

# SENG-403

## Group # 2

# Open Source Development

Final Report

Dated: April 10<sup>th</sup>, 2014

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# 1. Introduction

Open source software is defined as “any computer software, generally developed as a public collaboration, whose source code is made freely available”[1]. Many companies today are opting to make their softwares open source. Open source projects have many benefits to the companies who are supplying such code; also, have social, economic, and technical benefits. Some benefits that open source softwares have are features such as reliability, security, fast deployment, etc. Open source software also has many disadvantages like licensing issues, legal challenges, insufficient resources, and unfamiliarity. This report highlights the technical and human aspect of open source software like Linux, Eclipse and Ubuntu.

The case study chosen in this report is Linux; since, it is one of the largest open source projects. The case study demonstrates how open source software can influence human and technology aspects, and social relationships between software developers and users. Ultimately, companies are interested in how to commercialize the software. Another case study component is MySQL, which has created an enterprise edition, so that users can get more benefits of the platform for a certain fee. Lastly, Eclipse is an other case study discussed in this report. Eclipse receives donations in order to maintains its IDE. Overall, this report looks at the beginning of open source software and the benefits it provides to society.

## 2. Background

Open source software began in the 1970’s but the notion had started before then[2]. The concept of free sharing of information occurred before computers were invented. Before the 1970’s, most software that was produced was mainly by computer science academics and corporate researchers[2]. Although, the availability of free open source code and the thought of exchanging ideas had started to evolve in the 1970’s, the notion of open source software started back in the 1953’s when A-2 system UNIVAC division of Remington Rand source code was released to the users [2]. In 1967, IBM distributed the source code for the airline control program and users in IBM called it “SHARE”[2].

AT&T distributed early versions of UNIX at no cost to government and academic researchers, but these versions did not come with permission to redistribute or to distribute modified versions, and were thus not free software in the modern meaning of the phrase. After UNIX became more widespread in the early 1980s, AT&T stopped the free distribution and charged for system patches. As it is quite difficult to switch to another architecture, most researchers paid for a commercial licence. [3]

However, there were still those who wished to share their source code with other programmers or with users on a free basis. Prior to the introduction and widespread public use of the internet, there were a number of alternative ways available to do this, including magazines and computer programming books. In 1997, Eric Raymond published “The Cathedral and the Bazaar. ” a reflective analysis of the hacker community and free-software principles[4]. Netscape's act prompted Raymond and others to look into how to bring free-software principles and benefits to

the commercial-software industry. In the early 1980's, two groups established the movement of open software project, Richard Stallman and Computer Science Research Group (CSRG)[4]. Richard Stallman was a programmer at the MIT AI Lab who launched the GNU Project and the Free Software Foundation [4]. The CSRG mainly worked on improving the Unix system [5]. Also, many UNIX hackers around the world helped debug, improve, and maintain the system [4].

The label "Open Source" was adopted by some people in the free software movement at a strategy session held at Palo Alto, California, in reaction to Netscape's January 1998 announcement of a source code release for Navigator. The group of individuals at the session included Christine Peterson, who suggested "open source", Todd Anderson, ,Larry Augustin, Jon Hall, Sam Ockman, Michael Tiemann and Eric S. Raymond. [3]

## 3. Analysis

We all enjoy doing something meaningful, something that serves a purpose we think worthy. Contributing to open source projects is definitely a good way to do something meaningful. There are many reasons to contribute to open source.

### 3.1 Social Benefits

- **Sharing:** Open source means developing the system or upgrading an existing system. This is done by allowing people to use, modify, share and study valuable source code. This is the next step toward helping, something that is common with many developers. Some people believe that taking part in open source means working for the advancement of greater shared knowledge.
- **Helping:** Participating in open source efforts helps others reach their goals. It educates others by sharing valuable, intellectual value with them. This is helping others, something that I believe is profoundly human and draws people in; thus, illustrating the dedication people show toward their open source efforts.
- **Customer Focus:** In many open source projects, the community interaction helps developers gain a clear awareness of the needs of people using their code. Open source projects often believe that putting the customer first will result in great things. This is both useful as a great learning opportunity and as something that is fulfilling for those involved, by helping the customer.
- **Community:** As human beings, we usually enjoy the sense of belonging to a group of like-minded people and that is even stronger when we join a group that works towards a purposeful goal.
- **Skill development:** Someone can become a master of their trade in non-open-source environments. Open source projects foster a sense of ownership and responsibility that pushes people towards greater achievements.

### 3.2 Economic Benefits

- On average 30% of implemented functionalities is based on reused open source code ( Sojer M., Henkel j. “Code reuse in Open Source Software Development” )
- Gartner reported that among the surveyed customers, 26% of the code deployed was open source. [6]
- Koders survey in 2010 found that 44% of all code was open source. [6]
- By reducing effort, staffing and duration the 35% code reuse introduces a reduction on these parameters of 10%. [6]
- Reduction in Failure rate of 2%. [6]

### 3.3 Technical Benefits

- Open source software referred to as appropriate technology meaning the technology is accessible and affordable [7].
- It enables production, as well as consumption. [7]
- It has been proposed as a new model of enabling innovation for sustainable development. [7]
- Reliability increases with an open source software, since it is peer-reviewed [5].
- Companies are flexible in order to adapt to specific software [8].
- Open source software has fast deployment, since, the software is constantly improving.
- Less hardware costs, like Linux is an open source solution that is easily portable and compressed [9].
- Lower software costs, meaning users don't have to pay for licensing and maintenance costs [9].

### 3.4 Personal Benefits

- **Jobs:** There are many software companies that base their product on existing open-source GPL code (such as Ubuntu) and they are actively seeking developers who are familiar with these open-source code. Job seekers who have contributed would have a competitive advantage over those who did not.
- **Experience:** There is very little difference between a well-known open-source project and a “real” software development project. So it's very easy to gain valuable working experience by contributing to an open-source project.

### 3.5 Drawbacks

- **Legal Challenges:** The Open Source Movement has faced a number of legal challenges. Companies that manage open source products have some difficulty securing their trademarks.
- **Unfamiliarity:** Open Source Software generally does not focus on making user interface design intuitive which makes it difficult for average computer users to learn and use it

due to which they prefer proprietary software.

- **Licensing issue:** Issues with licensing remains a major concern. There are multiple licenses available for open source software which makes licensing of these software a complex process.
- **Insufficient resources:** Smaller organizations cannot afford the resources individually [8].
- **Multiple Sources:** Often there is no single source that supports all aspects of the application [8].

## 4. Case Study: Linux

With hundreds of distributions, thousands of developers and millions of lines of code, Linux is one of the largest open source projects. It holds a strong example of how open source software can both influence technology, and interpersonal relations between software developers and users. The technology aspect can be studied through various different distributions of the operating system and the human aspects can be studied through the communities themselves which have formed around both the distributions and the applications developed for them.

### 4.1 Technology Influences

Linux holds a wide variety of distributions to meet many needs for computations [10] and for ones that have advanced their fields in ways which only open cooperation between experts could.

- Backtrack Linux [11]:

Linux distribution with a focus on computer security; it focuses on penetration testing of networks and is used by security professionals around the world in order to make sure their data is safe. There are very few other services available in such an open manner which allow for users to explore hacking and security in such a free manner. Some of the more specific abilities built into the OS for users are information gathering over networks (attempts to obtain passwords through network observation), MySQL database exploitation testing, and Openvas which provides many different vulnerability scans in order to better gauge how secure a system is.

- Scientific Linux [12]

Linux distribution with a focus on bringing together scientists and engineers; it focuses on reducing duplicate work for scientists and engineers in their labs and experiments. Now being used on approximately 120 000 computers [13], the endeavor has been received successfully in many areas of academia including labs and universities due largely from being developed by the major organisations of CERN and Fermilab [14]. The OS has been designed to have the ability to be customised to take on large scale computations found in the various scientific while maintaining its compatibility with the enterprise world.

- Android [15]

An enterprise OS developed by Google, and used in the smartphone industry, which is based on the Linux kernel and has remained open source for its developers. This style of business has allowed the OS to become the most used smartphone environment [16]. The OS has allowed for massive expansion in the portable computation community in its ability to customise the kernel itself in order to meet the personalized needs of its users. However, as of late google appears to be working towards closing the system down more on its users [3], and this leads into the interpersonal interactions between developers, users and companies found within the linux system.

## 4.2 Human Aspect

One of the main draws to making use of open source software are the social aspects of them. The thousands of developers and millions of users working together on linux have created a vast community of people eager to help one another and share their individual experiences.

- Ubuntu [17]

The Ubuntu Forums are a community of programmers and Ubuntu users with just under two million members [18]. They showcase some of the best aspects of the social benefits of open source software; they've created a massive community of people with similar interests who are enthusiastic about sharing their work and helping other users both old and new. Ubuntu has gathered such a large following, in part thanks to their community based view on open source software; they set themselves apart from commercial Linux systems because Ubuntu doesn't try to divide its efforts between creating a for profit, commercial version as well as a free 'community' version. Both the commercial and the community teams collaborate to produce a single, high-quality release [17]. One of the key tenets of the Ubuntu Project is that it remains a shared work between Canonical, other companies, and thousands of individual volunteers so that they can all use their unique expertises to create the best system that they can [17]. With the users playing such an active role in the development of Ubuntu they are able to more effectively tailor the operating system to their individual needs. These human aspects are what have molded Ubuntu into what is today. Unfortunately not everything regarding open source software and Ubuntu is positive to the community; Canonical (the company that develops Ubuntu) has added surveillance code to the system. When the user searches their own local files for a string using the desktop, Ubuntu sends this info to Canonical's servers [19]. Luckily due to the open nature of the code users were able to discover this privacy breach and decide for themselves whether they'd like to continue using Ubuntu regardless.

- Linux[20]

The Linux.org forums are another community setup by both programmers and users alike who all share a similar interest in Linux. They've created a large number of beginners, intermediate and advanced user level tutorials covering various topics such as file compression, the linux kernel and security, [20] in order to help users with a desire to advance their knowledge base. A large part of the human aspect is people taking pride in things they have a hand in working on and being able to spread things they've made to other people all while gaining valuable

experience. The Linux forums are a great place for these users to share their work with other like-minded individuals while educating others and learning at the same time.

### **4.3 Business Model**

We live in a capitalist world, where almost everything is driven by money and it's impossible to find enough volunteers to create all the open source software in the current market, so open source developers need some method to earn profit and sustain themselves. Here are two common methods by which some well-known open source developers make money

- MySQL (Oracle) [21]

MySQL is an open source database software owned by oracle. Their “MySQL Standard Edition” is free to use by anyone, but they are offering an “MySQL Enterprise Edition” and “MySQL Cluster Carrier Grade Edition for sale at \$2000 - \$60000 per year [22] . The advanced edition contains a number of features that are not available in the standard edition such as “MySQL Enterprise Backup”, “MySQL Enterprise Security”, etc. [23] and as their names suggest, these features are designed for a large enterprise. Oracle is also selling support/training/consulting services in separate packages. Therefore, in reality, Oracle is not much different than a standard closed-source software developer, where the standard edition is equivalent to a demo version with limited features and the advanced editions is company's real product.

- Eclipse (Eclipse Foundation) [24]

Eclipse is an open source Integrated Development Environment written in Java by the Eclipse Foundation. The Eclipse Foundation is a not-for-profit organization founded by IBM and supported by a consortium of software vendors [25]. Unlike MySQL, Eclipse is completely free. There are no “advanced” editions and extra support cost, the majority of Eclipse's revenue comes from donors. So why would people donate? Since, Eclipse is free, it holds competitive advantages over similar non-free product and attracts a large user base. The users of Eclipse need the IDE maintained and Eclipse Foundation needs revenue to keep itself running, so it is logical for the users to donate to Eclipse Foundation and for the foundation to continue to improve Eclipse to satisfy its users. Thus, the developer and the donor form a mutually beneficial symbiotic relationship.

## **5. Conclusion**

Open source software started in the 1970's, where it was made widely available to the public. Open source software brought many technical and human factors. Open source software allows sharing of ideas, helping others, skill development, and community engagement. Ultimately, many people receive different benefits from open source software. Not only people, but organizations receive many benefits when engaging with open source software. Many organizations can customize open source software to obtain efficiency or to suit their own practice. Not only is it efficient for organizations to engage in open software but many save huge amounts of money when using open source software since proprietary software can be

expensive. Organizations can avoid possible vendor lock-ins and can modify the code to their liking. The ability to be flexible to change or add new software remain as a huge advantage for open source software.

Open source software is accompanied by many disadvantages. For example many organizations have legal challenges for securing their trademark and licensing issues. Users also have an unfamiliarity with learning the software, and some may prefer the proprietary software. Various case studies were done to evaluate if open source software was valuable to the organization. Linux was used as an example case study in this report, which demonstrated how open source software can influence technology and interpersonal relations between developers and users.

The ultimate goal for any company is to earn money. For example My SQL is offering an enterprise edition. Others, such as Eclipse. In order to earn money it holds a competitive advantage over other open source software; so many people donate to Eclipse in order to maintains its IDE. Open source software has various advantages and disadvantages, therefore, it remains uncertain if open source software is better than proprietary software.

## 6. Contributions

Name	Contribution
Mariam Dost	<ul style="list-style-type: none"> <li>● Section 1 Introduction</li> <li>● Section 2 Background</li> <li>● Section 5 Conclusion</li> <li>● Edited               <ul style="list-style-type: none"> <li>○ Section 3.3 Technical benefits</li> <li>○ Section 3.5 Drawbacks</li> </ul> </li> <li>● Final formatting of references</li> </ul>
Reeta Suman	<ul style="list-style-type: none"> <li>● Section 2 Background</li> <li>● Section 3 Analysis               <ul style="list-style-type: none"> <li>○ 3.1 Social Benefits</li> <li>○ 3.2 Economic Benefits</li> <li>○ 3.3 Technical Benefits</li> <li>○ 3.5 Drawbacks</li> </ul> </li> </ul>
Jameson Weber	<ul style="list-style-type: none"> <li>● Section 4 Introduction               <ul style="list-style-type: none"> <li>○ 4.1 technological aspects of a Linux case study</li> </ul> </li> </ul>
Jordan Gay	<ul style="list-style-type: none"> <li>● Section 4.2 Human aspect of a linux case study</li> </ul>
Xiao Lin	<ul style="list-style-type: none"> <li>● Section 4.3 How do open source developers make money</li> <li>● Section 3.4 Personal Benefits</li> </ul>

Shadda Mohammed	<ul style="list-style-type: none"> <li>• Format references</li> <li>• Final edit and formatted report</li> <li>• Final formatting of references.</li> </ul>
Mac Tonogai	<ul style="list-style-type: none"> <li>• Edited introduction</li> <li>• Format references</li> <li>• Final edit and formatted report</li> </ul>

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