A SURVEY OF CURRENT STATUS AND USAGE TREND OF OPEN SOURCE OPERATING SYSTEMS IN IT-RELATED ORGANIZATIONS IN THAILAND

JONGJIT RITTIRONG

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Jongjit Rittirong

Miss. Jongjit Rittirong
Candidate

Asst. Prof. Rawin Raviwongse, Ph. D.
Major-Advisor

Assoc. Prof. Varachai Thongthai, Ph. D.
Co-Advisor

Assoc.Prof.Rassmidara Hoonsawat , Ph.D.
Dean
Faculty of Graduate Studies

Lect. Thanakorn Uan-on, D.Engr.
Chairman
Master of Science Programme in Technology of Information System Management
Faculty of Engineering

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On
September 30, 2002

Jongjit Rittirong
.....
Miss Jongjit Rittirong
Candidate

.....
Asst. Prof. Rawin Raviwongse, Ph.D.
Chairman

Varachai Thongthai
.....
Assoc. Prof. Varachai Thongthai, Ph.D.
Member

Chakarida Nukoolkit
.....
Lect. Chakarida Nukoolkit, Ph.D.
Member

.....
Assoc.Prof.Rassmidara Hoonsawat , Ph.D.
Dean
Faculty of Graduate Studies
Mahidol University

.....
Lect. Thanakorn Uan-on, D.Engr.
Dean
Faculty of Engineering
Mahidol University

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Jongjit Rittirong

4237417 EGTI/M: MAJOR: TECHNOLOGY OF INFORMATION SYSTEM MANAGEMENT; M.Sc. (TECHNOLOGY OF INFORMATION SYSTEM MANAGEMENT)
KEY WORDS : OPEN SOURCE, OPEN SOURCE SOFTWARE, OPERATING SYSTEM, LINUX, CURRENT STATUS, TREND, THAILAND

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The objectives of this study are 1) to investigate open source software usage in Thailand; 2) to investigate patterns and trends of open source software usage in IT organizations; 3) to determine factors affecting the usage of open source software. The sample is comprised of students who were majoring in computer science, computer engineering, and information technology in both public and private universities in Thailand. Multi-stage sampling is employed. Analysis approaches are percentage, mean, and chi-square. Furthermore, some case studies in public and private organizations are studied.

Open source software usage is related to operating systems. Linux is the most popular among open source operating system, but Windows has the largest market share, especially Windows 95/98/ME. Most of the other open source software is run on Linux. This study found that open source operating systems are used by respondents who spend the most time doing all activities, except research analysis. The Internet is the activity which most respondents spent the most time on. More than 50% of respondents who spent the most time on activities, hardware and computer networking, used open source operating systems.

There is no difference in usage of open source operating systems between public and private universities and sex. The majority of respondents, aged 20-24 years old, tend to increase volume of open source operating system usage by decreasing computer experience down to 4-5 years.

The three necessary requirements affecting the use of open source operating systems are the operating systems should be appropriate to do the work, should be easy to use, and should have Thai language ability. The first three obstacles that should be taken care of are the lack of experts for consulting, ability to display Thai font on Linux, and ability to use Thai language on Office Suit program. In business, function and features are the first concern. The second is reliability. Familiarity with current operating systems is also a concern.

Although Linux usage in Thailand in 2001 dropped more than 50%, there is a policy for Linux to become the Thai national operating system, with cooperation from many sources, especially NECTEC. Both of the open source operating system targets, Linux SIS (server) and Linux TLE (desktop), are encouraged. The open source software usage trend would increased.

4237417 EGTI/M: สาขาวิชา: เทคโนโลยีการจัดการระบบสารสนเทศ; วท.ม.
(เทคโนโลยีการจัดการระบบสารสนเทศ)

จงจิตต์ ฤทธิรงค์: การสำรวจสถานภาพปัจจุบันและแนวโน้มในการใช้ระบบปฏิบัติการโอเพนซอร์สขององค์กรด้านสารสนเทศในประเทศไทย (A SURVEY OF CURRENT STATUS AND USAGE TREND OF OPEN SOURCE OPERATING SYSTEMS IN IT-RELATED ORGANIZATIONS IN THAILAND) คณะกรรมการควบคุมวิทยานิพนธ์: รวิน ระวิวงศ์, Ph.D., วรชัย ทองไทย, Ph.D., 145 หน้า. ISBN 974-04-2420-1

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อการศึกษาสถานภาพปัจจุบัน รูปแบบและแนวโน้มในการใช้งานในการใช้งาน open source software และเพื่อศึกษาปัจจัยที่มีอิทธิพลต่อการเลือกใช้ open source software ในองค์การด้านสารสนเทศในประเทศไทย กลุ่มตัวอย่างคือนักศึกษาที่กำลังศึกษาในสาขาวิชาวิทยาการคอมพิวเตอร์ วิศวกรรมคอมพิวเตอร์และเทคโนโลยีสารสนเทศ ทั้งในมหาวิทยาลัยของรัฐและเอกชน สุ่มตัวอย่างโดยวิธี Multi-Stage Sampling และวิเคราะห์ข้อมูลเชิงสถิติโดยวิธี ร้อยละ มัธยฐานและไคสแควร์ นอกจากนี้ได้ศึกษาองค์กรของภาครัฐและเอกชนเป็นกรณีศึกษา

ผลการศึกษาพบว่าการใช้ open source software มีความสัมพันธ์กับระบบปฏิบัติการคอมพิวเตอร์ ในกลุ่มผู้ใช้ระบบปฏิบัติการโอเพนซอร์สในประเทศไทยนิยมใช้ Linux มากที่สุด แต่ระบบปฏิบัติการที่มีผู้ใช้สูงสุดคือ Windows โดยเฉพาะ Windows 95/98/ME สำหรับ open source software อื่นที่ใช้งานส่วนมากอยู่บนระบบปฏิบัติการ Linux จากข้อมูลการสำรวจยังพบว่า ในทุกๆกิจกรรมที่นักศึกษาใช้เวลามากที่สุดนั้น นักศึกษาใช้งานระบบปฏิบัติการโอเพนซอร์ส ยกเว้นกิจกรรมการวิเคราะห์ข้อมูลงานวิจัย นักศึกษาส่วนใหญ่ทำกิจกรรมบนอินเตอร์เน็ต กิจกรรม 2 อย่างเท่านั้น คือกิจกรรมด้านฮาร์ดแวร์ และเครือข่ายคอมพิวเตอร์ ที่มีนักศึกษาใช้งานระบบปฏิบัติการโอเพนซอร์สมากกว่า 50%

ผลการวิเคราะห์พบว่า ประเภทของมหาวิทยาลัยและเพศไม่มีผลต่อการระบบปฏิบัติการโอเพนซอร์สในกลุ่มนักศึกษาที่มีอายุ 20-24 ปี ซึ่งเป็นกลุ่มอายุที่มีนักศึกษามากที่สุด มีแนวโน้มใช้ระบบปฏิบัติการโอเพนซอร์สเพิ่มสูงขึ้น ในขณะที่ประสบการณ์คอมพิวเตอร์น้อยลงจนกระทั่งประสบการณ์คอมพิวเตอร์ 4-5 ปี

ปัจจัย 3 ประการหลักที่มีอิทธิพลต่อการใช้ระบบปฏิบัติการโอเพนซอร์ส คือ ความเหมาะสมกับงาน ใช้งานง่าย และสนับสนุนการใช้งานภาษาไทย ส่วนอุปสรรคที่ควรได้รับการแก้ไขเป็นอันดับแรก คือ ขาดผู้เชี่ยวชาญที่ให้คำปรึกษา ความสามารถการแสดงตัวอักษรภาษาไทยบน Linux และความสามารถในการในการใช้ภาษาไทยในโปรแกรมสำนักงาน สำหรับองค์กรธุรกิจพิจารณาความสามารถและคุณสมบัติพิเศษที่เหมาะสมกับงานเป็นอันดับแรก รองลงมาคือความน่าเชื่อถือของซอฟต์แวร์

แม้ว่าการใช้ระบบปฏิบัติการ Linux ในประเทศไทยลดลงจากจำนวนผู้ที่เคยใช้มากกว่า 50% ในปี พ.ศ. 2544 แต่นโยบายการพัฒนา Linux เป็นระบบปฏิบัติการแห่งชาติและได้รับความร่วมมือจากหลายหน่วยงานโดยเฉพาะศูนย์เทคโนโลยีและคอมพิวเตอร์แห่งชาติที่ได้พัฒนา Linux SIS (Server) และ Linux (TLE) เพื่อส่งเสริมให้คนไทยใช้ พร้อมกับนักศึกษายินดีที่จะเรียนรู้เครื่องมือใหม่ที่เหมาะกับการใช้งาน เพราะฉะนั้นแนวโน้มการใช้งาน open source software ในประเทศไทยน่าจะเพิ่มสูงขึ้น

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CHAPTER I

INTRODUCTION

1.1 Background

The software industry is currently influencing almost all organizations. This is because computers are the infrastructure of organizations and every computer needs software which processes with many purposes. Several software products are disseminated and supported by vendors. One kind of software, Open Source Software, can not be clearly identified developers but their products are popular and volume of users is increasing.

This study classifies software into 2 types based on rights that are given to software users. These are Proprietary Software and Open Source Software (OSS). Proprietary software usually has a copyright but OSS can be utilized independently. Copyright makes sure intelligent properties such as software, keep a monopoly due to the legal rights of software owner. OSS concept is opposite to proprietary software. It protects the rights legally for everyone. The rights which users can do or can not do depends on each software (1). However, both proprietary software and OSS have licenses.

OSS concept comes from free software (definitions and software categories are shown in appendix A). It is not zero priced but there are certain rights that software must grant computer users to be certified as open source. The main rights of OSS are the right to make copies of programs and distribute those copies, access to the software's source code, and make improvements to the program. The software is still

maintained even if the company that produced it went out of business. The users could use their software on many computers such as desktop computers, workstations or laptops instead of just one computer, or they could probably still be using the software they paid for years ago. OSS is often free to use and it allows for selling, so the price will be low and development to reach new markets will be rapid.

Proprietary software is software that is not free or semi-free. Its use, redistribution or modification is prohibited, or requires users to ask for permission, or is restricted so much that users effectively can not do it freely (2). This restriction is written on copyright. Copyright, the rights of the owner, usually utilizes in commerce. The owners would like to keep their source code as a secret so nobody can access it Then the users can only use software. Although the copyright keeps the right for the owner of intellectual property, it also keeps a monopoly right which is an obstacle for software development and freedom of competition. The giant software development companies make their products as monopoly right software. Many users use software traditionally, whereas many problems of software currently used, such as unreliability, obscurity, limitation, and expensive, are the consequences of the copyright (3). Some users use the legal software but some users do not. There are many reasons that lead them to use software piracy.

Much proprietary software is widely distributed but recently open source users volume is increasing such as Linux, a popular OSS operating system. Linux counter, a counter that counts the Linux users, shows that the number of Linux users has been increasing at a rapid rate as shown in Figure 1.1.

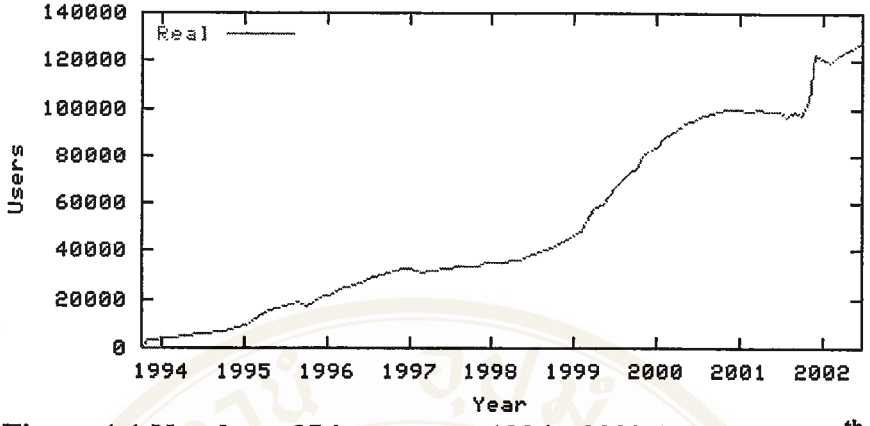

Figure 1.1 Number of Linux users, 1994 - 2002 (as of June 24th 2002)

However, OSS developers are difficult to identify. Almost all of them are volunteers. Many OSS organizations were established and their communities are on the Internet. This is a topic discussed too often because nobody can support and there is no responsibility from any organizations which is opposite to proprietary software vendors. In spite of this conflict, OSS use is increasing whereas most of the software market share belongs to proprietary software vendors; OSS, however, is the leader in the software market.

1.2 Statement of problem

Thailand is a developing country and almost all of its technology is imported, and hence a large portion of its budget is spent on imported technology. According to the Business Software Alliance (BSA) Vice President "Huey Tan" (4), the piracy rate in Thailand was unacceptably high at 79 percent in the year 2000, and this translated into losses of US$53 million for the software industry and threatened jobs for local people and reduced tax revenue. A worrying trend was that companies were purchasing brand name computers with a pre-installed licensed operating system, but tolerated using unlicensed application software. Table 1.2 shows software piracy in

Asia Pacific during 1995-2000 (4). Thailand was the fifth in software piracy in Asia Pacific during 1995-2000.

Table 1.2 Percentage of software piracy in Asia Pacific during 1995-2000

Order	Country	1995	1996	1997	1998	1999	2000
1	Vietnam	99	99	98	97	98	97
2	China	96	96	96	95	91	94
3	Indonesia	98	97	93	92	85	89
4	Pakistan	92	92	88	86	83	83
5	Thailand	82	80	84	82	81	79
6	Malaysia	77	80	70	73	71	66
7	India	78	79	69	65	61	63
8	Philippines	91	92	83	77	70	61
9	Hong Kong	62	64	67	59	59	57
10	Korea	76	70	67	64	50	56
11	Taiwan	70	60	63	59	54	53
12	Singapore	53	59	56	52	51	50
13	Japan	55	41	32	31	31	37
14	Australia	35	32	32	33	32	33
15	New Zealand	40	35	34	32	31	28

The OSS movement is establishing itself in the software market. Many open source vendors such as Red Hat, Caldera, SuSE, Mandrake, Kiwal, the operating system vendors especially Red Hat succeeded in increasing opportunities of financial benefits for contributors. These ensure the success of OSS movement.

Many OSS are available for downloading from the Internet and often free of charge, however, many OSS vendors succeed to increase opportunities of financial benefits for the contributors to open source movement. Some are listed on NASDAQ such as Red Hat. This is an indicator that OSS is accepted. There are many countries such as Germany, which is the leader of technology, that are replacing proprietary software with OSS. So it could be useful for Thailand.

Although many OSS are available for downloading from the internet and usually free of charge and provided with the useful rights, it seems that the proprietary software especially operating systems are disseminating into parts of IT organizations in Thailand. Software piracy could destroy the national economy and international commerce. All of the advantages should be considered by IT developers in developing countries, especially Thailand. According to the rights and advantages of OSS, the OSS movement is growing and succeeding in increasing opportunities for financial benefits for contributors. The cause of more stress is legal software usage. OSS should be considered for development and utilization. It is essential to investigate the situation of operating system usage in Thailand and the popular OSS that are still being used in order to analyze the factors influencing the use of OSS including OSS usage trend.

1.3 Objectives

The objectives of this dissertation are;

1. To investigate the usage of Open Source Software in Thailand.
2. To determine factors affecting the usage of Open Source Software.
3. To investigate the pattern and trend of Open Source Software usage in IT organization.

1.4 Scope of study

The scope of this study include;

1. Open Source Software definition in this research is complied with Open Source Software version 7.0 of Open Source Initiative (OSI). Therefore, the Open Source Software consists of 4 categories; they

are Operating system, Application environment, Development library, and Application (5).

2. Although the study will examine all types of OSS, the operating system software is the focus point because it influences other software usage.
3. IT organizations in this study include only organizations that use information technology for development, process, or study. Thus, it will include :
   a) The company which uses or develops information technology such as software development firm or software house.
   b) The national organization or public service which uses or develops information technology.
   c) IT section of academy especially in the university.

1.5 Expected Result

The expectations of this research are the current status and usage trend of OSS and guidelines to increase the volume of OSS users in Thailand.

CHAPTER II

REVIEW OF LITERATURE

This chapter describes the definition of Open Source Software (OSS), license of OSS, factors affecting software usage, and involved research.

2.1 Definition of the Open Source Software

Open Source Initiative (OSI), a non-profit corporation, defined the meaning of the Open Source version 1.7 saying that it must comply with the following criteria (6):

1. Free Redistribution

The license may not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license may not require a royalty or other fee for such sale.

2. Source Code

The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost-preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the program.

Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.

3. Derived Works

The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.

4. Integrity of The Author's Source Code

The license may restrict source-code from being distributed in modified form only if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.

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

The license must not restrict anyone from making use of the program in a specific field of endeavor. For example, it may not restrict the program from being used in a business, or from being used for genetic research.

7. Distribution of License

The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

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. If the program is extracted from that distribution and used or distributed within the terms of the program's license, all parties to whom the program is redistributed should have the same rights as those that are granted in conjunction with the original software distribution.

9. License Must Not Contaminate Other Software

The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.

Everyone can read, redistribute, and modify the open source. Then the Open Source Software can be developed at a rapid speed. Efficient OSS can be achieved easily because there are many OSS available for downloading free of charge. Moreover, users can get support and information about those OSS from their web site or mailing list or web board of their communities. The users can decide to pay some reasonable price for software document in form of CDROM or hardcopy. OSS-users never live alone because Internet is a popular method for distribution and

communication among developers and users around the world. All of these are advantages of the open source.

2.2 Types of the Open Source Software

There are many criteria for classifying Open Source Software. Free Software Foundation (FSF) classifies Free Software/Open Source Software into 9 categories. There are Operating System, General Utilities, Languages, Windowing Systems, Desktop Environments, Web Browsers, Productivity Applications, Office Suits, and Server Type Software (7). Examples of the OSS in each category are exhibited in Table 2.1.

Table 2.1 Types of Open Source Software by category

Categories	Examples of Open Source Software
Operating Systems	Linux (or GNU/Linux), Free BSD, OpenBSD, NetBSD, GNU/Hurd
General Utilities	GNU Utilities
Languages	GNU C/C++, Perl, Python, Tcl
Windowing Systems	The X Window System, Xfree86
Desktop Environments	GNOME, KDE, GNUStep, Xfce
Web Browsers	Mozilla (Netscape6)
Productivity Applications	ABIWord, GNU Image Manipulation Program
Office Suits	Open Office, Koffice
Server Type Software	Samba, Apache, PhP, Zope, MySQL, PostgreSQL

Wang and Wang (5) provided the aggregated real-time financial information that studied in the OSS adoption shown in Table 2.2. This study paid attention to the license of each software type. They classified OSS into four categories: Operating System, Application Environment (software which encourages the system works completely), Development Library (code library for program development), and

Application (software which has its target function separate from system working). The description of Table 2.2 is shown in Appendix E.

Table 2.3 compares software which can run on proprietary operating system and software which can run on open source operating system. They could work instead of license software (8).

2.3 License of Open Source Software

Adopting OSS is not free from the terms set forth by software licenses. OSS products have several different types of license, each of which imposes a different set of restrictions that could potentially impede critical project capabilities such as internal reuse, proprietary custom extensions, and resale. Cooperation designed sets of rights in term of license. The poplar license is GNU General Public License or GPL. GPL was designed be Richard Stallman who formed the Free Software Foundation (FSF) and its GNU project in 1984 (9). Moreover, other popular licenses are shown in Table 2.4 with their effects. LGPL (Library GPL), a modified version of GPL applying specifically to software libraries; BSD (Berkeley Software Development), applying mostly to derivatives and variants of BSD Unix; and CPL (Community Public License), a type of license typically found in community versions of commercial software.

The licensing terms of chosen software will affect current and future project scope, such as internal use versus resale (5). The full context of the licenses are shown in Appendix A.

Table 2.2 Open Source Software Characteristics

Open Source Software Characteristics												
		Technical support							Managerial			
		Technical support	Backward compatibility	Standard compatibility	Binary availability	Integration with commercial SW	Commercial adoption	Open source dependency	Software license	Current development status	Commercial substitutes	Notes
Operating System	BSD	+	++	OSF	Y	+	+	n/a	BSD	Stable	Y	freebsd.org
	Linux	++	+	OSF	Y	+	++	n/a	GPL	Stable	Y	linux.org
	Macintosh OS X	++	-	OSF	Y (binary only)	-	-	n/a	CPL	Com-mercial release	Y	apple.com
	Solaris (announced)	++	++	OSF	Y (binary only)	++	++	n/a	CPL	Com-mercial release	n/a	sun.com
Application environment	Bind	+	++	DNS	Y	+	++	Unix	BSD	Stable	Y	isc.org/bind
	Gnome	+	-	n/a	Y	-	+	Linux, BSD	GPL	Stable	Y	gnome.org
	GNU CC	++	++	ANSI	Y	++	+	OP	GPL	Stable	Y	gnu.org
	GNU Emacs	++	+	n/a	Y	+	+	Unix	GPL	Stable	Y	gnu.org
	GNU Make	++	++	n/a	Y	+	+	Unix	GPL	Stable	Y	gnu.org
	Java	++	+	n/a	Y (binary only)	++	++	OP	CPL	Stable	n/a	javasoft. com
	KDE	-	-	n/a	Y	-	-	Linux, BSD	BSD	Dev. Release	Y	kde.org
	Perl	++	+	n/a	Y	++	++	OP	BSD	Stable	N	perl.org
	Sendmail	++	++	SMTP	Y	+	++	Unix (OS version)	BSD	Stable	Y	sendmail. com
	Tk/Tcl	++	+	n/a	Y	+	-	OP	BSD	Stable	N	scriptics. com
	X-Windows	++ (ven dor)	++	X11	Y (binary only)	++	++	Unix	BSD (X)	Stable	N	x.org

Table 2.2 Open Source Software Characteristics (Cont.)

Open Source Software Characteristics												
		Technical support							Managerial			
		Technical support	Backward compatibility	Standard compatibility	Binary availability	Integration with commercial SW	Commercial adoption	Open source dependency	Software license	Current development status	Commercial substitutes	Notes
Development library	Gimp	-	-	n/a	Y	-	-	Unix	GPL	Dev. Release	Y	gimp.org
	JDK	++	++	n/a	Y (binary only)	++	++	OP	CPL	Stable	n/a	javasoft.com
	LDAP	-	n/a	LDAP	N	+	-	Unix	BSD	Disc.	Y (Netscape)	Defunct
	OpenLDAP	-	-	LDAP	N	-	-	Open	BSD	Dev. Release	Y	openldap.org
	OpenSSL	-	+	SSL	N	-	-	Open	BSD	Dev. Release	Y	openssl.org
	SSLeay	-	+	SSL	N	-	-	Unix	BSD	Disc.	Y	mozilla-cryptosslleay.org
Application	Apache	+	++	HTTP	Y	+	++	Open	BSD	Stable	Y	apache.org
	Mozilla	+	+	HTML	Y	++	-	OP	CPL	Stable	Y (Netscape)	mozilla.org
	MySQL	+	+	SQL	Y	-	-	Unix	CPL (Recent GPL)	Stable	Y	mysql.org
	PHP	+	+	n/a	Y	-	-	OP	BSD	Stable	Y	php.net
	Pine	+	+	SMTP, MIME	Y	-	+	Unix	BSD	Stable	Y	pine.org

Note: OP = Open Platform

Table 2.3 Name of software by application and operating system

Application	Windows 2000	Free Red Hat Linux 7.1 Alternative
Word processor	Word 2000	StarWriter
Spreadsheet	Excel 2000	StarCalc
Presentation	PowerPoint 2000	StarImpress
Database	Access 2000	LAMP intranet using a PHP/MySQL application
PIM with Email	Outlook 2000	StarSchedule, StarMail
POP3 E-mail	Outlook Express	Sylpheed 0.6.2-1
Browser	Internet Explorer 5	Mozilla 0.9.4
FTP	WS-FTP6	GFTP 2.0.7
Firewall	ZoneAlarm pro	Firestarter 0.7.1
Anti-Virus	Norton Anti-virus	Not required with Linux, according to the experts.
PDF Writer	Acrobat Writer	StarWriter configured to print PDF directly.
CD-R Recorder	Easy CD Creator	Gtoaster 1.0Beta2
Image Viewer	ACDSee 3	Gqview 0.8.1
Image Editor	Fireworks 4	Gimp1.2
PDF Viewer	Acrobat Reader4	Acrobat Reader 4 or xpdf 0.92
Archive Utility	Winzip 8	Archiver (ark 1.9)
VCD, DVD Player*	Power DVD	Xine
MP3 player	WinAmp 2.7	XMMS1.2.4

Source: http://robval.com/linux/desktop/
**** Linux TLE (Thai Linux Extention)***

Table 2.4 Open Source Software Licenses and Their Effects

Open Source Software Licenses and Their Effects				
License	**Can be mixed with nonfree software**	**Proprietary modifications can be made private**	**Can be relicensed**	**Allows proprietary licensing**
GNU Public License	Y	N	N	N
Library GPL	Y	Y	N	N
Berkeley Software Development	Y	Y	N	N
Community Public License	Y	N	N	Y
Commercial	Y	Y	N	N

To open source a program, it is important to first state that it is copyrighted then Free Software Foundation (FSF) add distribution terms, which are a legal instrument that gives everyone the rights to use, modify, and redistribute the program's code or any program derived from it but only if the distribution terms are unchanged. Thus, the code and the freedoms become legally inseparable (10).

2.4 The use of some Open Source Software

Linux is an operating system which is helping to run the corporate engine room in more than 20 percent of large companies in the United State such as Mercedes Benz and Cisco. It allows the speedy development of quality product (11).

International Data Corp. (IDC) identified that, in terms of unit sales, the commercial versions of Linux accounted for 17 percent of the server operating system market in 1998. The Linux user community believes that about 14 million copies are in use worldwide. IBM, Hewlett-Packard, Dell, Siemens and SAP are just some of the companies that support Linux for instance. IBM now offers products that run Linux and according to the UK's Internet magazine, it has made its way into the ISP community, with up to 40 percent running Linux servers (11).

Furthermore, there are other popular OSS. Apache Web server is one of the most broadly deployed open source programs. This server was quickly adopted by the Internet community and thus found its way into major corporations as well as small businesses. Managed by an ad hoc group of programmers called the Apache Group, it is often cited as proof that open source can succeed with tradition customers. More than half of all Web sites are deployed on Apache, usually in combination with Linux. So it is another successful example of the model used only in the appropriate circumstances (12).

Sendmail is a Web server software that has been developing in the open source realm, and it has more than 70 percent of the e-mail server software market. But to pay for its ongoing development, the creator formed Sendmail Inc. which makes money by selling services and commercial products for e-mail management to ISPs and corporations (12).

2.5 Individual Characteristics

Using data compiled from a 1990 survey of 776 knowledge and information workers from a large university in the southern United States, eight propositions were tested concerning the relationship between individual differences in skill and end-user computering (EUC). A multiple regression analysis indicated that such factors as the male gender, younger age, more experience with computers, less anxiety towards computers, an attitude of confidence towards computers, lower math anxiety, and a creative cognitive style serve as viable individual differences associated with higher computer skills. These findings suggest that organizations should manage EUC using complementary global and individual processes. The former would be responsible for areas such as standards, controls, and security. The latter would address education and training, selection and recruitment, and the introduction of new technology into workplace (13). This research found that individual characteristics related to behavior changing. To use new approaches need complementary global and individual processes.

2.6 Factors Influencing Software Usage

Many factors influence to software usage. A criteria applying a product-oriented evaluation framework is shown as follows. (5).

- **Requirements-oriented consideration**

  a) Functional capability: The ability to perform a specific purpose of an entity or its characteristic action (16, 17).

  b) Efficiency: Any measure of the ratio of the quality of processing to its cost (18).

  c) Speed of execution: Speed of processing by a computer of the instructions in a program (18).

  d) Organization standard: Clearly-defined and agreed-upon conventions for specific programming interfaces. Standards may be proprietary (used only within the environment provided by a single computer vender), public (widely used across a variety of vendor equipment), or formal (developed by a standards organization) (17).

  e) Preferences: Something or someone preferred which may be cause of easy-to-operate or non-technical term (17, 21).

- **Technical requirements (19)**

  a) Availability of technical support: The help and verbal advice to other individuals and organizations which are provided by professionally trained individual with computer technical experience or vendor supplier.

  b) Future functional upgradability: The ability to reconfigure a computer system in order to increase its computer power and function in the next future.

  c) Open-standard capability: A quality possessed by computer system that enable it to handle both data and programs that can be run or developed or modified on different computer.

d) Customizability and extensibility: The ability to alter a piece of general purpose software or hardware to enhance its performance, usually to fit a specific user's need and ability to add the additional feature to a programming language or computer system. Feature beyond what is regularly available in the standard.

e) High reliability: A measure of the ability of a program or system to function without failure.

- **Management requirements (19, 21)**

a) Budgetary: Economical, inexpensive.

b) Development team expertise: Development team or software developer who produces or publishes software system with professional skill.

c) License and project scope: An authorization of product to run the product or software on computer and an undertaking, having a definite objective and specific start and completion points, that is the composite of tasks and activities set up in a logical order to achieve the objective.

d) Long-term maintainability: The ability to keep any activity intended to eliminate faults or to keep program in satisfactory working condition, including tests, measurements, replacements, adjustments, and repairs for long time period.

2.7 Linux and open source software development in Thailand

Many Linux and Thai OSS communities are established, and they are found on the Internet. Some of communities are shown as follow:

2.7.1 The development group, collaborators, and communities

- Thai Linux Working Group (TLWG : http://linux.thai.net)

Mandates : Publish news, developed corner, develop Linux TLE, web board, distribute Linux TLE, Thai extension, other programs for download, and documentation

- Thai Linux User Group (TLUG)

  Mandates : Linux user communities and provide Linux user meetings

- OpenSource.thai.net (http://opensource.thai.net)

  Mandates : Distribute open source guideline, distribute licenses, distribute announcement, distribute open source software for download

- Source Forge (http://sourceforge.net)

  Mandates : Publish news, project hosting, distribute open source software for download, and publish useful links

  Source Forge was established for developers, experts, and general user

- Thai Linux Cafe (http://www.thailinuxcafe.com)

  Mandates : Publish Readme, review, Howto, distribute open source software for download, CD corner, web board

  Thai Linux Cafe was established for Linux Newbies

- LinuxBoard.com (http://www.linuxboard.com)

  Mandates : Publish guide for the beginner, useful links, and web boards

- Thai Linux Documentation Project (ftp://ftp.nectec.or.th/pub/thailinux/docs/)

  Mandates : Publish Howto, C programming guide, collection of Thai documents

- Thai Linux Journal & Magazines such as

  Mr.Linux : http://www.ziif.com

  Thai Linux : http://www.thailinux.com

- Web board such as

  Linux Siam : http://www.linuxsiam.com

  Thai Net : http://www.thainet.org/linux

All of the above open source development groups, collaborators, and communities are private or informal organizations. They are established for developers and general users who are interesting in open source software and Linux. The formal community, the open source federation, will be established in the near future with cooperation of National Electronics and Computer Technology Center (NECTEC) and Software Park. The secretary of the open source federation will be Software Park which join approximately sixty open source developers (14).

The objectives of the open source federation are:

- To state the direction or policy for open source software development
- To launch the system management and governmental procurement policy as a handbook. It is useful for budget management and offers an alternative way because there is no software restriction. Furthermore, the open source is cost efficient.

2.7.2 Open source development period in Thailand

There isvery few Thai local software which includes Thai enabled operating systems, word processor, spreadsheet, and presentation. NECTEC found that it was necessary to develop Thai local software as a national knowledge base. Thai language system development began before 1990 and has been developing until the present (15). The development can be described in four phrases as the following:

- *Standard Implementation period* (before 1990 until present)

Thai writing is not the same as English because each Thai word is composed of letter(s), vowel(s), and tonal accent(s). The appearance on screen of a Thai letter cell can be changed during typing like the word "อยู่". This word is composed of 2 letters, 1 vowel, and 1 tonal accent. During typing อย, then the vowel and tonal accent will be on top and bottom of the letter ย. The letter ย will be changed to ยู่. A precise Thai language standard is needed to develop Thai software. Many Thai language standards were developed such as TIS620-2539, TIS620-2533, ASCII, EBCDIC Extension, X-TIS (2 bytes for cell-based appearance). Thai language standards are the standard for producing by vendors such as

IBM CP838	: TIS
IBM CP874	: TIS and extension
Microsoft Windows-874	: TIS620-2 and extension
Mac Thai	: TIS620-1 and extension
GTK2	: TIS620-0, TIS620-1, TIS620-2,

- *Implementation* (1991 until present)

Many Thai language standards were implemented such as:

X Consortium: Thai language in X11R6

SUN : Thai Solaris, Thai language in CTL/Motif (with OSF), Thai language in Pango Engine

IBM : Thai language in AIX, OS/2, Thai language codepage

Microsoft : Thai language codepage, font extension, Unicode on Office 97 and Windows 2000

MacIntosh : Thai language codepage, font extension, Thai language supporting

Moreover, many Thai language developments was found in software and library modules

- tterm, Xbitmap fonts
- cttex, Thailatex, likit, xiterm+thai
- xfig+thai, Thai Howto
- LibInThai, Mozilla
- Mule/GNU Emacs, Xemacs
- Babel-based Thai LaTex, Omega, Norasi, NECTEC font
- Thai locale in GNU C Library, Thai Translation Project
- SWATH, OpenOffice, KLEXiTRON, KDE, KOffice

These modules can be used in Thai local software such as Norasi is a font in word processor, KLEXiTRON is dictionary module.

- *Solution* (1996 until present)

Many Linux distributions have been developing to accept Thai characters such as

- Kaiwal Software : KW Linux (RedHat based)
- Burapha University : Burapha Linux (Slackware based)
- NECTEC : Linux-SIS (Slackware, RedHat based)
- NECTEC and TLWG : Linux-TLE (Mandrake, RedHat based)
- Zion Interface : Ziif Linux (RedHat)

- Debian GNU/Linux : There is Thai package such as cttex, font, xiterm+Thai, Thai LaTex

- *User/Public Relation* (2001 until present)

Many organizations and communities are cooperating, encouraging and developing Linux such as Thai Linux Working Group (TLWG), Thai Linux User Group (TLUG), National Electronics and Computer Technology Center, Software Park, SUN, IBM, Kasetsart University, Burapha University, Electricity Generating Authority of Thailand (EGAT), Ministry of Science, Technology and Environment. Since 2001, there have been many activities and more encouragement and public relations about open source software usage and development.

- TLUG meeting on the second Thursday of every month. The meeting provided by NECTEC, TLUG, and Software Park.
- The third open source software exhibition on November 21,2001 and the fourth is on February 2002.
- A seminar "Open Source Software in Thailand" which was exhibited in ComMart-ComTech Exhibition on 4th-7th October 2001. Many people are interested in the discussion involving OSS. There were experts from various organizations such as the research assistant of NECTEC, public authority, and private section (4).
- A conference "Thai language enable on Linux and the migration to Line" on October 13, 2001 at Software Park
- NECTEC included open source software contest into National Software Contest (NSC). The first year of open source software

contest is the third NSC (2000). There are 9 open source projects of 597 projects (1.5%) in year 2000 and 36 open source projects of 656 projects (5.5%) in year 2001 (22).

According to the four phrases, many organizations have been making the OSS development during the past ten years. A lot of activities, which involve OSS, were established. These tend to increase OSS development and usage in Thailand.

2.8 Open source software research

There is much research that pays intention to the OSS concept. Some research concerns about the business while others use OSS concept agreement to develop their works.

Mantarov (23) studied about OSS as a new business model which is the entry of Red Hat Software Inc. to the operating system market with Linux. He found that a few large companies dominate the market of operating systems for computers. Therefore, only a company making a large investment could enter this mature market, exposing itself to retaliation unless it targeted a narrow niche of no interest of the incumbents. Since 1994, Red Hat Software Inc. has gained market share with Linux. Although it first aimed at a small segment of the market-Internet-related applications, Red Hat is now aggressively pushing its product for other uses and offers high margin services such as technical support. The market entry of Red Hat has been made possible by the very nature of its product which is OSS operating system named Linux.

The large number of contributors to OSS, the decentralized nature of the development process, and the Darwinian selection among the numerous solutions proposed for each problem ensure the fast development of high-quality program whose complexity would be almost unmanageable in a corporate context. OSS is not

user-friendly enough to threaten commercial software in the consumer market yet, but it is a credible alternative in the professional sector (23).

Extensions to recursive partitioning, the thesis research of Hawkins (24), the computer codes developed in the thesis research may be downloaded through the Internet as OSS. Architecture and implementation of online communities is the research of Winston (25). He designed a unified and general software engineering architecture for web applications, implementations, implemented an open-source toolkit for developing community web services, used the toolkit to construct online communities that are sustainable without commercialization, and distributed this toolkit and underlying philosophy to thousands of web service developers (25).

In Thailand, NECTEC develops Thai OSS. Its projects are Linux TLE, Linux SIS, and Thai Open Office with Sun Microsystem (Thailand) Co., Ltd.'s corporation.

Linux TLE

Linux TLE (Linux Thai Language Edition) has been developing by NECTEC. The latest version is Linux TLE 4.2, based on Red Hat, which is the popular distribution. The necessary software was added in.

The objective of Linux TLE is to be a desktop operating system. There are software packages to develop such as word processor, spreadsheet, drawing, input/output (display) interfaces. Linux TLE is integrated into three Thai national fonts (Narasi, Krut, Kinari).

Linux SIS

Linux SIS (Linux School Internet Server) is another OSS project of NECTEC. It is a proper operating system for server machines. Linux SIS has necessary software for internet-service functions. A package of new version added features such as the

level for internet access, administration via web access, web server (Apache-1.3.22_2 plus ssl, php etc), and mail server (sendmail-8.11.6-3).

Linux SIS is not only for use in schools. Other organizations such as the Internet service shop (Internet cafe), small and medium organizations can also utilize it. Since few Linux TLE and Linux SIS developers, the integration of Linux TLE project and Linux SIS project will be occurred in the future.

Open Office

Office suit program is the most widely used program and it is an important issue in development because of having a lot of Microsoft documents. File management on other platforms is the main problem for these documents. Open Office is developed from open source, Star Office version OpenOffice.org 638C (26), with Sun Microsystem (Thailand) Co., Ltd. and NECTEC cooperation. Star Office was taken over by Sun Microsystem Co., Ltd. and trade was registered. This open source office suit program is distributed in the name "OpenOffice" (22).

Pladao, the code-name of OpenOffice.org was released on January 2002. Pladao is composed of Writer (word processor), Calc (spreadsheet), Impress (presentation) and Draw (drawing). Pladao can be run on 3 platforms (Sun Solaris, Microsoft Windows 95/98/ME/NT/2000/XP/, and Linux).

The basis features of Pladao are:

1. Text wrapping at the end of line
2. Thai word sorting
3. Thai word searching
4. Input checking
5. Thai language standard (the location of vowel and tonal mark)

6. Output printing is the same as on screen
7. Spell checking
8. Every dialog and menu are Thai enable
9. Support 5 true type fonts
10. Thai date/time format

Additional features for Thai language are:

1. The ordering list such as ๑, ๒, ๓, ..., ก, ข, ค,..., ก, กก, กกก,... etc.
2. Thai date/time standard
3. Thai date can be customized by user such as ว วว (date) ด ดด dดด (month) ปป ปปปป (year) คค (Christian Era) ชช (hour) นน (minute) ทท (seconds) ต (a quarter of year) etc.
4. Drop caps, users can drop a whole word or an alphabet cell (includes vowel and tonal mark)
5. Cursor language status, Thai language status is "L" and English language status is "l".

The highlight features of Pladao are the opening and saving capability on many file types includes doc file, xls file, ppt file and then the portability problem was solved. Although some errors are found, Pladao development is progressing. OpenOffice.org is not exactly the same as Microsoft Office but it looks very similiar. Users do not spend as much time learning how to use it and locate where the menu is located (27). Development in the future is integrating the language-translated module or the text-to-speech and OpenOffice.org (22).

2.9 Conceptual Framework

The conceptual framework of this study is divided into three issues.

First, this study intends to investigate the usage of OSS in Thailand in 4 types of OSS classified as follows:

1. Operating system
2. Application Environment
3. Development Library
4. Application.

Second, this study investigates the pattern and trend of OSS usage in IT organization in issues of organization's type and individual characteristics of respondents as follows: activity, sex, age, and computer experience.

Third, this study also intends to determine factors affecting the usage of OSS. Factors are classified as follow (5):

1. Requirement-oriented consideration
2. Technical requirements
3. Management requirements

2.10 Hypothesis

To achieve the answer as to why OSS is not popular in Thailand. The hypothesis is that the individual characteristic and factors of requirements: requirement-oriented consideration, Technical requirements, and Management requirement, affects OSS usage.

CHAPTER III

METHODOLOGY

According to the conceptual framework described earlier, a research methodology was developed containing 4 steps as the followings:

1. Preliminary Investigation
2. Creation of the instruments to gather data
3. Gathering data
4. Analysis of using Open Source Software and factors effecting Open Source Software usage

3.1 Preliminary Investigation

The process of the investigation consisted of:

- Investigate the current status of software usage from statistical data report and IT news
- Investigate type of Open Source Software from announcement of original open source software organizations such as Free Software Foundation and Open Source Organization.
- Investigate the initial organization of Open Source Software form researches, journals, and web sites.
- Observe current status and adoption about the use of Open Source Software, especially operating system from OSS vendors, OSS communities on the Internet, and OSS conferences in Thailand.

3.2 Creation of the instrument to gather data

Instruments of research are classified into 2 types: 1) survey questionnaire, 2) interview questions. The survey questionnaire method was utilized to gather data from samples who use information technology as a part of the IT section of academic, especially universities in Thailand. Moreover, the questions for the interviews were created in order to get more information from developers in IT-related organizations in both public and private organization. The questionnaire and questions are shown in Appendix B.

3.3 Gathering data

The data for this study is classified into 2 parts. The first part is data from students in universities/institutes. The survey questionnaires are used to gather data. The second part is the data from interviews with representatives of organizations in both public and private organizations in order to get more information for analysis.

3.3.1 Population and sampling of population in universities

There are 74 universities/institutes in Thailand. All of them could be classified by type of institution in the academic year 2000. The number of universities/institutes classified by type of institution in the academic year 2000 is shown in Table 3.1(28).

The scope of the research is studying about the population who are undergraduate or graduate students in the department of computer sciences, computer engineering, information technology, and the computer/software development related field as classified by the Ministry of University Affairs.

Table 3.1 Number of universities/institutes classified by types of institution in academic year 2000

Type of Institution	Number
Grand Total	**74**
1. Public institute	**24**
1.1 Limited Admission University	18
1.2 Open University	2
1.3 Antonomous University	4
2. Private institute	**50**
2.1 University	22
2.2 College	27
2.3 Institute	1

Sampling of population in universities

A Multi-stage sampling is employed in this study. The first stage is stratified random sampling. There are 3 strata, Ramkhamhaeng University (RU), public institutes, and private institutes. Since nearly 50 percent of all public institute enrollments were in RU, RU is a strata. Probability Proportional to Size Sampling (PPS) is employed in the second stage.

The research needs 4 public institutes and 4 private institutes. The number of students enrolled in public institutes (in fields of study) excluding Ramkhamhaeng University is 13,672 and the number of students enrolled in private institute is 7,115. The number of enrollments in public and private universities/institutes is shown in Appendix C.

The sample universities are

Public Institutes/Universities

1. Ramkhamhaeng University
2. Kasetsart University
3. Mahidol University

4. King Mongkut's Institute of Technology North Bangkok

Private Institutes/Universities

1. Bangkok University

2. Rangsit University

3. The University of the Thai Chamber of Commerce

4. Assumption University

Fifty questionnaires were provided for each sample institute/university with a total sample population of 400. Weight case was necessary for accurate results because the number of Ramkhamhaeng University subjects was nearly one-half of all students in public universities. Then it was separated from other public universities before sampling another 3 public universities. Table 3.3 shows the number of samples and their unweighted and weighted percentages by institute/university.

Table 3.2 Number of population, percentage of population, number of samples and their weighted value by institute

Institute	Number of population	Percentage of Population	Number of samples	Weighted value
Ramkhamhaeng University (RU)	10,485	33.1	50	2.6488
Public Institute (excluded RU)	13,672	43.9	150	1.1704
Private Institute	7,115	23.0	200	0.4600
Total	**31,272**	**100.0**	**400**	

***Note**: Weight = (Percentage of Population/100) x (Total of sample x Sample size)*

Table 3.3 Number of samples, their unweighted and weighted percentages by institute/university

Institute/University	Total	Percentage	
		Unweighted	Weighted
Ramkhamhaeng University	50	12.5	33.1
Kasetsart University	50	12.5	14.6
Mahidol University	50	12.5	14.6
King Mongkut's Institute of Technology North Bangkok	50	12.5	14.6
Bangkok University	50	12.5	5.8
Rangsit University	50	12.5	5.8
The University of the Thai Chamber of Commerce	50	12.5	5.8
Assumption University	50	12.5	5.8
Total	400	100.0	100.0

Questionnaires were tested 2 times with IT students in a university before beginning collect data. The gathering data period is one month during 24th November 2001 until 25th December 2001. After classrooms were randomized and the letters were enclosed to departments, data collection was allowed. Almost all students were Thai but some students were international students, so English questionnaires were translated from Thai for the international students. Students spent 10-20 minutes to answer questions. There are the missing values of classes that were allowed to explain less than other classes. Almost all questions were answered completely. Although the research needs fifty reported questionnaires in each university, sixty questionnaires were provided to every university. The best fifty reported questionnaires were selected, coded and analyzed.

3.3.2 Population and sampling of population in IT-related organizations

The study classifies organizations in Thailand into public and private organizations. National Electronics and Computer Technology Center (NECTEC), a public organization was selected to represent the public sector, since it is responsible for the development of Information Technology in Thailand. Its mission is to ensure Thailand's competitiveness in Electronics and Computer and the use of IT to stimulate economic and social impact through its own R&D programs as well as R&D funding services to universities.

Private organizations which were studied are software development firms and companies which have its business related to open source products and services (a software development firm, and Sepion Software Co., Ltd.: a new business with OSS). After appointments were made with all representatives by telephone, the researcher began interviewing all representatives during October until August 2001 with good co-operation. Each interview was 1.5-2 hours long.

3.4 Analysis

Data was analyzed quantitatively through the use of statistics such as percentage, mean, and Chi-Squared.

Test statistic: Chi-Squared Equation

Tabulate observed data and calculate expected frequencies by the following formula (29).

Expected frequency = (row total x column total)/ (overall total) (3.1)

In situations where sets of observed and theoretical frequencies are to be compared, χ^2 is defined by

$$\chi^2 = \sum \frac{(O - E)^2}{E} \quad (3.2)$$

where O and E denote the observed and expected, frequencies respectively (30).

If χ^2 is equal to or greater than the critical value required for significance at an accepted significance level for the appropriate degrees of freedom, *df*, the null hypothesis is rejected (30). Degrees of freedom can be calculated by the following formula (29):

$$\text{Degrees of freedom} = (r - 1)(c - 1) \quad (3.3)$$

where r is number of rows, c is number of columns

With the Chi-Squared test, the number of degrees of freedom (equation 3.3) does not depend upon the sample size, but on the shape of the data table (29). Therefore, the differences between the observed and expected frequencies are significant and cannot reasonably be explained by sampling fluctuation (30). Note that the Chi-Squared test (equation 3.2) should only be used if all of the expected frequencies are greater than 5.0 (29).

The in-depth interview data is analyzed in the following issues:

- Software usage
- Development in the future
- Facts about the use of OSS operating system
- Factors for choosing an operating system
- Opinion and recommendation

CHAPTER IV

RESULTS

This chapter describes the results after gathering and analysis data. Results are presented in five parts. The first part is the background of respondents. The second is the survey data that was analyzed from the questionnaires. The third part is data from interviews representative of public and private organizations. The fourth part is the case studies of open source operating system usage in the organizations and the final part is the future of Linux.

4.1 Background of respondents

The population are the students who were studying in the major of Computer Science, Computer Engineering, or Information Technology. Four hundred students who responded to the questionnaires included 316 undergraduate students and 84 graduate students. They consisted of 63 percent males and 37 percent females.

Three-fourths (74 percent) of respondents were studying in the Faculty of Science, nearly a quarter (23 percent) was in Faculty of Engineering, and only 3 percent was in Faculty of Information Technology. There were students in every level of years. However, most of them were studying in the senior year. Their ages were between 15-39 years and their computer experience was from a few months to more than ten years. While they are 23.2 years old on the average, they have around 5.7 years of computer experience. The tables of characteristics of respondents are shown in Appendix D.

4.2 Survey data analysis

After gathering data from 400 respondents, the analysis data is described as the following.

4.2.1 Open source usage

Only 5 percent of respondents do not have their own computer. Twenty two percent of the respondents who have their own computer and 6 percent of respondents who do not have their own computer used OSS operating system.

The percentage of computer usage in each activity that the respondents spent the most time with and the percentage of computer usage in each activity is shown in Table 4.1. Internet is the activity which the respondents spent the most time with and almost all of the respondents did internet activity. Sixty seven percent of respondents used the computer everyday.

Table 4.1 Percentage of computer usage which respondents spent the most time with and percentage of computer usage in each activity: ordered by descending of time spent

Activities	Percentage of computer usage which respondents spent the most time with	percentage of computer usage in each activity
1. Internet	34.2	98.9
2. Programming	27.5	96.6
3. Game	20.3	90.9
4. Office suit program	8.4	86.4
5. Computer graphic /Multimedia	5.1	87.2
6. Hardware	1.4	70.7
7. Computer network	0.9	65.3
8. Research Analysis	0.4	56.6

Table 4.2 Percentage distribution of operating system usage in year 2001

Operating system	Percent
Windows 95/98/ME	83.7
Windows 2000	11.7
Windows NT	2.0
Windows XP	1.4
Mac OS	0.3
OS390	0.3
Tandem Guardian	0.3
Dos	0.1
OS/2	0.1
Unix	0.1
Total	100.0

Table 4.3 Percent of students who were using Windows 95/98/ME by reason of using, 2001

Reasons of using	Percentage
1. Appropriate to my work	78.0
2. Easy to use, not complicated	57.0
3. Thai enable ability	50.4
4. Portability	42.9
5. Have many books and knowledge resources for studying	38.0
6. Good efficiency. Does not hang or crash often	37.7
7. Upgradability	30.6
8. Provided by my University / Institute	22.9
9. Have plenty of staff or experts for technical support	21.6
10. Expandability	20.3
11. High-speed processing	16.8
12. Reliable and accurate processing	14.1
13. Suggested to friends/teachers	12.6
14. Legal license is affordable	10.0
15. Has technical staff for long term maintenance	7.5
16. The license of this operating system can be used with the current work	6.3
17. No other operating system is better	5.0
18. Standard program, most of program run on Windows	1.1
19. Comfort to use, World wide disseminate	0.8
20. Appropriate to available resources	0.7
21. Use up to the company/office	0.6
22. Easy to understand, not complicated	0.4
23. Appropriate for games	0.3
24. Microsoft is the strong competitor and the product is effective	0.3

Most of the population did not use OSS operating system in the year 2001. Table 4.2 shows the operating system which was used in the year 2001. Microsoft Windows got almost all of the market share. Table 4.3 shows the reasons for using the most popular operating system, Windows 95/98/ME, as the current operating system in the year 2001.

Most of respondents considered the operating system which was associated with their work. Moreover, the operating system should be easy to use and Thai enable is necessary. The other reasons are answered by a minority of respondents.

Nearly three quarters (72 percent) knew that OSS can be downloaded from internet, 15 percent did not know, and 13 percent did not know anything about OSS. Table 4.4 shows that 22 percent of respondents used OSS operating system in the year 2001. Four percent of respondents used OSS operating system with more than one operating system. The comparison of each OSS type was described in Table 4.5. Comparison among open source operating system usage that has been used in the past and was currently used in year 2001 show that the percentage of open source operating system usage down to 20 percent from 43 percent in year 2001.

Table 4.4 Percentage distribution of open source operating system usage in year 2001

OSS operating system usage	Percent
Did not use OSS OS	78.2
Used only one OSS OS	17.8
Used two OSS OS	3.2
Used three OSS OS	0.7
Used four OSS OS	0.1
Total	100.0

Table 4.5 Percentage of open source operating system usage that ever used and current used in year 2001

Operating system	Percentage of open source operating system usage	
	Ever used	Currently use
Linux	43.4	19.5
Solaris	5.8	5.1
Macintosh OS X	1.8	1.7
BSD	1.3	0.5

Table 4.6, Table 4.7, and Table 4.8 show usage of Open Source Application Environment, Open Source Development Library , and Open Source Application which were used until the year 2001 respectively. Almost all of them were found on Linux such as X-Window, KDE, Sendmail, Gnome, GNU CC, GNU make, Bind, Emacs, Apache, Mozilla, MySQL, PHP, Pine, and Open Office. Java was the most popular in Table 4.6. The Development Library is described in Table 4.7. JDK was popular and was used to synchronize withTable 4.6 because JDK has the Java Library.

Table 4.6 Open Source Application Environment ever used till year 2001

Application Environment	Percentage of usage (393 cases)
Java	52.7
X-Window	19.5
Perl	18.2
KDE	12.8
Sendmail	10.5
Gnome	9.8
GNU Make	3.8
GNU CC	3.7
Tk/Tcl	2.5
Bind	2.2
GNU Emacs	0.9
Free Pascal	0.3
Vi	0.3
EJB Application Server	0.3

Table 4.7 Open Source Development Library ever used till year 2001

Development Library	Percentage of usage (393 cases)
JDK	42.8
OpenSSL	3.7
Gimp	2.7
OpenLDAP	1.9
SSLeay	1.0
OpenGL	0.8
GTK	0.3
QT	0.3
GDK	0.3
LDAP	0.2
SDK	0.1

Table 4.8 Open Source Application ever used till year 2001

Application	Percentage of usage (393 cases)
PHP	33.7
MySQL	27.7
Apache	17.1
Pine	15.7
Open Office (Star Office)	7.3
Mozilla	4.4
GRASS	0.6
XMMS	0.3
QuantaPlus	0.3
Kdevelop	0.3
QTDesigner	0.3
Xine	0.3
PfaEdit	0.3
InterBase	0.3
GLAD	0.3
DIA	0.3
GQView	0.3
MRTG	0.1

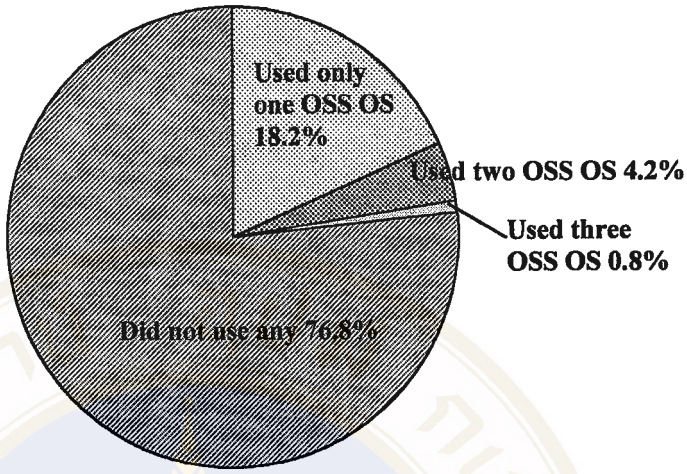

Figure 4.1 Open source operating system usage in public institute/university

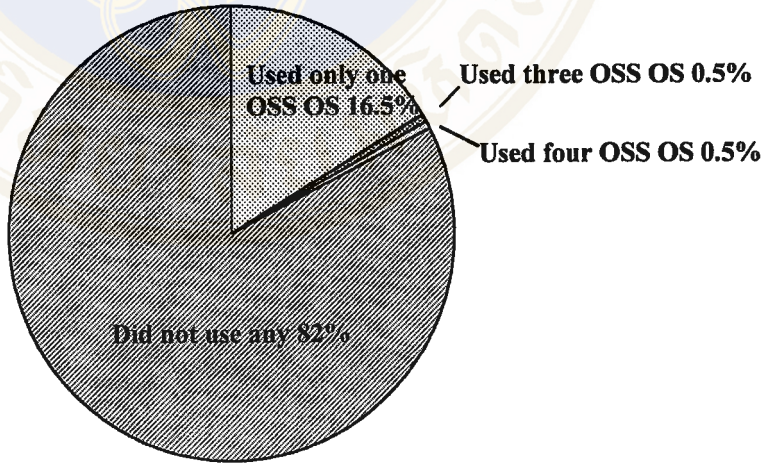

Figure 4.2 Open source operating system usage in private institute/university

4.2.2 Pattern of open source software usage

In the year 2001, almost all of respondents used Microsoft Windows as the major operating system. Twenty two percent of respondents also used OSS operating system. Figure 4.1 and Figure 4.2 show the comparison between public and private universities/institutes. The OSS operating system usage in both types of universities is not significantly different.

Table 4.9 shows the percentage distribution of students who reported using open source software by type of software and institute. Students in the public universities used all types of OSS, while students in private universities did not use as many types of OSS. Nearly three quarters of students had used Application Environment, Development Library, Application and four-fifths of students who have used OSS operating system were in public universities.

Table 4.9 Percentage distribution of students who reported ever used open source software by type of software and institute

Type of software	Institute		Total (392 cases)
	Public	Private	
Operating system	82.2	17.8	100.0
Application Environment	77.6	22.4	100.0
Development Library	76.0	24.0	100.0
Application	75.3	24.7	100.0

Table 4.10 Percentage distribution of students who reported ever used of open source operating system by sex

OSS OS Usage	Sex		Total
	Female	Male	
Used	16.4	24.8	21.8
Did not use	83.6	75.2	78.3
Total (400 cases)	100.0	100.0	100.0

Table 4.10 shows the open source operating system usage classified by sex. Null hypothesis: Sex does not effect open source operating system usage, and Alternative hypothesis open source operating system usage is related to sex. Critical value from Chi-Squared table with one degree of freedom is 3.841 at 5% significance level. This study found the Chi-Squared value is 3.811 (3.811 < critical value); therefore, no grounds for rejecting the null hypothesis of sex does not effect open source operating system usage.

Table 4.11 Percentage of each activity that users spent the most time to and Percentage of open source operating system usage in each activity order by descending of open source operating system usage

Activities	Percentage of each activity that users spent the most time to	Percentage of students using OSS OS when doing each activity most often
1. Hardware	1.5	83.3
2. Computer network	1.0	50.0
3. Programming	28.1	29.1
4. Internet	34.6	23.5
5. Office suit program	8.6	20.6
6. Computer graphic /Multimedia	5.1	15.0
7. Game	20.6	6.2
8. Research analysis	0.5	0.0

The activity which most users spent the most time on was Internet but Table 4.11 shows that internet activity was not the top of the OSS operating system usage group in spite of OSS operating system, Linux, which is the best one for network and Internet. The students who spent the most time on the activity with hardware, computer network, and programming used OSS operating system more than the Internet users group. Table 4.11 could be classified into three categories. The first is hardware and computer network which is more than or equal to 50 percent usage; the second is programming, internet, and office suit program which is between 20-30

percent usage and the last one is computer graphic/multimedia, game, and research analysis which is less than 20 percent usage, especially research analysis which no one used. The students who were interested in computer hardware and network usually had more technical experience than other students. They may be able to fix complicated problems which happen on the OSS operating system by themselves. It may have some software involving graphic/multimedia, game, and research analysis which can run on OSS operating system. There is inadequate software response to the needs of students. Thus the OSS operating system usage of students who spent the most time on activities with graphic/multimedia, game, and research analysis is small.

Table 4.12 shows percentage distribution of the OSS operating system usage classified by age and computer experience. OSS operating system usage does not decrease with a decrease in age and computer experience. In the 20-24 age group which is the majority of respondents (61.7 percent), the OSS operating system usage tends to increase by decreasing computer experience down to 4-5 years computer experience.

Table 4.12 Percentage distribution of the OSS operating system usage classified by age and computer experience

Age (year)	computer experience (year)						Total
	0-1	2-3	4-5	6-7	8-9	10+	
15-19	-	16.7	33.3	16.7	33.3	-	100.0
20-24	3.6	12.6	36.9	18.0	11.7	17.1	100.0
25-29	2.2	6.5	15.2	37.0	13.0	26.1	100.0
30+	-	-	5.9	23.5	11.8	58.8	100.0
Total (400 cases)	2.8	10.0	28.3	23.3	12.8	22.8	100.0

The operating system usage would effect other software usage including the OSS. Table 4.13 shows that most OSS operating system users used other OSS.

Table 4.13 Percentage distribution of each open source software usage depended on open source operating system usage

Type of open source software	Open source operating system usage		Total
	Used	Did not used	
Application environment	60.0	40.0	100.0
Development library	66.5	33.5	100.0
Application	64.4	35.6	100.0

4.3 Case studies of organization that use Open Source Software

This section contains the interview data of the representatives of public and private organizations.

4.3.1 Case 1: a private company

- Background of organization

This private company has been a software development company or software house for 10 years ago. The company has been developing software for financial companies and GL-system for non-life insurance companies (31).

- Software usage

Firstly, the company used Novell Netware as the operating system of server machine, DOS as client machine and Informix as database management system. After the MS Windows series was released, almost all of officer's computers had Windows operating system as the desktop operating system and some of Netware server was ported to Windows NT. Since Internet was necessary for globalization, the developers of the company began to learn about Linux and used it as internet server, web server, mail server, and file server. The company has been growing and still is using Linux

and Samba. Samba was installed in order to communicate with other operating system platforms (31).

- Development in the future

Software development of the private company in the future will be composed of 2 types, in-house development software and software packages which will be bought from abroad. Both types are utilized by company's customers. The limitation of the software packages is that users are not allowed to modify and also the software environment is restricted by software vendors, include the operating system. It is rather impossible for porting to other environments. Although, some systems are portable with a lot of budget and time, the new software development would be developed or ported to Linux. Linux is a choice when making system development decisions because of cost saving (31).

- Factors for choosing an operating system

The functions and features were certainly determined. The reliability is the advantage of operating system. The other factors considered are cost, upgradability, experience of developers, operation and maintenance. Thai language enable feature is not necessary on the server but is on the desktop. It is very important. Almost all of the document files are Microsoft Office (31).

- Fact of using OSS operating system, Linux

The comparison between Windows and Linux operating system on desktop is as follows. Windows was more accepted by users than Linux because of the ease of installation, greater hardware support, less complicated problems found, more support for maintenance, and a lot of software could run on Windows. The first problem with using Linux is its difficulty in installation. Linux does not support plug & play like

Windows. Many hardware vendors do not support Linux. Games are an attraction, as there are only a few popular games on Linux. Almost all of the popular games run on Windows. According to above information, when deciding to select an OSS operating system, Linux is a difficult choice because the users had to trade off the easier maintenance of Windows with the lower license cost of Linux (31).

A serious problem is a familiarity with the current operating system. It is very difficult to change the user's behavior.

- Opinions and recommendations

The other large organizations could buy a lot of brand name computers bundled with MS Windows operating system. The price per each computer is cheap (20,000 baht approximately) but the price for an operating system which requires up-grading frequently is high. Those organizations prefer the current Windows version instead of replacing new versions with more expensive ones. The interviewee believed that OSS is not used widely in Thailand because OSS has fewer features than user's expectation. The cost is not the main issue to determine thus it does not mean that OSS is cheaper than proprietary software. The most interesting aspect of open source software is the freedom to learn and modify by the potential developers (31).

4.3.2 Case 2: Sepion Software Co., Ltd., a private company

- Background

Sepion Software Co., Ltd. is a new company with a new a business approach in Thailand because the company uses OSS operating system as a part of its product and services. Business of Sepion Software is composed of 3 services.

1. Product: Server computers bundle with 100 percent Linux operating system and common features. Basic configurations are required such as Internet server, DNS service, mail service, web server, database server, etc.

2. Services: Installation and maintenance when customers require.

3. Training: Training in many issues such as Linux usage, maintenance, and elementary configuration.

- Software usage

Sepion Software Co., Ltd. provides and services 100 percent Linux based on Red Hat and Slackware and also OSS on Linux.

- Factors for choosing an operating system

Cost saving of software is the major reason for business.

- Facts about the use of OSS operating system

The company's staff has to spend a lot of time learning about Linux by themselves because there is no open source training center in Thailand. The Thai OSS community is required for expert discussion and also learning for novices. The continuous public relation information is necessary to inform OSS information and provide technical support.

- Opinion and recommendation

Linux has been working as server machines but it is seldom used on desktop machines. Desktop of Linux needs more than Thai language ability development and document portability to the Linux platform. If all of the people including professors, students, policy planners, were conscious of OSS advantages, then learning with OSS tools would be intensified. OSS learning should be included into the curriculums of computer science, computer engineering, and information technology especially

emphasizing the supplemental software development and the excellent program structure learning (32).

The interviewee referred that many strong technology countries such as Germany (Linux SuSE), China (Red Flag) moved almost all of their works to Linux platform due to license cost saving and their security (33). The considerate subcommittee of science and technology in communication and information division, member of the parliament was delegated to consider Linux as the Thai national operating system. The issues of consideration are a weak point and a strong point of economy and technology. Moreover, the other factors such as human resources, material, and preparation are set up as hypothesis for the next five year later (34).

The interviewee explained that the critical problem was software piracy. The users had too much pride to use illegal software. Using illegal software wrong attitude that is an attitude that will destroy the Thai national economy. The consequence of this problem is there would be no software developers in Thailand because they are scared of the copying (32).

4.3.3 Case 3: Information Research and Development Division (RDI), National Electronics and Computer Technology Center, a public organization.

- Background

NECTEC is a dynamic organization which is responsible for the development of Information Technology in Thailand. Its mission is to ensure Thailand's competitiveness in Electronics and Computer and the use of IT to stimulate economic and social impact through own R&D programs as well as R&D funding services to universities.

The organization has been operating for twelve years in Research and Development, IT Policy Planning, and Government Information. NECTEC is also the secretariat office for Thailand's National Information Technology Committee.

There are several new projects on IT infrastructures in Thailand which they are handling. NECTEC is an organization under the National Science and Technology Development Agency (NSTDA). It operates under the Science and Technology Development Bill of 1991. NSTDA is an organization in the Ministry of Science, Technology and Environment.

- Development in the future

Windows is a popular operating system which is widely used. More than 90 percent of RDI-research is developed on Windows platform (35) because an objective of RDI is to realize the greatest number of Thai users. However, a lot of software has been trying to develop independently from operating system, but C was been usually chosen. Porting all software to OSS operating system was in the political plan of theThai government budget of year 2001. The releasing of source code will be tightly considered and will also depend on each condition and license.

- Attitude in Open Source Software

The OSS researchers of NECTEC are impressed by OSS concept because they can improve themselves due to the opportunity to learn the excellent programming and including time saving. They can add subprograms which are downloaded free of charge to the main program. Sometimes they have got technical problems. They raise questions on web boards or search engines or find out at FAQs on OSS-community web sites. The speedy replys to their questions, without cost, is the technical support. It can help them to continue their works (35).

OSS concept has gained popularity aboard. The software vendors usually release source code of open source version before the commercial version. This strategy makes their software more effective due to user's feedback (35).

- Facts about the use of OSS operating system

The critical problem is many people are not confident in OSS concept. Actually, almost of all users never have got support from their operating system vendors. Nobody can answer its problems such as the dead blue screen which always shows when Windows system fails. Recently ten new vulnerabilities for Microsoft Internet Information Server were announced. The majority of them were discovered by outside parties (36). The users could not do anything to it except using and waiting for the patch files upgrade. In contrast, OSS errors could be found and fixed by everyone.

- Opinion and recommendation

Future of Open Source Software

The problems that restrictRDI researchers and Thai developers development are the retrieval news and information about the open source development in Thailand. In order to solve these problems, Thai Linux User Group Part II (TLUG) was founded on October 10th 2001. TLUG is the open source community for Thai people with approximately sixty members . The main participants are Software Park, NECTEC, IBM, and Kasetsart University (35).

The higher educated users would use Linux more than the lower educated users because the applications on Linux are developed by the researchers for themselves which are not suitable for children. Thus Windows niche is greater than Linux. The beginners such as children through to the specialist all use Windows. At present, there

are a lot of programs on Linux which are easy to use and response to the user's requirements. If Linux was promoted in schools or universities, the response and research on Linux would be increased (35).

The trend of Linux usage has been growing as more applications run on Linux. Actually, these are the consequences of supplemental development and also capability of researchers and developers.

RDI began developing open source operating system 3 years ago and found that the main problem was office suit program. Recently, RDI released Linux TLE 4.2 as a desktop operating system. OpenOffice.org, an office suit program can open, modify, and save the Microsoft document files. OpenOffice.org can be run on three operating systems, Solaris, Windows, and Linux. If Linux is promoted in Thailand, because of the easy installation and a lot of software with Thai language ability, especially effective network applications, Linux may be a powerful operating system (22).

Suggestion

The OSS attitude of users is concerned. These are the suggestions of director of RDI as the following:

a) The users should respect all software including open source software.

b) Almost all of OSS is free, however, some OSS is not free. Users should learn about the rights of each software license in order to investigate its rights or what they can do or can not do.

c) The price of OSS is not zero because there is the cost as CD, the optimized solution finding, software integration, software customization, and services. The organizations should not cut off this budget.

d) Users should asset to the open source software because it is the intellectual property.

e) The open source development in Thailand should be promoted further. The effective applications can be exported and Thai people will pay for Thai products instead of imported foreign products.

4.4 Open source operating system usage in organizations

Many organizations, both public and private organizations appreciate Linux working as server such as mail server, web server. Those organizations include Electricity Generating Authority of Thailand (EGAT), Ministry of Science, Technology and Environment, Department of Computer Engineering, Faculty of Engineering, Kasetsart University, and Department of Computer Science, and Faculty of Science, Burapha University.

Electricity Generating Authority of Thailand (EGAT) :

Approximately 30,000 employees with 7,000 computers connected to network. Modems support the using of 150 dual-lines (37). The various operating systems in EGAT are

- 2 sets of Solaris operating system
- 3 sets of Unix operating system
- 2 sets of Windows NT
- 1 sets of Windows 2000
- 27 sets of Linux operating system
- 20 sets of BSD operating system
- The main operating system in EGAT is the open source technology, Linux and BSD.

Department of Computer Engineering, Faculty of Engineering, Kasetsart University :

Kasetsart University has been conducting extensive research in cluster computing since 1996. To make Thailand sustainable in the area of high performance computing system for PC equipment available in the country is their goal. The research is useful for science and engineering processing such as weather modeling, remote sensing, Internet, Intranet, and database. Having no technology to build or integrate such powerful supercomputers and lacking a budget to buy; the department of computer engineering has focussed on cluster computing research. Advanced research is conducted in the area of parallel and distributes computing and focuses on realistic research with strong industry linkage (38).

The solution is using personal computer (PC) with Linux and OSS to integrate powerful supercomputer called clustering technology. A PIRUN cluster (Piles of Inexpensive and Redundant Universal Nodes) consists of 72 nodes (in 2002) PC based machines, 128 MB RAM fast, Ethernet 100 Mbps, 3 file servers with 60 GB RAID and 1 GB RAM. Performance 12 Gigaflops (Linpack). KU PRG reduces the expensive development tools because Linux and open source software are available and allow many works to be completed. Open Source Library helps speed up the research development because there is no need to reinvent things. As a result, OSS helps to build the highly technical skill researchers (38). PIRUN cluster is the most current powerful computing system in Thailand. It can save 10-20 million baht for Kasetsart University (38).

Department of Computer Science, Faculty of Science, Burapha University :

Burapha University (BUU) is an university that utilizes Linux efficiency. Burapha Linux has been developing as a distribution of Linux. Burapha Linux project

was founded in 1982 and has been developing by professors and students of the department of Computer Science. The current version (2002) of Burapha Linux is BLCD3. BLCD3 is based on Slackware 7.1 which supports web server's function such as Apache 1.3.19, various modules for web application (39).

Open source is the main tool for learning. More than 90 percent of all subjects in department of computer science include open source as the learning tools. The subjects which use OSS tools such as Internet Information Service, Linux System Administration, Operating, and Object-Oriented Programming. In computer lab rooms, most computers are installed with only Linux and some are dual operating system boot with Linux such as Windows NT and Linux, Windows 95/98 and Linux. Samba joins Linux computer and Windows computers together (39). All of these approaches make students in Burapha University familiar with open source software so they can also work on various operating system platforms. Mr.Panumas Thanyaboon, a student of department of computer science, is a developer of Burapha Linux Project. He said that he began to use Linux when he became a first-year student. He had to do homework and sent them via Linux platform. Previously he was familiar with Windows platform, but currently he prefers Linux because Linux does not often fail. He has used the other distribution such as RedHat but the most works run on Burapha Linux. Some of his friends, based on his referal, prefer using Linux as networking, programming, server but some are against Linux (40).

4.5 Future of Linux

Since Linux is the most popular OSS operating system in Thailand and since there is a policy to adapt Linux as the national operating system, the respondents were asked about this matter which could be used as an indicator of usage trends in the

future. This section is the feedback of respondents to the issue of Linux becoming the national operating system. According to the questionnaire, "If you must pay for the expensive software license, would you decide to use Open Source Operating System (such as Linux) instead?" 78 percent decided to choose open source operating system, and 22 percent did not choose. Table 4.14 summarizes the reasons for decision of choosing and Table 4.15 are the reasons why they did not choose. Percent of Table 4.10 and Table 4.15 should be compounded to 100 percent. Because of this problem, the questionnaire may be unclear.

Table 4.14 Reasons for decision of choosing

Reason	Percentage
1. Open Source Software can be downloaded for free	48.4
2. There are many knowledge resources or technical support communities	23.4
3. Open Source Software is easy to get	19.3
4. Open Source Software can support Thai language	7.0
5. Linux can be modified and customized	1.0
6. To save expense	0.2
7. To avoid a legal problem	0.7

The reason, Open source software can be downloaded for free, was considered by the majority of respondents. There were some other reasons that respondents recommended OSS such as the efficiency of Linux was better than Windows and Linux requires less resource than Windows, to obtain knowledge from a new operating system, there was the continual development, waiting for Lindows because it was portable between Windows and Linux, and anything can be used cause up to their abilities.

Table 4.15 Reasons for decision of not choosing

Reason	Percentage
1. Familiar with the current operating system	13.5
2. The present operating system is efficient and can support my work	10.0
3. I don't want to waste the time learning a new operating system	6.4
4. No staff for technical supporting	6.1
5. The University/Institute has another operating system software installed	2.0
6. Worry about the security of operating system	0.9
7. There are many cheap illegal software	0.5

Familiarity with the current operating system was the reason for not choosing open source software. Other reasons which the respondents recommended werethe efficiency can not be accepted, and business needs reliability.

Table 4.16 shows the percentage distribution of decision of OSS system if the population must pay for the expensive software license classified by open source operating system experience. It was found that the open source operating system experience would not be the main effect to the decision.

Table 4.16 Percentage distribution of decision if the respondents must pay for the expensive software license classified by open source operating system experience

Open Source Operating System Experience	Decision for OSS operating system usage		Total
	Did not choose	Chose	
No experience	21.1	78.9	100.0
Some experience	22.5	77.5	100.0
Total	47.6	45.5	100.0

The respondents were also asked "Do you agree that Linux would become the Thai National Operating System?" 65 percent agree, 35 percent did not agree. Sixty

four percent though thought that Linux should be promoted to use in curriculum of universities/institutes. More opinions are shown in Table 4.17.

Test statistic with Chi-Squared in issues "decision if the respondents must pay for the expensive software license classified by open source operating system experience" and the issue "agreement with Linux becomes the Thai national operating system classified by open source operating system experience" are shown as the following respectively.

Question: Does the OSS operating system experience effect the decision of choosing OSS operating system if the respondents must pay for an expensive license?

Null Hypothesis - OSS operating system experience does not effect on the decision of choosing OSS operating system if the respondents must pay for expensive license

Alternative Hypothesis - OSS operating system experience effects on the decision of choosing OSS operating system if the respondents must pay for expensive license. This study found χ^2 value is 0.114. It is less than critical value with one degree of freedom at 5% significance level ($0.114<3.841$). Consequently, null hypothesis is accepted that OSS operating system experience does not effect on the decision of choosing OSS operating system if respondents must pay for expensive license.

Question: Does the OSS operating system experience effect on agreement with Linux becomes the Thai national operating system?

Null Hypothesis - OSS operating system experience does not effect on agreement with Linux becoming the Thai national operating system

Alternative Hypothesis - OSS operating system experience effects on agreement with Linux becoming the Thai national operating system

This study found χ^2 value is 0.186. It is less than critical value with one degree of freedom at 5% significance level (0.186<3.841). Consequently, null hypothesis is accepted that OSS operating system experience does not effect on agreement with Linux becoming the Thai national operating system.

Table 4.16 would assume that the open source operating system experience was not significant to the decision for choosing open source operating system and Table 4.18 would be assumed that the open source operating system experience was not significant to agreement with Linux becomes the Thai national operating system, however, most students who had no experience with Linux had spent less confidence than students who had Linux experience. Table 4.19 shows that more than half of respondents (57 percent) who had some experience with Linux believed that Linux was possible to be the Thai national operating system whereas less than half of respondents (43 percent) who had no experience with Linux did not believe Linux was possible to be the Thai national operating system.

Most of the respondents (38 percent) spent 51-79% possibility to Linux. With this group, respondents who have some Linux experience had more confidence than respondents who had no Linux experience in both cases of client and server Linux. It is shown in Table 4.20.

Most of the respondents thought that it should be 5-6 years of Linux development before becoming the Thai national operating system. The Mean of the time period for Linux development is 5.11 years. Table 4.21 shows time for development Linux becomes Thai national operating system classified by computer experience. While the majority of respondents believe that 5-6 years is the time period for development Linux becomes the Thai national operating system, the percentage of

respondents who have 8-9 years computer experience believe that "more than 10 years" should be sufficient for development This is equal to percentage of respondents who believe "5-6 years" with 24.3 percent.

Table 4.17 Percentage of students who reported their opinion when Linux becomes the Thai national operating system

Opinion	Percentage
1. Linux should be promoted to be used in University/Institute's curriculum	63.9
2. Linux can be further modified and developed	55.0
3. Saving budget	52.1
4. It helps promoting the use of legal software	45.4
5. Not sure whether some software can run on Linux	41.0
6. It is efficient and can support my work	31.1
7. Lack of technical staff or organization in Thailand for technical support.	27.7
8. Not sure whether some hardware can work with Linux	25.5
9. Lack of application program that run on Linux	20.4
10. Lack of books and knowledge resources for Thai people	19.3
11. It wastes a lot of time to learn a new operating system	10.3
12. Worry about the security of Linux	9.7
13. The present operating system works well. No need to change	7.2

Table 4.18 Percentage distribution of agreement with Linux becomes the Thai national operating system classified by open source operating system experience

Open Source Operating System Experience	Do you agree with Linux become the Thai National Operating System?		Total
	no	yes	
No experience	35.8	64.2	100.0
Some experience	33.7	66.3	100.0
Total	34.8	65.2	100.0

Table 4.19 Percentage of possibility of Linux's becoming the Thai national operating system classified by Linux usage

Possibility	Linux Experience		
	No experience with Linux	Some experience with Linux	Total
Absolutely sure (100%)	2.5	5.1	3.0
Rather possible (80-99%)	4.4	6.4	4.8
May be. If we have a good cooperation from several sources (51-79%)	35.7	44.9	37.5
Not sure(50%)	29.8	14.1	26.7
There will be a lot of effort to reach that (30-49%)	15.4	11.5	14.6
Close to impossible (1-29%)	8.8	15.4	10.1
Impossible (0%)	2.8	-	2.3
no opinion, don't know	0.3	-	0.3
Not at all accept	0.3	-	0.3
For a user, it is impossible, but for a server it is possible	-	1.3	0.3
It should not be required because of study restriction	-	1.3	0.3
Total (396 cases)	100.0	100.0	100.0

Table 4.22 shows percentage distribution of time for development of Linux before it becomes the Thai national operating system classified by Linux usage. Both case respondents who have and do not have experience with Linux thought that Linux development should take 5-6 years before becoming the Thai national operating system.

Most of the client and server Linux users thought that 5-6 years is the time for Linux development. Table 4.23 shows time period comparisons between percentage distribution of Client Linux and Server Linux respondents. Among most respondents who have no experience with Linux as server or client thought that it would take between 5-6 years for Linux to become the national operating system. However, respondents who have experience with Linux as client thought 5-6 years whereas respondents who have experience with Linux as server thought 3-4 years before becoming the Thai national operating system. Both types of Linux usage in total shows that it should take 5-6 years.

Table 4.20 Possibility comparison between percentage distribution of Client Linux and Server Linux respondents

Possibility	Client Linux Experience			Server Linux Experience		
	No experience with Client Linux	Some experience with Client Linux	Total	No experience with Server Linux	Some experience with Server Linux	Total
Absolutely sure (100%)	2.3	6.3	2.8	2.5	5.9	2.8
Rather possible (80-99%)	5.2	2.1	4.8	4.1	11.8	4.8
May be. If we have a good cooperation from several sources (51-79%)	35.3	54.2	37.6	37.3	41.2	37.6
Not sure(50%)	28.7	12.5	26.8	28.2	8.8	26.5
There will be a lot of effort to reach that (30-49%)	15.2	10.4	14.6	15.5	8.8	14.9
Close to impossible (1-29%)	9.5	14.6	10.1	9.4	17.6	10.1
Impossible (0%)	2.6	-	2.3	2.5	-	2.3
No opinion, don't know	0.3	-	0.3	0.3	-	0.3
Not at all accept	0.3	-	0.3	0.3	-	0.3
For a user, it is impossible, but for a server it is possible	0.3	-	0.3	-	2.9	0.3
It should not be required because of study restriction	0.3	-	0.3	-	2.9	0.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 4.21 Percentage distribution of time for development Linux becomes the Thai national operating system classified by computer experience

Time Period	Computer Experience						Total
	0-1	2-3	4-5	6-7	8-9	10+	
Immediately	-	-	0.9	-	-	1.8	0.5
Less than 1 year	-	-	3.7	1.0	8.1	-	2.1
1-2 year	10.0	19.2	18.3	9.4	8.1	21.4	15.5
3-4 year	-	23.1	24.8	32.3	18.9	26.8	25.4
5-6 year	50.0	35.9	29.4	30.2	24.3	19.6	29.5
7-8 year	-	1.3	5.5	11.5	5.4	3.6	5.7
9-10 year	30.0	7.7	2.8	5.2	8.1	12.5	7.0
More than 10 years	10.0	10.3	11.1	6.3	24.3	8.9	10.7
Others	-	2.5	3.5	4.1	2.8	5.4	3.6
Total (386 cases)	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 4.22 Percentage distribution of time for development Linux becomes the Thai national operating system classified by Linux usage

Time Period	Linux Experience		Total
	No experience with Linux	Some experience with Linux	
Immediately	0.5	1.2	0.8
Less than 1 year	2.8	1.8	2.4
1-2 year	19.0	10.7	15.3
3-4 year	24.2	27.2	25.5
5-6 year	29.9	27.8	28.9
7-8 year	7.1	4.7	6.1
9-10 year	4.7	9.5	6.8
more than 10 years	8.5	13.0	10.6
Others	3.3	4.1	3.6
Total	100.0	100.0	100.0

Table 4.23 Time period comparison between percentage of Client Linux and Server Linux respondents

Time Period	Client Linux Usage			Server Linux Usage		
	No experience with Client Linux	Some experience with Client Linux	Total	No experience with Server Linux	Some experience with Server Linux	Total
Immediately	0.9	-	0.8	0.8	-	0.8
Less than 1 year	2.1	4.1	2.3	2.3	3.0	2.3
1-2 years	14.7	18.4	15.2	15.9	9.1	15.3
3-4 years	26.5	16.3	25.3	24.6	33.3	25.4
5-6 years	28.6	34.7	29.4	30.0	24.2	29.5
7-8 years	6.2	4.1	5.9	5.7	6.1	5.7
9-10 years	5.0	18.4	6.7	6.8	6.1	6.7
More than 10 years	11.8	4.0	10.8	10.5	12.1	10.6
Others	4.2	-	3.6	3.4	6.1	3.7
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 4.24 shows that 37 percent of respondents thought that the lack of experts for consulting was the problem that should be taken care of first. Whereas 16-18 percent of respondents thought that the ability to displays Thai font on Linux and the ability to use

Thai language on Office Suit program should be taken care of first. The difference between the Thai language problem and the lack of experts for consulting is approximately 50 percent.

Table 4.24 Obstacles should be taken care of to make Linux the Thai national operating system classified by problems and order of obstacle should be taken care

Obstacles should be taken care (percent)	1st	2nd	3rd
Lack of experts for consulting	36.8	14.6	16.7
The ability to display Thai font on Linux	17.8	24.4	25.6
The ability to use Thai language on Office suit program	16.4	27.4	14.4
Lack of software that runs on Linux	12.9	9.2	11.9
Lack of the continuous public relations	8.0	5.4	9.6
Lack of books or knowledge resources for Thai people	5.5	17.3	14.7
Linux does not support some hardware	2.6	1.7	7.1
Total	100.0	100.0	100.0

CHAPTER V

DISCUSSION

The finding of this study analyze open source software usage in Thailand, factors affecting open source software usage, and usage trends in Thailand. In order to show the results of the data analysis more obviously, a discussion of each issue studied would be useful.

5.1 Usage of Open Source Software in Thailand

This study found that OSS is used in every activity of the respondents who spent time on the computer doing all activities except research analysis. OSS operating system usage is classified by activity which respondents spent the most time using in descending order: hardware, computer network, programming, internet, office suit program, computer graphic/multimedia, game, and research analysis (no respondents used the OSS operating system for this activity). Internet is the activity which most respondents, 34 percent, spend the most time on but hardware and computer network are activities which respondents used OSS operating system over 50 percent of the time. In the year 2001, only 22 percent of respondents were using OSS operating system. Linux was most popular. Some other OSS operating systems were Solaris, Machintosh OS X, and BSD listed in order of descending popularity. MS Windows got the biggest market share, especially Windows 95/98/ME. Except for the operating system, the popular OSSs are tools for programming including computer programming language, development library, and database. Java was the most popular OSS computer language and Java development library was also the most important for programming. The

advantage of Java is write can run on any platform. This would be a reason for selecting it. MySQL, a database management system, was found to be most popular. PERL, KDE, Sendmail, Apache, Pine, Mozilla, and OpenOffice (Star Office), which can be found on Linux platform ,were used by some respondents.

From the survey data, 43 percent of respondents used Linux and this number decreased to 20 percent in year 2001 (the gathering data period is during 24 November 2001- 25 December 2001). More than one-half decreased.

Twenty three percent of public universities and 18 percent of private universities use OSS operating system. Sixteen percent of female and 25 percent of male students use OSS operating system. This study found that the type of university, or sex is not statistical significant to OSS operating system usage by Chi-Squared analysis at 5% significance level. The majority of OSS operating system users had 4-5 years computer experience and were 20-24 years old. Sixty two percent OSS operating system usage tends to increase in volume by decreasing computer experience, down to 4-5 years computer experience in 20-24 year age group.

Operating system affects other software usage. Respondents who used OSS operating system also used other OSS types including Application Environment, Development Library, and Application. Twenty two percent of students who have their own computer and 6 percent of students who do not have their own computer used open source operating system.

5.2 Reasons of Open Source Software Usage

The factors why OSS usage was most popular could be the same reasons why OSS is not popular in Thailand. Although the operating system is a part of computer system working, it is very important and influences other software usage. Seventy eight percent of respondents were concerned with their work. The Operating system has to be appropriate to their work. The percentage of the ease of use and Thai language ability is more than 50 percent of respondents reported. Furthermore, there are many factors that should be considered. After considering the factors which affected the usage of the most popular operating system usage in the year 2001 (Windows 95/98/ME) and considerations that would make Linux become the Thai national operating system, the most interesting factor was the appropriateness or support for the user's work. The respondents reported 31 percent for Linux and 78 percent for Windows 95/98/ME that appropriate for their work. The difference of the both operating system is more than one-half of percentage of Windows. Linux needs the enthusiasm to develop and promote its features and efficiency.

5.3 Pattern and trend of Open Source Software usage in IT organization

According to the opinion survey about which was the most popular open source operating system, Linux was the Thai national operating system. Most of the respondents, 65 percent, agree with this policy and also 78 percent of all respondents decided to choose open source operating system to work instead of current expensive license operating system. The first reason is open source software can be downloaded for free. On the other hand, the first reason in case of respondents who did not choose is the familiarity with the current operating system.

After comparison between respondents who do have and do not have experience with OSS operating system, this study found 78 percent of respondents who chose OSS operating system instead of expensive software license never used OSS operating system before. Sixty five percent of respondents who agree with Linux becoming the Thai national operating system and more than one-half, 52 percent have no experience with OSS operating system. This means that although users do not have experience with OSS operating system, they are ready to learn it in order to accomplish their works.

Forty five percent of respondents felt confident to the possibility of Linux becoming the Thai national operating system. Fifty six percent have some experience with Linux. Respondents who have some experience with Linux were more confident in Linux than respondents who did not have any experience.

Comparison between respondents who do have and do not have experience with Linux as client and server machine found that respondents who have some Linux experience felt more confident than respondents who have no Linux experience in both of client and server. Most of respondents, 30 percent, thought that 5-6 years is the time for development Linux. Forty four percent of all respondents believed that it would take less than 5-6 years but 27 percent believed that it would take time more than 5-6 years. The mean of time to develop Linux to become the Thai national operating system is 5.11 years.

Furthermore, this study found that experience with the open source operating system would not be the main factor in the decision. The Majority, 64 percent of respondents, recommended that Linux should be promoted for use in the curriculum of university or academic institutes. Whereas, many users did not feel confident in Linux due to software and hardware which can not run on Linux and security on Linux, some

expressed trust in the security of Linux. This is a conflict of the experience of users because there are few experienced respondents expressing their confidence. Ten percent of all respondents worry about the security of Linux whereas 1 percent express that the security of Linux is efficient. Not all worry about the Linux security but some express trust in the security of Linux. This feature should be promoted by Linux experienced users.

The interview data would emphasize factors affecting software usage. The operating system and software usage in companies has been following the new software products which can support their works. Not only the proprietary software was chosen but also OSS. Making a decision depends on many factors of business. The first, software supports their works and has the features that they need. The second, the reliability is the critical factor. The company prefers to pay for their confidence. They do not want any risks. They believed that the software products which have customer services or support tend to meet the expected results. The other factors such as cost, upgradability, experience of their developers would be minor factors for consideration.

The current file-type of data and current system is the problem for porting to open source due to expense and time. Moreover, Thai language enable ability is not complete on the necessary software such as office suit program.

After Linux arrived in Thailand, the discontinuation of Linux's promotion in many publications such as Thai computer magazines or Thai books effected the current usage. At present, many Thai government divisions and private sections are conscious of OSS, especially operating system thus Linux TLE (Thai Language Edition) and Linux SIS (School Internet Server) are developing for Thai people aiming to narrow the gap between pirated software and legal software use, and promoting local business

development (41). The problem, portability of data which has file-type as Microsoft document (doc) was solved after releasing Pladao; office suit program has been getting cooperation between NECTEC and Sun Thailand Co., Ltd.

The policy, making Linux as the Thai national operating system, shows the enthusiasm to break a software usage problem in Thailand; as a result the human resource development has been paying more attention too. OSS should be the best tool in which every one can learn, modify, and make own opportunities in software market. The academic institute or university should be the first pilot project to use OSS because consultants and experts are needed. Experts in academic institute should be the best consultants for software usage.

A few case studies in universities and government were found in this study. They showed the potential of OSS, especially the operating system Linux, and how well Linux worked and its reliability. The interview data was obtained from representatives of public and private sections. They were concerned with the same problem, "Familiarity with the current operating system", because this would make people unable to improve themselves. This attitude is the main problem to changeover.

This study found the necessary information to bring OSS to break IT consumption problems. The first eight obstacles are shown below in descending order that should be taken care of to make Linux the Thai national operating system.

1. Lack of experts for consulting
2. The ability to display Thai font on Linux
3. The ability to use Thai language on office suit program
4. Lack of software that runs on Linux
5. Lack of the continuous public relations

6. Lack of books or knowledge resources for Thai people

7. Linux does not support some hardware

8. Improve graphic user interface : easier to use

The first obstacle that should be taken care of is the "Lack of experts for consulting". Users need to ensure that they have consultants, but it seems that there are few consultants that they can ask for help directly thus they trust the traditional operating system like MS Windows which most of neighborhoods used, although the others are more efficient. Finally, OSS usage could not grow if the users do not trust in the system. Forty three percent of respondents have used open source operating system Linux but this number dropped down to 20 percent, more than one-half, in year 2001. If there is a OSS that can respond to user's need in every activity, the OSS will gain more popularity. Trusting in software efficiency is very necessary for novice users.

Many countries pay attention to OSS. Some countries have decided to replace Windows and other commercial software products with OSS applications. The following are the nations that encourage the use of Linux (41): 1) Finland, 2) Peru, 3) Korea, 4) Thailand, 5) Philippines, 6) France, 7) Germany, 8) Taiwan, 9) China.

Norway and United Kingdom are supporting both types of software, proprietary and OSS. Thailand is a country that is attempting to develop OSS operating system, Linux as the national operating system, Linux SIS for servers and Linux TLE for desktops. Both of them are being developed by the government-subsidized technology development group NECTEC (41). Moreover, there is cooperation from many collaborators in order to get rid of the OSS restrictions and most of all respondents had confidence in Linux. The trend of OSS usage would increase. Certainly, it will take a long time and it needs more co-operation.

5.4 Implications of results

The outcome of this study could be of benefit for policy information in encouraging legal software use. Pattern of OSS usage and factors affecting to OSS usage should be the projector for finding a solution to break the point problems in order to develop IT and IT consumption for Thailand specifically.

This research guides an alternative way for IT development in the future. Users should consider every tool by themselves not only by traditional software use. Opinions of students and representatives of public and private organizations should be useful for improvement of IT curriculum in order to develop effective IT human resources.

5.5 Limitation

Trend is from the analysis of the existing data of the one-year survey and opinions of the representatives from public and private organizations. It is not clear and is inadequate data. The research needs continuous data gathering for prediction of OSS usage trend.

CHAPTER VI

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Since almost all of the technology for IT development and utilization is imported, a large portion of the budget is spent abroad in order to get new innovations of technology, especially in computer software. Most software rights are held by software licensing agents. Users are restricted to be users because people use traditional software. Thailand, a developing country, needs its own knowledge base to reduce the gap between pirated software and legal software use, and to promote local business development. OSS should be considered by Thai people for use because of its concept, freedom for studying, modification ability, and distribution. It is essential to investigate the current status of OSS usage in IT-related organizations in Thailand and also gather necessary data including patterns and trends to determine factors affecting to open source software usage.

The survey data was obtained from questionnaires to 400 students in the institute/university in the major of computer science, computer engineering, and IT-related to computer and software development. They are 200 public university students and 200 private university students. This research investigates the usage of OSS in Thailand, determines factors affecting the usage of OSS, and investigates the patterns and trends of OSS usage in IT organization focussing on operating system. In order to accomplish research objectives, all of them were random by Multi-Stage Random Sampling approach in order to get the representative outcomes of the academic universities/institutes. The survey data was analyzed by using SPSS program. The percentage, percentage distribution,

and Chi-Squared were employed for and analysis and description. To get more information for analysis, this study interviewed the representatives of public and private organizations. Some organizations which utilize OSS are shown. In summary, the following major conclusions emerged from this study:

Open source software usage and current status

OSS is used in every activity: Internet, programming, game, office suit program, computer graphic/multimedia, hardware, computer network, except research analysis. Internet is the activity which most of respondents spent the most time on, but hardware and computer network are the activities which respondents used OSS operating system more than fifty percent of the time. Among OSS operating system, Linux is the most popular but Windows 95/98/ME has the largest market share. The usage of Linux in 2001 was reduced by more than 50 percent by people who have some experience with Linux.

Pattern of open source software usage

This study found that type of university, sex, and computer ownership are not statistical significant to OSS operating usage by Chi-Squared analysis at five percent significance level. Among the majority of the age group, 20-24 years old, OSS operating system usage tends to increase in volume by decreasing computer experience down to 4-5 years computer experience. Operating system affects the software use. Respondents who used OSS operating system also used other OSS software types including Application Environment, Development Library, and Application.

Opinion for becoming of Linux to the national operating system and case studies

Most of respondents agree with the policy of Linux becoming the Thai national operating system and also decided to choose OSS operating system to work instead of

current expensive license operating system. The majority of respondents recommend that Linux should be promoted to the curriculum of universities.

Reasons and obstacles for using open source software

The first three reasons which respondents reported are the operating system should be appropriate to their work, ease of use, and Thai language ability. In business, the first factor which they are concerned with is that the software has to support their work, the same as respondents reported. The second is reliability because customers do not want risk system fail. Because Thai language is the formal language of Thailand, users need to ensure that the new software such as OSS can support Thai language as well as MS Word. The first three obstacles are the lack of experts for consulting, ability to display Thai font on Linux, and ability to use Thai language on office suit program.

Usage trend of open source software in Thailand

It may take a long time to develop Linux and its necessary software for each activity before Linux becomes the Thai national operating system. OSS development in Thailand is in progress such as Linux TLE for desktop, Linux SIS for server, OpenOffice.org for Thai people. Although, OSS usage in Thailand decreased in 2001, OSS usage trend in Thailand will increase because of the enthusiasm of many sources.

6.2 Recommendation

Recommendation is presented in two parts as follows:

6.2.1 Recommendation regarding research outcome

The outcome of this study could be of benefit for policy information in encouraging legal software usage and also guide an alternative way for IT development.

The Pattern of OSS usage and factors affecting OSS usage should be the projector for finding a solution to break the point problems in order to improve IT development and IT consumption for Thailand. Opinions of students and representatives of public and private organizations should be used to improve IT curriculum to develop effective IT human resources because of the current lack of OSS experts, especially in the area of operating system, and students could have a chance to study and develop independently. The other factors such as open source knowledge resource, training, books, computer magazines for Thai people are necessary to develop human resources.

In addition to the technical problems the behavior of users are also a critical obstacle. They may be against immediate change. Because using software is not the religion, the correct suggestion would tend to increase the correct understanding and attitude for software use; moreover, learning in an academic institute or university should emphasize the legal software usage. A balance of OSS and proprietary software use and development should be further examined. Both of them should support each other because of the new innovations and OSS value.

6.2.2 Recommendation for further study

The next step in further study should be to compare universities that support OSS and universities that do not support OSS in the following issues: educational budget, computer-oriented learning, job opportunities, student's expectations; therefore, the IT policy comparison among public organizations, private organizations, and the government authority to other countries would be useful to discover the best solution for IT development in Thailand.

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Free software is a matter of freedom, not price. But proprietary software companies sometimes use the term ``free software'' to refer to price. Sometimes they mean that you can obtain a binary copy at no charge; sometimes they mean that a copy is included on a computer that you are buying. This has nothing to do with what we mean by free software in the GNU project.

Because of this potential confusion, when a software company says its product is free software, always check the actual distribution terms to see whether users really have all the freedoms that free software implies. Sometimes it really is free software; sometimes it isn't.

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Free software is often more reliable than non-free software.

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The term ``open source'' software is used by some people to mean more or less the same thing as free software. We prefer the term ``free software''; follow that link to see the reasons.

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Sometimes people use the term ``public domain" in a loose fashion to mean ``free" or ``available gratis." However, ``public domain" is a legal term and means, precisely, ``not copyrighted". For clarity, we recommend using ``public domain" for that meaning only, and using other terms to convey the other meanings.

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The X Window System illustrates this. The X Consortium releases X11 with distribution terms that make it non-copylefted free software. If you wish, you can get a copy which has those distribution terms and is free. However, there are non-free versions as well, and there are popular workstations and PC graphics boards for which non-free versions are the only ones that work. If you are using this hardware, X11 is not free software for you.

GPL-covered software

The GNU GPL (General Public License) (20k characters) is one specific set of distribution terms for copylefting a program. The GNU Project uses it as the distribution terms for most GNU software.

The GNU system

The GNU system is a complete free Unix-like operating system.

A Unix-like operating system consists of many programs. The GNU system includes all the GNU software, as well as many other packages such as the X Window System and TeX which are not GNU software.

We have been developing and accumulating components for the GNU system since 1984; the first test release of a ``complete GNU system'' was in 1996. Today, in 2001, the system is working reliably, and people are working on making GNOME and ppp work in it. In the mean time, the GNU/Linux system, an offshoot of the GNU system which uses Linux as the kernel, has become a great success.

Since the purpose of GNU is to be free, every single component in the GNU system has to be free software. They don't all have to be copylefted, however; any kind of free software is legally suitable to include if it helps meet technical goals. We can and do use non-copylefted free software such as the X Window System.

GNU programs

``GNU programs'' is equivalent to GNU software. A program Foo is a GNU program if it is GNU software.

GNU software

GNU software is software that is released under the auspices of the GNU Project. Most GNU software is copylefted, but not all; however, all GNU software must be free software.

If a program is GNU software, we also say that it is a GNU program.

Some GNU software is written by staff of the Free Software Foundation, but most GNU software is contributed by volunteers. Some contributed software is copyrighted by the Free Software Foundation; some is copyrighted by the contributors who wrote it.

Semi-free software

Semi-free software is software that is not free, but comes with permission for individuals to use, copy, distribute, and modify (including distribution of modified versions) for non-profit purposes. PGP is an example of a semi-free program.

Semi-free software is much better than proprietary software, but it still poses problems, and we cannot use it in a free operating system.

The restrictions of copyleft are designed to protect the essential freedoms for all users. For us, the only justification for any substantive restriction on using a program is to prevent other people from adding other restrictions. Semi-free programs have additional restrictions, motivated by purely selfish goals.

It is impossible to include semi-free software in a free operating system. This is because the distribution terms for the operating system as a whole are the conjunction of the distribution terms for all the programs in it. Adding one semi-free program to the system would make the system *as a whole* just semi-free. There are two reasons we do not want that to happen:

- We believe that free software should be for everyone--including businesses, not just schools and hobbyists. We want to invite business to use the whole GNU system, and therefore we must not include a semi-free program in it.
- Commercial distribution of free operating systems, including the GNU/Linux system, is very important, and users appreciate the convenience of commercial CD-ROM distributions. Including one semi-free program in an operating system would cut off commercial CD-ROM distribution for it.

The Free Software Foundation itself is non-commercial, and therefore we would be legally permitted to use a semi-free program ``internally". But we don't do that, because that would undermine our efforts to obtain a program which we could also include in GNU.

If there is a job that needs doing with software, then until we have a free program to do the job, the GNU system has a gap. We have to tell volunteers, ``We don't have a program yet to do this job in GNU, so we hope you will write one." If we ourselves used a semi-free program to do the job, that would undermine what we say; it would take away the impetus (on us, and on others who might listen to our views) to write a free replacement. So we don't do that.

Proprietary software

Proprietary software is software that is not free or semi-free. Its use, redistribution or modification is prohibited, or requires you to ask for permission, or is restricted so much that you effectively can't do it freely.

The Free Software Foundation follows the rule that we cannot install any proprietary program on our computers except temporarily for the specific purpose of writing a free replacement for that very program. Aside from that, we feel there is no possible excuse for installing a proprietary program.

For example, we felt justified in installing Unix on our computer in the 1980s, because we were using it to write a free replacement for Unix. Nowadays, since free operating systems are available, the excuse is no longer applicable; we have eliminated all our non-free operating systems, and any new computer we install must run a completely free operating system.

We don't insist that users of GNU, or contributors to GNU, have to live by this rule. It is a rule we made for ourselves. But we hope you will decide to follow it too.

Freeware

The term ``freeware" has no clear accepted definition, but it is commonly used for packages which permit redistribution but not modification (and their source code is not available). These packages are *not* free software, so please don't use ``freeware" to refer to free software.

Shareware

Shareware is software which comes with permission for people to redistribute copies, but says that anyone who continues to use a copy is *required* to pay a license fee.

Shareware is not free software, or even semi-free. There are two reasons it is not:

- For most shareware, source code is not available; thus, you cannot modify the program at all.
- Shareware does not come with permission to make a copy and install it without paying a license fee, not even for individuals engaging in nonprofit activity. (In practice, people often disregard the distribution terms and do this anyway, but the terms don't permit it.)

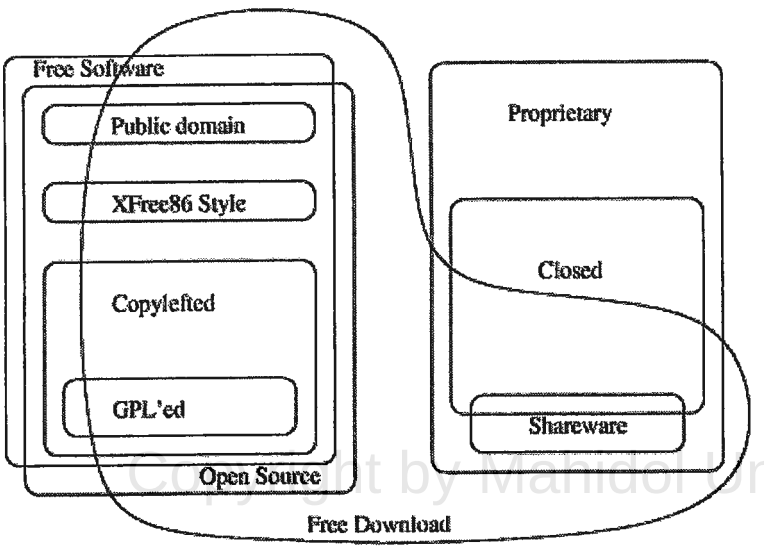
Commercial Software

Commercial software is software being developed by a business which aims to make money from the use of the software. ``Commercial" and ``proprietary" are not the same thing! Most commercial software is proprietary, but there is commercial free software, and there is non-commercial non-free software.

For example, GNU Ada is always distributed under the terms of the GNU GPL, and every copy is free software; but its developers sell support contracts. When their salesmen speak to prospective customers, sometimes the customers say, ``We would feel safer with a commercial compiler." The salesmen reply, ``GNU Ada *is* a commercial compiler; it happens to be free software."

For the GNU Project, the emphasis is in the other order: the important thing is that GNU Ada is free software; whether it is commercial is not a crucial question. However, the additional development of GNU Ada that results from its being commercial it is definitely beneficial.

Please help spread the awareness that commercial free software is possible. You can do this by making an effort not to say ``commercial" when you mean ``proprietary."



APPENDIX B

QUESTIONNAIRE AND QUESTIONS

Questionnaire
for

A SURVEY OF CURRENT STATUS AND USAGE TREND OF OPEN SOURCE OPERATING SYSTEM IN IT-RELATED ORGANIZATION IN THAILAND

A Thesis Submitted in Partial Fulfillment of the Requirements for

The Degree of Master of Science

(Technology of Information System Management)

Faculty of Graduate Studies Mahidol University

2001

Objective

1. **To investigate the usage of Open Source Software especially Operating System in Thailand.**
2. **To investigate the pattern and trend of Open Source Software usage in IT organization especially Operating System.**
3. **To determine factors effecting Open Source Software usage.**

This questionnaire has 7 pages, 20 questions. Please answer by check ✓ in ◯ or ☐ and write your information in the blanks.

1. Student from University / Institute .....
2. Sex ◯ Male ◯ Female
3. Age .....

4. Highest Education

◯ High school or equivalent

◯ Bachelor's degree Field ..... Faculty .....

◯ Master's degree Field ..... Faculty .....

◯ Doctoral degree Field ..... Faculty .....

◯ Other, please specify ..... Field .....

5. Current Study

◯ Bachelor's degree Field ..... Faculty..... Year .....

◯ Master's degree Field ..... Faculty..... Year .....

◯ Doctoral degree Field ..... Faculty..... Year .....

6. Your computer usage experience ..... Years

7. Do you have your own computer? ◯ Yes ◯ No

8. During the last year, how often did you use computer?

◯ Every day

◯ Every other day

◯ Once a week

◯ Twice a week

◯ Only on Monday - Friday

◯ Only on Holiday and Saturday - Sunday

◯ Other, please specify

.....

9. During the last year, your average time of using a computer each day is .... Hours

10. During the last year, please rank the activities you spent most time with. Given '1' is the activity that you spent most time with, '2' - '8' are the one you spent less time with, in descending order. (**Answer *ONLY* your activity. It's not necessary to answer all of activities.**)

_____Internet

_____Game

_____Computer Graphic / Multimedia

_____Programming

_____Office Suit Program (Word Processor, Spread Sheet, Presentation)

_____Computer Network

_____Research Analysis (SPSS, SAS)

_____Hardware

11. Check ✓ in ☐ in front of the Operating System(s) that you currently use and identify the type of work as Server's or Client/Desktop by checking ✓ in the corresponding column (**You can check more than one answer**)

Operating System	Server	Client /Desktop
☐ Dos.....	.....	.....
☐ Windows 3.1	.....	.....
☐ Windows 95/98/ME..	.....	.....
☐ Windows 2000.....	.....	.....
☐ Windows NT	.....	.....
☐ Windows XP	.....	.....
☐ Novell Netware	.....	.....
☐ Linux	.....	.....
☐ Unix	.....	.....
☐ BSD	.....	.....
☐ Solaris	.....	.....
☐ Mac OS	.....	.....
☐ OS/2.....	.....	.....
☐ Other Specify.....	.....	.....

12. During the last year, which Operating System did you used the most? (**Please select *ONLY* One operating system**)

- ◯ Dos
- ◯ Windows 3.1
- ◯ Windows 95/98/ME
- ◯ Windows 2000
- ◯ Windows NT
- ◯ Windows XP
- ◯ Linux
- ◯ Novell Netware
- ◯ Unix
- ◯ BSD
- ◯ Solaris
- ◯ Mac OS
- ◯ OS/2
- ◯ Other, please specify……

For what reason? (**You can answer more than one answer**)

- ☐ Appropriate to my work.
- ☐ Good efficiency. Does not hang or crash quite often.
- ☐ High-speed processing
- ☐ Provided by my University / Institute
- ☐ Use up to friends/teachers.
- ☐ Has many books and knowledge resources for studying.
- ☐ No other operating system is better.
- ☐ Has plenty of staff or experts for technical support.
- ☐ Upgradability
- ☐ Portability
- ☐ Expandability.
- ☐ Reliable and accurate processing.

☐ Legal license is affordable

☐ Easy to use, not complicate.

☐ The license of this operating system can be used with the current work

☐ Has technical staff for long term maintenance.

☐ Thai enable ability.

☐ Other, please specify .....

13. Have you known that the Open Source Software can be downloaded from the internet for free?

○ Yes ○ No ○ I don't know anything about the Open Source Software.

14. Have you ever used the Open Source Software? Check ✓ in ☐ in front of the type of the Open Source Software (**You can select more than one answer.**) and check ✓ in ☐ in front of the Open Source Software which you ever used before. (**You can select more than one answer.**)

☐ Operating System such as

☐ Linux ☐ BSD ☐ Macintosh OS X ☐ Solaris

☐ Other (You can specify more than one.).....

☐ Application Environment such as

☐ Bind ☐ Gnome ☐ GNU CC ☐ GNU Emacs

☐ GNU Make ☐ Java ☐ KDE ☐ Perl

☐ Sendmail ☐ Tk/Tcl ☐ X-windows

☐

Other (You can specify more than one.).....

☐ Development Library such as

☐ Gimp ☐ JDK ☐ LDP ☐ OpenLDAP

☐ OpenSSL ☐ SSLeay ☐ Other (You can specify more than one.) .....

☐ Application such as

☐ Apache ☐ Mozilla ☐ MySQL ☐ PHP

☐ Pine ☐ Open office (Star office)

☐ Other (You can specify more than one.).....

☐ Never used any Open Source Software.

15. If you must pay for the expensive software license, would you decide to use Open Source Operating System (such as Linux) instead?

◯ Yes..... Continue to ***15.1*** ◯ No..... Go to ***15.2***

15.1 What is the most important reason that made you decide to use the Open Source Operating System? (**Please select ONLY one reason.**)

◯ the Open Source Software can be downloaded for free.

◯ the Open Source Software is easy to get.

◯ There are many knowledge resources or technical support communities.

◯ the Open Source Software can support Thai language

◯ Other, please specify .....

15.2 What is the most important reason that made you decide not to use the Open Source Operating System? (**Please select ONLY one reason.**)

◯ The present operating system is efficient and can support my work.

◯ Familiar with the present operating system.

◯ The University/Institute has another operating system software installed.

◯ I don't want to waste the time learning a new operating system.

◯ No staff for technical supporting.

◯ Worry about the security of operating system.

◯ Other, please specify .....

16. If the Thai government declared that a "Linux" is the "National Operating System", what will be your opinion(s)? (**You can select more than one answer.**)

- ☐ Cost saving
- ☐ It helps promoting the use of legal software.
- ☐ It is efficient and can support my work.
- ☐ Linux can be further modified and developed
- ☐ Linux should be promoted to be used in University/Institute's curriculum.
- ☐ The present operating system works well. No need to change.
- ☐ It wastes a lot of time to learn a new operating system.
- ☐ Not sure whether some software can run on Linux.
- ☐ Not sure whether some hardware can work with Linux.
- ☐ Worry about the security of Linux.
- ☐ Lack of technical staff or organization in Thailand for technical support.
- ☐ Lack of books and knowledge resources for Thai people.
- ☐ Lack of application program that run on Linux.
- ☐ Other, please specify .....

17. Do you agree with Linux become the Thai National Operating System? (**Please select ONLY one answer.**)

◯ Yes ◯ No

18. What is the possibility that you think Linux can become the Thai National Operating System?

- ◯ Absolutely sure (100%)
- ◯ Rather possible (80-99%)
- ◯ May be. If we have a good cooperation from several sources (51-79%)
- ◯ Not sure(50%)
- ◯ There will be a lot of effort to reach that (30-49%)
- ◯ Close to impossible (1-29%)
- ◯ Impossible (0%)
- ◯ Other, please specify .....

19. If it's possible, how long do you think Linux can become the Thai National Operating System? (**Please select ONLY one answer.**)

- ◯ Immediately
- ◯ Less than 1 year
- ◯ 1-2 year
- ◯ 3-4 year
- ◯ 5-6 year
- ◯ 7-8 year
- ◯ 9-10 year
- ◯ more than 10 years
- ◯ Other, please specify .....

20. What is the most critical obstacle that should be firstly taken care of to make Linux the Thai National Operating System? Please rank your opinion using '1' as the activity you think the most important, '2'-'8' are the one you think less important, in descending order. (**Answer *ONLY* the item you think, no need to answer the items)**

_____ The ability to use Thai language on Office suit program (Word processor, Spread Sheet, Presentation)

_____ The ability to display Thai font on Linux.

_____ Lack of experts for consulting.

_____ Lack of books or knowledge resources for Thai people.

_____ Lack of software that runs on Linux.

Please specify .....

_____ Linux does not support some hardware.

Please specify .....

_____ Lack of the continuous public relations.

_____ Other, please specify .....

Thank you very much

To tear

You can visit the research here

Proposal : http://www20.brinkster.com/jongjit/thesis/index.html

Open your opinion : http://board.dserver.org/j/jongjit/index.html

แนวคำถามการสัมภาษณ์องค์กรรัฐฯ, NECTEC

1. ผู้วิจัย : น.ส. จงจิตต์ ฤทธิรงค์ 4237417 EGTI/M คณะวิศวกรรมศาสตร์ สาขาเทคโนโลยีการจัดการระบบสารสนเทศ มหาวิทยาลัยมหิดล
2. วิทยานิพนธ์เรื่อง : การสำรวจสถานภาพปัจจุบันและแนวโน้มในการใช้ระบบปฏิบัติการ Open Source Software ในองค์กรด้านสารสนเทศ ในประเทศไทย

   วัตถุประสงค์ :

   2.1 เพื่อศึกษาการใช้ Open Source Software ในประเทศไทยโดยเฉพาะระบบปฏิบัติการคอมพิวเตอร์

   2.2 เพื่อศึกษารูปแบบและแนวโน้มของการใช้ Open Source Software โดยเฉพาะระบบปฏิบัติการคอมพิวเตอร์ในองค์กรด้านสารสนเทศ

   2.3 เพื่อศึกษาปัจจัยที่มีผลต่อการใช้ Open Source Software

   ข้อมูลเผยแพร่งานวิจัย : http://www20.brinkster.com/jongjit/thesis/
3. บุคคลให้สัมภาษณ์ : ดร.วิรัช ศรเลิศล้ำวาณิช ผู้อำนวยการฝ่ายวิจัยและพัฒนาสาขาสารสนเทศ
4. บทบาทหน้าที่ของ NECTEC
5. ปัจจุบันโครงการวิจัยและพัฒนาของ NECTEC ที่กำลังดำเนินการมีอะไรบ้าง

   5.1 open source

   5.2 ไม่ใช่ open source
6. (จากข้อ 5) ใช้ operating system ใดบ้างในการวิจัย พัฒนาและ การปฏิบัติงาน (แจกแจงแต่ละโครงการว่าใช้ OS ใด พร้อมเหตุผลที่พิจารณาเลือก OS แต่ละตัว)

   6.1 ชื่อโครงการ

   6.2 รายละเอียด

   6.3 operating system ที่เลือกใช้

   6.4 เหตุผลที่เลือก operating system นั้น

   6.5 กรณีที่ไม่เลือก open source OS เพราะเหตุผลใด
7. ในอดีตที่ผ่านมาตั้งแต่เริ่มงานวิจัยและพัฒนาโครงการต่างๆ มีการใช้ operating system อะไรบ้าง และใช้กับงานพัฒนาประเภทไหน (ระบุปีหรือช่วงปีที่ใช้)

   7.1 ชื่อโครงการ

   7.2 ช่วงเวลาดำเนินโครงการ

   7.3 รายละเอียด

   7.4 operating system ที่เลือกใช้

   7.5 เหตุผลที่เลือก operating system นั้น

   7.6 กรณีที่ไม่เลือก open source OS เพราะเหตุผลใด
8. สำหรับโครงการทั้งที่พัฒนาไปแล้ว หรือ กำลังพัฒนา หรือ โครงการที่กำลังจะเกิดขึ้นในอนาคต ที่ไม่ได้พัฒนาบน operating system ที่ไม่ใช่ open source มีโครงการจะพัฒนา หรือ port ไปบน operating system ที่เป็น open source เช่น linux บ้างหรือไม่

9. นอกเหนือจาก operating system ที่เป็น open source แล้ว มีการใช้ open source software อื่นๆ บ้างหรือไม่ อะไรบ้าง
10. สรุปเหตุผลที่ใช้ในการพิจารณาเลือก open source operating system
    10.1 การวิจัย พัฒนา
    10.2 การปฏิบัติงานและสำนักงาน
11. developer ของ NECTEC ส่วนใหญ่ได้รับความรู้เกี่ยวกับ open source ในแง่การใช้และการพัฒนาจากแหล่งใดบ้าง และ NECTEC สนับสนุนให้เจ้าหน้าที่ศึกษา open source อย่างไรบ้าง
12. กลุ่ม developer ของ NECTEC กลุ่มต่างๆมีความคิดเห็นเกี่ยวกับ open source แตกต่างกันอย่างไรบ้าง ตามประเด็นต่อไปนี้
    12.1 แนวคิดของ open source (access, modify, distribute)
    12.2 ความสามารถของ open source (โดยเฉพาะ operating system)
    12.3 ความช่วยเหลือของกลุ่มคนในสังคม open source
    12.4 การพัฒนา open source project ของ NECTEC
    12.5 ข้อดี / ข้อจำกัดของ open source
13. จากประสบการณ์ของ developer มีความประทับใจจากการพัฒนา และ การใช้ open source ต่างๆ โดยเฉพาะ operating system ในเรื่องใดบ้าง เช่น ความช่วยเหลือจาก open source community , การตอบรับจากคนไทยที่นำ linux ที่ NECTEC พัฒนาไปใช้
14. นโยบายการพัฒนา IT ของประเทศไทยจะเป็นไปในแนวทางใด ในเรื่องการใช้เทคโนโลยีพัฒนาประเทศ ได้นำ open source เข้ามาเสริมในนโยบายบ้างหรือไม่ อย่างไร
15. ในอนาคตจะมีโครงการพัฒนาอะไรเพิ่มเติมเพื่อส่งเสริมคนให้ใช้เทคโนโลยี open source
16. มีความคิดเห็นอย่างไรที่จะทำให้สถานศึกษาเป็นสถานที่ที่ใช้ software ถูกต้องตามกฎหมายลิขสิทธิ์ โดยผลักดันให้ใช้ open source software ทดแทน proprietary software
17. มีแนวโน้มหรือความเป็นไปได้มากน้อยเพียงใดที่จะให้ใช้ open source software ทดแทน proprietary software โดยเฉพาะ operating system
    17.1 สถานศึกษา
    17.2 ภาครัฐ
    17.3 เอกชน
18. NECTECT ได้มีการส่งเสริมให้มีการศึกษา ใช้ และพัฒนา open source software รวมทั้ง operating system ในสถานศึกษาอย่างไรบ้าง
19. NECTEC มีนโยบายสนับสนุนทุนวิจัยแก่สถาบันการศึกษาในประเทศ เกี่ยวกับ open source software อย่างไรบ้าง
20. NECTEC วางแผนสำหรับอนาคตไว้อย่างไร เกี่ยวกับการใช้ open source software ทั้งใน NECTEC , ภาครัฐ, เอกชน และ สถานศึกษา

แนวคำถามการสัมภาษณ์กลุ่มบริษัทเอกชน

1. ผู้วิจัย : น.ส. จงจิตต์ ฤทธิรงค์ 4237417 EGTI/M คณะวิศวกรรมศาสตร์ สาขาเทคโนโลยีการจัดการระบบสารสนเทศ มหาวิทยาลัยมหิดล
2. วิทยานิพนธ์เรื่อง : การสำรวจสถานภาพปัจจุบันและแนวโน้มในการใช้ระบบปฏิบัติการ Open Source Software ในองค์กรด้านสารสนเทศ ในประเทศไทย

   วัตถุประสงค์ :

   2.1 เพื่อศึกษาการใช้ Open Source Software ในประเทศไทยโดยเฉพาะระบบปฏิบัติการคอมพิวเตอร์

   2.2 เพื่อศึกษารูปแบบและแนวโน้มของการใช้ Open Source Software โดยเฉพาะระบบปฏิบัติการคอมพิวเตอร์ในองค์กรด้านสารสนเทศ

   2.3 เพื่อศึกษาปัจจัยที่มีผลต่อการใช้ Open Source Software

   ข้อมูลเผยแพร่งานวิจัย : http://www20.brinkster.com/jongjit/thesis/
3. บุคคลให้สัมภาษณ์ :

   3.1 System Development eBusiness Manager, a private company

   3.2 eBusiness Integration (executive) Manager, a private company

   3.3 Manager Director, บริษัท เซเปี้ยน ซอฟต์แวร์ จำกัด
4. การบริการและธุรกรรมของบริษัท

   4.1 eMarketPlace (การบริการพื้นที่เพื่อขายสินค้าแบบ eCommerce)

   4.2 online Auction (การประมูลสินค้า online)

   4.3 value added service (บริการเสริมต่างๆ)

   4.4 โปรแกรมสำนักงาน
5. ในแต่ละการบริการใช้ operating system อะไรบ้าง ตั้งแต่อดีตจนถึงปัจจุบัน (ระบุแต่ละปี)

   5.1 eMarketPlace

   5.2 online Auction

   5.3 value added service

   5.4 โปรแกรมสำนักงาน

   เหตุผลที่เลือกใช้ operating system ในแต่ละการบริการ

   ☐ สามารถปฏิบัติหน้าที่ได้ตามต้องการ

   ☐ ประสิทธิภาพดี ไม่ล่ม (hang) บ่อย

   ☐ ประมวลผลได้รวดเร็ว

   ☐ ใช้เรียนในมหาวิทยาลัย/สถาบัน

   ☐ ไม่มีระบบปฏิบัติการอื่นที่ทำหน้าที่ได้ดีกว่านี้

   ☐ มีกลุ่มคนหรือผู้ให้การสนับสนุนช่วยเหลือด้านเทคนิค

   ☐ สามารถเพิ่มความสามารถหรือ upgrade ได้ในอนาคต

   ☐ สามารถใช้งานร่วมกับระบบงานอื่นได้ง่าย

- ☐ สามารถปรับแต่งหรือเพิ่มขยายความสามารถได้
- ☐ ระบบปฏิบัติการมีความน่าเชื่อถือ สามารถทำงานหรือคำนวณได้อย่างแม่นยำ
- ☐ ราคาพร้อมลิขสิทธิ์อยู่ในวงเงินที่พอจะจัดซื้อได้
- ☐ สามารถใช้งานได้ง่าย ขั้นตอนไม่ยุ่งยากนัก
- ☐ ลิขสิทธิ์ (licenses) ของระบบปฏิบัติการอนุญาตให้ใช้กับงานที่ทำได้
- ☐ มีบุคคลหรือผู้เชี่ยวชาญช่วยในการจัดการและดูแลรักษาระบบในระยะยาว
- ☐ รองรับการใช้งานภาษาไทย
- ☐ สนับสนุน Hardware ที่ใช้อยู่
- ☐ อื่นๆ ระบุ.....

6. แต่ละบริการเลือกใช้ซอฟต์แวร์และภาษาที่ใช้ในการเขียนโปรแกรมให้เข้ากับ operating system อย่างไร (ระบุแต่ละปี สอดคล้องกับ operating system ที่เลือกใช้ในข้อ 5)

6.1 eMarketPlace

6.2 online Auction

6.3 value added service

6.4 โปรแกรมสำนักงาน

เหตุผลที่เลือกใช้ ซอฟต์แวร์และภาษาที่ใช้ในการเขียนโปรแกรม ในแต่ละการบริการ

- ☐ สามารถปฏิบัติหน้าที่ได้ตามต้องการ
- ☐ ประมวลผลได้รวดเร็ว
- ☐ ใช้เรียนในมหาวิทยาลัย/สถาบัน
- ☐ ไม่มีซอฟต์แวร์อื่นที่ทำหน้าที่ได้ดีกว่านี้
- ☐ มีกลุ่มคนหรือผู้ให้การสนับสนุนช่วยเหลือด้านเทคนิค
- ☐ สามารถเพิ่มความสามารถหรือ upgrade ได้ในอนาคต
- ☐ สามารถใช้งานร่วมกับระบบงานอื่นได้ง่าย
- ☐ สามารถปรับแต่งหรือเพิ่มขยายความสามารถได้
- ☐ ซอฟต์แวร์มีความน่าเชื่อถือ สามารถทำงานหรือคำนวณได้อย่างแม่นยำ
- ☐ ราคาพร้อมลิขสิทธิ์อยู่ในวงเงินที่พอจะจัดซื้อได้
- ☐ สามารถใช้งานได้ง่าย ขั้นตอนไม่ยุ่งยากนัก
- ☐ ลิขสิทธิ์ (licenses) ของซอฟต์แวร์อนุญาตให้ใช้กับงานที่ทำได้
- ☐ มีบุคคลหรือผู้เชี่ยวชาญช่วยในการจัดการและดูแลรักษาระบบในระยะยาว
- ☐ รองรับการใช้งานภาษาไทย
- ☐ สนับสนุน Hardware ที่ใช้อยู่
- ☐ อื่นๆ ระบุ.....

7. Open Source Software

7.1 เหตุผลหลักที่เลือก Open Source Software แต่ละชนิดเพื่อพัฒนาระบบ (Linux etc.)

7.2 เหตุผลหลักที่ไม่เลือก Open Source Software เพื่อพัฒนาระบบ (Linux etc.)

8. สรุปแนวโน้ม การใช้ Operating system, Software ประเภทต่างๆ (Database, โปรแกรมสำนักงาน, โปรแกรม internet) และ ภาษาคอมพิวเตอร์ที่ใช้พัฒนา

9. ความคิดเห็นเกี่ยวกับแนวโน้มการใช้ Operating system, Software ประเภทต่างๆ (Database, โปรแกรมสำนักงาน, โปรแกรม internet) และ ภาษาคอมพิวเตอร์ที่ใช้พัฒนาของบริษัทอื่น

10. ลิขสิทธิ์ซอฟต์แวร์ที่พัฒนา

10.1 ตามกฎหมายลิขสิทธิ์ สิทธิในการใช้ซอฟต์แวร์ พร้อมสิทธิเกี่ยวกับ Source code ที่บริษัทพัฒนาเป็นอย่างไร

10.2 ลูกค้าสามารถขอดู Source code หรือขอ Source code เพื่อพัฒนาต่อได้หรือไม่

10.3 หากนำซอฟต์แวร์ใดๆก็ตามมาใช้เพื่อพัฒนาระบบ สิทธิและsource code นั้นจะเป็นของใคร

11. บุคลากร

11.1 นโยบายด้านการรับบุคลากรเข้าทำงาน (รับบุคคลที่มีความสามารถที่ตรงกับงาน / รับบุคคลที่มีศักยภาพแล้วอบรมเพื่อให้ทำงาน)

11.2 บุคลากรในบริษัทมีความสามารถหรือสนใจ เกี่ยวกับ Open Source Software บ้างหรือไม่

11.3 บริษัทมีนโยบายเพื่อส่งเสริมให้บุคลากรได้ศึกษา อบรม เกี่ยวกับการใช้ / การพัฒนาระบบด้วย Open Source Software บ้างหรือไม่

11.3.1 กรณีส่งเสริม เคยจัดกิจกรรม หรือ ส่งบุคลกรไปอบรม หรือ สัมมนาเกี่ยวกับ Open Source Software บ้างหรือไม่ ส่วนใหญ่เป็นซอฟแวร์ประเภทใด เช่นอะไรบ้าง

11.3.2 กรณีไม่ส่งเสริม เหตุใดจึงไม่ส่งเสริม

12. การศึกษา

12.1 ท่านคิดว่าการเรียนการสอนในสถาบันการศึกษา โดยเฉพาะระดับมหาวิทยาลัย มีอิทธิพลต่อการใช้ซอฟต์แวร์ประเภทต่างๆ รวมทั้ง Operating System ในที่ทำงานในอนาคตหรือไม่ อย่างไร

12.2 ท่านมีความเห็นอย่างไร หากสถาบันการศึกษาและสถาบันที่เกี่ยวข้องเช่น NECTEC ผลักดันให้มีความรู้,การใช้, และพัฒนา Open Source Software โดยเฉพาะอย่างยิ่ง Operating System

12.3 หากสถาบันการศึกษาหันมาใช้ Open Source Operating system หรือ Open Source Software จะส่งผลดีหรือผลเสียอย่างไร

12.3.1 บริษัทต้องปรับการพัฒนาระบบให้รองรับน.ศ.ที่ทำงานกับ Open Source Software หรือไม่

12.3.2 น.ศ. ควรเตรียมความพร้อมเกี่ยวกับการใช้งาน Open Source Software หรือไม่

13. ท่านมีความคิดเห็นอย่างไร ต่อการใช้ Open Source Software ทดแทนการใช้ Proprietary Software โดยเฉพาะอย่างยิ่งระบบปฏิบัติการคอมพิวเตอร์

13.1 กรณีองค์กรตั้งใหม่ (กังลังพิจารณาเลือกใช้ซอฟต์แวร์)

13.2 กรณีองค์กรที่ดำเนินงานมานานแล้ว (ใช้ซอฟต์แวร์อื่นอยู่)

14. การใช้ Open Source Software ในอนาคต

    14.1 โดยส่วนตัวแล้วท่านคิดว่าเป็นไปได้หรือไม่ที่ประเทศไทยจะหันมาใช้ Open Source Software

    14.2 จะเกิดผลดีหรือผลเสียอย่างไรหากนำ Open Source Software มาใช้ในภาวะที่เศรษฐกิจของประเทศไม่คล่องตัวเช่นนี้

    14.3 หากเป็นผลดี กลวิธีใดที่จะทำให้คนไทยเห็นประโยชน์, ใช้ และ พัฒนา Open Source Software

15. สรุป ความคิดเห็นเกี่ยวกับ Open Source Software ในมุมมองของธุรกิจการพัฒนาซอฟต์แวร์ในประเทศไทย

APPENDIX C

NUMBER OF ENROLLMENTS IN PUBLIC AND PRIVATE UNIVERSITIES/INSTITUTES

Table I Number of enrollments in department of Computer Science, Computer Engineering, and Information Technology in public institute classified by types of institution and levels of education in academic year 2001

Institution	Levels of Education									
	Total	Bachelor's			Master's			Ph.D.		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
1. Public Institute										
1.1 Limited Admission Universities										
1. Chulalongkorn University	719	318	145	463	162	63	225	19	12	31
2. Kasetsart University	697	264	169	433	164	100	264			
3. Khon Kaen University	566	330	231	561	5	0	5			
4. Chiang Mai University	355	176	161	337	11	7	18			
5. Thaksin University	83	49	34	83						
6. Thammasat University	692	338	257	595	72	24	96	1	0	1
7. Naresuan University	776	465	311	776						
8. Burapha University	575	294	281	575						
9. Mahasarakham University	753	399	354	753						
10. Mahidol University	787	286	132	418	196	173	369			
11. Maejo University	241	120	121	241						
12. Srinakharinwirot University	152	73	79	152						
13. Silpakorn University	203	84	119	203						
14. Prince of Songkla University	581	340	202	542	22	17	39			
15. Ubon Ratchathani University	421	304	117	421						

Table I Number of enrollments in department of Computer Science, Computer Engineering, and Information Technology in public institute classified by types of institution and levels of education in academic year 2001 (cont.)

Institution	Total	Level of Education								
		Bachelor's			Master's			Ph.D.		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
16. King Mongkut's Institute of Technology Ladkrabang	1,831	874	280	1,154	364	313	677			
17. King Mongkut's Institute of Technology North Bangkok	1,187	788	215	1,003	93	91	184			
18. The National Institute of Development Administration	641				332	309	641			
1.2 Open Universities										
19. Ramkhamhaeng University	10,485	6,988	3,497	10,485						
20. Sukhothai Thammathirat University										
1.3 Antonomous Universities										
21. King Mongkut's University of Technology Thonburi	1,688	539	374	913	447	328	775			
22. Suranaree University of Technology	451	232	219	451						
23. Mae Fah Luang University	144	52	92	144						
24. Walailuk University	129	40	89	129						
Total	24,157	13,353	7,479	20,832	1,868	1,425	3,293	20	12	32

Source: Ministry of University Affairs

Table II Number of enrollments in department of Computer Science, Computer Engineering, and Information Technology in private institute classified by types of institution and levels of education in academic year 2001

Institution	Level of Education									
	Total	Bachelor's			Master's			Ph.D.		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
2. Private Institute										
1. Bangkok University	674	398		674						
2. Kirk University										
3. Kasem Bundit University	199	132	67	199						
4. Chaopraya University	139	72	67	139						
5. Shinawatra University										
6. Saint John's University										
7. Nivadhana University	50	41	9	50						
8. Mahanakorn University of Technology										
9. Dhurakijpandit University	69	60	9	69						
10. Payap University	394	238	156	394						
11. North-Easter University										
12. Rungsit University	857	542	315	857						
13. Vongchavalitkul University										
14. Asian University of Science and Technology	3	3	0	3						
15. Webster University (Thailand)	44	36	8	44						

Table II Number of enrollments in department of Computer Science, Computer Engineering, and Information Technology in private institute classified by types of institution and levels of education in academic year 2001 (cont.)

Institution	Level of Education									
	Total	Bachelor's			Master's			Ph.D.		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
16. Sripatum University	535	336	116	452	43	40	83			
17. Siam University	442	322	120	442						
18. The university of the Thai Chamber of Commerce	1,257	765	492	1,257						
19. Huachiew Chalermprakiet University	365	161	204	365						
20. Assumption University	1,205	159	111	270	535	362	897	27	11	38
21. Eastern Asia University	250	169	81	250						
22. South-East Asia University	202	108	94	202						
23. Ratanakosin Institution of Technology										
24. Christian College										
25. Dusitthani College										
26. Tongsuk College										
27. Thonburi College of Technology										
28. Technology Ratchathani College	334	116	218	334						
29. Ratchathani Udon College of Technology										
30. Schiller-Stamford International College	5	4	1	5						

Table II Number of enrollments in department of Computer Science, Computer Engineering, and Information Technology in private institute classified by types of institution and levels of education in academic year 2001 (cont.)

Institution	Level of Education									
	Total	Bachelor's			Master's			Ph.D.		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
31. Saint Louis College										
32. Phakklang College	91	45	46	91						
33. Mission College										
34. Hatyai City College										
35. Yonok College										
36. Rajapak College										
37. Rattana Bundit College										
38. Lumnamping College										
39. Srisophon College										
40. Santapol College										
41. Saengtham College										
42. Yala Islamic College										
43. North-Eastern Polytechnic College										
44. Tapee College										
45. College of Bhandit Asia										
46. South-East Bangkok College										
47. North-Chiangmai College										
48. Fareastern College										
49. Phathumthani College										
50. Southern College of Technology										
Total	7,115	3,707	2,390	6,097	578	402	980	27	11	38

Source: Ministry of University Affairs

APPENDIX D

CHARACTERISTIC OF RESPONDENTS

Appendix D

Characteristic of Respondents

Table I Percentage distribution of respondents classified by faculty of current study and level of current study

Level of current study	faculty of current study			Total
	Science	Engineer	Information Technology	
Bachelor	85.7	10.5	3.8	100.0
Master	29.8	70.2	-	100.0
Total	73.9	23.1	3.0	100.0

Table II Percentage distribution of respondents classified by year of current study and level of current study

Year	Level of current study		Total
	Bachelor	Master	
First year	1.8	10.7	12.5
Second year	8.4	10.0	18.2
Third year	19.9	-	19.9
Fourth year	40.4	-	40.4
Fifth year	5.9	-	5.9
Sixth year	0.8	-	0.8
Seventh year	1.3	-	1.3
Eighth year	0.8	-	1.0
Total	79.3	20.7	100.0

Table III Percentage distribution of respondents who ever studied in undergraduate classified by faculty of previous study

Faculty	Percent
Science	10.1
Economy	0.3
Engineer	9.7
MBA	1.3
Education	0.1
Accounting	1.4
Industrial Education	0.1
Agricultural technology and engineer	0.1
Architecture	0.3
Other	76.6
Total	100.0

Table IV Percentage distribution of respondents classified by age

Age (year)	Percent
15-19	4.2
20-24	68.2
25-29	20.4
30-34	3.4
35-49	2.5
Unidentified	1.2
Total	100.0

Table V Percentage distribution of respondents classified by computer experience

Computer Experience (years)	Percent
0-5	51.6
5-10	40.8
10+	7.6
Total	100.0

Table VI percentage distribution of respondents classified by age and computer experience

Age (year)	computer experience						Total
	0-1	2-3	4-5	6-7	8-9	10+	
15-19	-	1.3	1.0	0.8	0.8	0.8	4.5
20-24	1.8	16.8	23.3	14.5	5.3	6.5	68.0
25-29	1.3	2.0	3.5	7.8	2.3	3.8	20.5
30+	-	0.8	0.3	1.3	1.0	3.8	7.0
Total	3.0	20.8	28.0	24.3	9.3	14.8	100.0

APPENDIX E

DESCRIPTION OF OPEN SOURCE SOFTWARE CHARACTERISTICS

Open Source Software Characteristics

The following list describes 10 OSS characteristics and the possible values the researchers can assign. By assigning a value to each of these characteristics for a particular OSS, they can specify that software's capability to meet its requirements. They did this with a representative collection of OSS that is either widely used or widely noted in technical periodicals, including the community source versions of Sun's Solaris and Apple's Mac OS X. Table 2.2 presents the resulting chart.

1. Technical support: the amount of available support for the OSS.
   - "-" Support limited to direct, ad hoc individual developer support.
   - "+" Support based on community-oriented group support.
   - "++" Support tied to one or more commercial entities providing comprehensive support for the OSS (for ex-ample, Red Hat provides complete support for Linux, and Cygnus supports all GNU packages (interestingly, Red Hat acquired Cygnus in November 1999).
   - "_" No longer being developed or supported.
2. Backward compatibility: the effort required by an existing system to maintain compatibility with the OSS.
   - "-" OSS is either in its first stable re-lease or its functionality has been modified such that systems using a previous version would require significant effort to upgrade to the current one.
   - "+" A moderate effort is required to upgrade to the current version.
   - "++" Virtually no effort is required to upgrade to the current version.
3. Standard compatibility: The open standard that the OSS adheres to and that multiple vendors have agreed to.
   - OSF (Open Software Foundation).
   - DNS (Domain Name System).
   - ANSI (American National Standards Association).
   - LDAP (Lightweight Directory Access Protocol).
   - SSL (Secure Sockets Layer).
   - SMTP (Simple Mail Transfer Protocol).
   - X11 (X-Windows Protocol).
   - HTTP (Hypertext Transfer Protocol).
   - HTML (Hypertext Markup Language).
   - SQL (Structured Query Language).
   - MIME (Multipurpose Internet Mail Extensions).
   - N/A: does not follow any open standard.
4. Binary availability: official or unofficial binary distributions are available. Even when an official distribution is widely available, there might be extensive unofficial binary packages that do not receive the same level of support and release up-grades as the official source-level and binary packages.
   - "Yes" Binary is available.
   - "No" Binary is not available.
5. Integration with commercial software: the extent to which the OSS has integrated with commercial software.
   - "-" Virtually no widely used commercial software can be integrated with the OSS.

- "+" A moderate number of commercial software can be integrated with the OSS, but no commercial installation
- "++" Many commercial software integration possibilities are available and have been deployed in commercial environments.

6. Commercial adoption: the extent to which the OSS has been commercially adopted.
   - "-" Virtually no commercial entity has adopted the OSS.
   - "+" A few commercial entities have selected and installed the OSS.
   - "++" The OSS has a large installed user base.
7. Operating System dependency: the specific operating systems on which the Open Source Software depends; if available for virtually all major ones, it is designated an open platform. Although there is not Open Source operating system is compatible with any application de-signed for commercial operating systems, almost all the OSS environments, libraries, and applications have been ported to commercial operating systems, except for the packages still under development (KDE, Gnome, Gimp) and Unix-specific applications (Bind, Pine).
   - Unix. • Linux. • BSD.
   - Open platform: available for virtually all major operating systems, including the various flavors of Unix (Linux, BSD, Solaris, and others), Windows, and Mac OS.
8. Software license: the Open Source Software's licensing format. The differences between the following types of licenses are the type of modifications and integrations an implementation party is permitted to perform on the OSS (see Table 2.3).
   - GPL (General Public License): applies to all OSS applications developed by the Gnu organization.
   - LGPL (Library GPL): covers the various libraries developed by the Gnu organization.
   - BSD: includes all derivatives of the BSD license, such as the X-Windows license "X."
   - CPL: includes various community source projects.
9. Current development status.
   - Development release: The OSS is still being actively developed and features added.
   - Stable: A stable, widely installed version of the OSS exists, with ongoing development efforts underway.
   - Discontinued: OSS development efforts have effectively stopped.
10. Commercial substitutes: whether commercial substitutes exist for the OSS.
    - "Yes" Have commercial substitutes.
    - "No" Have no commercial substitutes.
    - N/A: commercial vendors offer community source versions of the soft-ware; there is a corresponding commercial software flavor, such as the commercial Netscape Browsers and the community-source version of Mozilla.

If made a mere five years ago, Table 2.2 would have contained virtually no commercial adoption or commercial grade technical support for almost any of the OSS reviewed. Over the last five years, OSS has made giant strides in improving overall stability, sup-port, and compatibility (for more information, see the related sidebar). Nevertheless, only a minority of the representative OSS set now have commercial grade support and commercial adoption. Continued improvement in these areas will no doubt make other OSS candidates competitive for adoption in commercial IT projects.

APPENDIX F

OPEN SOURCE SOFTWARE WEB SITES

Appendix F

Open Source Software Web Sites

Open Source Software Foundation

1. **Thai Open Source:** *http://opensource.thai.net*; Open source software information translate to Thai language
2. **Thai Open Source Project:** *http://opensource.thai.net/nectec/* ; All of open source project by NECTEC
3. **FSF:** *http://www.fsf.org*; The Free Software Foundation (FSF), founded in 1985, is dedicated to promoting computer users' right to use, study, copy, modify, and redistribute computer programs. The FSF promotes the development and use of free (as in freedom) software particularly the GNU operating system (used widely today in its GNU/Linux variant) and free (as in freedom) documentation. The FSF also helps to spread awareness of the ethical and political issues of freedom in the use of software.
4. **GNU:** *http://www.gnu.org*; The GNU Project was launched in 1984 to develop a complete Unix-like operating system which is free software: the GNU system. (GNU is a recursive acronym for "GNU's Not Unix"; it is pronounced "guh-NEW".)
5. **Open source:** *http://www.opensource.org*; Open Source Initiative (OSI) is a non-profit corporation dedicated to managing and promoting the Open Source Definition for the good of the community, specifically through the OSI Certified Open Source Software certification mark and program.

Operating System

1. **Thai Linux:** *ftp://ftp.nectec.or.th/pub/thailinux/docs/*; Documents of NECTEC's project are provided for Thai people
2. **Linux TLE:** *http://linux.thai.net/linux-tle/*; Linux TLE for Thai people
3. **Red Hat:** *http://www.redhat.com*; Red Hat is the largest and most recognized provider of open source technology. We are headquartered in Raleigh, North Carolina on the Centennial Campus of NC State University and have 22 locations worldwide.
4. **Ziif:** *http://www.ziif.com;* ZioN Interface was established in 1999 to operate IT solution development business. The company concentrates on preparing research for new technological development, providing consultant service and disseminating new technology. The main projects of the company are to develop high-speed computer (by using clustering technology), Thai Linux Operating System " ZiiF LiNUX ", application software (with localization) and business software and to establish a training center for IT solution. ZioN Interface aims to be "the Leader of IT Solution" in the near future.

Application Resource

1. **Office TLE:** *http://opensource.thai.net/office-tle/*; Office suit program on Linux and Windows
2. **Free Soft:** *http://www.free-soft.org* ; This web site, refers to software distributed in source form which can be freely modified and redistributed, or freely modifiable and redistributable software
3. **Fresh Meat:** *http://www.freshmeat.net/*; Information in many topics
4. **Gimp:** *http://www.gimp.org*; The GIMP is the GNU Image Manipulation Program. It is a freely distributed piece of software suitable for such tasks as photo retouching, image composition and image authoring. This site contains information about downloading, installing, using, and enhancing GIMP. This site also serves as a distribution point for the latest releases, patches, plugins, and scripts. We also try to provide as much information about the GIMP community and related projects as possible.
5. **KDE:** *http://www.kde.org*; KDE is a powerful Open Source graphical desktop environment for Unix workstations. It combines ease of use, contemporary functionality, and outstanding graphical design with the technological superiority of the Unix operating system.
6. **Leapster:** *http://leapster.org/linoleum*; Linux programming resource
7. **Linux Berg:** *http://www.linuxberg.com*; News, Features, Download
8. **Pladao:** *http://www.pladao.com*; An office suit program which is supported by Sun Micro System (Thailand) Co., Ltd. Source code from OpenOffice.org.
9. **Sourceforger:** *http://www.sourceforge.net*; SourceForge.net is the world's largest Open Source development web site, with the largest repository of Open Source code and applications available on the Internet. SourceForge.net provides free services to Open Source developers, including project hosting, version control, bug and issue tracking, project management, backups and archives, and communication and collaboration resources.
10. **Xfree89:** *http://www.xfree86.org*; The XFree86 Project, Inc is the organization which produces XFree86 , a freely redistributable open-source implementation of the X Window System which runs on UNIX(R) and UNIX-like operating systems such as Linux, all of the BSD variants, Sun Solaris x86, Mac OS X (via Darwin), as well as other platforms like OS/2 and Cygwin.
11. **OpenOffice.org:** *http://www.openoffice.org*; To create, as a community, the leading international office suite that will run on all major platforms and provide access to all functionality and data through open-component based APIs and an XML-based file format.

Open Source Community and Knowledge Resource

1. **Linux Board:** *http://www.linuxboard.com*; Linux community for Thai people aim to exchange opinion and experience among Thai Linux users.
2. **Linux Center:** *http://www.linux-center.org*; Support in application, development, networking, system, information, commercialization and support, politics, Linux in business, distribution, etc.

3. **Linux Counter:** *http://www.linuxcounter.org*; The Linux Counter Organization is a non-profit organization established to encourage, promote and support the counting of Linux users. The Organization is a nonprofit membership organization, registered under Norwegian law.
4. **Linux Devices:** *http://www.linuxdevices.com*; News, Article, Events, Links supported by OpenSystems Publishing
5. **Linux Doc:** *http://www.linuxdoc.org*; Linux document and project
6. **Linux Games:** *http://www.linuxgames.com*; Games on Linux
7. **Linux Journal:** *http://www.linuxjournal.com*; Linux Journal
8. **Linux.org:** *http://www.linux.org*; Linux, Application, Document, General Information, Download, Book store, Course, and News
9. **LinuxSiam:** *http://www.linuxsiam.com*; News, Tutorial, and Web board with many distributions of Linux and open source software.
10. **Thai Linux Working Group:** *http://www.linux.thai.net*; News, Opinion, Open source software for Thai people by Thai Linux Working Group (TLUG)
11. **Linux Weekly News:** *http://www.lwn.net*; Linux weekly news
12. **Slashdot:** *http://www.slasdot.org*; provide 'News for Nerds. Stuff that Matters'.
13. **Thai Linux:** *http://www.thailinux.com*; Thai Linux journal and web board.
14. **Thai Linux Café:** *http://www.thailinuxcafe.com*; iCAFÉ, distribution for Internet café include other applications and also open source news.

BIOGRAPHY

NAME	Miss Jongjit Rittirong
DATE OF BIRTH	7 March 1978
PLACE OF BIRTH	Ratchaburi, Thailand
INSTITUTIONS ATTENDED	Faculty of Science, Silpakorn University 1995 – 1998: Bachelor of Science (Computer Science) Faculty of Engineering, Mahidol University 1999 – 2002: Master of Science (Technology of Information System Management)
SCHOLARSHIP	Thesis supported in part by the Ministry of University Affair and Faculty of Graduate Studies, Mahidol University in the academic year of 2001-2002