. Many of them argue that the open source software is good for economic development. This is mainly based on the notion that the proprietary software is costly and the OSS is ‘free’. The big question is what is free in the ‘free software.’

In the government procurements, they should consider all softwares that could meet their needs, based on functionality and cost. A cross-country analysis of, Europe, Brazil, China and India is presented in this section of the paper. Indian scenario is looked closely. This is mainly to test the hypothesis through a proxy variable that the development of the software industry means, selling of more computers vis-a-vis operating systems. It also argues that the intellectual property protection gives incentives to the software industry for further investment and development.

The procurement by government and industry should consider many factors when acquiring software that apply regardless of the licensing model. In evaluating or choosing a software model, many questions may be addressed, including:

- a) How does the functionality of any particular software address the relevant business needs?
- b) What is the total cost of customizing, implementing, managing, improving and maintaining the software over its useful life?
- c) What kind of services is provided, or what local services are available to maintain, modify or customize programs?
- d) How interoperable is the software with other programs?
- e) How secure is the software and what resources (vendor or otherwise) are available to respond to attacks?
- f) What is the stability, utility and assurance related to the rights transferred in the software?

The governmental incentives (direct subsidies) for developing software and exporting (export subsidies) are so high. The government procurement policies are also an important incentive, both for PSs and OSS. Indirect incentives include tax breaks and subsidized infrastructure facilities provided by the government.

The development of a country mainly depends on its economic activities. Recently, more and more governments are using information technology as a tool for job creation and economic development. The usage and promotion of OSS or PSs within the government and promoting its use within the country is exclusively depending on the policies of the
government. In many developing countries and most of the developed nations like the US and the European countries, OSS and PSs co-existed for a long time. During the 1980s, ‘free software’ emerged in the US as a tool mostly in office applications. Always, the adoption of the kind of technology has an impact on the industry. This is mainly due to the cost of the technology used and the chances of its further development. Many developing countries are of the view that OSS and PSs co-existence is better for a growing economy.

**Economic Growth, Open Source and Proprietary Software: Cross Country Analysis**

Debroy and Morris say, ‘economic growth and development is often an elusive goal.’ The governments are key players in promoting technology through their domestic law and policy. Increasing number of governments understand the compelling benefits of technology for their development. The selection of technology will always depend on their affordability, skilled manpower and training facilities within the country. The idea to promote the OSS is based on the notion that it will provide a low cost alternative to the PSs. The cost benefit argument is always controversial. The government is not only a policy maker but also the largest customer as well. It can direct the policies towards promotion of OSS or act as a neutral umpire. For example, in 2003 Brazil decided to use OSS in all municipal governments compulsorily. Some governments are taking decisions mostly on political reasons rather without analyzing technological and economic needs. The highest level of OSS is found in Brazil (12.9%), Kenya (12.3%) and Russia (12.8%). Turkey and India uses OSS and PR in parallel. The cross-country analysis reveals increased use and promotion of OSS not only in developing countries but developed countries like Europe also.

**Europe**

Europe accounts for around 30% of the global IT services market. According to IDC estimates, IT services spending in Western Europe is expected to grow at a compound annual growth rate of 11% in the medium term. In 1996, the packaged software industry generated $37 billion in sales; 334,181 jobs and $15 billion in tax revenues in Western Europe. In 2002, Western Europe has a software spending capacity of $109.6 billion. Its share in software exports are 21.3%. The software market was €56.7 billion in 2000 and it increased to a level of €109.3 billion in 2005. This represents an aggregate yearly growth rate of nearly 14% over the last five years, which is dramatically higher than for the economy as a whole.

The IMF predicted at that time only 1.2% of GDP growth in the euro-zone in 2002, and 2.9% in 2003. The software industry will not only contribute additionally to GDP, employment and tax revenues in Western Europe, but the use of the software will raise overall levels of productivity, efficiency and competitiveness for the region’s industry. In the year 2000, the packaged software market generated 1.1 million jobs through direct employment. These jobs contributed six times as much to the GDP as those in consumer goods. In 1999, the industry contributed €18 billion in tax revenue, grown to €32 billion in 2003. The e-commerce applications made the industry more buoyant in 2004 (Table 1).

Within Europe, UK is the largest IT market, estimated to be close to $39 billion and growing at a CAGR of 7.4%. The IT services market in Germany was $40 billion in 2005. Likewise in France, the IT services market was close to $30 billion in 2005. In Europe, local, state and federal governments spend 7.8 billion dollar on software in 2000. Microsoft sold 5 billion dollar of software in Europe in 2001.

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(Source: http://www.mindbranch.com)
Law and Policy

The European Parliament, for example, adopted a resolution in September 2001 that calls on the European Commission and Member States to promote software projects whose source text is made public.\textsuperscript{41} A number of Governments have pursued formal approaches to the adoption of OSS throughout Europe. This includes considering legislation to mandate the use of open-source solutions in government applications or at least seriously consider them as an alternative to proprietary software. In the industrialized world, this trend has been strongest in Europe, particularly, in France and Germany. The Sixth Framework Program (FP6) is the EU’s main instrument for the funding of research in Europe. The initiative will hand out \$17.5 billion 2003-2006, or 3.9\% of the Union’s total budget (2001).\textsuperscript{42}

The French Parliament proposed a bill concerned with both the use of open standards and the availability of source code for software used by the Government. An Italian bill under consideration mandates a preference for OSS in all government offices, and a Spanish bill requires regional governments to prefer and promote open source products. In April 2002, the administration of the Spanish district of Extremadura put in place a plan to switch all computer systems in government offices, businesses and homes to Linux and OSS applications.

The UK government has set out policy\textsuperscript{43} to consider open-source solutions alongside proprietary ones in IT procurement; to use products that support open standards and specifications in all future IT development; to consider obtaining full rights to bespoke and customized software code for proprietary software it procures; and to explore further the possibilities of using OSS as the default exploitation route for government funded R&D software.\textsuperscript{44} The EU-sponsored FLOSS survey (Berlecon/III 2002) found 43.7\% of German companies and 31.5\% of British companies using OSS.\textsuperscript{45}

The promotion of OSS by individual governments is evident in Europe. European Internet monitoring company announced that Firefox’s market share has very significantly risen in Europe in the recent months. Firefox usage was measured at 22.6\% in Finland, 21.46\% in Germany, 14.9\% in Poland, 12.4\% in France, and 10.7\% in U.K. Europe accounts for around 30\% of the global IT services market.

The development of any venture needs capital and profits for its long term sustainability. For example, two years of its overwhelmingly successful IPO in December 1999, the American open source corporation VA Linux Systems cut nearly 25\% of its staff.\textsuperscript{46} In contrast to more traditional software development firms, VA Linux Systems derives its profits from the sale of customized server platforms (or kernels) and the services associated with implementing an open source network. The present intellectual property regime in the EU promotes individual programmers and small enterprises. This should be streamlined in accordance with the international regimes, in particular the TRIPS under the WTO.

The greatest threat to continued innovation and investment in technology is the threat of piracy.\textsuperscript{39} Even the present proprietary rights and IPR regime has proven incapable of effectively addressing this issue. A study conducted by International Planning and Research in the year 2000 and cited by the Business Software Alliance (BSA) in its 2002 report on the health of the European software industry found that more than 30\% of software on Western European computers was unlawfully downloaded. The value of this loss was estimated at \$3.4 billion, 6\% of the value of the entire European software industry. This is much larger and has become a systemic problem in developing countries like China and India. In intellectual property protection and granting number of patents, the EU has a substantial growth of 47\% during 1996-2004. It increased from 40,069 to 58,730 in the same period. However, still the piracy rate is 34\% and the consequent loss is \$3.4 billion.\textsuperscript{47} The threat of piracy and counterfeiting are strong disincentives for software developers in Europe. The EU adopted 1996 World Intellectual Property Organization Copyright Treaties; member states must now implement the directive into national law. In November 2001, the European Parliament adopted directives to counter piracy and now it is strongly implemented throughout Europe.

The EU is one of the strong supporters of OSS. The governments should not mandate particular technologies or specific products in government procurement or support through policies. Let the consumer decide on the product which is suitable to his functions and business. The e-Europe initiative started in December 1999 helped to increase the computer literacy all over Europe and this will enhance the computer and software market in the near future also.
Brazil

Software Trade

Brazilian software industry is roughly the same size as that of India’s. The liberalization policies started in the 1990’s made the market more internationally competitive. Brazil is the largest software market in Latin America and the seventh largest software market in the world which represents 1% of the international software market. In 2002, software sales in Brazil were almost worth US$ 5 billion. In 2003, it increased to US$ 7.7 billion. Out of this 3.6 billion contribute to packaged software products and 4.1 billion from software services such as outsourcing, development integration and consultancy. Brazil imports between 1.5 to 2 billion dollar worth of software annually. Out of the total production of the Brazilian industry, 98% of sales have been consumed by its own domestic market. Exports represent only $100-million of Brazilian software sales. On human resources Brazil produces a strong contingent of 15000 IT graduates annually. The average Brazilian IT programers salary ranges from US $6,000 annually to over US $9,700. The personal computer sales are expected to grow 30%. The main problem with the Brazilian market is that less than 10% of the homes have computers. This compels the government to support the OSS program and localization of softwares in Portuguese language. The piracy rate is as high as 64%. However, the growth rate of IPR protection in Brazil is constantly increasing and as a result of this sales are also increasing (Table 2).


Law and Policy

In 2003, after two years trying to convince the public agencies to migrate to free software, a governmental ‘decree’ now compels all federal governments to adopt software of open code, as the Linux and the FreeBSD within a period of three years which replaces 80% of the Windows operating in state institutions. The decree compels the agencies of the government to adopt free software, at the first stage, four areas of use: in the operational systems for servers and stations of work (desktops); in applicatory the clerical one (publishers of text, spread sheet and of presentation); in the programs of inter-net navigation; and in the post electronic office. The government cabinets and public agencies that desire to keep software (of closed code, like the Windows) in its computers have to justify the option according to the decree.

At least five Ministries in the Federal Government plan to switch most systems to OSS. The Federal Governments are also providing incentives for state and local governments to follow. Brazil is considering a mandate to require all Federal Government agencies to use open source software and to encourage state and local governments to use open source software also (ZDNet, 27 April 2005). The national health care system plans to release 10 million lines of source code. In the province of Pernambuco, the world’s first law regarding the use of open-source software was passed in March 2000.

The cost of transition from proprietary to open source software was calculated by the Institute of Technology of Information (ITI) as R$ 230 million. The Institute estimates that the government spends about R$ 300 million per year with the payment of software licenses. This is a general calculation which is devoid of cost of manpower training, services and maintenance costs. The Brazilian economy as well software industry is growing well and there is a need to localize the operations of the Microsoft for capturing more market and help the government in programmes of IT education and training. On intellectual property protection, Brazil grants lesser number of patents in general. It was only 7078 in 1996 and there was a leap in patenting of 222% in 2004 and it reached 22821. This is a small number when compared to the US, 18,1322 patents granted in 2004.

China

China’s 10th Five-Year Plan (2001-2005) identifies software as a critical or ‘pillar’industry that is essential to economic progress and national security, hence deserving of government promotion, along with more established industries such as computer manufacturing, telecommunications, lasers, and aerospace. With the strong policy support, China’s software industry has developed rapidly in recent
years with an average annual growth of 30% on sales and 7 times growth on software export for the past five years. This was accelerated by the accession of China to the WTO agreement and liberalization of most of the economic activities. According the WTO agreement, wholly owned foreign companies are allowed to enter in the Chinese IT market. Software industry has already become a strategic industry for national economy and social development.

**OSS Initiatives**

China is a strong supporter of independent software making, because of its security concerns. One Chinese military official argues ‘maintaining independence and keeping the initiative over our own operating system will be the ‘Two Bombs and One Satellite’ [i.e. the intercontinental missile] of the new era.’

In 2000, the Ministry of Information Industry subsidized the Chinese Academy of Sciences to commercialize an operating system developed by Red Flag Linux, a Chinese Linux firm. Chinese government has been developing its own version of Linux (Red Flag Linux) for many years in order to remain self-sufficient and in order to protect its national security. The Beijing Software Industry Productivity Center was established by the Beijing municipal government and has launched a project named ‘Yangfan’to improve the performance of local distributions of GNU/Linux. In 2002, Microsoft signed an agreement with the Chinese government for the restricted use of its source code of Windows operating system. This made Microsoft more acceptable within the government and industry.

Chinese software market still remains immature due to many reasons. The users are not matured enough to understand softwares and the government firms do not have even a good e-governance structure. In China, government is still a big customer in the planned economy. The governmental policies greatly influence the selling of PCs and softwares in the country. There are problematic areas in the law and policy sector also. The lack of transparency in regulation and policymaking: state agencies and actors can (and do) change the rules of the game with little warning. Moreover the actions of different agencies and different levels of government in China are often contradictory. Piracy and counterfeiting are at the highest level in China and this is a major problem and disincentive to the software developers in the country. Approximately 60% of computers in China run on Microsoft Windows, but piracy means that the firm’s China revenues are less than 5% of what they would be if customers had paid for the software in newly sold computers.

**India**

India is one of countries with lowest rate of computer usage in the world with 9 computers for 1000 people. This is 500 in the US and the global average is 27. The drop in prices increased the selling of desktop PCs recently. The price cutting is mainly attributed to technological and competitive reasons. In 2003, the computer sales were about 3 million units in India which shows a comfortable growth rate of 30%. In 2004, it reached 3.63 million units which registered 20% growth and in 2005 it was 4.25 million (Fig. 2). This significant growth is due to the consumption of industries like telecom, banking and financial services, manufacturing, BPO and other e-governance programmes of Central as well as state governments.

The working of the operating systems in the desktops, 74% of the establishments had Windows while only 2% had Linux. In case of servers, 4% had Linux while 3% had other non-windows based operating system installed, 10% operated on Windows NT, 40% had Windows 95/98 and 25% had windows-2000. The figures show that Indian PC market is booming in the recent past. Increase in PC will increase the sales in operating systems, there is a huge market in the coming days.

**OSS Initiatives in India**

The Indian government announced that it would set up an open source software center to develop free software for its people and cut personal computer prices. A growing attraction to Linux in India has persuaded Microsoft to share source code with a particular government body. The Simputer was developed by a group of scientists from the Indian Institute of Science, Bangalore, and Encore Software.
Government agencies promote the use of localized solutions such as Indian-language computing. The Centre for Development of Advanced Computing and the Department of Information Technology is supporting the development of a Hindi GNU/Linux distribution called Indix. The Department of Information Technology has expressed an intention to introduce Linux as the de facto standard in academic institutions; research establishments will develop distributable toolboxes; central and state governments will be asked to use Linux-based offerings. The West Bengal Electronics Industry Development Corp Ltd, the state’s nodal IT body, has formed a Linux cell to support various governments IT projects inside and outside the state. Talks with major OSS industry players on joint projects are in progress.60

However, it is not desirable to eliminate the Windows lessons from school text books which have been done by the Kerala government recently. This amounts to denying the students a chance to study a technology which is prevalent all over the world. The recently released draft IT policy by the Kerala government emphasis on the use and development of OSS in the state. The policy proposals include establishment of an International Centre for Free Software and Computing for Development (ITES Training Centre) at Kochi. The policy envisaged that Free and Open Source Software will be used in e-governance projects. Open standards such as Unicode and Open Document Format and Open Architectures will be followed in e-governance projects to avoid total dependence on proprietary softwares. The government will provide incentives to companies developing free and open source softwares.51

The use of software is one of the ways to transform developing countries into a knowledge economy. The proprietary software helped India to become a leader in exports and making skilled experts in this field. India needs innovation promotion in local language versions in an affordable way. The Microsoft is charging differently in Indian and Chinese markets when compared to the European and US markets, which are much higher. These companies should help the developing countries to fulfill their developmental objectives and reduce the price of the softwares in a realistic manner.

The impact of softwares in the economy is hard to measure. The question at the heart of the debate is whether OSS or PSs is good for adoption and economic development of developing countries. More than 20% of the revenues of software developers are from government procurement. Even though OSS is ‘free’ software, many companies hire professional developers to work on improving OSS code to customize for specific business purposes. There is no compelling economic reason to support one model by the governments. The role of the government as an economic regulator is to maximize the welfare of the society through a policy that lead to the efficient use of softwares in the country. From the experience all over the world, political reasons and self-interest are the reasons for governmental intervention to curtail the market of PSs. It is for the governments to see that inefficient software is not used within the country for economic reasons. Ultimately, let the customer decide what type of software they want to buy.

The laws and policies should facilitate the demand supply side of the market and customer choices. For further development of the innovations in the IT sector, governments all over the world should proactively set in place concrete measures, policies and laws to protect the intellectual capital. In order to counter the spreading of OSS, Microsoft proposes a model of ‘shared source’ as an alternative to open source which looks practically nonviable.62

Conclusion

The limited data and a cross-country analysis reveal that governmental preferences of OSS are increasing, especially, in South America, Europe and Asia. If the PSs manufacturers want to prevent the switching over to OSS, there should be some incentives for using proprietary software. These incentives can be in the form of distribution of supplementary softwares or associated complimentary services to the consumers. This will enable them to increase their market share as well as further development and innovation in the proprietary software sector. This is important in the background that the governmental promotion of OSS is at the cost of proprietary software. Moreover, there is no reason to believe that the proposed governmental promotion of OSS increases social welfare. The argument of economic and technology development with the help of OSS tool is also weak. For example, India achieved the present level of economic achievement with the help of PSs rather than OSS in information and communication technologies.

The innovators develop softwares on two main streams: ‘proprietary’ and ‘open’. Neither method of
development is inherently better or worse; on the contrary, the existence of these different models serve as the foundation of a healthy and diverse software ecosystem, driving competition and thereby encouraging innovation—to the benefit of consumers and of society overall. But the free rider problem in OSS leads to underinvestment. The lack of appropriate incentive to develop products makes OSS as a general model unsatisfactory. The best model is the interaction between OSS and PSs that can impede innovation.

In India, there is no comprehensive policy on the use of either OSS or PSs at the federal level. Some of the states like, Kerala and West Bengal have taken an offensive policy against the use and spread of PSs as a part of their political agenda. These states took an agitative stand against computerization, as it would lead to unemployment. The result was that these states went backward in e-governance and producing skilled workers for the global need. Given the importance of the issue and timeliness of the debate, the central government should urgently formulate a comprehensive policy and the States should follow the suit in accordance with their local needs and development.

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References

2. The most basic definition of open source software is software for which the source code is distributed along with the executable program, and which includes a license allowing anyone to modify and redistribute the software, http://computing-dictionary.thefreedictionary.com/open-%20source.
3. Proprietary software is a private property owned by a person or a company. Its ‘private propertiness’ is protected by different intellectual property rights. It has restrictions on use and copying. Usually these are protected by patents, copyrights and software licensing, http://en.wikipedia.org/wiki/Proprietary_software.
6. ‘Open source software’ here is taken to mean all software which is sold, or made available along with its source code, and can be distributed after additional inputs subject to licensing terms set by the GNU GPL or any other licensing agreement. Open source software is software that is usually not sold for profit, includes both human-readable source code and machine-readable object code, and allows users to freely copy, modify, or distribute the software, http://www.training.tmsasia.com/article.cfm?id=22&sid=27.
7. ‘Proprietary source’ in this context refers to all software sold without the source code, for which the users are licensees, and they cannot freely distribute the software after acquiring license to it. Software that cannot be used, redistributed, or modified without permission, http://www.gartner.com.it/products/research/asset_129504_2-395.jsp.
8. The BSD or Berkeley Software Distribution license only requires that re-distributions of code covered under it identify the original copyright holder(s) and pass through a disclaimer in the form of warranty, BSD license, http://www.opensource.org/licenses/bsd-license.php.
14. Cathedral & the Bazaar is an essay by Raymond Eric S on software engineering methods based on his observations of the Linux kernel project and his experience with managing the open source project. Latter this essay was published in 1999 and it is considered as a manifesto of open source movement, http://en.wikipedia.org/wiki/The_Cathedral_and_the_Bazaar.
21. An unauthorized text of the so-called Halloween Memo can be found in unabridged format at www.scripting.com/misc/halloweenMemo.html. The OSI has posted the leaked version of the memo with commentary at www.opensource.org/halloween/halloween1.php. The OSI reported that the Microsoft Halloween Memo explicitly stated: ‘OSS is long term credible… [because] the real key to GNU/Linux isn’t the static version of the product but the process around it. This process lends credibility and an air of future-safeness to customer GNU/Linux investments. GNU/Linux has been deployed in mission critical, commercial environments with an excellent pool of public testimonials….Recent case studies provide very dramatic evidence that commercial quality can be achieved/exceeded by OSS projects. The Internet provides an ideal, high visibility showcase for the OSS world. The ability of the
OSS process to collect and harness the collective IQ of thousands of individuals across the Internet is simply amazing. More importantly, OSS evangelization scales with the size of the Internet much faster than [Microsoft’s] evangelization efforts appear to scale.’ In 2002 and 2003 Microsoft began experimenting with allowing limited viewing of its source code to large customers and Governments that in particular may wish to audit for security concerns, under particular agreements relating to nondisclosure and non-competition.


23 http://www.oss-watch.ac.uk/resources/softwarepatents.xml.


25 Copyright Act, 1976, Sections 117(a) and 1201(f).


27 Nearly 90% of the patents awarded in the last fifty years are owned by multi-national corporations.


37 Infrastructure facilities provided to the software companies in the Indian software parks.


40 Detamonitor, http://www.datamonitor.com/-e102s8492ade4495a09e86a5bb3bd06~/kc/.


44 www.wired.com/news/business/0,1367,51994,00.html.


56 Cited in Naughton and Segal (2001), p. 38. Chinese policymakers have even suggested that Microsoft Windows has ‘backdoors’ that allow either the company or the US to spy on users.


60 European Union interoperable delivery of European e-government services to public administrations, businesses and citizens open source observatory (3 August 2005).


63 http://www.microsoft.com/licensing/sharesource/.