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Privacy and Intellectual Property Right

F/LOSS and the Software Industry

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Abstract

This is the final paper for Privacy and Intellectual Property Right course. The subject matter of this paper is Free/Libre Open Source Software and in particular its impact in the Software industry and also in the world economy in general.

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Contents

1. Introduction

Thanks to the rapid development of technology and the huge amount of software that nowadays exist, different needs and trains of thoughts, related to this issue, start to gain a place in the world and especially in the market. Usually, people ideas can be divided in two different main schools of thoughts such as liberal and conservative thinking. These two strands are applicable in the software industry as well, especially talking about proprietary and free and open-source software. This paper will focus on Free/Libre Open Source Software (FLOSS) ideology in the today's market, making first of all a summary of free software history and concepts and then deepening on the impact, the benefit and the view of the free software movement in the software industry comparing them also with some private software characteristics.

2. FLOSS History and concepts

Before looking into the FLOSS economy, I think is important to lay the foundation of FLOSS by telling its history and its concepts.

2.1 History

Free software ideology born and grew in parallel with the computer science development. In fact, in the 1950s, 1960s, and 1970s, it was common for computer users to have the source code for all programs they used and the permission and ability to modify it for their own use as well [1], for instance two IT communities such as IBM 701 group and Massachusetts Institute of Technology were used to share their works to the people without any restrictions, letting them to modify it, fix bugs, and also share it in turn, in order to improve the software created in the fastest, cheapest, and perhaps in the better way. They actually based their work on the opinion that, with a large user group, you can attain a higher product quality, as a larger number of people use the software in different situations and provide feedback. It also limits the development costs, as you will receive some of the software from others. “Sometimes, the greatest ideas come from outside, ideas that you never had thought of. Users often widen our view.” (Project manager, Tulip).

In any case the ideology of FLOSS as we know it nowadays, started when software development began to change hands from universities to companies, and in further detail, when softwares started to be very complex and difficult to develop, so much that, companies, started to be “jealous” about their own works, preventing so, the sharing of their computer programs and algorithms, using copyright on it. This situation raised many problems, in fact, companies

which wanted to modify, adapt, or even improve a copyrighted software needed the owner's permission, leading in this way to a decrease of the speed of the computer programs development and to an increase of the software development costs. Therefore, in the 1983 Richard Stallman, a MIT community member disappointed with the culture's changing of the computer industry and its users, announced the first free software, mass collaboration project: GNU project.

Two years later the launch of the GNU project, Stallman founded the Free Software Foundation. The foundation started continuing some already existing free software GNU projects and in the 1989 they published the first GNU General Public License, which is the first license that prevents software distributors to restrict the freedoms that define free software. The license was basically based on four grants, which ensure the freedom to study, modify, use and adapt the program; the freedom to distribute the program to anyone, and, last of all, the freedom to take the program, modify it in order to improve it (the improvement must be released with the same license that the original program had, no further restrictions can be applied to the program).

2.2 FLOSS meaning

Thanks in particular to Stallman and the Free Software foundation, we have a general definition of FLOSS.

According to Wikipedia a FLOSS is a computer software that can be classified as both free software and open-source software. That is, anyone is freely licensed to use, copy, study, and change the software in any way, and the source code is openly shared so that people are encouraged to voluntarily improve the design of the software[1], while, in the English dictionary, Free Software is a software that everyone is free to copy, redistribute and modify. That implies free software must be available as source code, hence "free open source software" "FOSS"[2].

These definitions explain clearly the concept of free software popping that the main idea of F/LOSS is working together to create tools everyone wants to use individually. However I think that it is important to clarify the meaning of the words “free” and “open source” presents in the FLOSS concept, being always a lot of confusion about that. “Free”, indicates that the software does not have constraints on copyrights instead of that you don't have to pay for it, while “open source” indicates that the software is in its project form, enabling easy software development from expert developers collaborating worldwide without any need for reverse engineering[3].

2.3 FLOSS in law and differences between Free Software licences

Software patents are recognized by the courts of the United States since the 1980s. The industrial players of information technology have all taken out patents on software, as they were accustomed to do on hardware[4]. Theoretically, in Europe instead, software patents are prohibited, although many patents have been granted by the European Patent Office.

In any case in a legal view, both proprietary software and free software apply the regulations for the protection of copyright even if the ideological goals are different (in Europe and in the US as well). In fact the copyright usage on the Free Software is implemented in order to make the computer program actually free, in some cases also in order to avoid that third parties can deprive users of the freedoms granted by the author of the original software. Proprietary software instead makes use of copyright rules for advantageous economic purposes and, of course, to define the software owner. Law manages, in fact, free and proprietary software in the same way, others regulations such as distribution and usage of the software are regulated trough licenses. So the difference treatment of softwares depends only on how they are licensed.

There is instead, a little confusion between the different kinds of free-licences. FLOSS and FOSS softwares (which have basically the same free software meaning) have a license which satisfies the definition related in the four ethical points mentioned before, while open source refers instead to the Open Source Definition derived from the Debian Free Software Guidelines (series of 10 practical points that define what legal criteria must be met for a license to be effectively open source)[Table 1]. Even though open source seems to be more restrictive compare to FLOSS the differences between those are basically ideological. There are also softwares that for marketing or some others reasons have got licenses that are a merge between free and proprietary license, semi-free licenses (Freeware, Shareware and abandonware) and now I'm going to clarify the meaning of these three terms. The first one consist in a proprietary software available for free. Shareware instead is also available for free but only for a trial period. The last one, abandonware , consist in a proprietary software, covered by copyright, but the license is no longer imposed. In the special case of abandonware where the software owners make the proprietary computer program observed ,and the source code as well, available in the public domain, the software will become FLOSS.

Table 1: Open Source principles[5]

N	Grants	Specifications
1	Free Redistribution	
2	Source code	The program must include source code, and must allow distribution in source code as well as compiled form
3	Derived works	The license must allow modifications and derived works
4	Integrity of the Author's source code	
5	No discrimination against persons or groups	The license must not discriminate against any person or group of persons.
6	No discrimination against fields of endeavor	
7	Distribution of licenses	License must be distributively
8	License must not be specific to a product	The rights attached to the program must not depend on the program's being part of a particular software distribution
9	License must be technology-neutral	
10	License must not restrict other software	No provision of the license may be predicated on any individual technology or style of interface.

3. FLOSS economy

In this chapter will be examined further the importance of FLOSS in the market and its rule in the software industry, by analyzing first, the FLOSS commercial view, in order to explain specifically the development of FLOSS in the world economy after.

3.1 FLOSS is commercial

There is another frequent and common controversy error, probably came from a translation problem, talking about FLOSS. That is that, usually, people are used to think that FLOSS are noncommercial softwares. Actually the US law and regulation that define the term “commercial item“ shows in a perfect way that FLOSS software can also be commercial software, reaching the conclusion that FLOSS that has been released and licensed to the general public, and has at least one non-government use, is by definition commercial[6].
FLOSS projects, in fact, are supported by many for-profit companies. A good example could be The Apache web server that supports more websites than any

other; IBM and Oracle make some of their money on FLOSS projects as well. Still part of GNU/Linux code has been written by developers-for-hire, i.e. in the 2004 it was noted that 37,000 of the last 38,000 changes in the Linux kernel were made by developers specifically paid to make those changes[6], while the Linux Foundation's December 2010 in the report "Linux Kernel Development: How Fast it is Going, Who is Doing It, What They are Doing, and Who is Sponsoring It" (by Jonathan Corbet, Greg Kroah Hartman, and Amanda McPherson) reported that the percentage of Linux kernel developers paid for their worked is around the 70 %. But why companies do investments in free software? And how do they make money with them?

One grant of software under FLOSS license is the free distribution of the source code and the software itself, thus, it would be such a no-sens to sell FLOSS computer programs. In any case there are other way to earn through free software. Free software companies usually earn with other computer science services correlated to the free software observed, such as advice services to the clients, improvement and update required from companies which are using the free software, computer program personalization and fix bugs, advertising and donations. Another method used by "commercial open source" companies in order to make money is to make available, under FLOSS license, just a piece of software, while, customers have to pay the remaining software part which is licensed differently(open core). In conclusion, we can say that some FLOSS projects attempt to earn money (directly or indirectly), but nearly all FLOSS projects attempt to create wealth in the form of improved software. And they attempt to create wealth via trade and dealings [6] and that, makes in any case, FLOSS softwares commercial.

3.2 Who is using FLOSS

Despite FLOSS softwares companies haven't got a marketing campaign as big as proprietary softwares companies have, there are many organizations and companies that nowadays depend upon FLOSS, first of all for economics benefits. FLOSS in fact works well in small and medium-sized enterprises, both when it is used and when it is developed as well. That is because the purchase and management costs are lower than those of patent-protected software and it also can be used on older machines tend. Still some public institutions decided to adopt free software systems for security and ideological reasons, for instance in 2005 the Government of Peru voted to adopt open source across all its bodies[8] and in March 2015 the Indian government announced a policy on adoption of open source software[1]. Public administration and governments even tends to give priority to free software respect to proprietary software, for instance the Article 68 of the Digital Administration Code says that the Italian public administrations, when acquiring or adopt software, are expected to carry out a comparative evaluation (technical and economic) that gives priority to open source solutions than proprietary softwares.

Actually, not only small and medium-sized enterprises and public institutions are using and support free software. There are also many famous organizations (Wikipedia, European Commission, CERN, NYSE New York Stock Exchange, US. Department of Defense) which run their works on the free software system GNU/Linux. These organizations found in FLOSS the best solution for their problem statements and their needs, and the most appreciated quality of Free softwares seems to be its flexibility, so much that the US Department of Defense's Associate Director Daniel Risacher in a interview made by the Free Software Foundation said: "... the ability to gain victory by changing and adapting according to the opponent is called genius. Free software provides us new ways to adapt, remix, and change our software capabilities in ways that traditional software models have not. That agility can be essential in the face of determined and adaptive adversaries[9]". Nevertheless both of FLOSS and proprietary software approaches have their advantages and disadvantages which companies, organizations and public institutions must analyze carefully in order to make the right decision between them. The main reasons that lead companies to the FLOSS software decision, rather than proprietary, usually are that in one hand you want to protect the data accessibility by customers and users even after a long time with the use of open formats, eliminating, at the same time, the potential risks related to dependence on proprietary software.

3.3 FLOSS business advantages

There is a very large quantity of benefits that a free software usage could bring, related on the companies situations and needs. In any case the most important and common advantages reported until now can be summarized in two main points:

3.3.1. Quality and stability

The most important advantages is tapping into external contribution in the innovation activity. That is, F/LOSS activity emphasizes access to external capabilities rather than internal resource ownership. Harnessing this innovation potential would allow the production of software and services that would be more tailored to users' needs[10]. In general, in fact, FLOSS gets more closer to what users want, precisely because those users can have a hand in making it so, than proprietary softwares. In addition the market competitions leads software suppliers to try to establish a virtual monopoly on his products, forcing upgrades onto its audience. Typical these tactics include new improved file formats (which require the new and improved software to read them) or to withdraw support and bug fixes for older versions after a short period.[11]

"It is the use of proprietary standards and protocols that effectively mandates the purchase of further products from the same supplier. Mandating the use of

open Internet standards (as in the e-GIF) rather than proprietary formats, and developing XML-based data definitions, for intra-Government, and Government-to-Citizen interoperability, is a practical approach to controlling the [proprietary lock-in]".[11]

Free software instead tend to make standard changes slowly, trying to maintain stability on file formats, eliminating as much as possible the problem of incompatibility of formats. Furthermore, proprietary software producers tends to handle bugs problems of their programs in a slower way, typically because they need to filed a defect report then there will be a delay before the vendor determines when or whether to issue an updated release, while thanks to the availability of the source code, usually in free softwares bugs are resolved faster (Still companies or users that fund bugs can fix them).
So, in conclusion, technical superiority is typically the primary reason enterprises choose open source software[12].

3.3.2. Auditability, accuracy and costs

Proprietary software, in order to sell their product, try to convince customer to trust the vendor claims. But, without the possibility of see the source code, these claims cannot be verified. That's could be a serious problem especially for customers that are looking for software with specific characteristics, for instance specific security features. On the contrary, if the source code is available, the software users can easily verify the seller's claims.

Another advantage is the reduction of costs resulting from the purchase of licenses but also necessary for the maintenance of operational systems,such as costs given by IT support cost sand staff training. However from a business perspective the purchase cost of software is only one factor; total cost of ownership is what really matters[11]. Furthermore the visibility of the code behind open source, the possibility of modify it and the liberty of publish new version of the revised software observed, allow the computer program users to add the features they want without any restriction or additional costs. It's also true that nowadays expensive software providers often ensure personalized updates, and assistance, but freedom and flexibility are in any case limited.

3.4 FLOSS business disadvantages

Changing business prospective, the applicability of FLOSS in the market is being reduced. Open source software, first of all, can tend to evolve more in line with developers' wishes than the needs of the end user [13] since there are no money reasons generated from the software sale. There is indeed, an high group of companies which have a very low computers science knowledges, therefore, these companies are not able to modify fix or update FLOSS software, leaving to external developers these tasks. One consequence is that

FLOSS usually becomes less user-friendly than proprietary software, because external developers pay more attention in technical details rather than others useful features such as design and interactivity, thereby making free software more uncomfortable for average users.

Next, since free software rely on its community of users for respond to and fix problems, FLOSS tends to have less support available, making bugs, installation and others technical issues more difficult, or at least slower, to solve. So, in other words once a company decide to use free software usually it is on its own. In fact, free software does not provide for a technical support staff, at least not as free service.

Another little and not very common free software issue arising from its transparency is that, since the source code is available, FLOSS allows people to study it, allowing also possible malicious users to discover any vulnerabilities. In any case I think that although this problem is hypothetically possible to occur, it is also true that transparency strengthens in terms of software security, considering that the majority of the people who handle the code, it does it in order to improve it and thus to avoid also security problem. It is also possible to say that, “experts” of free software usually believe in free software and in its ethics, respecting them. Cracking a software would mean to go against FLOSS and Open source principles.

It must also consider that proprietary software is a big-time money, much more than Open Source. This means that, proprietary software companies, bet more on advertising and other marketing strategies, becoming, in this way, the most widely used products. People therefore result to be more used, comfortable and friendly on proprietary softwares. For example most knowledge workers are familiar with Microsoft Word and Excel, even though there are some excellent open source alternatives to Office, such as LibreOffice and Apache OpenOffice, that they aren't identical in terms of functionality or user interface, performance, plug-ins and APIs for integration with third-party products [14].That could be a problem in terms of adaptability and comfort as well as the casting on suppliers or customers documents issue. For the same financial reason, typically proprietary software fit better with the hardware, since proprietary hardware and software works , in a way, together. Therefore, usually open source developers don't know the hardware with they have to deal. "Open source developers may not be able to 'see' the hardware, so the proprietary driver may well work better"[14], often reaching worse results in terms of hardware adaptability.

The last disadvantage that I think it is important to write about is that FLOSS updates are uncertain. This problem is focused, in most cases, on small free software projects where is much more easy that developers lose their interest on them.

In conclusion we can say that Commercial products typically promote visible features (giving marketing advantage) over harder-to measure qualities such as stability, security and similar less glamorous attributes.[11] Then we can describe FLOSS and proprietary software as quality vs features. Furthermore free software require technical knowledges than proprietary software and a company, before make a FLOSS usage choice, has to prevent time and effort into training employees to the level required to use it, obtaining in the other hand an higher qualitativity product.

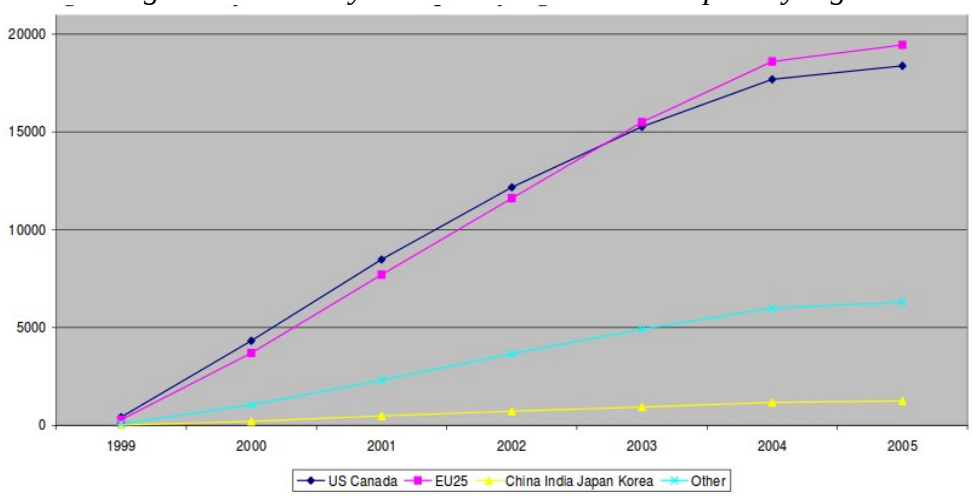
4. FLOSS economic impact

In this paper until now, I have demonstrated that FLOSS can be, at very least, competitive in the market, most of all in the software industry, and it has a role to play in the ICT business. Performance of the ICT industry has potential to be strongly affected by Free/Libre/Open Source Software[15]. The European Commission in 2007 released a report containing the economic impact of Free/Libre or Open Source Software on the European ICT sector precisely in order to show the data of this impact. The study has been carried out by UNU-MERIT. The report may seems a little bit old, in any case, I think that, being the software industry steadily increasing, FLOSS industry increasing as well. In this way, I am going to summarize the European Commission report not in order to put down the actual data of the FLOSS impact in the software industry, but in order to show that Free software actually is in the software industry and the consequences, direct and indirect, carried out by that.

4.1 FLOSS impact in Europe

The study begins by claims that the leader of the continent regarding the collaboration of FLOSS developers, it is Europe, taking the role of project leader in the most FLOSS global projects having a peak since the 2000s[Figure 1]

Figure 1: Globally active FLOSS core developers by region



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They reported that FLOSS applications are first, second or third-rung products in terms of market share in several markets, including web servers, server operating systems, desktop operating systems, web browsers, databases, e-mail and other ICT infrastructure systems, supporting the 29 % of the total of software developed internally in the EU. This is mainly due to Central Europe and Scandinavia which provide for a very large number of FLOSS developers. FLOSS has had an impact on both the European public and private market, although, for the moment, FLOSS software are used mostly in the public sector. As we already reported in fact, many governments and public administrations link on FLOSS especially for security, transparency, and ethic reasons. However, also private companies have benefited from FLOSS, gaining ground also in medium- and large-sized companies. In fact, usually, the source code written by companies and institutions, is carried out by firms with an high number of employees[Table 2].

In any case, even if private and public institutions use, update, manage and deal with Free software applications they still provide a less direct contribution on FLOSS development than individuals developers do. The report indeed showed that about the 65 % of the FLOSS code has been written by individuals, establishing at least 400million € in voluntary contribution from individuals programmers alone each year[16]. They reported that when compared to the US, it would seem that there is a better individuals contribution in Europe that has led to an increasing number of globally successful European FLOSS small- and medium-sized enterprises (SMEs)[16].

On the other hand, the U.S. has the lead in the large FLOSS-related business. Of course this huge amount of individuals free developers is a large savings for businesses, from the commercial and also public point of view, allowing in this way companies and institutions to invest the money they saved in further innovations.

Table 2: FLOSS Firms' code output (source lines of code) by size and sector

Size class: number of employees:	Small <51	Medium 51-250	Large >250	TOTAL
Computing equipment	0.11%	0.20%	34.35%	34.65%
Software consultancy and supply	2.77%	10.28%	25.60%	38.65%
Services - excl software consultancy and supply	1.11%	0.02%	3.35%	4.48%
Manufacturing - excl computer equipment	0.07%	0.03%	1.87%	1.96%
Other	0.73%	0.65%	18.88%	20.26%
TOTAL	4.78%	11.17%	84.05%	100.00%

They in fact approximated that the existing base of quality FLOSS applications with reasonable quality control and distribution would have cost to the firms almost 12 billion € to reproduce internally[17], and, this cost, is steadily increasing.

In any case European firms also have invested an estimated 1.2 billion € in developing FLOSS software that is made freely available[16] and, the notional value of European FLOSS investments covered about the 20 % of the total European software investments. All these FLOSS investments, in concrete terms, has generated for Europe wealth and created employment that are pretty important, especially in the European software industry, that has always had lower ability to create new software businesses compared to the US[15], bringing new software business opportunity.

In the end, the study led with a simulation model where it has been shown that, the increase in investment on FLOSS would bring indirect benefits on the GDP , producing a 0,1 % annual GDP (equal to 10 billions per-year).

4.2 FLOSS impact in the US.

At the same time in the USA thanks to a higher venture capital and risk tolerance, the software industry investments counted about 180 billions of dollars, out of which, the 20 % are investments made for FLOSS. Software industry in the US. can claim higher investments, project and software development employment than Europe, as much that many and many developers from all around the world plan to stay in the US, obtaining as results a fastest and easiest development of this industry compared to all the others regions. This larger business money racket allows the US. to boast high-quality and big products, where Europe and the rest of the world cannot compete with

them. In any case this also means and implies a disincentive of the usage and the development of FLOSS and all the products supported by free movement. Despite, in fact, the dominance of the US. in the software industry, the North America is second in terms of global project leaders, preceded by Europe. Nevertheless FLOSS directly supports the 43% share of software that is developed in-house, and it was calculated that FLOSS investment will be raised from 1.7% to 2.3% of GDP in the US by 2010, predicting astrong growth of 30% on average from 0.5% to 5% of the total market of information technology[16].

5. Conclusion

Therefore in the 2007 FLOSS have already had an important role in the software industry and in the economy in general both in Europe and in the US., being well established in sectors as diverse as aviation, health, telecommunications, finance, publishing, education, and government. Nowadays the trend of Open Source driving new technologies continues. Cloud computing, Big Data, Operating Systems, and the Internet of Things rose to the top of the list. Security has become a focal point of discussion for all technology solutions, but despite overall industry challenges around security, confidence continues to rise in Open Source Software's ability to deliver secure solutions.[18]

Looking further ahead, the 2015 Future of Open Source Survey research carried out by Black Duck Software and North Bridge, reported in fact that the 78 percent of the respondents companies use OSS in at least one of they operation, while 66 percent creates software for customers built on open source systems. Furthermore 64 percent of companies currently participate in open source projects[19], that, compared to the 20 % found in the 2006, seems such a huge and optimistic increment of the FLOSS economic belief. On the top of that the 88 % of the companies took into consideration for this study are expected to increase contributions in open source projects over the next few years. This growing corporate usage is certainly credit of the advantages provided by FLOSS, and suggest an additional increment of the FLOSS usage in the future. In any case, for the moment, FLOSS is an extremely important and strong piece of the software industry all over the world and it has been undoubtedly a key factor for the computer science development.

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