

**John Magnotti
and the
JMU Unix Users Group**

Student Open Source Use on the JMU Campus

Michael Lam

Executive Summary

"Open source software" is computer software for which the source code (the instructions that describe the software's behavior) is made available to the public. This kind of software is not a new phenomenon--the open source GNU project was originally started in 1982. Since then, projects like Mozilla Firefox (an open source web browser) and GNU/Linux (an open source operating system) have gained popularity and market share. Unfortunately, there have been few studies of open source use by college students.

This study was conducted to examine the James Madison University student population to determine current awareness and usage levels of open source software. There are two broad areas in which students may use open source software: on-campus computer labs and privately-owned computers. Interviewing a member of the lab services staff and surveying the JMU student population revealed that open source software is being used on the JMU campus, but has not yet experienced widespread adoption. The open source web browser Mozilla Firefox makes a decent showing in the computer lab statistics, and most students had at least heard of the Linux operating system. Only a small number of students reported being unwilling to try open source software.

In general, students seem open to learning more about and perhaps experimenting with open source software in the future. More research is necessary to determine whether this is a goal worth pursuing, and if so, what the best education and dissemination methodology is. A funded study with a reward for participation might induce more students from a wider variety of background to participate, thus improving the statistical significance of the results.

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Introduction

"Open source software" is computer software for which the source code (the instructions that describe the software's behavior) is made available to the public. This availability permits anyone to copy and modify the source code without paying royalties or fees. Open source software evolves through community collaboration.

Early History

The open source movement originally started as a part of the hacker culture of the early 1980s. At that time, the title of "hacker" was one of honor that indicated the highest level of merit among computer programmers. During these formative years of modern computing, leaders like Ken Thompson (inventor of the Unix operating system), Dennis Ritchie (inventor of the C programming language), and Richard Stallman (inventor of the Emacs text editor) shaped the future of computing. In 1982, Richard Stallman began working on a clone of the proprietary Unix operating system, which he planned to release free of charge along with its source code. Later he founded the Free Software Foundation to provide a central community for the development of this operating system, which he titled "GNU," a recursive acronym for "GNU's Not Unix" (Raymond 3-11).

The project nearly stalled in the early nineties because of the slow development of GNU HURD, the core component of the GNU operating system. However, in 1991 a Finnish student from Helsinki University named Linus Torvalds began developing an alternative free kernel for use with the GNU project. The quality of his programming led to the rapid success of the new "Linux" kernel, which attracted the attention of other hackers. Because of this development, the GNU and Linux projects experienced a huge boost in participation and by 1993 the operating system compared favorably with the various proprietary versions of Unix that existed at the time (Raymond 14-16).

Eric Raymond, creator of the fetchmail program, was an early participant in and observer of the free software movement. In 1997, he presented a paper entitled "The Cathedral and the

Bazaar” that contrasted traditional, closed source methods of software development with the radical new concept of free software. This essay struck a nerve within the hacker community and was widely accepted and applauded. It was also was one of the major factors that influenced what is perhaps the most pivotal event in open source software history: the release of the Netscape web browser client software as free software. This announcement was made 22 January 1998, and is significant because it was the first time a Fortune 500 company had participated in the free software movement (Raymond 169-173).

Current State

According to Raymond, “The Netscape announcement cracked that barrier [...]; the business world had been jolted out of its complacency about what 'hackers' are capable of” (Raymond 174). Realizing that this project needed to succeed in order for the free software movement to continue, Raymond and others realized that a new approach was necessary: “The real conceptual breakthrough, though, was admitting to ourselves that what we needed to mount was in effect a *marketing campaign*—and it would require marketing techniques (spin, image-building, and rebranding) to make it work” (Raymond 175).

The term “open source” was the most important product of this new campaign, along with the new Open Source Initiative organization (Raymond 175-176). The phrase “open source software” is now preferred over the previously used “free software” because of the ambiguity of the word “free.” According to the Free Software Foundation, “'Free software' is a matter of liberty, not price. To understand the concept, you should think of 'free' as in 'free speech,' not as in 'free beer'” (“Free Software” 2). This distinction is important because it goes beyond a simple monetary definition of “free” and guarantees four basic software “freedoms:”

1. Freedom to run the program for any purpose
2. Freedom to study and modify the program's source code
3. Freedom to redistribute copies of the program's source code
4. Freedom to improve the program and release any changes to the public

Student Use of Open Source

There are two broad areas in which students may use open source software: on-campus computer labs and privately-owned computers.

Computer Labs

There have only been a handful of institutions that have encouraged the use of open source software. For example, Mountainland Applied Technology College in Utah has over the past five years replaced much of its Windows-based software with open source software on both desktops and servers. They describe the experience as being generally positive, with the most important benefit being the inexpensive nature of acquiring open source software (Ruffolo). Virginia Commonwealth University has also experienced success in using open source applications to provide more efficient and cost-effective email solutions for students and faculty (Davis 69). Kinki University in Japan has experimented with switching its computer literacy education courses from Microsoft Office to the open source package OpenOffice.org. This effort met with mixed success because of several training and support issues (Uchida 11).

The Lab Services division of Computing Support maintains the general computing labs on the James Madison University Harrisonburg campus. According to Michael Ripley, a programmer analyst for Lab Services, his division supports 891 machines (including lab and faculty computers) and manages licenses for all non-free software used on these machines. Lab Services also uses a software package called Sassafras K2 to track applications being used on these machines. The software logs an event every time an application is started or stopped and can show roughly how long the application was used. On-campus computer labs are tracked in Carrier Library, Chandler, Godwin, HHS, Harrison, Hillside, Maury, Memorial and Showker—a total of 365 Windows PCs and 86 Macintoshes. According to Ripley, the only two pieces of software in the labs that would qualify as open source software are the Mozilla Firefox web browser and PuTTY, which he describes as “an interface program to Linux and Unix machines.”

Software usage statistics from Sassafras K2 indicate that as of 8 November 2006, Firefox only has a little under 40% of the total time in use as does its primary closed source competitor, Microsoft Internet Explorer (IE), as measured from the beginning of the Fall 2006 semester. Ripley cautioned, however, that these numbers may be slightly skewed by technical differences in how the programs run. These differences might inflate IE's numbers since each new window opened while browsing is counted as a separate instance of the program, whereas Firefox opens new windows in tabs within the same instance. Firefox has a much better showing on the Macintosh computers, with a little over 75% of the total time in use as its primary competitor Safari. There is no closed source equivalent to PuTTY in the labs. See Table 1 for details.

According to Ripley, the JMU Lab Services division does not treat open source software differently from other software. They only install software that is faculty requested and JMU supported, and currently have no plans for installing new open source software in the near future.

	Current Simultaneous Instances	Maximum Simultaneous Instances	Total Launches	Total Hours In Use
<i>Firefox (PC)</i>	74	200	34191	105814
<i>MS IE (PC)</i>	152	317	74124	281792
<i>Firefox (Mac)</i>	45	75	1960	52623
<i>Safari (Mac)</i>	37	73	2209	68347
<i>PuTTY (PC)</i>	0	15	117	17

Table 1. Software Usage Data From JMU Lab Services as of 4pm, 8 Nov. 2006

Student-Owned Computers

The process of open source adoption by the general public is still in its early stages, and there have been no conclusive studies of open source use on privately-owned student computers. The two main questions to be asked in the current study are 1) to what extent are students

aware of open source software, and 2) what open source software packages (if any) do students use? An online survey (see Appendix A) was conducted of JMU students to explore possible answers to these questions. The survey was posted to the JMU student portal home page and remained there for approximately two days during the Fall 2006 semester. All figures, tables and statistics in this section were extracted from the results of this survey.

In total, 55 students responded to the anonymous survey, and the respondent demographics roughly correlated with the JMU student population. Figures 1 and 2 relate some general statistics about the respondent sample. In all, 75% of respondents agreed that “learning new software is usually easy,” but only 44% said “I enjoy learning new software.” In addition, 71% of respondents indicated that they did not regularly try new software in their spare time.

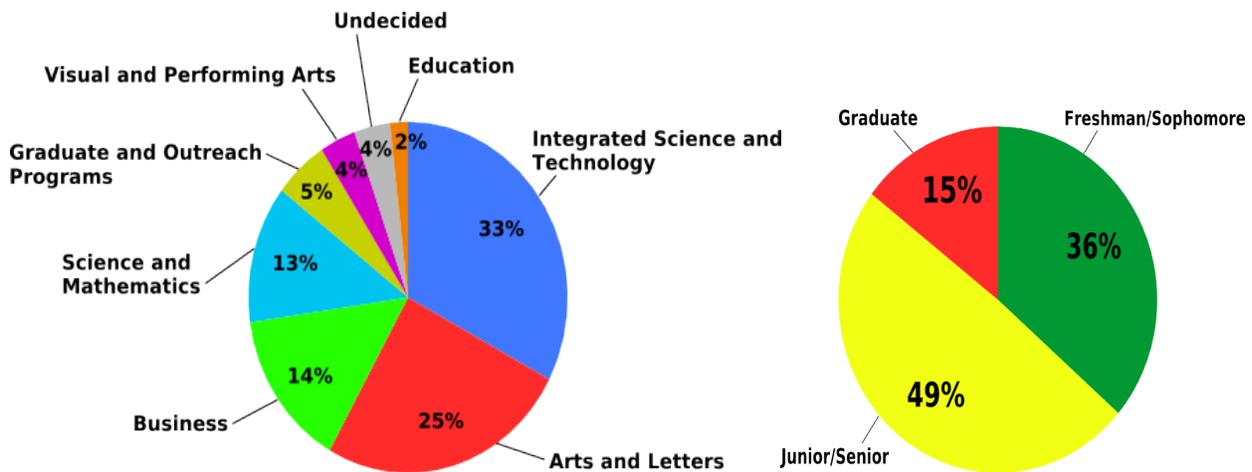


Figure 1. Survey Respondent Demographics

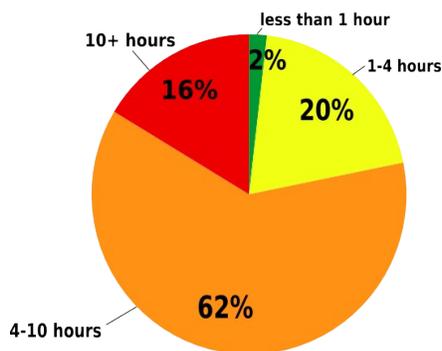


Figure 2. Amount of Time Spent on the Computer Each Day

Forty-seven percent of respondents had heard the term “open source software” before, but only 29% reported that they knew the definition of the term. Of those respondents who knew the definition, half stated that they used open source software on a regular basis. Of the 69% of respondents who had never heard of open source software or were unsure about its definition, 47% said they would be interested in learning more about open source software, and only 21% said they would not be willing to try open source software in the future.

Of the 29% of respondents who said they knew what open source software was, 38% of them cited a particular family member or friend as their source of knowledge and 25% mentioned that they heard about it in class. Fifty-six percent of those respondents reported using open source software on a regular basis, and the most commonly mentioned software titles were Mozilla Firefox and OpenOffice.org. Other packages cited include Gaim (a chat client) and GIMP (an image editor).

The 15% of all respondents who said they would not be willing to try open source software in the future cited various reasons, including the following examples:

- “I have no need and no time for open-source software. What are the advantages?”
- “It doesn't sound legal.”
- “Don't like the idea of using something that someone else has modified. I don't really trust people, especially when it comes to software and technology.”
- “I'd prefer to use already established programs that are not changing and are tried and true. Because I know nothing about coding, etc I'm not comfortable with others changing the program since I wouldn't understand what they did.”

Table 2 and Figure 3 contain survey results for specific software packages. Of particular interest is the high percentage (49%) of respondents who claimed to have stopped using Microsoft Internet Explorer. All respondents had at least heard of all proprietary packages, but the only open source program that all respondents had heard of was Mozilla Firefox. Firefox is

also the only open source package that a large portion (34) of respondents used on a regular basis. Microsoft Office had the highest percentage (91%) of regular users, which is even higher than the percentage (81%) of regular Microsoft Windows users. This may be because Office also works on MacOS computers.

	Never heard of it (%)	Heard of it but never used it (%)	Used it once or twice (%)	Use it routinely (%)	Used it routinely in the past but no longer (%)
Proprietary					
<i>Adobe Photoshop</i>	0	13	47	20	20
<i>Microsoft Internet Explorer</i>	0	0	5	45	49
<i>Microsoft Windows</i>	0	0	2	81	16
<i>Microsoft Office</i>	0	0	2	91	7
Open Source					
<i>GIMP</i>	65	25	5	0	4
<i>Linux</i>	16	60	16	7	2
<i>Mozilla Firefox</i>	0	9	24	62	5
<i>OpenOffice.org</i>	60	15	16	4	5

Table 2. Use of Specific Software Packages

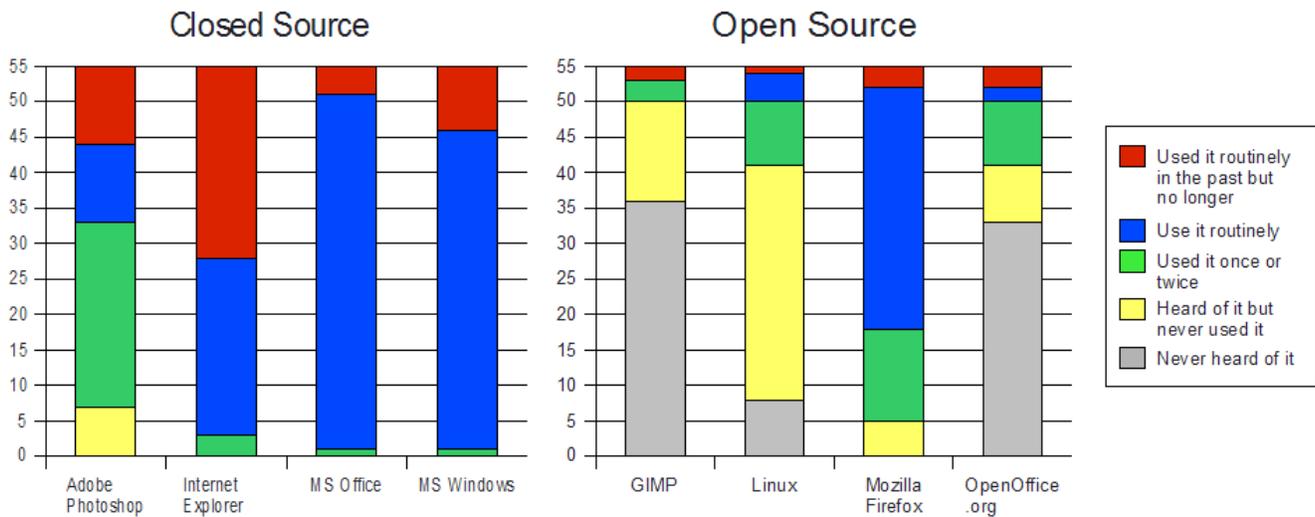


Figure 3. Use of Specific Software Packages

Conclusion

Surprisingly, almost half of the students surveyed were already aware at least of the existence of open source software. In addition, of 55 students surveyed, only eight stated that they had no interest in learning about or trying open source software. Although response bias is a valid concern since the survey was online and voluntary (and thus perhaps attracting a higher number of students who were already computer-savvy), the survey did prompt responses from a variety of majors.

Although open source software such as the GIMP and OpenOffice.org suffered from low awareness levels, a surprisingly high number of students had at least heard of the Linux operating system, even if they had never tried it. A little over a quarter of the respondents claimed to know what open source software was, and about half that number claimed to use open source software regularly.

Open source web browser Mozilla Firefox makes a decent showing in the computer lab statistics with 40% of the usage of its Windows competition and 75% of the usage of its Mac competition. Furthermore, these numbers probably under-estimate the usage of Firefox because of the difference in how the browsers handle multiple windows. The survey results show that a large number of students have stopped using Microsoft Internet Explorer. These students presumably switched to Firefox instead, although this is not certain since other alternatives do exist.

In general, JMU students seem open to learning more about and perhaps experimenting with open source software in the future. More research is necessary to determine whether this is a goal worth pursuing, and if so, what the best education and dissemination methodology is. A funded study with a reward for participation might induce more students from a wider variety of background to participate, thus improving the statistical significance of the results.

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Appendix A

Open-Source Software Use Survey

Identification of Investigators & Purpose of Study

You are being asked to participate in an anonymous research study conducted by Michael Lam from James Madison University. The purpose of this study is to examine student use of open-source software. "Open-source software" is computer software whose source code (the instructions that describe the software's behavior) is made available to the public. This lets anyone copy, and modify the source code without paying royalties or fees. Open source software evolves through community cooperation. This study will contribute to the student's completion of his classroom project.

Potential Risks & Benefits

The investigator does not perceive more than minimal risks from your involvement in this study. Potential benefits from participation in this study include helping a JMU student learn more about software usage among the JMU student population.

Research Procedures

This study consists of an online survey that will be administered to individual participants using Web Surveyor (an online survey tool). You will be asked to provide answers to a series of questions related to computer software use.

Confidentiality

The results of this research will be presented at in the researcher's TSC 230 class. While individual responses are anonymously obtained and recorded online through WebSurveyor, data is kept in the strictest confidence. No identifiable information will be collected from the participant and no identifiable responses will be presented in the final form of this study. All data will be stored in a secure location only accessible to the researcher. The researcher retains the right to use and publish non-identifiable data. At the end of the study, all records will be shredded. Final aggregate results will be made available to participants upon request.

Participation & Withdrawal

Your participation is entirely voluntary. You are free to choose not to participate. Should you choose to participate, you can withdraw at any time without consequences of any kind. However, once your responses have been submitted and anonymously recorded you will not be able to withdraw from the study.

Questions

You may have questions or concerns during the time of your participation in this study, or after its completion. If you have any questions about the study, contact Michael Lam (lam2mo@jmu.edu).

Advisor: Dr. Lucy Bednar (bednarlx@jmu.edu) +1 540 568 8160

Giving of Consent

I have been given the opportunity to ask questions about this study. I have read this consent and I understand what is being requested of me as a participant in this study. I certify that I am at least 18 years of age. By clicking on the link below, and completing and submitting this anonymous online survey, I am consenting to participate in this research.

https://websurvey.jmu.edu/ss/wsb.dll/TSC23002-06/software_use.htm

Michael Lam

Name of Researcher(s) (Printed)

November 14, 2006

Date

For questions about your rights as a research subject, you may contact the chair of JMU's Institutional Review Board (IRB). Dr. David Cockley, (540) 568-2834, cocklede@jmu.edu.

Open-Source Software Use Survey

1) What college is your primary major in?

- Arts and Letters
- Business
- Education
- Graduate and Outreach Programs
- Integrated Science and Technology
- Science and Mathematics
- Visual and Performing Arts
- Undecided

2) What is your class status?

- Freshman/Sophomore
- Junior/Senior
- Graduate

3) How much do you use the computer per day?

- 10+ hours
- 4-10 hours
- 1-4 hours
- less than 1 hour

4) How do you feel about learning new software? (check all that apply)

- Learning new software is usually easy
- Learning new software is usually difficult
- I enjoy learning new software
- I avoid having to learn new software

5) Do you regularly try new software in your spare time?

- Yes
- No

6) Please rate your use of the following software packages:

	Never heard of it	Heard of it but never used it	Used it once or twice	Use it routinely	Used it routinely in the past but no longer
Adobe Photoshop					
Linux					
GIMP					
Microsoft Internet Explorer					
Microsoft Windows					
Microsoft Office (Word, Excel, Powerpoint)					
Mozilla Firefox					
OpenOffice.org					

7) Have you ever heard the term "open-source software?"

- Yes
- No

8) Do you know what open-source software is?

- Yes
- No
- Not sure

9) How did you learn about open-source software?

10) Do you currently use any open-source software packages on a regular basis?

- Yes
- No

11) Which open-source software packages do you use, and how did you find them?

12) "Open-source software" is computer software whose source code (the instructions that describe the software's behavior) is made available to the public. This lets anyone copy, and modify the source code without paying royalties or fees. Open source software evolves through community cooperation.

-- taken with modifications from Wikipedia.org

Does this sound like something you would be interested in learning more about in the future?

- Yes
- No

13) Do you think you would be willing to try using open-source software in the future?

- Yes
- Maybe
- No

14) Why not?

15) If you have any other opinions or comments about open-source software or this survey, please enter them below.

Thank you for taking this survey. If you are interested in learning more about open-source software, the following websites are excellent starting points:

<http://theopencd.org/> - TheOpenCD is a collection of free Windows software and is a great way of obtaining high-quality, general-use open-source software.

<http://opensource.org/> - The Open Source Initiative provides lots of information and online reading about open-source software.

<http://sourceforge.net/> - SourceForge is the primary place to find and download open-source software on the internet.

The JMU [Unix Users Group](#) is a group of hobbyists who provide support for students who decide to use open-source software.