DIFFUSION OF FREE AND OPEN SOURCE SOFTWARE AS INNOVATION: A CASE STUDY OF METU

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

ALTAY Ş. ÖZAYGEN

IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF SCIENCE AND TECHNOLOGY POLICY STUDIES

DECEMBER 2004

Approval of the Graduate School of Social Sciences.

Prof. Dr. Sencer Ayata
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

Assist. Prof. Dr. Erkan Erdil
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

Assoc. Prof. Dr. Mustafa Akgül
Co-Supervisor

Prof. Dr. Haluk Geray
Supervisor

Examining Committee Members

Assist. Prof. Dr. Erkan Erdil (METU) _____

Prof. Dr. Haluk Geray (METU) _____

Assoc. Prof. Dr. Mustafa Akgül (Bilkent Univ.) _____

Dr. Funda Başaran (Ankara Univ.) _____

Dr. Onur Tolga Şehitoğlu (METU) _____

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last Name : ALTAY Ş. ÖZAYGEN

Signature :

ABSTRACT

DIFFUSION OF FREE AND OPEN SOURCE SOFTWARE AS INNOVATION:

A CASE STUDY OF METU

ALTAY Ş. ÖZAYGEN

M.S., Department of Science and Technology Policy Studies

Supervisor: Prof. Dr. Haluk Geray

Co-Supervisor: Assoc. Prof. Dr. Mustafa Akgül

December 2004, 154 pages

In this thesis, the diffusion of free and open source software (FOSS) on desktop PCs at Middle East Technical University in Ankara (METU) is investigated within the framework of the diffusion of innovation theory. This thesis aims to propose some policies for the migration to FOSS on desktop PCs at METU. The research is conducted through two similar web-based surveys. The first survey was held during 27-28 September 2003 after the examination of exemption for the IS100 course. The second survey was held between 23 March and 24 May 2004 in the whole of the METU campus. This survey was open to all students and academic and non-academic staff with a METU network account. There were 402 participants in the first survey and 1224 in the second. As expected, Microsoft OS rules the desktop PCs within the METU campus. According to the surveys, there is a rather large PC user base which could potentially migrate to GNU/Linux system. In addition to a large amount of data, it has been found out that a migration to FOSS is welcomed greatly by the users

if the process is explained on the basis of public economic gains. However personal migration is still difficult if the user is left alone to install any new OS. Activities which will eventually increase the awareness for FOSS at METU, change in the curriculum of the IS100 course, collaboration among METU FOSS users and creation of a software catalog with possible FOSS equivalent for METU courses are some of the propositions which will eventually help the migration process. Furthermore, different innovation-decision models are discussed based on the research findings.

Keywords: Free Software, Open Source Software, diffusion of innovation, web-based survey

ÖZ

YENİLİK OLARAK ÖZGÜR VE AÇIK KAYNAK YAZILIMLARIN YAYILIMI: ODTÜ ÖRNEĞİ

ALTAY Ş. ÖZAYGEN

Yüksek Lisans, Bilim ve Teknoloji Politikaları Çalışmaları Bölümü

Tez Yöneticisi: Prof. Dr. Haluk Geray

Ortak Tez Yöneticisi: Doç. Dr. Mustafa Akgül

Aralık 2004, 154 sayfa

Bu tezde Orta Doğu Teknik Üniversitesi, Ankara'da özgür ve açık kaynak kodlu yazılımların masaüstü bilgisayarlarda yayılımı yeniliklerin yayılımı kuramı çerçevesinde incelenmiştir. Bu tez ODTÜ'de özgür ve açık kaynak kodlu yazılımlara geçiş için gerekli olan kimi politikaları önermeyi amaçlamaktadır. Araştırma iki web tabanlı anket üstünden yürütülmüştür. İlk araştırma 27-28 ekim 2003 tarihinde IS100 muafiyet sınavının ardından yapılmıştır. İkinci anket 23 Mart - 24 Mayıs 2004 arasında ODTÜ sunucularında hesabı olan herkesi, öğrenci, akademik, idari personeli kapsayacak bir şekilde yapılmıştır. Birinci ankete 402 kişi, ikincisine ise 1224 kişi katılmıştır. Tahmin edileceği üzere ODTÜ kampüsünde Microsoft İşletim Sistemlerinin masaüstü bilgisayarlarda hakimiyeti sürmektedir. Araştırmalar sonucunda çok geniş bir kesimin GNU/Linux sistemine geçişi gerçekleştirebileceği ortaya çıkmıştır. Eldeki birçok verilerin dışında geçerli ekonomik nedenlere dayandırılan bir geçişin kabulunun zor olmayacağı ortaya çıkmıştır. Ancak kullanıcının tek başına bırakıldığı bir durumda kişisel

geçişin hala zor olduğu da ortaya çıkmıştır. Özgür ve açık kaynak kodlu yazılımlara karşı duyarlılığı artırmaya yönelik etkinlikler, IS100 dersinin içeriğinin değiştirilmesi, ODTÜ Özgür ve açık kaynak kodlu yazılım kullanıcılarının işbirliği geçiş için verilen kimi önerilerdir. Bunların dışında kimi yenilik karar verme modelleri de tartışılmıştır.

Anahtar Kelimeler: Özgür Yazılım, Açık Kaynak Kodu, yeniliğin yayılımı, web tabanlı anket

ACKNOWLEDGMENTS

I am sincerely grateful to my supervisor Prof. Dr. Haluk Geray for his important guidance, support, encouragement and valuable discussions during the development of this thesis.

I would also thank my co-supervisor Assoc. Prof. Dr. Mustafa Akgül for his remarks and discussion on free software.

Many of my friends helped me during this thesis I am grateful to all of them. I would thank to Yasemin Salihoğlu and Selçuk Han Aydın for their helps for the first survey. I am obliged to Ayberk Koç, İbrahim Çalışır, Cengiz Acartürk, Bahar Tabakoğlu, Deniz Unat, Ozan Tuğluk and Özgür Tek for their helpful suggestions and discussions. Another individual who proved very generous and helpful during the proofreading of this thesis was Dr. Deniz Ertan, whom I extend my deepest appreciation.

I owe many thanks to my brother Alkım who introduced me to the free software universe back in 1994. Without my parents moral support I would not have been able to take up this research, I am especially grateful to them.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

OS : Operating System
FOSS : Free and Open Source Software
GNU : GNU's Not Unix
METU : Middle East Technical University
MIT : Massachusetts Institute of Technology
FTP : File Transfer Protocol
GPL : General Public License
LGPL : Lesser General Public License
BSD : Berkeley Software Development
FSF : Free Software Foundation
ARPA : Advanced Research Projects Agency
OSI : Open Source Initiative
GUI : Graphical User Interface
FUD : Fear Uncertainty Doubt
LSB : Linux Standard Base
OGC : Office of Government Commerce (U.K.)

CHAPTER 1

INTRODUCTION

Free Software Foundation which was founded by Richard M. Stallman releases softwares since 1985. Free software users have basically four types of freedom; freedom to use the software for any purpose, freedom to have access to the source code and to change it for any purpose, freedom to redistribute copies for a fee or freely and freedom to redistribute any modified version of the software. These rules have been set within the General Public License (GPL) (Stallman, 1996b). Since 1985 many software pieces have been released, but in 1991, GNU/Linux operation system started to be developed by a Finnish student and aided by thousands of hackers[1] through the Internet. The GNU/Linux software is important because it was the last missing software piece in order to run a computer only with Free Software products. During its launch, GNU/Linux OS was developed solely for i386 CPUs, but as it became more widely accepted, it has been modified in order to be run within high end mainframes, personal digital assistant, mobile phones or even home electronic devices. It is very widely used since the mid 90s within the server market niche and is accepted by many as a robust, secure and stable operating system resistant to unpredictable crashes,

[1] The use of "hacker" to mean "security breaker" is a confusion on the part of the mass media. Hackers refuse to recognize that meaning, and continue using the word to mean, "A person who enjoys exploring the details of programmable systems and how to stretch their capabilities, as opposed to most users, who prefer to learn only the minimum necessary" (Jazdzewski and Jazdzewski, 1995).

viruses etc.

Proponents of free and open source software claim that the use of FOSS has many advantages (Stallman, 1994; Open Source Initiative, 2003a, 2004b,a, 2003b) . Its increased secure design gives resistance to viruses which causes many hours of work losses, network instabilities, and so on. Having the source code, applications are transparent; if a security flaw is found it can be solved over the Internet in a very short period of time. Thus, free software, which can store rather sensitive and secret data, is able to provide a greater security. Having the source code open, even if users do not know how to programme, many hackers read and correct many flaws found within the software. Users become certain that there are no back-doors, spy features or eastern eggs.[2]

Apart from increased security, having the source code enables users to understand how computers work, contributes software developers with capabilities of SMEs and software industry, thus job creation in the long run. Moreover, beyond all these advantages, through an acceptable Internet connection speed, the downloading of this software is free of charge, decreasing cost. All these issues reveal rather significant advantages for the developing countries, such as the ability to catch up with or at least reduce the digital divide. Having all of these advantages, GNU/Linux still has some difficulties regarding the diffusion within the desktop market niche. However, the diffusion is slowing down due the lock users of Microsoft Windows OS and Microsoft's monopolistic behaviors, which are sometimes subject to court investigations, even in the U.S. The desktop market is still dominated by Microsoft Windows OS.

[2] Secret message or screen buried in an application. Typically, easter eggs are used to display the credits for the development team or to display a humorous message. To see an easter egg, you need to know a special procedure or sequence of keystrokes (Webopedia, 2004).

GNU/Linux operating system as well as other free, open source softwares are a highly significant innovation not just for its technical merits but also for the way it is developed. This development process and pace cannot be reached without the Internet. GNU/Linux and other FOSS are among the products of the Internet. It would have been impossible to develop such softwares without the distributed, open forms of the Internet.

GNU/Linux is an important alternative to the dominant Microsoft Windows OS on the desktop market niche. The Ankara campus of Middle East Technical University is the first university to be connected to the Internet in Turkey since 1993. According to Temizlisoy's (2003) research carried for ULAKBİM[3] there are more than 5000 desktop computers in the METU, Ankara campus. METU, apart from still being a model university to other Turkish universities in many aspects, it has a considerably great knowledge accumulation on a large scale, with its campus wide networking, the system administration, in-house-software development, etc. In addition to these capabilities the "*.tr*" domain name service is provided by METU. If METU is also to consider a migration from Microsoft OSs, in order to achieve this important step it needs to have an acceptable policy designed for this institution.

By using the theory of innovation this thesis aims to investigate the ratio of diffusion of the GNU/Linux operating system within Middle East Technical University and the possible reasons for its acceptance and rejection amongst the GNU/Linux users. For these purposes, two similar web-based surveys have been carried out, the ultimate target of which is to help these "decision makers" toward the design of their

[3] Turkish Academic Network and Information Center, ULAKBİM aims at providing technological facilities such as computer networks, information technology support, and information and document delivery services, to meet the information requirements of Turkish universities and research institutions, and to increase the efficiency and productivity of their end users. http://www.ulakbim.gov.tr/

own policy, involving a possible migration from Microsoft OSs which dominates the campus to FOSS OS. Furthermore the obtained data from these surveys is likely to improve the quality of the service provided by METU's Computer Center. These surveys also aim to present some modest data on the human-computer interaction for future research and surveys that may be carried out by the METU Computer Center.

Chapter 2 gives a brief summary of the theories of information society. The theory of innovation, which is introduced in Section 2.2, presents certain tools that can be used to predict the present situation.

In Chapter 3 history and economics of free software, several business models of GNU/Linux, some quantitative analysis of a GNU/Linux distribution, and the design of the graphical-user interface are explained.

Chapter 4 briefly discusses the design criteria of web-based surveys and lists the findings of the two web-based surveys carried out within METU campus.

Chapter 5 evaluates the results of these surveys, suggesting a short policy guidelines for the University to adopt GNU/Linux operating system.

CHAPTER 2

THEORETICAL BACKGROUND

2.1 Theories of Information Society

Scholars as well as commentators often underlie "information" as a distinguishing aspect of the modern world. In this new age, society and its economic relations are no longer organized on the basis of material goods but on the accelerated flows of information and the increased usage of knowledge. Many terms are used to define this new society as "post-industrial society" (Bell, 1973), based on "knowledge economy" (Machlup, 1962), or as the "third wave" (Toffler, 1989) after agriculture being the first and the industrial revolution being the second wave. The economy of this new society is not based on the trade of manufactured products but on knowledge which is why it is also called "weightless economy". Countries like United States, Britain, Japan, Germany and other nations with similar means and life-styles, are defined as information societies, examples of a "new network society" (Castells, 2000). The concept of information society is a controversial issue; for some

> the beginning of a truly professionalized and caring society while to others it represents a tightening of control over the citizenry; to some it heralds the emergence of a highly educated public which has ready access to knowledge while to others it means a deluge of trivia, sensationalism and misleading propaganda (Webster, 2002, 2).

There are many researchers who propose certain schematic distinctions among different approaches toward the information society. Geray (2003) divides information society theories into two phases; firstly the theoretical discussion phase starting in the 1950s, and secondly, the discussion period concerning new regulation policies needed by this new era, which started during the 1990s with the spread of the use of the Internet among civilians. Further, Webster (2002) divides theoreticians of the information society into two wings; "those who proclaim a new sort of society that has emerged from the old one and on the other side writers who emphasize on the continuities". May (2003, 7) separates the information age into three waves: "an American phase (1960s to 1970s), a modernization phase (late 1970s to early 1980s) and a global (or Internet) phase (from mid-1990s to now)", adding that he does not "suppose that contemporary developments are completely novel analysis". May (2003) gives credit to such thinkers as Benjamin, Ellul, Innis, Mumford who analyze the role of information and technology in society.

In that new era proclaimed as the "information society", a great dilemma emerged regarding the information age, which is the control of the flow of information. While information flows freely, it does not lose any of its value; but if the flow of information is controlled, the controlling mechanism can profit from its value (May, 2003, 128).

Another frequently discussed issue concerning the information age is the digital divide. There are three different views on this subject. The first view is that there is no digital divide and that there is an increasing availability of inexpensive computers and Internet connections. Digital divide does not appear to be a major obstacle or problem for the underdeveloped countries considering other more relevant problems such as hunger, AIDS, wars, environmental issues and other similar inequalities,

causing greater problems than those by the digital divide. The second view suggests that the digital divide exists but the situation is continually improving, and that the adoption of new technologies is not the same for different groups. Some adopt them faster than others, even if they have the means and the opportunity. The third view is the pessimistic one suggesting that the digital divide exists and that the situation is worsening. Data can be found in literature to support all of these views.

The digital divide has been discussed within UNESCO since the end of the 1970s. Some mechanism has been developed to aid and support developing countries to narrow the gap in the telecommunication area. But these discussions did not result in projects, and caused the withdrawal of U.S. and Great Britain from UNESCO. In the mean time, similar discussions have been held within the International Telecommunication Union also with no results. But at the 2000 Okinawa G-8 Summit, the same issue was raised and discussed, leading to the proposition of some remedies (Geray, 2003, 133-135). According to Geray (2003), this new approach is the result of the transformation of international capitalism since 1970s. The digital divide is also a problem within the developed countries where social and economic activities use more and more interactive digital networks. While some parties of these developed societies have already reached the interactive digital network, others have not. Such an environment causes a division within the society. Given the demographic status of the developed countries, the problem of low Internet usage is due the high population of elderly people. This problem could be solved by the connection of the periphery countries to the interactive digital networks creating a lucrative market for IT products. But the initiative of the G-8 countries should be examined carefully in order to understand whether it aims a "desktop colonization" (Geray, 2003, 138) or not.

On the other hand, Luyt (2004) proposes that there are four groups which have an interest in the promotion of the digital divide issues.

> Information capital achieves a new market for its products as well as an educated workforce capable of producing those products in the first place. The state in the South benefits through the legitimation conferred through programs designed to combat the divide. Not only do these offer new accumulation opportunities for its elite, they also hold the possibility of defusing discontent over poor economic prospects for the middle class, a volatile section of the population. The development industry, suffering from a neo-liberal attack that views development as irrelevant in the modern world, also benefits from the digital divide. [...] And finally, the organs of civil society are also winners, as they attempt to capture information and communication technologies for their own increasingly successful projects (Luyt, 2004).

By analyzing some of the free and open source software usage in such sectors as firms and research in the U.S. or in rural India, it becomes clear that FOSS usage gives the opportunity to easily implement for the conceived aims, the reduction of software expenditure, increased security as well as fostering of local software industries. It might also be a cure for the "desktop colonization", a term which has been developed independently by Geray (2003, 138) and Stallman (2003), is crucial issue for the underdeveloped countries trying to catch up with the developed ones through the help of their young, educated population within the software industry.

2.2 The Diffusion of Innovation

Many innovations such as the models of "information society" require a lengthy period of time to be adopted. The main problem is, "how to speed up the rate of diffusion of an innovation". This section is mainly based on Rogers's book "Diffusion of Innovation" (Rogers, 1995, 1-130, 405-442).

2.2.1 The Definition of Diffusion

According to Rogers (1995), diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Diffusion is a special type of communication in which the messages are about a new idea. Due to this "newness", diffusion has some degree of uncertainty. When new ideas are invented, diffused, and are adopted or rejected, they lead to certain consequences, such as social change. Many technologists believe that if an innovation has certain advantages and that an innovation would sell itself; but often this is not the case. In fact, most innovations diffuse in a rather slow rate or they never reach a user base. One example is the control of the scurvy in the British Navy, which took nearly 150 years after its reasons and cure have been understood. Another well-known example is the non-diffusion of the Dvorak keyboard in the U.S., which is more efficient than the "QWERTY" keyboard. This example could be extended to Turkey as the very low acceptance and usage of the "F" Turkish keyboard on PCs despite the fact that this type of keyboard has been the standard for all typewriters for many decades.

2.2.2 The Four Elements in the Diffusion of Innovation

The four elements in the diffusion of innovation are innovation, communication channels, time, and the social system. The adoption rate of an innovation is shown in Figure 2.1.

The Innovation: An innovation is an idea, practice or object that is perceived as new by an individual or group of individuals. If the idea seems new to the individual, it is an innovation. Newness of an innovation may be expressed in terms of knowledge, persuasion or a decision to adopt (Rogers, 1995).

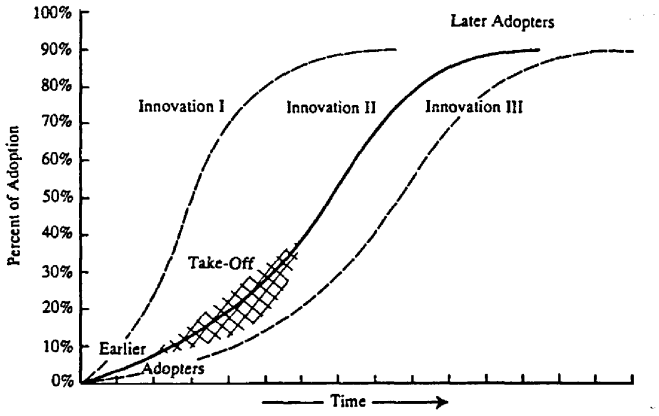

Figure 2.1: Diffusion of Innovation Models (Rogers, 1995)

A technology usually has two components:

1. Tools embedded within technology: hardware.

2. The information-base: software.

The social embedding of the software of a technology is less visible than its machinery or equipment, and so the technology is often thought mainly in hardware terms.

Characteristics of Innovation:

1. Relative advantages -economic terms, social prestige, convenience and satisfaction- are the degree to which an innovation is perceived as better than the precedent ideas.

2. Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters.

3. Complexity is the degree to which an innovation is perceived as difficult to understand and use.

4. Trialability is the degree to which an innovation may be experimented with on a limited basis.

5. Observability is the degree to which the result of an innovation are visible to others.

Communication Channels: A communication channel is the means by which messages get from one individual to another. Mass media efficiently informs an audience of potential adopters about the existence of an innovation, that is, it creates awareness-knowledge. But interpersonal channels are more effective in persuading an individual to accept a new idea, especially if these people are homophilious, i.e. similar in certain attributes, such as beliefs, education, social status etc. But the problem arises when the diffusion occurs within a heterophilious group which is often the case.

Time: The elements of time is also involved in diffusion.

- During the innovation-decision process by which an individual passes from initial knowledge of an innovation through its adoption or rejection.
- The innovativeness of an individual or other units of adoption, i.e. relative earliness/lateness of the adoption.
- Rate of adoption in a system, usually measured by the number of adopters in a given period of time.

The five main steps of the innovation-decision process are

1. knowledge,
2. persuasion,

3. decision,

4. implementation,

5. confirmation.

Knowledge occurs when an individual (or decision-making unit) gets some information about an innovation. Persuasion is the formation of a positive or a negative opinion for the innovation in question. Decision is made for the adoption or the rejection of the innovation. When the adoption is chosen, implementation begins. During the process of implementation the innovation starts to be used, after which, depending on the experience gained, confirmation occurs when the innovation-decision reaches its target.

A Social System: A social system is defined as a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organizations, and/or subsystems. The four distinct units making up the social system are listed below:

Norms: Established behavior patterns for the members of a social system.

Opinion leaders: Those who are at the center of interpersonal communication networks.

Change agents: Individuals who influence clients' innovation-decisions in a certain direction.

Aides: People who intensively contact clients in order to influence their innovation-decisions, an aide is less than a fully professional change agent.

Types of Innovation-Decision

There are four types of innovation-decision processes, the last one of which is a combination of the first three innovation-decision types. These are listed below:

1. Optional innovation-decision: Choices made individually to adopt or to reject an innovation independent from other individuals in the system. But even in this case these decisions might be influenced by the norms and the interpersonal networks of the system.

2. Collective innovation-decision: Choices made with the consensus of all members of the system. Once a decision is reached, all members take the same action.

3. Authority innovation-decision: After certain choices are made by a decision maker, all the units of the system obey this decision.

4. Sequential combination of two or more of the above: Often an innovation-decision is taken with a combination of some of the above mentioned innovation-decision types.

Consequences of innovation are concerned with the adoption or the rejection of the innovation by the system or the individual. There are at least three kinds of consequences:

1. *Desirable vs. undesirable* consequences, depending on whether the effects of an innovation are functional or not.

2. *Direct vs. indirect* consequences, whether the changes occur in immediate response to an innovation or as a second-order result of the direct consequences of an innovation.

3. *Anticipated vs. unanticipated* consequences, depending on whether the changes are as expected or not.

Change agents usually expect that the innovation they introduce to the system will have desirable, direct and anticipated consequences. But even in a successful process of change there will always be some kind of undesirable, indirect and unanticipated consequences.

2.2.3 Critical Mass and Interactive Innovations

Critical mass is the point at which enough individuals adopt an innovation so that the further rate of adoption becomes self-sustaining. Critical mass is highly significant in the adoption of an interactive innovation such as electronic messaging systems, fax, and teleconferencing. The adoption of interactive innovations depends on the perceived number of individuals who have already adopted the innovation. An interactive innovation becomes useless if other individuals with whom the adopter wishes to communicate do not adopt that interactive innovation. With each new adopter, the utility of the interactive innovation increases. As seen from the Figure 2.2, the shape of the "S" curve for the rate of adoption of an interactive innovation differs from that of the usual innovation. In other words, the rate of adoption of an interactive communication does not take of like the familiar "S" shape until a critical mass of adopters is reached.

Mahler and Rogers (1999) have explored the role of the critical mass in the diffusion of interactive innovations with the data gathered from 392 German banks. The most frequently mentioned reasons for the non-adoption of the 12 innovations were a perceived low-rate diffusion (41% of all banks), followed by "bad information" on

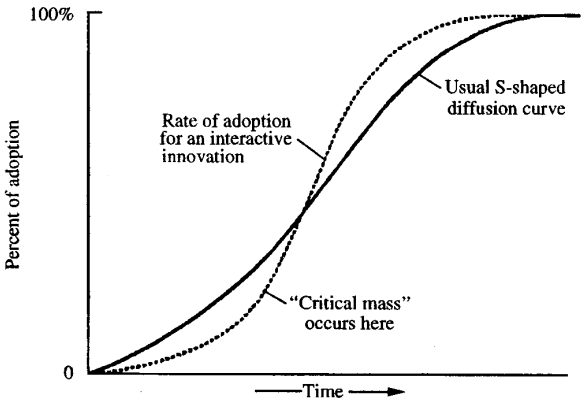

Figure 2.2: The Rate of Adoption (1) for a Usual Innovation, and (2) for an Interactive Innovation, Showing the Critical Mass (Mahler and Rogers, 1999)

the innovation (15%) and a "bad price/value ratio" (15%). Mahler and Rogers (1999) have also evaluated the innovativeness of these banks, and found out that banks which mentioned ten different reasons for non-adoption did not vary much as regards the banks' innovativeness. The process of diffusion of the telecommunications innovation among 392 German banks was one of watching other banks' adoption levels; while being watched, each bank might perceive a somewhat different critical mass point for the telecommunication innovation. This research concludes with the suggestion that while the critical mass is important, perception is crucial towards the adoption of innovations.

2.2.4 Models of Technology Diffusion

In this section, certain models that give rise to the "S" curve diffusion pattern will be discussed. Geroski (2000) writes that "the most popular explanation is the epidemic model of information diffusion while the leading alternative is the probit model which argues that differences in adoption time reflect differences in the goals, needs and abilities of firms". Furthermore, other diffusion models are based on organiza-

tional ecology; the first one on legitimation and competition and the second one on information cascades.

Epidemic Model: The main discussion concerning technology diffusion is that if an innovation adds a considerably important improvement over its predecessor, then why certain firms change at a slower rate than others. The most obvious explanation is to do with the timing of knowledge acquisition as regards the new technology; one firm may find out about the possible advantages earlier than another one. This model further supposes that information spreads from a central source. Time spent on the adoption of technology is often longer on the order of magnitude than it is for the spread of information. The reason behind this is that the composition of a new technology consists a hardware and a software aspect. The largest part of software is the tacit knowledge which is transmits from person to person. In this diffusion of word-of-mouth information, the main source is the previous users. Word-of-mouth diffusion starts after the building up of an initial base of user. Even if the advantages of the new technology are known without appropriate software knowledge, it would not be adopted. Diffusion tends to be faster for simpler technologies which are easily learned and transmitted within dense populations.

The critical point concerning this model is that "once one begins to think seriously about diffusion as a process of persuasion rather than simply as a process of spreading news, the analogy with epidemics begins to break down" (Geroski, 2000).

Probit Models: Epidemic model does not take into account the differences of goals, the capabilities or actions of individual members of the population; the epidemic model conceives the diffusion of information in simple, tractable and non-strategic settings.

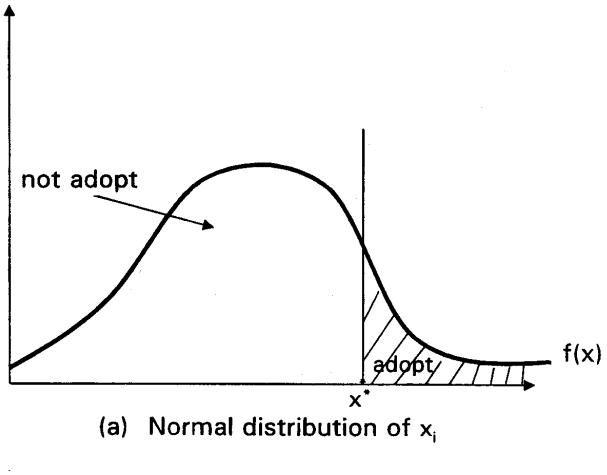

Figure 2.3: Normal Distribution of f(x) with Thresholds Separating Adopters from Non-Adopters (Geroski, 2000)

Change agents make different choices for the best of reasons for their clients. Differences between individuals may have a potentially important role to play in explaining patterns of diffusion. The analysis of decisions for individual adoption decisions is more compatible with the probit-model rather than the epidemic model.

If x^* shifts to the left at a constant rate over time in figure 2.3, the rate of adopters would gradually rise then fall, generating the "S" shaped curve. The problem with this model is to define the interesting and relevant characteristics of x^{i} which is most of the time the firm size. For one reason or another, large firms are quicker at imitating than small firms which easily fit to this model. Suppliers are one of the most important factors of information flow and of marketing of new technology. The learning process that the suppliers undergo is likely to lead to a downward trajectory in prices which pushes x^* to the left at the start, and then continues at a declining rate. At the same time incremental innovations of the existing technology will slow the diffusion of the new technology. Other factors lock firms into existing technologies, such as the high switching costs, the firm's ability to learn and so on. The probit model seems

more natural as it focuses on individual decisions, making it attractive to economists. However, the downside of this model is that if the diffusion is a social process the characteristics of a firm (such as size) should not be among the determining factors, hence this model may lead to a paradox.

Legitimation and Competition: This model is taken from the population ecologist's "density dependent growth model", which explains the systematic increase and decrease of net birth rates observed in natural environments. The model accepts the existence of two forces affecting the birth and death rates of organizations over time: competition and legitimation. If resources become scarce, this would limit the number of organizations causing competition between them. Legitimation is the process when a new type of organization becomes accepted, institutionalized or simply taken for granted depending on the number of the same type of organizations. As firms start using the new technology, the earned returns of early adopters begins to decrease. This shows that competition as well as legitimation slow down the diffusion process. In the begining, the competition is between the old and the new technologies, but after sometime when the new technology is accepted and legitimized, competition changes and moves in between the various firms that use the new technology. Density dependence is too simple to explain the process of standardization in markets; particularly when economic agents behave strategically altering the diffusion process explained in the legitimation and competition model. Hence, making choices within competing technologies have an important effect on the time path of adoption of the technology which will be accepted.

Information Cascade: Suppose that A and B are two new technologies competing for the same market niche, appearing on the market at the same time. If A, for some reason, is adopted and turns out to be the better technology than the existing one than it will gradually have a user base and become more widely used. The late adopter will prefer A to B. Something of a bandwagon is likely to be built, as the late adopter will probably not learn and choose the new technology by trying it out for itself, but by gathering information on the experiences provided by the early adopters. When it becomes clear that A is chosen by the early adopters, a sudden burst of adoption might occur. This process is defined as the "information cascade". In this model the "S" curve is not the starting point but one of the several possible outcomes. Only the successful innovation will have an "S" curve. First users are rather crucial; without them the "forward movement" of the bandwagon is less likely to occur. Although this model describes this process closely through the choices to be made, it is hard to predict which technology would be selected. This statement brings us back to the first model; the epidemic model.

2.2.5 Criticism of Diffusion Research

Since 1970s some criticism started to take shape among the diffusion scholars. One of the most important shortcomings of research on the diffusion has been the pro-innovation bias. (Rogers, 1995) defines the pro-innovation as "the implication in diffusion research that an innovation should be diffused and adopted by all members of a social system, that it should be diffused more rapidly, and that the innovation should be neither re-invented nor rejected". The pro-innovation bias is seldom stated straightforwardly, often it is assumed and implied through the publications on diffusion. The reason behind the pro-innovation bias is that much diffusion research is

carried out by change agencies. On the other hand, successful diffusions have the data which could be retraced by diffusion researchers, while efforts of unsuccessful diffusions do not leave much trace that can easily be reconstructed.

Another criticism toward the diffusion research is the individual-blame bias, which is the tendency that the researcher take the "side" of the change agency, rather than that of the potential adopter. The problem arises because it is the potential adopter that is responsible for the situation, not the system.

There is another problem concerning the research methodology of diffusion of innovation. Often data is gathered through surveys, which ask the participant when he/she decided to adopt the innovation, yet he/she may fail to give the right answer. Through survey methodologies, only snapshots are collected since most diffusions involve processes that extend in time; a research mainly covers the sequential flow of events.

Diffusion researchers have not paid much attention to the consequences of innovation. The diffusion of innovation, often, widens the socioeconomic gap between the higher and the lower status segments of a system. But in the 1960s, the classical diffusion model started to be used by development agencies in Latin America, Africa and Asia for the proliferation of developing countries. In 1970 an intellectual shift occurred and a new criteria began to emmerge for the development of a just social structure (Rogers, 1995).

A highly significant criticism of the theory has been carried out by Flynn and Preston (1999). They question influential universal models of "theory-led" explanations of the diffusion in telephone systems with respect to the development of historical trajectory of telecommunications in Ireland from 1922 to 1998 with the empirical data.

Flynn and Preston (1999) criticize Rogers's model for its "universalistic assumptions that innovations diffuse within a context marked by an autonomous or free market and that diffusion is driven by the demands of individual consumers freely exercising their market power". Flynn and Preston (1999) argue that through empirical studies, a robust theory could be developed by taking into account the role of social and institutional factors that shape the trajectory of diffusion.

CHAPTER 3

FREE and OPEN SOURCE SOFTWARE

3.1 History of the Free Software Foundation

The free software movement started during the 1970s as a practice, and during the 1980s it turned into a technological and at times a political issue. The movement has its origin in a manifesto written by Richard M. Stallman. Until the 1980s whenever a programmer of a university or a company wanted to port or use a program, the community of programmers enabled that individual to do so without causing any legal problems. When one saw another individual using a different, interesting program, he/she would be asked to share the source code, so that anyone could read or change it, or copy certain parts to make it into a new program. The idea behind these values was that software, like all scientific or creative work, is based on prior products. Moreover, the software was not a cash generator; it was in fact a hook to sell the hardware. But these accepted values among hackers, and practices within the computer industry ceased to continue for some time. By 1980s obtaining the source code of a commercial software became extremely difficult. Companies started to give drivers, programs and so on, only in their compiled, thus binary forms without the source codes. Programs became increasingly controlled by their manufacturers via strong license agreements. Even if an individual received the source code, he/she was forced to sign some kind

Figure 3.1: The Logo of the Free Software Foundation (Suvasa, 1996)

of non-disclosure agreement.

After having worked for for the MIT's Artificial Intelligence Laboratory from 1971 onwards, Richard Stallman quit his job and founded the Free Software Foundation in 1985 as a reaction to the moral changes that were taking place within the software industry. As an operating system[1] developer, he started to develop a free operating system with a community of cooperating hackers and invited anyone to join. He chose a system that was compatible with Unix,[2] so that it would be portable, and Unix users would easily migrate to this new environment. The name GNU was chosen following a hacker tradition, as a recursive acronym for "GNU's Not Unix". The head of the African animal gnu, also known as the wildebeast, became the logo (as seen in Figure 3.1) of the Free Software Foundation.

[1] Often abbreviated as "OS". It represents the foundation software of a machine, which presents a default interface to the user between applications and the hardware.

[2] An interactive time-sharing system invented in 1969 by Ken Thompson, abandoned Bell Labs left the Multics project. Dennis Ritchie, the inventor of C programming language, is considered as the co-author of the system. The turning point in Unix's history came when it was re-implemented almost entirely in C programming language during 1972–1974, making it the first source-portable OS. Unix subsequently underwent mutations and expansions at the hands of many different individuals and company, resulting in a uniquely flexible and developer-friendly environment (Jazdzewski and Jazdzewski, 1995).

3.1.1 First Product: GNU Emacs

GNU Emacs is a text editor which is highly popular among computer programmers but demands a steep learning curve. As Stallman started to work on it by the end 1984 and in the winter of 1985, it became a useful and a stable program. At this point, although people became interested in the program and wished to acquire copies, of it at the time, the insufficiencies of the Internet did not allow an easy access to it, even though it was on the public FTP site of the MIT. Thus, Stallman started to sell his program for $150 U.S. by mailing tapes of copies of GNU Emacs together with the source code. This way, he became the precursor of the free software business on which many companies rely today (Stallman, 1998a).

3.1.2 The General Public License (GPL)

The term "free software" is sometimes misunderstood. It has nothing to do with cost or price. It is about freedom. To understand the concept, one should think of "free" as in "*free speech*", not as in "*free beer*" (Stallman, 1996a). For Stallman, a program is a free software for a particular user if

- You have the freedom to run the program, for any purpose.
- You have the freedom to modify the program to suit your needs. (To make this freedom effective in practice, you must have access to the source code, since making changes in a program without having the source code is extremely difficult.)
- You have the freedom to redistribute copies, either freely or for a fee.
- You have the freedom to distribute modified versions of the program, so that the community can benefit from your improvements (Stallman, 1984).

According to Stallman,

> there is no contradiction between selling copies and free software. In fact, the freedom to sell copies is crucial: collections of free software sold on CD-ROMs are important for the community, and selling them is an important way to raise funds for free software development. (Stallman, 1996a)

There are over 40 different types licenses compatible to GPL, most commonly used ones being LGPL, BSD, Artistic, MIT, Berkeley, etc. Consulting a legal adviser might be a solution for any software license problems, but even after twenty years after the publication of the first version of GPL, the license has not been tested as court case. GPL's strength derives especially from the collective opinion of the community members. So far no one has been litigated, when a dispute takes place, it is generally conducted on the Internet through mailing listings, web based forums, and so on.

O'Mahony (2003) has presented several tactics and comments on the prevention of the proprietary appropriation of FOSS. Licensing is one of the several tactics discussed in his paper. The goal of FSF with GPL is to give users the kind of freedom described above, and not just to make the author of the software "popular". Therefore, GPL is needed for the use of distribution terms that would prevent the GNU software from turning into proprietary software. This method is called "copyleft". The key idea of copyleft is to permit everyone to run, copy and modify the program, and distribute its modified versions, without the permission to add new restrictions. Thus, the crucial freedom that defines "free software" is guaranteed for everyone with a copy. For an effective copyleft, modified versions must also be free. This guarantees that derivative works based on free software are also available to the free software community if published. For instance, if a company develops a software derived from a free software, the company does not have to release the source code if used for its own purposes, but should provide the source code when the software is sold or given to a third party.

For some, the GPL is more innovative than other GNU softwares which are, in fact, mere programs rather similar to other proprietary Unix programs. The GPL is described as a virus-like license, one that contaminates all the new codes derived from the original code. In other words, GPL is "a clever way to prevent behavior that might threaten the sustainability of freely available code" (O'Mahony, 2003).

3.2 GNU/Linux

In 1991, Microsoft introduced MS-DOS 5.0, and dominated the PC market. There was no other alternative for PC users. Apple Macintosh was "better", but was sold at astronomical prices, with few being able to afford to buy it at that time. The other computing camp was the Unix world, though it was far more expensive and was not available on desktops PCs. During the 1970s with the courtesy of Bell Laboratories, UNIX was taught in universities with its source codes, but after the 1980s it became a closed source. In the early 1980s, ARPA[3] decided to support the development of an OS which would run independently on machines. BSD, the Berkeley variant of Unix became the most advanced OS; and by 1991, a fully compiled and bootable system for the 386-based PC architecture (called 386/BSD) was released. During the early 1990s, an endless legal battle on the grounds of intellectual properties rights started between AT&T and University of Berkeley. By 1994, a legal settlement was reached, draining Berkeley's fund for the project. However, during that time, different versions of BSD (Net/Free/Open BSD) emerged. On the other side, there was another option: MINIX. It was written by Andrew S. Tannenbaum, a Dutch professor of Computer

[3] Advanced Research Projects Agency (ARPA) was created on 1958 within the Department of Defense of U.S. It has the responsibility for the direction or performance of advanced projects in the field of research and development as the Secretary of Defense shall, from time to time, designate by individual project or by category. http://www.darpa.mil/body/arpa_darpa.html

Science, who was lecturing on operating systems. MINIX was designed to run on the Intel 8086 microprocessors which had dominated the world market at the time. The book "Operating System" written by Tannenbaum, was sold together with the MINIX source code consisting of nearly 12,000 lines of code, written in C and assembly language. Up until then the software vendors had strictly and jealously guarded the source code of an operating system. The students of Computer Science all over the world would have been able to study in depth and understand about computers, if they had had access to this written source.

The operating system GNU/Linux started to be developed in 1991 in Helsinki by a Finnish university student, Linus Torvalds. In August 25, 1991 Linus Torvalds sent an e-mail to the MINIX operating system users group, announcing that he had been working on an OS as a hobby, asking what features people would most wish to see improved. Later in mid-September 1991, he released the code freely under a GPL, naming his program, Linux. In addition, during the 1980s, FSF had started to develop an operating system, named HURD, but due to its demanding architecture it is still in its development phase.[4]

3.2.1 GPL/Linux vs. Linux, Free Software vs. Open Source Software and Other Terminology Debates

As opposed to the common view, GNU/Linux is not a bunch of programs on a CD of free distribution. To put it correctly, GNU/Linux is one of the programs under the General Public License (GPL), but it constitutes one of the core programs because it is the operating system.

[4] For a longer discussion of the history of open source movement the reader may wish to consult Open Sources: Voices from the Open Source Revolution (DiBona et al., 1999).

The software industry was skeptical towards Stallman's ideas that emphasize such notions as ethics and freedom, which, to many businessmen were rather ubiquitous ideas. In 1998, Bruce Perens and Eric S. Raymond declared that the term "free" made it difficult for the free software to be accepted among businessmen, and founded the "Open Source Initiative" by creating open source software license (Perens, 1998). Although the open source software license is a near equivalent to General Public License, the movement differs especially on the philosophical grounds. The movement of open source software has emphasized the practical benefits of such licensing practices over the ethics of usage. The movement targeted CEOs of Fortune 500 company and mainstream publications. Just after the foundation of the OSI, Netscape released its browser code as an open source code, and Oracle and Informix, the two important database software vendors, announced that they were going to port their software to the GNU/Linux OS.

Stallman (2000) writes that -instead of "free"- the use of "open" or "liberated" may be appropriate though they may at times misrepresent the intended meaning or have other similar disadvantages in expressing the ideas behind the concept. Stallman (1998b) recognizes that the "Free Software movement and the Open Source movement are opposite on the basic principles but agree more or less on the practical recommendations". For Stallman, free software is an important value of free speech in the information age, an element more crucial than the technical merits.

On the other hand, DeLanda (2001) presents philosophy of these two movements in his essay, as "shallow" and "brittle". While he does not fully criticize these philosophical ideas, he focuses on the weaknesses of these two views in relation to their success. For DeLanda (2001), Stallman over-moralizes the social costs of exclusion,

and the divisive effects on the society through the use of closed source programs. On the other hand, by developing his pragmatic views Raymond uses ethnographic studies about hackers and their practices which fall short in the practical conditions of success of open source projects. DeLanda (2001) also shows that the model of open source development is not as anarchic as Raymond claims, but is distributed via a project leader who has his/her last final word on any patches of the project. On the other hand, the success of Linux "can only be discerned only in retrospect", and even Torvalds "seems to confirm that much of the dynamics of the Linux project were unintended consequences". DeLanda (2001) adds that the movement does not need any philosophical account, and if such philosophy is required, then it would evolve like the software, developed by the collective production of the users of that philosophy.

3.2.2 GNU/Linux Distributions

A GNU/Linux distribution consists of many programs which could be on a desktop computer as well as on high end servers. All distributions have different properties, fans, and areas of use. According to Bodnar (2004), there are 290 GNU/Linux and 7 different BSD distributions which are still actively developed, but in general 5 or 6 of them are well-known due to their a strong community base. Among 290 distributions, floppy-based and embedded distributions, and those that run within the Microsoft Windows partition are excluded. Most of the GNU/Linux distributions are based either on Debian or on Fedora/Red Hat systems. These well-known distributions are able to run on many different architectures. The Intel x86 architecture is the default one but it may also run on ARM, Motorola 680x0, Power PC, Alpha and SPARC etc. Because it is free software, the source code of all distributions can have free availability on the web or via CD distribution. Among some of the well-known

distributions is Debian GNU/Linux, which is rather different, since it has been created by the participation of over 1300 volunteers world wide. While this distribution is not the creation of an SME, half of these volunteers are based outside the U.S., making this distribution a global one. It is also known as one of the most robust distributions whose selected programs are not the latest releases but the most stable ones.

According to Stallman (1997) on a GNU/Linux CD distribution, the GNU project softwares are the largest single contingent, with approximately 28% of the total source code, which includes some of the vital components - without which there would be no system. On the other hand, the kernel, GNU/Linux software constitutes about 3% of the total source code.

Other well-known distributions are developed in a software house which are all SMEs. The real market share of a distribution and of OS is not accurately known because the distributions are given away freely over the Internet and the copies can be copied without any restriction. To name some of the well known ones, Red Hat is accepted as the leader, whose head office is in U.S. Another one is Mandrake Linux, which is seen as the most user-friendly distribution, particularly developed for newbies in France. SuSE Linux, once a German SME, is currently owned by Novell, one of biggest American software companies. SuSE Linux is known for its robustness; the last two distributions have been extremely popular in Europe. Most of the distributions could be freely downloaded through the Internet, but the user base of distributions differ from region to region in the world. Turbo Linux is highly popular in Japan, Korea and China but not in the western part of the world. The Brazilian Connectiva Linux distribution is rather important for the South American software market. Not only are these distributions highly significant for the local markets, but also these

SMEs have a greater ability to get contracts into these regions than many other mainstream American or European companies. The distribution of SMEs around the world support the local economy, improve local abilities and maintain local markets that target softwares.

Gelecek Linux is one of the distributions created in Turkey, which is based on Fedora/Red Hat Linux with the adjusted default language settings as Turkish. Gelecek Linux also added an English-Turkish dictionary, an accounting software designed for the Turkish market (which was developed by a Turkish developer team) and some other several softwares of relevance and importance. The boxed set[5] of Gelecek Linux also includes certain installation guides/booklets in Turkish. Another new Turkish distribution is on the way of being launched. Its name is still undecided but the name of the project is Uludağ,[6] which is the name of a mountain in Turkey as well as the composite first syllables of "Ulusal Dağıtım", i.e. National Distribution. This project does not just aim to create a new distribution based on other existing distributions, but new technologies and contribution to the Linux community. The obvious objective of this project, which is supported by TÜBİTAK (The Scientific and Technical Research Council of Turkey), is to enhance and reduce the cost of softwares on the PC desktops of Turkey.

In addition to the obvious usage of desktops or servers GNU/Linux, could be used on other platforms such as cell phones, PDAs etc. Matsushita and Sony are currently collaborating in the integration of GNU/Linux into digital home electronic devices, as well as considering the creation of a forum that would expand their activities. This

[5] Boxed sets include CDs, books and sometimes pins, caps, stickers etc.

[6] "Uludağ", in the Turkish language stands for "Grand/Glorious Mountain". http://www.uludag.org.tr/

forum may consist of IBM, NEC, Hitachi, Samsung and Philips (Sony Corp. and Matsushita Corp., 2002).

In order to establish a certain standard among distributions, Linux Standard Base[7] (LSB) was established aiming increase compatibility among different GNU/Linux distributions and to enable software applications to run on any compliant GNU/Linux system. In addition, LSB aims to help to coordinate efforts in recruiting software vendors and to port and write products for GNU/Linux. Many popular GNU/Linux distributions started to opt for these standards, but LSB is not especially related to the GUI of the end user.

3.2.3 Business Model of GNU/Linux Distributions

Firms which develop GNU/Linux distributions earn money by providing such services as support, training, consulting and customization, since it is not possible to make money by selling boxed sets of free software. These firms compete with one another through their own selection of software programs, and development of installation scripts and of desktop design. In other words, competition on the Internet as it is difficult for such a firm as it aims to "sell" support for their free distributions. According to Spiller and Wichmann (2002), software users rarely buy only the product; they tend to buy also the services provided. On the other hand, enterprises buy solutions, a combination of hardware, of software, of customization and of support. Hoch (1999) refers to an internal McKinsey Consulting study, arguing that 30% of the cost of a software solution concerns the license, while the rest which is (70%) is the implementation cost.

The price of a boxed set for a home user is around $30-40, provided together e-mail

[7] http://www.linuxbase.org/

support for possible installation problems for a period of 1 to 4 months. But the cost for a company, for example, can rise as much as $100.000 a phone help line 24 hours a day, 365 days a year.

The major problem for a distribution is to receive payment for something provided for free. The "Street Performer Protocol" developed by Kelsey and Schneider (1999) presents a business model which a novel writer releases a product free of charge, and waits for sufficient contributions from the consumers of the product before he/she releases a new version. In order to make the Street Performer Protocol more attractive, authors have taken a close look at the level of motivation of the potential contributors, and reached the following conclusions:

- A donor may give money partly out of the desire to be recognized as a generous person or a patron of the arts.
- There may be additional premiums involved in donating - a lunch with the author, for example.
- A donor may be more likely to provide money when he can see that it has an immediate effect. Thus, public radio stations have goals for pledge drives, and also for specific times. This might translate into releasing novels in small fragments, as small additional goals are met. Experience in the market will determine what pricing and marketing strategies work best (Kelsey and Schneider, 1999).

Mandrakesoft modified their business model after Kelsey and Schneider's article and created the Mandrakeclub in November 2001. Members of the Mandrakeclub benefited early and had privileged access to the coming releases, proprietary drivers and plugins, commercial applications, and the new versions of popular software in an easy to install package. There are also many software developers waiting for donations but the developers of Compiere ERP[8] software have modified the above mentioned model by gaving to donors a right to vote for the coming release's properties. This

[8] http://www.compiere.org/

way, the next release is likely to have the determined number of properties after the elections.

3.2.4 Free Software and Regional Development

With appropriate training, firms, institutes etc. can develop softwares while saving money that is normally spent on copies of proprietary software or on upgrades and maintenance, which is often enough to pay the salaries of software development groups. In addition to saving money, in-house software developments with free software tools increase the capabilities of local software development, and most importantly, provide technological independence over the software companies which consider their customers as cash-cows. A major example of regional development is the Extremadura case, which is explained in Section 3.6.2.

On the other hand, Latin-American software developers - as well as their politicians (Dibbel, 2004; Scheeres, 2002) - are highly active within the field of free software (Noronha, 2003). Another interesting case for METU would be UNIVATES, a university center in the south of Brazil, committed to free software development.

> UNIVATES decided to outsource its own IT services to the group already providing these services to the University, allowing the inauguration of SOLIS. By doing this, UNIVATES expects SOLIS will grow and provide a workplace for its computer science and other students, fostering regional development, once money spent on free software solutions stay in the region and won't go to proprietary software companies outside Brazil. SOLIS is formed now by almost 30 people who make their living producing free software and selling training, customization and services to customers who are able to understand and share the Free Software philosophy. All software produced by SOLIS is licensed under the GPL. (Brod, 2004)

Free software is a good option for non-mainstream languages with fewer number of speakers. Majority of the distinct dialects are not supported by closed source softwares because the limited size of the market does not justify the cost. On the free software

front however, translations are often carried out voluntarily when governments cannot support this. Depending on the popularity of the free software in question and the willingness of the users concerning translation, most languages tend to receive support.

3.2.5 Quantitative Analysis of the Debian 2.2 and RedHat 6.2 Distributions

In literature there is not much quantitative analysis of the a GNU/Linux distribution. Debian is accepted as the distribution which contains the largest software packages and Red Hat, as the most used commercial distribution. Debian 2.2 which has been analyzed by Gonzalez-Barahona et al. (2002), contains over 4,000 packages. The number of physical source lines of code (SLOC) of this release in the year 2000 contains more than 55 million physical SLOC. If it had been developed using traditional proprietary methods, like those of the Microsoft, the COCOMO model estimated that its cost would have been close to 1.9 billion U.S. $ to develop Debian 2.2. The estimated effort to build this release would be 168,000 person/month (14,000 person/year).

On the other hand, Wheeler (2001) analyzed Red Hat 7.1, which was released in April, 2001, finding out that it contains over 30 million physical source lines of code (SLOC). Using the COCOMO cost model, Wheeler estimated that in order to develop Red Hat 7.1, more than 8,000 person/years of development time is required, which would cost over a billion dollars to develop in the U.S.

While SMEs are able to defy big software companies with the help of the Internet, this data presents the difficulties in building a distribution within the classical software development techniques.

3.3 Economics of Free Software

For what reason(s) and how do people choose to give so much of their time to projects from which they receive no money? Behind this question lies a new research topic; economics of free software. As Himanen (2001) explains, a new form of work ethics has emerged with the help of a network society. Provided that money is not the ultimate aim or reason for motivation, it becomes useful as a means for what it can allow or bring. While it is easy to survive with earned money, it is much more difficult to "buy" social connection and entertainment.

As of October 2004, there are more than 88,000 projects and 925,000 registered users and/or contributors at http://www.sourceforge.net/ and more than 2,100 projects and 30,000 registered users and/or contributors at http://www.savannah.gnu.org/ the two important FOSS repositories on the Web. Some of the developers of these projects may be sponsored by firms. However, these numbers do not reflect neither the quality, nor the usability of these projects.

For hackers, the medium of computer is primarily an entertainment. In a way, this is how GNU/Linux and other free softwares are created. Though such models of software development, hackers are "entertained" both by producing something useful and meaningful, and by taking part in a social activity or group. Hackers enjoy what they do, even though it is "free". Most of them even consider themselves as artists; and the first wishes of an artist is to have renown.

Castells (2001) points out that the Internet culture contributes to the ideology of freedom, and notes that Gates, who asks, "Who can afford to do professional work for nothing?" puts "money-making before technological innovation by asserting the primacy of proprietary rights". Further, Castells (2001) sees Microsoft as the "en-

trepreneurial current that developed by commercializing the process of technological innovation in computing, without sharing its founding values".

Apart from Castells's "network society", another term explaining the motivation of the developers is "gift economy" where social status depends on what one gives away rather than what you have or own. According to Raymond (2002b), the gift culture can be seen within aboriginal cultures of the world, in this case, as part of the wealthy modern industrial societies. For Raymond (2002b), the logic of gift culture might work well for softwares, since its values can be measured by other members of the community; "the success of a giver's bid for status is delicately dependent on the critical judgment of peers". Zeitlyn (2003), explains:

> In systems not governed by classical economics, time and quantity are not counted. In such systems there are no metrics for these variables. Ideas of ownership exist but these are symbolics since, by definition, with open source software possession by one person does not dispossess another.

In his paper, Zeitlyn (2003) also criticizes E.S.Raymond's bazaar-like analogy regarding free software, and adds that "the maximization that occurs is not of profit" through the kinship structure he proposes for the free software community. Hence, the most important interaction within this community is gift exchange; the gift is the code and "kinship amity and gift relationships actually structure the social webs that link participants in open source development" (Zeitlyn, 2003). Bezroukov (1999) also claims that the model of OSS development model praised by Raymond resembles the structure and process of the scientific community.

According to Madanmohan and Navelkar (2002), there are seven groups within the free software community: core organizer, expert, problem poser, implementer/bug reporter, integrator, institutionalizer and philosopher. Their knowledge management activities are shown on Table 3.1.

Table 3.1: Knowledge Management Activities within the Free Software Community (Madanmohan and Navelkar, 2002)

Role	Knowledge management
Core organizer	Organize the community, initiate talks and groups formation.
Experts	Tacit knowledge, knowledge sharing.
Problem poser	Brings problems to the platforms, poses queries.
Implementer/bug reporter	Informs limitations, and bugs.
Integrator	Collate several rules/suggestions, build taxonomy, build manual.
Institutionalizer	Push for standardization, regulatory support.
Philosopher	Advocacy and discussion of the free software movement.

Few surveys have been carried out on free software developers. Survey realized by Krishnamurty (2002), shows that some of the much publicized free softwares like Linux Kernel, Apache server[9] attracts many developers but most of the software is developed by very few programmers. For Lerner and Tirole (2000), the reason for this is that most of the developers seek to work on projects which are likely to have an important and significant contribution to the software world and community. "They do not want to make small and marginal impact. This is the reason why it is still difficult to attract some developers for free software projects" (Lerner and Tirole, 2000).

According to Mockus et al. (2000), top 15 developers of Apache software contributed to nearly 90% of the code (Line of Code). Moreover, Koch and Schneider (2002) also showed that, within the GNOME project, 52 out of 301 programmers wrote 80% of the code. An analysis of the top 100 most prolific contributors identified by the 2000 Orbiten Survey reveals (Ghosh and Prakash, 2000) that of the 100, 70 were individuals or very small groups (typically pairs). These individuals accounted

[9] http://www.apache.org/

for 46.1% of the code and 50.4% of the projects. One interesting finding is that just one individual has contributed to 267 projects.

One of the most important surveys on FOSS was carried out by Ghosh and Glott (2002) which is known as FLOSS, a comprehensive study of developers and users. Its results indicated that the most important reason for developers to participate in a OSS project was to increase their learning or or to develop new skills without having to pay any fees. On the other hand, for users, the most important reasons to adopt OSS included higher security and better performance, compared to those of proprietary software. This survey also revealed that nearly 30% of the participants earn their income directly from their own support, development or administration of FOSS, while 20% earn their income indirectly through a job that uses experience gained from developing FOSS. According to this survey (Ghosh and Glott, 2002), 71% of the participants contribute to OS development in order to increase their skills (creativity mode), while 43% wish to increase reputation through improved job opportunities (reputation mode).

Hertel et al. (2003) conducted a survey on the motivations of Linux kernel contributors with an Internet-based questionnaire study. Their survey was based on models from social sciences, one of them, Extended Klandermans Model, examining the general motives of participation in the Linux kernel community. The other model, VIST, was used to predict the motivation of the developers who actually contribute software to the Linux kernel-based on teamwork. Authors concluded that motivational forces are in accordance with the given models of voluntary action and virtual teamwork.

3.3.1 Closed Source Software Project Management

Unlike free software project management, which will be described in the next section, closed source software project management differs greatly. PC software companies often put unrealistic targets on their employees to deliver new products. It is observed that very talented programmers often burn out and consequently quit their jobs straight after important project deadlines.

According to Brooks (1975), as the number of programmers (n) on a project rises, the scale of work performance increases *linearly* by a factor of n; however, aspects of complexity, communication costs, and number of bugs increase *geometrically* by a factor of n squared. This principle is known as the Brook's Law, valid for Microsoft and all other closed source software companies; but on the other hand, FOSS projects have managed to overcome this problem through their own model of software development (Jones, 2000; Raymond, 2002a) .

Cusumano and Selby (1995) described Microsoft company in a detailed way, focusing on its management and strategies for the future. While this study could be criticized for its positive and complimentary attitude toward Microsoft, the date of research may explain this reason. In 1994, the GNU/Linux was not a serious threat to Microsoft whose plans against free softwares were not unveiled, such as the Halloween documents (Microsoft Corp., 1998). The strategy described in Cussumano and Selby's book on the management of Microsoft were

- Organizing and managing the company: Find smart people who know the technology and the business.
- Managing creative people and technical skills: Organize small teams of overlapping functional specialists.
- Competing with products and standards: Pioneer and orchestrate evolving mass markets.
- Defining products and development processes: Focus creativity by evolving features and "fixing" resources.

- Developing and shipping products: Do everything in parallel, with frequent synchronizations.
- Building a learning organization: Improve through continuous self-critiquing, feedback and sharing.
- Attack the future by shaping the company and product line on how products, markets, and technologies seem to be evolving (Cusumano and Selby, 1995, 8).

3.3.2 Free Software Project Management

Contrary to the conventional project management, free softwares have a totally different character. Each project starts by necessity for a developer and often the code reuse is the rule i.e. nothing starts from scratch. For example when GNU/Linux first started, it inherited MINIX codes. If the developer loses his/her interest in the project, another individual can always continue as the project leader designated by the previous project leader. Further, it is accepted that users are also involved in the project if they provide the much needed feedback to the developers, without which it would be extremely difficult to develop and to improve any program.

Software releases are crucial. Before the release of a software, it should be tested with appropriate feedback to be given to the developers. Even when a strict testing methodology is implemented, certain bugs will always remain. In order to overcome this situation, "release early, release often" has become the motto among free software developers. This way, the code would be improved rapidly with sufficient number of beta-testers and co-developers. This development process is described by Raymond (2002a) as the bazaar model and the process of traditional software development as the cathedral model. This analogy gave Eric S. Raymond's well-known book, its name, which is on the Internet, Cathedral and Bazaar for free. Two of the most important quotes by Raymond on the OSS are "given enough eyeballs, all bugs are

shallow" which describes the security and stability of FOSS due its open nature, and the second one on the creation of a project: "scratching a developer's itch".

The community of open source software shares the general design and concepts of Unix programming. A submitted code is accepted when it is effective, or rejected by the project leader(s) when it is not. But the problem begins when several codes of the same quality appear as they cannot be evaluated objectively or distinctively. The selected code is known to be written by the person who contributed most to the project or the code, determined by the lead developer or the project leader, as part of seniority rules.

A project leader should be able to maintain the coordination and manage the complexity of such projects. Here, what we call as complexity is surpassed by a good architectural and engineering design. In Unix philosophy which is passed to Linux, a program should be kept small and unifunctional; this is called modular design.

The GNU Emacs editor is an extreme example, it is the first product of FSF which has a history of nearly 20 years. More than 100 developers have contributed to it, and it is one of the most robust programs which still in development, remaining highly popular. There are no programs which have been produced in this cathedral style, (closed source, proprietary way) One of the most used desktop OSs, Windows 98 has lost its technical support after having been "cut of" by Microsoft at the end of Fall 2001, only 3 years after its release.

Torvald's project management is a model for many, Raymond (2002a) says that "Linux's cleverest and most consequential hack was not the construction of the Linux kernel itself, but rather his invention of the Linux development model". This model exemplifies the constant release of any piece of code which maintains the interest

and the motivation of the developers and delegates responsibilities for motivated and capable developers, who are known as "lieutenants" - thereby sharing equally all credits of work while effacing himself. Torvalds is also named as the "benevolent dictator" (Raymond, 2002b).

On the other hand, BSD which is an open source software, is developed by a small and closed team but often developers do not use any code that have been submitted from people outside the developers' team, for which there is no regularization. The BSD license allows users to modify the code and close it for selling, but this code cannot be named BSD, which is very different than the GPL practice.

3.4 Graphical User Interface (GUI) and Free Software

An operating system could be divided roughly into two main usages; server and desktop. A server is a computer system to which, many clients are connected simultaneously through multiple-sessions of programs. Contrary, a desktop is used by only one user, and its most important component is the GUI, graphical user interface. Although free software has a large share within the server market, Microsoft still dominates the desktop market.

A graphical user interface facilitates many tasks done before the command line.[10] Today, the command line is still powerful and appreciated by server administrators and advanced users. A graphical user interface consists of icons, pull-down menus, check boxes, radio buttons, etc. These facilitate the usage of the computer, but at the same time restrict many other types of possible usage. If all of the possibilities of a software within the command line were integrated into a GUI, there will be

[10] A space provided directly on the screen where users type specific commands (Red Hat Inc., 2004).

serious usability problems and handicaps because the design of a GUI is crucial for the computer-human interaction. Hence it should be intuitive, user-friendly with a degree of consistency between different programs. For example, websites of many programs include a section dedicated section to screen-shots, so that users can decide for themselves whether to use that program or not, just by judging from the screen-shots since seeing is believing.

Most popular free or open source software GUIs also adopted the predominant design of GUI that Microsoft developed, which is criticized by Microsoft as well as by a minority within the free software community. Today, Microsoft complains that their GUI is more or less copied by free software developers, but the real problem for Microsoft is that a GUI cannot be patented and developing a new usable GUI costs a lot of money. The minority who criticizes the copying of certain Microsoft designs within the free software community points out that the free software might fall into the same design pitfalls as Microsoft. Because of these distinct approaches and the decentralized nature of the FOSS community, many different GUIs are designed.

Two most popular desktop environments which have a distinct GUI are KDE and GNOME. Others are not as popular but have many devoted users, such as Window Maker, Black Box and so on. Even a Turkish hacker once developed his own desktop environment, which is named Efsane II.[11] KDE and GNOME are integrated desktop environments, i.e. these desktops have their own office programs, games, web browsers, file managers, window managers, help systems, configuration systems, uncountable tools and utilities, and an ever increasing number of applications, including - but not limited to - mail and news clients, drawing programs and so forth.

[11] Efsane in the Turkish language means fabulous. http://directory.fsf.org/gui/windowmanager/efsane.html

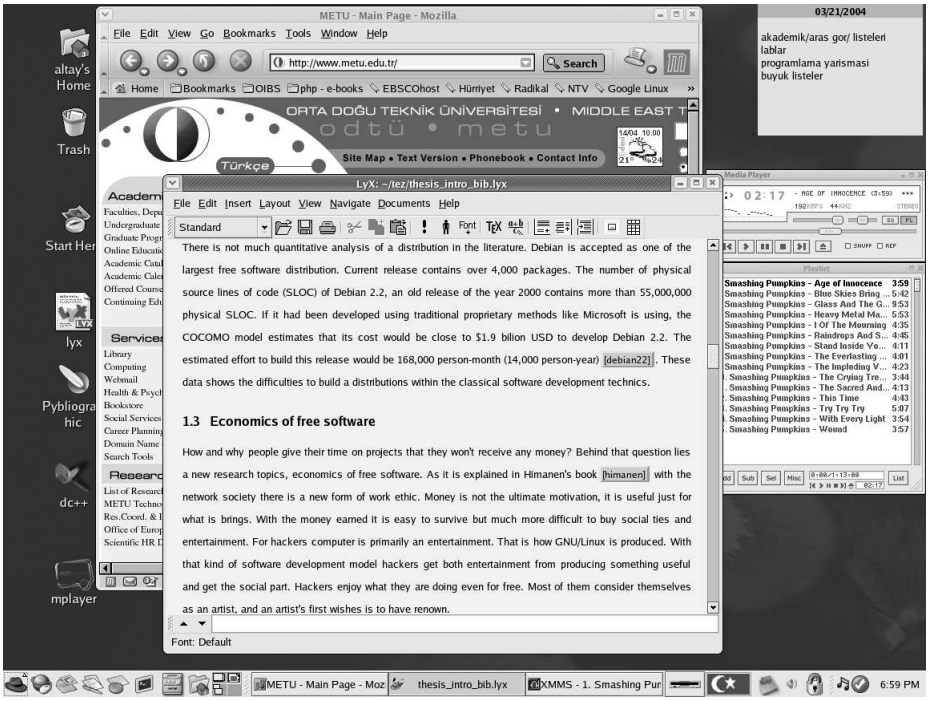

Figure 3.2: The GNOME Desktop with the Bluecurve Theme

The number one commercial GNU/Linux distributor Red Hat designed Bluecurve, a desktop environment merging KDE and GNOME for an easier switch from Microsoft to GNU/Linux without being confused by the great number of choices that GNU/Linux offers. Such a step toward a unified look and feel of the desktop also is criticized by many. The development, rather than the unification, of the desktop might be another kind of contribution to the wide range of choices available for the world of desktop environments.

As Figure 3.2 displays, the environment of GNOME with the Bluecurve theme adopted a popular and predominant design which Microsoft has made many to accepted. A program panel on the left side pop-ups when the Red Hat icon is clicked; the icon of important programs are placed on the panel below or on the desktop. The desktop is highly customizable but in the above example, the digital clock and the

keyboard flag are located on the right side. The four rectangles on the horizontal panel are virtual desktops which are not found in default Microsoft desktops. The concept of virtual desktop can be found nearly on every desktop environment of GNU/Linux. Instead of placing one window over another, different programs are opened on different desktops, which reduces the amount of confusion generally caused by the simultaneous use of several programs.

3.5 Analysis of Free Software on Desktops

3.5.1 Advantages and Disadvantages of Free Software

The most important social advantage of free software is that it is not used against the consumer for the purpose of making money through a multinational firm, but for the freedom of the community of the all computer users, while software sellers tend to divide the users by locking them, making each user agree not to share the product with others. By using free software, users do not need to sign a nondisclosure agreement which may lead to a social conflicts among free software users. These views are mostly emphasized by Stallman and the Free Software Foundation.

On the other hand, the Open Source Software Initiative is more pragmatic. They do not base the use of free open source software on ethical grounds, but on its practical advantages, which, from the user's point, derive from the source code. Most customers cannot understand or read the source code, which is also true also for most of the developers, for whom reading other codes - especially poor codes - can be rather difficult. But if the code is free, then there will always be someone who will be able to read and change, as long as the code is worth spending time on. Since customers can access the source, users can survive even after a possible collapse of software

vendors. Thus, the customer is no longer totally at the mercy of unfixed bugs and bad support. If the support fees of the vendor are high, customers can buy support from elsewhere (Open Source Initiative, 2004b). On the other hand, free software allows different options for customers who can choose according to their needs. Moreover, the multiplicity of choice in free software, available and usable for the same task may lead to conflict during their selection of the appropriate program by the end-users. And on the business side, the distribution or program to support may become a serious problem also for a firm. Companies working on the free software market often face problems in selecting and supporting the right program(s) and/or distribution(s).

Free software is based on open standards, i.e. anybody who would like to develop a program can easily do so and may be accepted by end-users quickly. Open softwares are not designed to upgrade the hardware after new major releases, nor to change the software with new hardware, but for backward compatibility. By use of emulators[12] such as WINE,[13] many of the applications written for the Microsoft OSs could be run on a GNU/Linux system. Through adapters, files which are created on different OS platforms could be used with some free software. For instance, *.doc* files created by the popular MS Word program could be read, modified and saved on Open Office software. Open standards, backward compatibility, emulators and adapters are all vital and reliable tools. The primary aim of the developers of such tools is to facilitate the process of migration, especially from Microsoft to open source softwares.

Another practical advantage of the source code involves the developers; free software movement provides an opportunity to define great technological innovations. In

[12] An emulator, in the most general sense, duplicates (provide an emulation of) the functions of one system with a different system, so that the second system appears to behave like the first system (wordiq.com, 2004).

[13] http://winehq.org/

a way, this is not unlike the way art and science have developed over the centuries, by standing on the shoulders of "giants". Internet and Unix hackers, as a rule, understand the technical benefits of open source quite well because it is a central part of their engineering tradition and of their culture. In fact the Internet is created and developed in this fashion, and all hackers are aware of the softwares that run the Internet: TCP/IP,[14] DNS,[15] Sendmail,[16] Perl,[17] Apache[18] were all developed as open source programs, and cannot be changed with a closed source software. Clearly, it would be an enormous task to rewrite all of this software in a closed source, in-house development scheme. Developers are not typical end-users and the programs designed just by developers may face usability problems. Usability experts do not get involved in free software projects however; the free software front lacks the resources to undertake high quality usability work.[19]

In addition, the free software front is inclined to promote the kind of complexity that is both open-ended (for further possibilities) and richer in its technical aspects, rather than the kind of simplicity that is strict and limiting.

The open source model has much to offer the business world through its capacity to build open standards as actual software, rather than paper documents. The model is such that many companies and individuals can collaborate on a product which cannot be created alone. It includes rapid bug-fixes, changes and upgrades that the users require, who are able to contact the developers of their software via e-mail.

---

[14] A communication protocol on which whole Internet relies.

[15] Domain Name Server translates between domain names and IP addresses, and controls Internet email delivery.

[16] A program used in servers for sending e-mails; 80% of servers use sendmail.

[17] A must learning programming language for all system administrators; it is a powerful and portable language.

[18] Web server program controls 60% of the whole of web servers.

[19] For an excellent discussion on the usability of open source software refer to Nichols and Twidale (2003).

The open source model also means increased security as the code is in the public view. It will be exposed to extreme investigation, with problems being found and fixed instead of being kept secret until the wrong person discovers them (Open Source Initiative, 2004a). Even though the closed source software might seem more secure for governments, their technological choices have changed after the emergence of the Echelon system. The governments of European Union, Japan, Korea and China are rather skeptical toward American technology, even on their desktop PCs. On the other hand, even the U.S. National Security Agency has released some patches to reinforce the GNU/Linux kernel, which are also open source. Furthermore, due to the GNU/Linux robustness and reliability, many governments are on their way to opt free softwares in many of their missions regarding critical areas, as well as on desktops.

Free software gives the opportunity to some innovative SMEs to come together; and even if they cannot beat a monopoly, at least they may be able to create a market niche for themselves. But the free software front is so much distributed, and since all firms supporting free software are SMEs, they lack an efficient public-relations campaign. Because of GNU/Linux's weak public-relations capabilities, Microsoft effectively uses FUD[20] to hold their lock users. Moreover, if a migration is decided upon by the upper management of an organization, end-users may resist the new interface. For instance, even switching from Windows 98 to Windows XP became a burden for most end-users. Big corporates like IBM, Compaq-HP, Oracle support free software and are, in turn, supported by the free software community. Corporates tend to be afraid of the Microsoft dominance and often want to break its monopoly. By using

[20] FUD stands for fear, uncertainty and doubt. By spreading questionable information about the drawbacks of less well-known products, an established company can discourage decision-makers from choosing those products over its wares, regardless of the relative technical merits. http://en.wikipedia.org/wiki/FUD

GNU/Linux, they provide for the free software front a very important public relations service and technical support. Such support given by these multinational corporations encourage many of the policy makers to opt free software in their companies and/or institutions. Up until this point, many CTOs and policy makers tended to think that free software is a hobbyist product developed from the Internet with no "real" support as many proprietary software companies promise to use closed source products. The distributed and non-hierarchical composition of free software allows many people (from the free software front) to discuss free software without any coherence among the ideas submitted. This can easily confuses any newbies as well as CTOs as regards the free software concept.

During the spring of 2001, IBM announced that it was going to invest over 1 billion U.S. $ to Linux. IBM also started to make some key alliances with many important Linux distributions like Red Hat, SuSe, Mandrake etc. With the momentum gained from IBM's investment on Linux, free softwares started to be accepted from the big business as well.

There is also a globally rising anti-American ideology which has been taken into account by Newsweek magazine (Miller, 2003) based on the research about the change in power brand rating index, 2002-2003. The research shows that many American brands are loosing ground, Microsoft being just the second one after the McDonalds. Because of these changes, many governments, firms or institutions might undergo the switch even more easier.

According to Bonaccorsi and Rossi (2003), the adoption and diffusion of FOSS are influenced by its perceived intrinsic value. The effect of negative network externality comes from the dominant standard forced by Microsoft while effects of the positive

network externality comes from the access to the community of programmers and the competitive reactions of SMEs in the commercial software industry. The simulation exercise carried out by Bonaccorsi and Rossi (2003) under several situations reveals that commercial software and FOSS are likely to coexist in the future.

3.5.2 Microsoft Strategies for Market Dominance

Microsoft evaluates free software as a major threat to their business. It is believed that certain confidential memos have leaked from Microsoft to the Internet, which are all called "Halloween Documents" - after the first memo, which was sent to Eric S. Raymond in October 1998 during the Halloween weekend, who is another open source evangelist, Microsoft was forced to acknowledge its authenticity. As the press covered these developments as a major story, the document now named "Halloween Document 1" (Microsoft Corp., 1998) was also used during the long antitrust accusations against Microsoft. During their testimonials, the relevance of these memos were accepted by the principal authors. Microsoft has publicly acknowledged that this memorandum is authentic, but viewed it as an engineering study that cannot be linked to any Microsoft policy.

The body of the Halloween Document is an internal strategy memorandum on Microsoft's possible responses to the GNU/Linux, free and open source software phenomenon. Until then GNU/Linux, FOSS movement was not considered openly by Microsoft as a threat to their business. To sum up the content of this document,

- FUD tactics cannot be used to combat FOSS.
- FOSS software is at least as robust - if not more - than commercial alternatives. The Internet provides an ideal, high-visibility showcase for the FOSS world.
- GNU/Linux has been deployed in mission critical, commercial environments with an excellent pool of public testimonials. [...]GNU/Linux outperforms many other UNIXs.

- GNU/Linux can win as long as services/protocols are commodities.
- FOSS projects have been able to gain a foothold in many server applications because of the wide utility of highly commoditized, simple protocols. By extending these protocols Microsoft aims to stop the diffusion of the free software (Microsoft Corp., 1998).

Microsoft can only win if services and protocols are complex, opaque, and closed sources. Microsoft aims to lock up open protocols and crush the IETF[21] in order to "de-commoditize protocols and applications" and stop free software development. In short, Microsoft started a war on standard so as to continue their monopoly.

With the Digital Millennium Copyright Act, reverse engineering became a crime in the U.S. If certain protocols, applications and standards are altered according to Microsoft's wishes, the free software front would not be able to reverse-engineer and even protect their market share.

Much software development depends on the ideas of others. It is shown by Aharonian (1996) that the number of patents of software has increased dramatically. Companies and individuals are hardly able to develop software without using one or more ideas of others; yet in many cases a company has patented these ideas. On the other hand, the free software front does not have a patent hence they cannot use it against another patent owner as a means of the mutually assured destruction strategy - a strategy that big companies have adopted since mid 1980s. Most open source and free software communities simply lack the money as companies can block such communities from developing a better alternative to their software and from entering their market niche. That is, it is possible to push the open source and free software communities out of the software market through these means (Microsoft Corp., 1998). Anyone

[21] The Internet Engineering Task Force (IETF) is a large open international community of network designers, operators, vendors and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. It is open to all interested individuals.

developing software must therefore constantly check the patent databases to ensure that they are not using an already patented idea. In short, independent developers and the developers of small companies might be inhibited from developing software if the chance of a patent infringement and consequent legal action is too great. To illustrate, the complicated American legal system is very well used by the firm SCO to prevent the use of GNU/Linux by suggesting that the use of free software is an infringement to some of their intellectual properties right.

On the other hand, the companies of closed source software claim that pirated software usage shrinks the size of the software market and decreases the incentives of software companies to innovate and produce better products. It has been suggested by Osorio (2002) that illegal copying of software generates the faster development of the market to the benefit of the copyright owner. After having reached the critical mass, the proprietary software companies enforce their copyright and use this strategy to dominate the market by legal means. According to Osorio (2002), this strategy has been used especially in the developing countries.

Microsoft's initiative, named "Government Security Program" (GSP)which started in January 2003, aimed to open the source code of their OS to government bodies, including China and Russia by allowing a security audit. The GSP also supports and builds on the Common Criteria certification, a globally accepted independent standard for evaluating the security features and capabilities of information technology products. By September 2004, Microsoft has had to compromise further by having to show the source code of their Office suite to more than sixty governments. The reading of the code will be done via secure Web connection. But those who have access to the code will not be able to copy the source nor will they be able to modify

it. The target of these programs is to appease countries like China where there is no backdoor in any Microsoft product; hence being poured in millions of lines of code is still debatable (Foucart and Macke, 2004; Shankland, 2003; Microsoft Corp., 2003).

3.6 Migration to GNU/Linux

In this section several influential migration studies will be discussed and certain successful migration cases will be presented. When designing a migration policy, one of the most crucial questions is the number of the user base. It would be quite difficult to determine the number of the user base for desktop operating systems because many PCs are sold together with the preinstalled Microsoft products - although certain users choose not to use them and install a FOSS alternative, most commonly from a CD with data downloaded from the Internet. Further, many computers work with dual booting i.e. running both Microsoft Windows and any GNU/Linux distributions and/or any BSD OS work on the same PC. This is the reason why any number estimated for the desktop usage would not accurately reflect the size of the user base.

3.6.1 Migration Studies to GNU/Linux

European Commission has agreed on a U.K.-based consultancy firm for a $250,000 contract to study the issues of migrating government computers in member states to a free software environment. The consultancy firm has been hired by the Commission to draw up guidelines on a move to open source technologies and to help define EU IT strategy on desktop computing. The German state of Mecklenburg-Pomerania is to be used as a test bed in defining this strategy, which goes beyond the investigation of a switch between Windows and Linux PCs (Leyden, 2002).

Another highly influential migration study was prepared in 2001 by MITRE Cor-

poration which is in partnership with government clients. It is a non-profit corporation which "manages three federally-funded research and development centers and partners with (U.S.) government sponsors to support their critical operational missions and address issues of national importance" (MITRE Corp., 2004). The MITRE report on OSS was "investigating the usage of OSS in military systems and aims to help Program Managers to evaluate whether open source software and development methodologies are applicable to their technology programs" (Kenwood, 2001). The importance of this report is reflected through the rather positive evaluations for Linux OS and OSS development models, for the highly critical deployment areas of military use, by a government-sponsored non-profit corporation.

Washington D.C. based AEI-Brookings Joint Center for Regulatory Studies published a book (Hahn, 2002), which is also available freely on the Internet. This book examines the impact of government policy on OSS, and comprises articles from four authors having rather different approaches to government policy toward OSS. Discussed issues in this work include software patents which favor proprietary developers, government software procurement policy, the software market and the government subsidies for OSS.

The U.K. Office of Government Commerce (OGC) has published their final report on FOSS for government usage. OGC works with the British government to improve procurement and project/program management. OGC also works with suppliers to make the government marketplace more efficient and attractive to business. Their report shows that

> Open Source software is rapidly maturing, offers significant potential benefits to government and should be actively considered alongside proprietary alternatives (The Office of Government Commerce, 2004).

This report also contains many migration cases from around the world within governmental institutions.

3.6.2 GNU/Linux Cases in Public Sector

In April 2002, the local government of Extremadura of Spain (pop. 1.1 million) launched an unorthodox campaign to convert all the computer systems within the area, in government offices, businesses and homes, from Windows operating systems to Linux. For this purpose, the local government freely distributed 150,000 CDs and paid $180,000 to a local software company (Cha, 2002), this new distribution is called as gnuLinEx project. According to Ghosh (2003), it "has led to the growth of a number of small businesses to provide commercial support, since with open source there is no need to approach one sole vendor for support approaching local entrepreneurs is possible and an obvious choice".

One of the most important GNU/Linux migration case is the city of Munich, Germany. The administration of the City of Munich operates around 14,000 desktops for 16,000 users. The City of Munich was forced to migrate all their IT infrastructure when Microsoft announced the end of their support for the Windows NT OS. The city council studied various alternatives and decided to migrate to FOSS; their migration project is called LiMux. After the beginning of planning in June 2003, the migration phase started in January 2004, a process in progress (Interchange of Data between Administrations, 2004).

U.K. police also started a project regarding the use free software on their desktops. If successful, the number of computers using GNU/Linux were to be 65,000 within the U.K. police force. The pilot project in West Yorkshire on 3,500 PCs with a cost saving of 1 million pounds/year (Lettice, 2002).

In China, Chinese government-sponsored software development group unveiled their Linux distribution named Yangfan Linux, based on Red Flag and Cosix distributions, both of which are also among Chinese distributions. While Yangfan is installed on 2,800 government desktops, Linux has about 2.2% of the OS market in China, compared to 45% of Microsoft (Berger, 2002).

U.S. National Security Agency released some kernel level codes and some utilities to increase the security of GNU/Linux systems. This project is called Security-enhanced Linux (SELinux) (National Security Agency, 2001).

The government of India has also showed interest in the use of Linux in e-governance, defense and education. Since GNU/Linux support is still a crucial issue, the government also considered setting up a support system such as call centers for Linux users. Security sensitive agencies like Bhaba Atomic Research Center and National Information Center have shown enthusiasm for the use of GNU/Linux in India (Bhattacharya, 2002).

Furthermore, Chinese Ministry of Science and Technology and French Atomic Energy Commission have agreed in October, 2004 on the development of a new computing platform based on GNU/Linux. The aim of this cooperation is to develop new hardware and software platforms for server use, PCs and mobile terminals (STMicroelectronics, 2004; Debrard, 2004).

Fitzgerald and Tony (2003) explain that the Beaumont Hospital in Ireland made a saving of 13m Euros over 5 years through the use of free software solutions. The amount of this saving could be even greater if the Beaumont Hospital were not receiving a certain amount of academic discount for proprietary softwares.

The Central Bank of Turkey is one of the first successful migration examples in

Turkey. Eroğlu and Öngün (2004) expressed in their presentation that the Central Bank of Turkey does not use the latest Microsoft XP, nor does it consider purchasing a new Microsoft license for their desktop PCs.

3.7 Chapter summary

In this chapter, the history and evolution of free software were explained. In addition to the threats of monopolist corporations to the free software community, the advantages of free software have also been clarified. As the quantitative analysis of several GNU/Linux distributions reveal, the development costs of these softwares cannot be afforded easily by financially strong corporations. Further, different business models of and economic explanations on free softwares were presented, and a number of migration reports and several case studies were discussed. Perhaps, this thesis can be regarded as another small contribution to the present discussions on migration processes, within the general context of the diffusion of innovation theory. In the next chapter, the quantitative analysis of two web-based surveys, carried out at METU, will be presented.

CHAPTER 4

RESEARCH PROCEDURE and RESULTS

4.1 Methodology of the Survey

According to Rogers, most of the diffusion research surveys have been conducted on potential adopters, and survey methods in diffusion research tends to "destructure human behavior" (Rogers, 1995). Web surveys became highly popular as the compatibility across web browsers increased and free or inexpensive softwares became available. According to Burkey and Kuechler,

> with a modest design effort a web-based survey offers the potential to interact with the respondent as would a surveyor in a face-to-face interview, providing assistance and checking for completeness of answers, without the same potential for bias that occurs in personal interviews (Burkey and Kuechler, 2003).

Participants had considerable freedom in their answers; i.e., no one was forced to participate in the survey. When a questions was left unanswered, a notice popped up, reminding the participant to answer for the sake of the survey without forcing them to cover all questions.

In order to prevent inaccurate feedback through multiple responses, access to the surveys on the same IP was restricted. For the first survey which was done to students taking the examination of exemption for the IS100 course. As the second survey targeted the whole campus, the restriction was carried out by LDAP authentication.

The surveys were done with the PHP programming language, and answers were stored within a Postgresql database. The web address was http://anket.metu.edu.tr, an easy address to remember. Further, a web link was provided through the popular web-mail login page in order to encourage and increase the participation for the second survey. The survey was designed in a multiple pages with forking depending on the answers given. The forking of the survey were done on the basis of adopters behavior;

1. Those who adopted free software,
2. Those who will use free software,
3. Those who will not use free software,
4. Those who never used free software,
5. Those who never heard of what free software and/or open source softwares are.

Depending on the adopters' behavior, the survey consisted of 3 to 6 sequential web pages. The time spent by every participant on each survey page was also measured to be used later on other possible surveys, which may be held by the METU Computer Center. The design of these web surveys mostly follows the outlines described by Burkey and Kuechler (2003).

Aims of the Survey: Two nearly identical surveys were held at different times. Questionnaires in Turkish and English translations are given at the Appendix. The reason behind the time difference was to understand METU's social contribution to the usage and diffusion of FOSS and to the PC usage habits by targeting different groups within the METU campus. There were different aims of these surveys, one

of the most important was to understand the diffusion of the usage of FOSS OS[1] and the reasons of adoption or rejection of the FOSS in the METU Ankara campus. Furthermore, the survey also aimed to understand the desktop computer usage habits of all participants.

Test Subjects: For the purpose of this thesis, two different web-based surveys have been carried out. The first one was done in 27-28 September 2003 after the examination of exemption for the IS100 course, which is taken by freshmen and the student of English preparatory class. It is designed to give the student enough knowledge of computing, word processing as well as using spreadsheets, which are unfortunately limited solely to Microsoft products. The aim of the course is to prepare the student to be self-reliant on his/her assignments which will be done on a PC. Students taking this exam consider themselves as computer-literate and try to exempt themselves from taking this course. The second survey was done during 23 March and 24 May 2004 within the whole of the METU campus. All students, staff, academics and others having a METU account, had the chance to participate in the second survey.

Analysis: Generally speaking, web-based surveys gave quantitative data. For certain questions, participants were able to give their own opinions and answers if the available choices/options were not sufficient. Analysis were carried out mainly by SPSS data analyzing software.

[1] In this thesis, FOSS OS is used for Free and Open Source Software Operating System, which comprises GNU/Linux systems as well as other BSD operating systems.

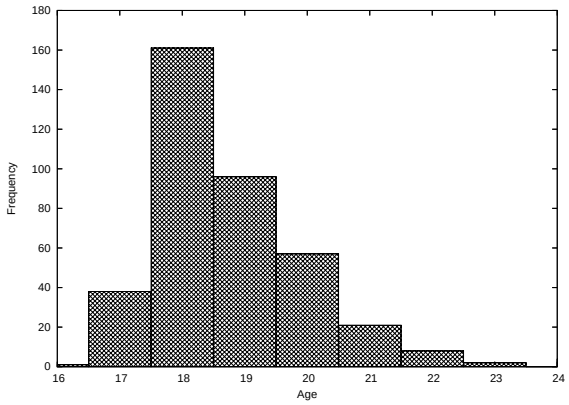

Figure 4.1: Age Distribution of Participants (First Survey)

4.2 Results and Discussion of the Surveys

In this section results and discussion of both surveys will be presented. Firstly, general habits of PC usage and profiles of the participants will be revealed; secondly depending on the behavior of the participants' FOSS adoption, results will be discussed.

4.2.1 General Profile of Participants

There were 402 participants in the first survey and 1224 in the second one. The initial questions were on demography. This survey type also follows the conventional way of starting by asking the age of the participant. As predicted, the age average of the first survey was 18.8 and 23.2 in the second one. The age distribution is shown in Figure 4.1 for the first survey and the second survey's age distribution is shown in Figure 4.2. The difference is because the first survey was concerned with the freshmen, while the second one was open to the entire campus.

Sex distribution is also consistent within the first and the second surveys: 77.8% male and 22.2% female for the first survey, and 74.7% male and 25.3% female participation for the second one. There were no other choices provided for the question on

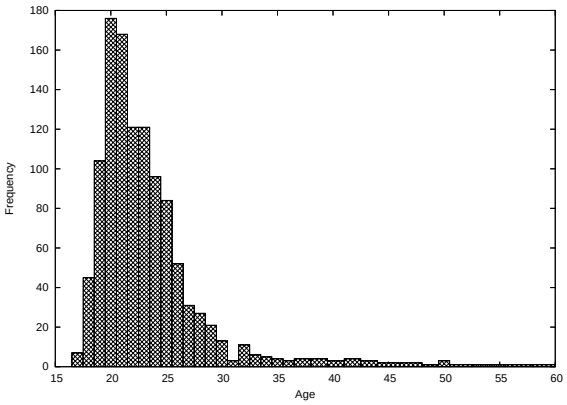

Figure 4.2: Age Distribution of Participants (Second Survey)

gender.

In order to measure the social factors and effects of working and studying at METU, the first survey asked whether it was the participant's first year at METU or not. The finding reveal that 238 people were in their first year of METU and 150 were not. 14 people did not answered this question.

For the second survey, in order to measure the social background and environment of the participants, the departments and units to which they belong was asked. Students and staff were mixed; however the survey was carried out openly, to be able to design a migration policy that is suitable for the each unit or section. The Faculty of Engineering is by far the leading section where the participants constitute 47.9% of the 1085 valid responses. The total number of the participants from administrative units is 53, but 37 of them are from the Computer Center (where the author of this thesis is a full time programmer). Details are shown on Figure 4.1.

The titles of all participants are shown on Table 4.2, obtained from the second survey. As expected, undergraduate students are the most populated group. The participation of academics would not be high if research assistants did not consist

Table 4.1: Unit Distribution of Participants (Second Survey)

	Frequency	Percentage
Faculty of Engineering	546	48.3
Faculty of Arts and Science	160	14.2
Faculty of Economics and Adm. Sciences	99	8.8
Graduate School of Natural and App. Sciences	88	7.8
Faculty of Education	76	6.7
Graduate School of Social Sciences	38	3.4
Faculty of Architecture	21	1.9
Graduate School of Informatics	12	1.1
Graduate School of Applied Mathematics	8	0.7
Other Academic Units	23	2.0
All Administrative Units	55	4.9
Other	4	0.4
Total	1130	100

14.4% of the participants, while the total number of academicians represents 16.6% of the 1131 people in total who answered that question. But as expected, 66.9% of the participants are undergraduate students and the total number of all students (of both undergraduate and postgraduate levels) is 79.0%.

The experience of computer usage and the diffusion rate among participants are rather high compared to old but large scale surveys carried by TUENA[2] for the Ministry of Transportation's of Republic of Turkey: The Turkish National Information Infrastructure Masterplan report (1999). For the first survey, answers were given in a pull down menu with four choices; the distribution is shown on Table 4.3. For the second survey, the answers was obtained through a text box for the same set of questions. The PC experience distribution of the second survey is shown in Figure 4.3. 69.6% of the participants of the first survey have computational experience for more than 3 years, and the average of the second survey's participants computer usage is 8.4 years. These results show that most of the students who participated in these

[2] Turkish National Information Infrastructure Project Office. http://tuena.tubitak.gov.tr/

Table 4.2: Title Distribution of Participants (Second Survey)

	Frequency	Percentage
Undergraduate	757	66.9
Research Assistant	163	14.4
Master Student	123	10.9
Administrative Staff	39	3.4
Ph.D. Student	25	2.2
Teaching Staff	14	1.2
Prof. Dr.	4	0.4
Assist. Prof.	3	0.3
Assoc. Prof.	2	0.2
Specialist	1	0.1
Total	1131	100.0

Table 4.3: Computer Usage Experience of Participants (First Survey)

	Frequency	Percentage
1 year	43	11.1
2 years	27	7.0
3 years	48	12.4
More than 3 year	270	69.6
Total	388	100

surveys started to use computers before their entry to the university.

All computers at METU's computer laboratory (approximately consist of 500 PC) are dual boot (Microsoft XP and Mandrake Linux distribution). However, installations and trials of other OSs became crucial during the process of decision-making. To understand this fact, the participants were asked only in the second survey whether they had a computer which they could install and configure softwares to their own taste. 90.7% (of 1023/1128 people) were positive, while 9.3% (105/1128 people) were negative.

To find out the METU's social system of the participants within the context of the theory of diffusion it has been asked to state two sources where the participant gets

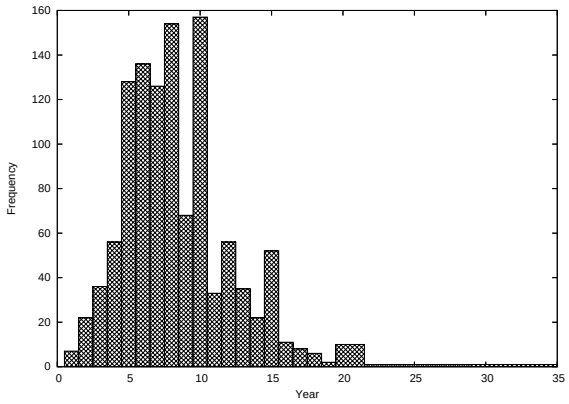

Figure 4.3: Distribution of PC Experience (year) of Participants (Second Survey)

any aid whenever he/she encounters any problem with their PCs. The most important answer for both surveys were friends. Friends, got 43.3 % of the answers of the first survey and 36.9% of the second survey. The Web is the second most important source to solve problems regarding PCs in both surveys. The whole distribution could be found on Table 4.4 for the first survey and on Table 4.5 for the second survey. The most important source of help given in the "other" choice is "a relative" (with 17 of 27 answers in the and 15 of 70 in the second survey). But in the second survey, participants reveal with 17 answers that they solve their own problems by themselves, while the third choice is "technical support" provided by the PC vendor (with 11 of 70 answers).

In order to understand the evolution of the users, the first survey asked the first operating system that the participant have ever used. This question was included only in the first survey because the targeted participants were freshmen unlike the second survey which addressed the whole campus with a wide age distribution. The distribution of the first OS is given in Table 4.6. The newest OSs -such as Windows 2000 and XP- were not the first ever used OS by participants, which is consistent with

Table 4.4: Sources of Help Regarding PC (First Survey)

	Frequency	Percentages
Friends	302	43.3
Web	114	16.3
Professional support	108	15.5
Books	24	3.4
Documentation on the installation CDs	58	8.3
Does not need any help	65	9.3
Other	27	3.9
Total	698	100

Table 4.5: Sources of Help Regarding PC (Second Survey)

	Frequency	Percentage
Friends	805	36.9
Web	536	24.6
Documents on the installation CD	187	8.7
Department's PC coordinator/CC Staff	164	7.5
Professional support	115	5.3
Books	39	1.8
Students	83	3.8
Does not need any help	183	8.4
Other	70	3.2
Total	2182	100.0

Table 4.6: The First Operating System Used by Participants (First Survey)

	Frequency	Percentage
Windows 95	122	31.4
DOS	101	26.0
Windows 98	96	24.7
Windows 3.1	35	9.0
XP	22	5.7
Windows 2000	8	2.1
Macintosh	2	0.5
Linux	2	0.5
Total	388	100.0

their experience of PC usage as shown in Table 4.3.

As predicted, the OS distribution was in the favor of Microsoft products. After six years of its launch, the mostly used operating system by the first survey's participants was still Windows 98 with 40.5% of all answers. The distribution of the first survey's participants who used OS is shown in Table 4.7. On the other hand, OS usage varied in the second survey where Microsoft products still lead but GNU/Linux OS has its share with 5.9% and BSDs consist of 0.2%, making FOSS users 6.1% of valid answers. Windows XP was the leader with 63.7% usage within the second survey's participants which might also show the difference of hardware quality from that of the first survey's participants, where Windows XP share was 37.2%. On the other hand, Windows 98 is still important among the participants of the second survey, being the second most used OS with 18.7%. Answers regarding Windows 98 are quite interesting since it is not supported anymore, and users are often forced to upgrade their operating system as well as their hardware due to the increase of needed resources required by newer Microsoft products. This user group could be persuaded to migrate to GNU/Linux products which does not require much resource if well configured. Moreover, the process to migration from Windows 98 to XP might be as difficult as the migration

Table 4.7: The Operating System Used by Participants (First Survey)

	Frequency	Percentage
Windows 98	159	40.5
XP	146	37.2
Windows 2000	46	11.7
DOS	21	5.3
Windows 95	13	3.3
Linux	6	1.5
Unix derivatives	1	0.3
Macintosh	1	0.3
Total	393	100.0

Table 4.8: The Operating System Used by Participants (Second Survey)

	Frequency	Percentage
XP	677	63.7
Win98	199	18.7
Win2000	107	10.1
Linux	63	5.9
Other	8	0.8
Win95	4	0.4
BSD (Free/Net/Open)	2	0.2
Win3.1	2	0.2
Macintosh	1	0.1
Total	1063	100.0

process from Windows to GNU/Linux. The distribution of the second survey's OS usage is shown in Table 4.8.

Today, many people complain about new technology, particularly about computers. The usability of a computer has become one of the most important areas of research. When the participants were asked if they were satisfied with their operating systems, results from the first survey were as follows; 12.3% were not satisfied, 22.3% had no idea and 65.5% were satisfied (out of 391 answers). And according to the second survey: 71.7% were satisfied, 10.4% were not satisfied and 17.9% had no opinion. The cross-tab distribution in the second survey concerning the level of satisfaction of

OS vs.the OS used is given in Table 4.9. This cross-tab analysis was not included in the first survey where nearly all participants use Microsoft products. From these results it is easily seen that 95.2% of GNU/Linux users are are satisfied, while 73.2% of XP users, 61.3% of Windows 98 and 67.3% of Windows 2000 are satisfied with their OS used. By adding the percentage of the group which expressed uncertainty concerning their satisfaction with the group which are not satisfied, it gives a user base (of 26.8% of XP, 38.8% of Windows 98 and 32.7% of Windows 2000 users) which could be a good target with a great potential for a conversion to GNU/Linux. Two participants who use BSD, stated that they were satisfied with their OS.

The upgrading of an OS to a later version could lead to certain undesirable and unpredictable consequences, such as problems related to hardware drivers or some backward compatibility. Backward compatibility is one of the main assets for the open source softwares and a major target of criticism concerning Microsoft products. But the main challenge is to do with the change of users' habits, which they gain from the earlier versions. Such problems sometimes result in the immediate downgrading of the newly installed software. It was obvious from the start that Microsoft products dominate the METU campus. Hence, in order to find out whether such Microsoft upgrades are problematic or not, the survey also asked whether the participant downgraded his/her operating system after an upgrade. The findings of the first survey are shown on Table 4.10, and the cross-tab of downgrade vs. OS is displayed on Table 4.11. Both surveys presented approximately the same result for this problem; those who downgraded to the previous version consisted of 28.9% in the first survey and 28.0% in the second one. Furthermore, the downgrade rate among Microsoft OS users in the first survey is 29.1% and in the second survey, 28.1%. These results show that

Table 4.9: The Cross-tab Distribution of OS Satisfaction vs. the OS Used

OS		OS sat.			Total
		No	Not Sure	Yes	
XP	Frequency	63	118	495	676
	% within the used OS	9.3%	17.5%	73.2%	100.0%
	% within the OS satisfaction	56.8%	62.1%	65.0%	63.6
Win98	Frequency	31	46	122	199
	% within the used OS	15.6%	23.1%	61.3%	100.0%
	% within the OS satisfaction	27.9%	24.2%	16.0%	18.7%
Win2000	Frequency	13	22	72	107
	% within the used OS	12.1%	20.6%	67.3%	100.0%
	% within the OS satisfaction	11.7%	11.6%	9.4%	10.1%
Linux	Frequency	1	2	60	63
	% within the used OS	1.6%	3.2%	95.2%	100.0%
	% within the OS satisfaction	0.9%	1.1%	7.9%	5.9%
Other	Frequency	0	0	2	2
	% within the used OS			100.0%	100.0%
	% within the OS satisfaction			0.3%	0.2%
Win95	Frequency	3	1	0	4
	% within the used OS	75.0%	25.0%		100.0%
	% within the OS satisfaction	2.7%	0.5%		0.4%
BSD	Frequency	0	0	2	2
	% within the used OS			100.0%	100.0%
	% within the OS satisfaction			0.3%	0.2%
Win3.1	Frequency	0	1	1	2
	% within the used OS		50.0%	50.0%	100.0%
	% within the OS satisfaction		0.5%	0.1%	0.2%
Macintosh	Frequency	0	0	1	1
	% within the used OS			100.0%	100.0%
	% within the OS satisfaction			0.1%	0.1%
Total	Frequency	111	190	755	1056
	% within the used OS	10.5%	18.0%	71.5%	100.0

Table 4.10: OS Downgrade After an Upgrade (First Survey)

	Frequency	Percentage
Never downgraded	275	71.1
Downgraded	112	28.9
Total	387	100.0

Table 4.11: Cross-tab of OS Downgrade vs. the OS Used (First Survey)

used OS		downgraded or not?		Total
		No	Yes	
Microsoft OSs	Frequency	270	111	381
	% within the used OS	70.9	29.1	100.0
	% within the downgrade	98.2	99.1	98.4
GNU/Linux	Frequency	5	1	6
	% within the used OS	83.3	16.7	100.0
	% within the downgrade	1.8	0.9	1.6
Total	Frequency	275	112	387
	% within the used OS	71.1	28.9	100.0

FOSS OS users tend not to downgrade as much as Microsoft users. The results of the second survey can be seen on Table 4.12, and the cross-tab of downgrade vs. OS, on Table 4.13. If these individuals downgrade their OS due to backward compatibility or hardware problems, this creates another potential target for the free, open source software migration.

In order to describe more precisely the social and communicative systems of computer usage at METU, questions regarding software providers were asked. In the

Table 4.12: OS Downgrade After an Upgrade (Second Survey)

	Frequency	Percentage
Never downgraded	765	72.0
Downgraded	298	28.0
Total	1063	100.0

Table 4.13: Cross-tab of OS Downgrade vs. the OS Used (Second Survey)

used OS		downgraded or not?		Total
		No	Yes	
FOSS OS	Frequency	48	17	65
	% within the used OS	73.8	26.2	100.0
	% within the downgrade	6.3	5.8	6.2
Microsoft OSs	Frequency	710	278	988
	% within the used OS	71.9	28.1	100.0
	% within the downgrade	93.7	94.2	93.8
Total	Frequency	758	295	1053
	% within the used OS	72.0	28.0	100.0

Table 4.14: Software Providers (First Survey)

	Frequency	Percentage
Friends	188	35.2
Preinstalled on the PC	134	25.1
Ambulant street vendors	77	14.4
P2P programs	57	10.7
Authorized sellers	45	8.4
School/work	27	5.1
GPLed software	6	1.1
Total	534	100.0

answers, nearly the same total percentage in both surveys was obtained as regards the illegal ways of software procurement. These illegal ways consist of friends, ambulant street vendors (who are in fact just sellers of often pirated software copies) and peer to peer programs which aid to share files and software on the Internet. In the first survey, the total percentage of these three sources is 60.3% and in the second, 56.1% of participants. As Table 4.14 and 4.15 display, friends constitute the most important routes in obtaining software. This question was answered by ticking the listed sources, which were not limited to any number of choices.

The objective to find out how FOSS is generally perceived and how the partici-

Table 4.15: Software Providers (Second Survey)

	Frequency	Percentage
Friends	545	30.1
Preinstalled on the PC	381	21.1
Ambulant street vendors	271	15.0
University	244	13.5
P2P programs	199	11.0
GPLed software	103	5.9
Authorized sellers	61	3.4
Total	1808	100.0

pants might respond to different innovation-decision process led to three Lieckert type propositions. For an evaluation, inclinations were calculated for each proposition. All answers had a value starting from one to five, where the answer "Absolutely no" had a value of 1 and "Absolutely yes", of 5. Number of answers were multiplied by their corresponding value and the sum was divided into the total number of answers that showed an inclination for the Lieckert type proposition.

The first proposition was "The public sector should consider other software solutions if it costs less to the public expenditure", the distribution of answers for the first survey is shown on Table 4.16, and for the second survey on Table 4.17. The inclination for this proposition was 3.69/5 in the first survey and 3.99/5 in the second. These answers are encouraging for the process of migration within public places such as libraries, possible public kiosks (which are still not that popular in Turkey) and computer laboratories, if the economical ramifications are explained to users with clarity and precision.

The second proposition was "Should the participant himself/herself consider solutions other than softwares with licensing fees (i.e. Microsoft products) in order to be economical for his/her personal budget". Answers of the first survey are shown on

Table 4.16: Public sector should consider solutions other than software which have a licensing fees (First Survey)

	Frequency	Percentage
Absolutely no	12	3.1
No	21	5.5
No idea	120	31.3
Yes	151	39.3
Absolutely yes	80	20.8
Total	384	100.0

Table 4.17: Public sector should consider solutions other than software which have a licensing fees (Second Survey)

	Frequency	Percentage
Absolutely no	27	2.5
No	59	5.6
No idea	189	17.8
Yes	406	38.3
Absolutely yes	379	35.8
Total	1060	100.0

Table 4.18: As a personal user I should consider solutions other than softwares with licensing fees (i.e. Microsoft products) in order to decrease my own expenditure (First Survey)

	Frequency	Percentage
Absolutely no	10	2.6
No	7	1.8
No idea	70	18.2
Yes	66	17.1
Absolutely yes	232	60.3
Total	385	100.0

Table 4.19: As a personal user I should consider solutions other than softwares with licensing fees (i.e. Microsoft products) in order to decrease my own expenditure (Second Survey)

	Frequency	Percentage
Absolutely no	18	1.7
No	105	9.9
No idea	100	9.4
Yes	498	47.0
Absolutely yes	339	32.0
Total	1057	100.0

Table 4.18 and of the second one on Table 4.19. The inclination percentage for this second proposition was 4.30/5 in the first survey and 3.99/5 in the second. When results are compared, it can be seen that personal economical gain is more important for freshmen students than for the public; and in the second survey, participants expressed the same view/opinion. From these results it might be concluded that a personal and public migration policy designed on economic grounds would be effective.

The third proposition was "I am afraid to damage my PC or lose data during the installation of new softwares on my PC". Answers of the first survey are on Table 4.20 and of the second survey on Table 4.21. The inclination for the third proposition was 3.26/5 in the first survey and 3.04/5 in the second one. Thus, participants did not

Table 4.20: I am afraid to lose data during the installations new softwares on my computer (First Survey)

	Frequency	Percentage
Absolutely no	35	9.2
No	100	26.2
No idea	36	9.4
Yes	151	39.6
Absolutely yes	59	15.5
Total	381	100.0

Table 4.21: I am afraid to lose data during th installation of new softwares on my computer (Second Survey)

	Frequency	Percentage
Absolutely no	136	12.9
No	355	33.6
No idea	51	4.2
Yes	357	33.8
Absolutely yes	158	14.9
Total	1057	100.0

appear to have a strong inclination to either "way", revealing that personal migration would unlikely difficult if the user is left alone with no help during any installation process, even just to try any FOSS OS. However, if the users are informed that there are various Live CD[3] options, the trialability of the innovation could be carried out without hesitation or fear.

The first step in the innovation-decision process is knowledge. In order to assess this, the participants were asked whether they have ever heard of free softwares, open source software concepts. The distribution for the first survey is given on Table 4.22 and the second on Table 4.23. The awareness of innovation i.e. to the free, open

[3] Live CDs are made to run just by booting the PC from the CD drive (containing Live CD). This process does not affect the hard disk in any way; hence, there is no installation. The most famous one is known as the KNOPPIX distribution, based on the Debian project.

Table 4.22: Distribution of Participants Who Have Heard of the Concepts of FOSS (First Survey)

	Frequency	Percentage
No, never heard	234	59.5
Yes, heard of the concepts	159	40.5
Total	393	100.0

Table 4.23: Distribution of Participants Who Have Heard of the Concepts of FOSS (Second Survey)

	Frequency	Percentage
No, never heard	245	22.9
Yes, heard of the concepts	823	77.1
Total	1068	100.0

source softwares in the first survey is 40.5%, and in the second one, 77.1%. While the first survey targeted mainly the freshmen, their answers seem to indicate that within METU's social system, the greater the computer usage experience, the higher the awareness of innovation.

After this question the first forking within the survey occurs. For those who have not heard of FOSS concepts, the survey ends with the questions of whether the participant wishes to participate in further investigations or not, and whether the he/she wants to attain the results of the survey or not and if yes, the participant is asked provide his/her e-mail address. Until that point, the difference between the first and the second surveys is the demographic questions such as those concerning the section to which they belong as well as personal/professional/academic titles of the participants.

Table 4.24: Communication Channels of the FOSS Concepts (First Survey)

	Frequency	Percentage
Friends	58	35.8
Internet	52	32.1
Printed press	39	24.1
Television	5	3.1
Courses	2	1.2
Radio	0	0
Computer courses	0	0
Other	6	3.7
Total	162	100.0

4.2.2 Those Who Have Heard of the Concepts of Free and Open Source Software

To find out about the communication channels, the questions of how the participant first heard of the sources and how they learned about free software and open source software concepts were asked. The communication channels of free software and open source software concepts are on Table 4.24 for the first survey and on Table 4.25 for the second survey. The communication channels of the concepts are primarily the through the Internet with 44.2% and secondly, friends with 32.3% in the second surveys. This is natural since these concepts are born within and spread through the Internet. The different distribution of percentage between friends (with 35.8%) and the Internet (with 32.1%) in the first survey might be explained by the spread usage of Internet technologies within the METU campus compared to that of Turkish high school environments. The third source of information is the printed press with 24.1% for the first survey and 15.1% for the second survey.

One of the most crucial softwares, the killer application for desktop usage, is the office suite to which a word processor, a spreadsheet, a slide show and some other minor

Table 4.25: Communication Channels of the FOSS Concepts (Second Survey)

	Frequency	Percentage
Internet	355	44.2
Friends	259	32.3
Printed press	121	15.1
Courses	32	4.0
Students	10	1.2
Television	7	0.9
Radio	3	0.4
Other	16	2.0
Total	803	100.0

Table 4.26: Trialability of Open Office (First Survey)

	Frequency	Percentage
No, did not tried	126	80.8
Yes, tried	30	19.2
Total	156	100.0

programs are incorporated. On the open source software front, among certain choices is one of the most important software, is the Open Office suite. Sun Microsystem's Star Office code base is based on the Open Office but comprises certain closed source add-ons. The most important aspect of such softwares is that they have many different releases for a multitude of operating systems which eases the migration from any OS to another. Those who know about the open source, free software concepts were asked whether they have ever used Open Office and Star Office through individual questions in the first survey and combined questions in the second survey. Answers of the first survey are shown on Tables 4.26 and 4.27, and those of the second survey on Table 4.28.

Those who tried at least one of these softwares constitute 19.5% of the first surveys' participants and 43.3% of the second one. While the Office products explained above

Table 4.27: Trialability of Star Office (First Survey)

	Frequency	Percentage
No, did not tried	125	80.1
Yes, tried	31	19.9
Total	156	100.0

Table 4.28: Trialability of Open Office or Star Office (Second Survey)

	Frequency	Percentage
No, did not tried	428	56.7
Yes, tried	327	43.3
Total	755	100.0

are vital in METU, the IS100 course is based on Microsoft products as well as the campus, making the trialability and usage of Open Office software useless for many. This situation inhibits the awareness of Open Office software even though it has several advantages and built-in functionalities (such as converting written documents to pdf files which Microsoft Office does not have). The METU Computer Center tried to improve this situation by preparing a manual guide on Open Office software in Turkish, aimed to be distributed freely on the Internet and in the form of a printed version with a modest price for the academic year 2004-2005.

In order to estimate the number of people who are converted, which is the second step of the innovation-decision process, the trialability of the innovation was assessed by asking the participant if he/she ever tried using FOSS OS. This question leads to the second forking in the survey with those who have tried FOSS OS and those who have not, within the group that has heard of the concepts of FOSS. The result of the first survey are shown on Table 4.29 and the second one on Table 4.30; among those who have heard of these concepts, 37.2% have tried FOSS OS. Among the participants

Table 4.29: Trialability of FOSS OS (First Survey)

	Frequency	Percentage
Did not try	98	62.8
Tried at least once	58	37.2
Total	156	100.0

Table 4.30: Trialability of FOSS OS (Second Survey)

	Frequency	Percentage
Did not try	376	49.7
Tried at least once	381	50.3
Total	757	100.0

of the second survey 50.3% is the ratio of those who have tried FOSS OS at least once.

4.2.3 Those Who Have Not Tried FOSS OS

The reason why a participant has not even tried a FOSS operating system is crucial while constructing a policy that attempts to persuade people to adopt the innovation. This question was asked with four choices (very important, important, less important and not important); but because the number of participants for the first survey was low, the degree of "Very important" was added to "Important" values, and "Less important" was added to the "Not important" values (details are on Table 4.31). For the second survey, as the number of participants increased, an inclination variance emerged for each reason of non-trialability (data is on Table 4.32). This inclination was calculated by a value number starting from 0 to 3, where the answer of "Not important" had a value of 0 and "Absolutely important" was equal to 3. Later, these numbers were multiplied by their corresponding value and their sum were divided to the total number of answers.

Within the inclination data, shown on Table 4.32, the most important reason-

category was not among the provided ones, but the one given under the choice "Other" which was selected by 54 participants. The second most important reason for not having tried at least once was a lack of friend who is also interested in the subject, willing to help, the inclination for this choice was 1.62/3, which is between the values of "Less important" and "Not important at all". Not being interested in the subject got an inclination point of 1.06/3. It could be concluded that the interest in the subject is not low among those who have not tried FOSS OS. The third important reason for not having tried FOSS OS at all is the lack of a "society" at the university which could educate and inform the students. Other reasons such as slow network connection, difficulties of finding installation CDs or introductory books in Turkish got an inclination between "less important" and "not important".

When 54 "Other" answers are analyzed, 9 of them are concerned with the incompatibility of software, 5 are related to lack of time, 10 of them show satisfaction with the Microsoft products and 16 of them point at the needlessness of a trying a FOSS OS. While these results indicate the potential of lock users, the incompatibility among OS could be surpassed by the use of or at least the presentation of a cross-platform office suite such as the Open Office.

4.2.4 Those Who Have Tried FOSS OS

One of the four elements of the diffusion of innovation is time. Even though questions regarding past experiences might be misleading, the participant was asked when he/she tried a FOSS OS for the first time. This question was included for the purposes of finding out when the persuasion occurred first. The answers of the two surveys differed greatly. In the first survey, Table 4.33, 40.3% and in the second survey, Table 4.34, 63.1% of the participants stated that they have tried a FOSS OS approximately

Table 4.31: Reasons for Not Having Tried FOSS OS (First Survey)

	Important	Not Important	Total
Network is very slow	71	18	89
Do not have any friends who can help	67	19	86
There are no institutions that teach students	62	26	88
Do not know any society which can help	60	25	85
Cannot find any related CD	58	30	88
Not interested	48	37	85
There are no introductory books in Turkish	40	45	85
Do not have any self confidence	32	53	85
Other	7	5	12

Table 4.32: Reasons for Not Having Tried FOSS OS (Second Survey)

	Absolutely important	Important	Less Important	Not Important	Total	Inclination (over 3)
Do not have any friends who can help	80	115	76	66	337	1.62
Do not know any society which can help	66	79	86	96	327	1.35
There are no institutions that teach students	38	89	78	119	324	1.14
Not interested	36	86	77	139	338	1.06
Do not have any self confidence	35	72	83	142	332	1
Network is very slow	60	41	56	173	330	0.96
Cannot find any related CD	25	57	88	155	325	0.85
There are no introductory books in Turkish	21	32	68	198	319	0.61
Other	28	17	2	7	54	2.22

Table 4.33: The First Time a FOSS OS is Tried by FOSS OS Non-Adopter (First Survey)

	Frequency	Percentage
6 months before	13	22.8
1 year before	21	36.8
2 years before	13	22.8
more than 2 years before	10	17.5
Total	57	100.0

Table 4.34: The First Time a FOSS OS is Tried by FOSS OS Non-Adopter (Second Survey)

	Frequency	Percentage
6 months before	65	17.2
1 year before	71	18.7
2 years before	80	21.1
more than 2 years before	163	43.0
Total	379	100.0

two years ago or more. If that was their only and the first experience, they might have had an inaccurate impression of what FOSS OS actually is. The pace at which FOSS is developed over the years have been very fast, and particularly during the past two years, which saw the addition of many improvements to most FOSS.

Another question asked to the participants, who have tried FOSS OS once but still used OS other than FOSS OS, was whether they considered migrating to a FOSS OS today; results are shown on Table 4.35 for the first survey and on Table 4.36 for the second survey. Participants who have tried FOSS OS once and consider migrating constituted 21.1% of the first survey and 29.5% of the second survey. The percentage of those who did not have any opinion was rather high however: 45.6% for the first survey and 43.9% for the second presenting an important base for those who could be convinced to migrate. Those who do not consider switching was 33.3% in the first

Table 4.35: People Considering to Migrate to a FOSS OS (First Survey)

	Frequency	Percentage
No, do not consider to switch	19	33.3
No idea	26	45.6
Yes, consider to switch	12	21.1
Total	57	100.0

Table 4.36: People Considering to Migrate to a FOSS OS (Second Survey)

	Frequency	Percentage
No, do not consider to switch	101	26.6
No idea	167	43.9
Yes, consider to switch	112	29.5
Total	380	100.0

survey and 26.6% in the second, showing that there is a base which could not be underestimated as they are attached to their OS habits.

4.2.5 Those Who Will Switch to FOSS OS

The reasons for switching to a FOSS OS among participants who consider migrating to a FOSS OS in the first survey are shown on Table 4.37. Even though the number of people who consider this is low, one person's stated reason to switch was significant: "Hatred for Microsoft and Gates". The results of the second survey are shown on Table 4.38. Due to the low number of answers the results of the first survey are not discussed.

Reasons for switching to FOSS OS in the near future are mostly to do with FOSS's technical merits. The number one reason is its stability, and the third reason (which is close to the first one) is the security that FOSS provides. The second reason is the curiosity of the participants who want to know its usage. These three reasons got an inclination of over 2.5/3, which is between "absolutely important" and "im-

Table 4.37: Reasons for Switching to a FOSS OS (First Survey)

	Important	Not important	Total
Stability	12	0	12
Easiness to find professional software	11	1	12
Flexibility to configure and control a PC	11	0	11
Independence over firms	10	1	11
Want to know how to use	10	2	12
Not to support financially transnational corporates	10	1	11
To decrease software expenditure	10	1	11
Easy to use	9	2	11
Known users are happy	9	2	11
Other	1	0	1

portant". Other reasons with an inclination over 2 point in the order of importance are, decreasing software expenditure, independence over firms, getting the ability to control and configure the PC and not to finance transnational corporates. The lowest inclination was for the ease of use, the satisfaction of known users and the easiness to find professional grade software. From the data given in Table 4.38, it could be concluded that GUI, desktop usage, user-friendliness are not appreciated by the future FOSS OS users while stability and security are the ultimate reasons for migration.

In the first survey, there were only 12 people who were persuaded to migrate to FOSS OS. Ten of them considered switching during the following three months, which was the shortest period of time among the provided options. One person considered switching within a year, and another within the following two two years. The reasons why they had not already switched are shown on Table 4.39.

In the second survey, those who considered migrating were 104 people. Their estimated time plan for the migration is shown on Table 4.40. 79 of 104 planned to

Table 4.38: Reasons for Switching to a FOSS OS (Second Survey)

	Absolutely important	Important	Less important	Not important	Total	Inclination (over 3)
Stability	72	26	5	3	106	2.58
Want to know how to use it	70	32	4	3	109	2.55
More security	67	33	7	1	108	2.54
To decrease software expenditure	61	33	10	5	109	2.38
Independence over firms	62	27	13	5	107	2.36
Flexibility to configure and control a PC	56	37	12	3	108	2.35
Not to support financially transnational corporates	56	23	17	13	109	2.12
Ease of use	24	42	28	11	105	1.75
Easiness to find professional software	25	37	28	16	106	1.67
Known users are happy	21	41	29	15	106	1.64
Other	5	1	0	0	6	2.83

Table 4.39: Reasons Why Those Who Consider Migration Have Not Done It Yet (First Survey)

	Frequency
I will upgrade my PC	7
There is nobody around who can help me	2
My old files cannot be used in the new system	1
My personal/professional software are not running on the new system	0
Other	2
Total	12

Table 4.40: Time Plan of Migration to FOSS (Second Survey)

	Frequency	Percentage
within 3 months	42	42.0
within 6 months	10	10.0
within a year	32	32.0
within 2 years	12	12.0
2 years after	4	4.0
Total	100	100.0

do this within a year. Reasons why these 104 people have not already migrated are shown on Table 4.41. On Table 4.41 the total number of answers are greater than 104 because some of the participants selected both one of the provided options and the "Other" section.

The planned time for most of the participants (84%) to switch is within a year but the main reason for not having migrated yet is the need to upgrade the PC and the second, the lack of needed professional or educational software. Through various information campaigns, this problem could also be easily surpassed. Most of the software needed by an undergraduate student are in their stable phases and could be downloaded; further, FOSS OS can run even on old hardwares. One of the proposed answers for the survey was the creation of a help center, but it was selected only by two people.

4.2.6 Those Who Will Not Switch to FOSS OS

Participants who do not consider switching to a FOSS OS were given reasons of four choices ("Very important", "Important", "Less important" and "Not important"). Because the number of participants for the first survey was low, the category of "Very important" was added to the "Important" values as well as the "Less important"

Table 4.41: Reasons Why Those Who Consider Migration Have Not Done It Yet (Second Survey)

	Frequency
I will upgrade my PC	51
My personal/professional software does not run or does not have an equivalent on the new system	27
There is nobody around who can help me	9
My old files cannot be used in the new system	8
After a help unit is created whether public or private	2
Other	34
Total	131

category was added to the "Not important" values; further details of this question are shown on Table 4.42. The results of the second survey are on Table 4.43.

In addition to the reasons with an inclination of 2.5/3 with 36 answers is the most important reason for not switching: lack of educational and/or professional purpose software with an inclination of 2.26/3. Other important reasons with an inclination between 2/3 and 1.68/3 include old files which cannot be used, fear of losing data, difficulties of usage and lack of help centers. Less important reasons include security, PC capacity to run FOSS OS and possible financial cost of migration. These findings indicate that the help of some education on FOSS, many users could switch to FOSS OS. The fear of losing data is another consistent reason with the obtained date from the same question.

4.2.7 FOSS OS Users

Those who used FOSS OS in the first survey were rather few, just six people. FOSS OS users consisted of the 6.1% of the second survey's participants and 1.5% of the first

Table 4.42: Reasons for Not Switching to a FOSS OS (First Survey)

	Important	Not Important	Total
Difficulties of usage	38	4	42
There is no place to find help	30	12	42
Old files cannot be used	31	9	40
Some educational/professional softwares are lacking	30	10	40
Afraid to lose some data	27	14	41
Switching will have some financial cost	15	25	40
My own computer cannot run a FOSS OS	7	34	41
Other	5	0	5

Table 4.43: Reasons for Not Switching to a FOSS OS (Second Survey)

	Absolutely important	Important	Less important	Not Important	Total	Inclination (over 3)
Some educational/professional softwares are lacking	131	84	22	21	258	2.26
Old files cannot be used	99	83	37	33	252	1.98
Afraid to lose some data	78	74	46	53	251	1.71
There is no place to find some help	60	105	47	45	257	1.70
Difficulties of usage	59	95	71	36	261	1.68
Not secure	21	52	60	114	247	0.92
Switching will have some financial cost	4	25	54	164	247	0.47
My own computer cannot run a FOSS OS	12	21	35	179	247	0.46
Other	25	7	1	3	36	2.5

Table 4.44: Reasons for Using GNU/Linux OS (First Survey)

	Important	Not important
Stability	5	0
Tried and liked it	5	0
Not to support financially transnational corporates	4	0
To decrease the cost of software expenditure	4	0
Ease of use	3	0
Should use in office/school	3	0
Easier to find educational/professional software	3	0
Did not want to be a lock user of a corporate product	3	0
Flexibility to configure and control a PC	3	0

survey's. In the first survey, there were no BSD users, hence all FOSS OS users were in fact of GNU/Linux. Because, there were two BSD users, in the second survey, the term, FOSS OS, was used to comprise both answers. In this section only the second survey's answers will be discussed because participants who use FOSS OS in the first survey were fewer in number than those of the second survey.

Two participants of the first survey had been using GNU/Linux for six months and the other four for a year. The reasons why they started to use GNU/Linux OS are shown on Table 4.44. Six people who installed GNU/Linux OS for the first time on their own PCs are indicated on Table 4.45. The distribution of the GNU/Linux OS provider is shown on Table 4.46.

82.2% of those using FOSS OS migrated around two years ago or more, are early adopters. The details of this answer can be seen on Table 4.47. The rest adopted within a year. This answer is also one of the main points of evidence in accordance with S shape of the diffusion of innovation theory, a process still in its early days.

Table 4.45: People Who Installed GNU/Linux OS to the Participants PC for the First Time (First Survey)

	Frequency
A friend who knows PCs	2
Someone from the IT department	1
Myself	1
Other	2
Total	6

Table 4.46: Source of the GNU/Linux OS (First Survey)

	Frequency
Writable CD	4
CDs from PC magazines	1
Original boxed set	1
Total	6

Table 4.47: Time Plan of Migration to FOSS Which Has Been Completed (Second Survey)

	Frequency	Percentage
about 6 months ago	3	4.8
about a year ago	8	12.9
about 2 years ago	11	17.7
more than 2 years ago	40	64.5
Total	62	100.0

Table 4.48: Reasons for Using FOSS OS (Second Survey)

	Absolutely important	Important	Less important	Not important	Total	Inclination (over 3)
Security	50	12	1	0	63	2.78
Stability	48	12	2	1	63	2.7
Flexibility to configure and control a PC	44	10	2	6	62	2.48
Did not want to be a lock user of a corporate product	33	12	9	8	62	2.13
Not to support financially transnational corporates	24	16	12	10	62	1.87
Tried and liked	18	21	13	9	61	1.79
To decrease the cost of software expenditure	22	16	9	15	62	1.73
Easier to find educational/professional software	19	14	15	14	62	1.61
Ease of use	6	26	22	7	61	1.51
Should use in office/school	20	9	17	17	63	1.51
Other	5	0	0	0	5	3

The reasons for using FOSS OS and the inclination of the participants are shown on Table 4.48. The top reasons for using FOSS OS are security (2.78/3) and stability (2.7/3); the ease of use and being forced to use in office or school are the least important reasons. Other two important reasons for using FOSS OS include the ability to configure the PC and not being a lock user of a corporate product. These results reveal that FOSS OS users tend to be early adopters with high technical capabilities, giving not so much importance to GUIs or PC usability and so on, but rather, emphasizing the importance of not being manipulated by becoming a lock user of a corporate product.

Among those who did migrate, 52 of 63 people installed FOSS OS by themselves,

Table 4.49: People Who Installed FOSS OS to the Participants' PC for the First Time (Second Survey)

	Frequency
Myself	52
A friend who knows about PCs	8
Department PC coordinator	2
Staff of the Computer Center	1
Total	63

Table 4.50: Source of the FOSS OS (Second Survey)

	Frequency
Writable CD	25
CDs from PC magazines	17
From network (FTP/NFS/HTTP)	11
Ambulant CD vendors	4
CD from METU Computer Center	3
Original boxed set	2
Total	62

once again showing their relative technical competence and ability. 8 of them received help from their friends, which was the second most selected answer. The details can be seen on Table 4.49. And the media distribution used for installation is on Table 4.50.

The source of FOSS OS is mainly a writable CD (25 out of 65 answers) and CDs given by PC magazines (17 out 65 answers). Thus the role of PC magazines is significant concerning this area. The third source was installation over a network (consisting of 11 answers), which has the advantage of being connected to the Internet within the METU campus because important distributions are mirrored on METU's FTP site, or if not found, they can be installed over the ULAKBİM network (National Academic Computer Network).

There were four propositions for those using GNU/Linux in a 5-option Lieckert-

Table 4.51: Four Propositions Given to GNU/Linux Adopters (First Survey)

	Absolutely no	No	No idea	Yes	Absolutely yes	Total
I would aid people around me to adopt FOSS OS.	0	0	3	2	0	5
I would be glad to help people around me regarding FOSS.	0	0	3	2	0	5
I would help my relatives/family to adopt FOSS OS.	0	0	4	1	0	5
I would be glad to help my relatives/family regarding FOSS.	0	0	3	2	0	5

type answers, those of the first survey are shown on Table 4.51. The answers of the second survey are given with their inclination values on Table 4.52. The inclination values on Table 4.52 show that all FOSS users are eager to be of help to their social environment.

In order to understand the lacking aspects of GNU/Linux from the standpoint of adopters, some issues were proposed and questioned. Due to the low GNU/Linux users answers given for "Absolutely important" and "Important" were added, the same procedure is done for "Less important" and "Not important". The details are shown on Table 4.53. And the answers of the second survey are given with their inclinations on Table 4.54. The most important lacking point is the ease of use, is the answer having the highest inclination with 2.25. The other closest answer is support in Turkish with 1.78. Other answers were around 1 point or less. Even though FOSS OS users appear to be early adopters, they are also critical of FOSS OS's non-user-friendliness.

The last question for FOSS OS users, was concerned with their first source of

Table 4.52: Four Propositions Given to FOSS OS Adopters (Second Survey)

	Absolutely no	No	No idea	Yes	Absolutely yes	Total	Inclination (over 5)
I would aid people around me to adopt FOSS OS.	0	2	3	25	31	61	4.39
I would be glad to help people around me regarding FOSS.	0	1	2	25	33	60	4.55
I would help my relatives/family to adopt FOSS OS	1	2	6	27	25	60	4.27
I would be glad to help on my relatives/family regarding FOSS.	0	1	1	22	37	60	4.63

Table 4.53: Lacking Points of GNU/Linux From the Standpoint of Adopters (First Survey)

	Important	Not important	Total
Multimedia	4	1	5
Help	4	0	4
Professional grade software	4	0	4
Professional help from a firm	4	1	5
Slowing down of PCs	3	1	4
Ease of use	3	1	4
Turkish support	3	1	4
Installation	3	1	4

Table 4.54: Lacking Points of FOSS OS From the Standpoint of Adopters (Second Survey)

	Absolutely important	Important	Less important	Not important	Total	Inclination (over 5)
Ease of use	30	17	9	3	59	2.25
Turkish support	18	22	9	11	60	1.78
Professional grade software	10	18	18	15	60	1.38
Support from CC/Dept's coordinator	7	21	8	24	60	1.18
Multimedia	9	17	6	29	61	1.10
Help	8	6	21	25	60	0.95
Professional help from a firm	5	9	24	23	61	0.93
Installation	5	12	15	29	61	0.89
Slowing down of PCs	2	5	9	43	59	0.42
Other	4	1	0	1	6	2.33

information, when they encounter problems regarding their preferred OS; answers of the first survey are on Table 4.55 and of the second, on Table 4.56. According to the second survey, the first source for these early adopters is the Web with 35 answers, and forums, e-mail lists and so on, as the second source with 12 answers.

The survey ended with the question whether the participant wished to receive the results of the survey, and if so the participant were asked to provide their e-mail

Table 4.55: The First Source of Information Whenever a Problem Occurs with the GNU/Linux OS (First Survey)

	Frequency
WEB	3
IT department	1
Friends	1
Total	5

Table 4.56: The First Source of Information Whenever a Problem Occurs with the FOSS OS (Second Survey)

	Frequency
WEB	35
Forums, e-mail lists	12
Friends	10
Documents within the installation CDs	2
Department PC coordinator	1
Total	60

addresses. In the first survey, 239 out of 404 participants (50.9%) wanted to receive the results of the survey. And in the second survey, covering whole METU campus, 795 out of 1224 participants (65.0%) wished to receive the results of the survey. The survey questions both in Turkish and English can be found in the Appendices. In average, neither surveys took more than six minutes to complete.

4.3 Comparison of Innovation Adopter Types

This section will cover only the participants of the second survey. The average age of FOSS users is 23.5, which is slightly higher than the total average of the participants which is 23.2. The average age of FOSS users is the highest average among innovation adopter types. Those who decided not to migrate to FOSS OS have the age average of 22.4, being the lowest within the innovation adopter groups. Furthermore, FOSS users were predominantly male, constituting 96.3% of the early adopters (of 65 people).

The innovation adopter type with the highest PC usage experience is the early adopters of FOSS OS. This group has the average of PC experience of 9.8 years. The second highest PC usage experience belong to those who plan to migrate to FOSS OS with an average of 9.5 years The general average of PC usage experience of the participants of the second survey is 8.4 years. The lowest belongs to those who have

never heard of the concepts of FOSS; this group's PC experience average is 7.4 years.

It has been explained that Open Office and/or Star Office is an important application and platform for the migration process. Those who plan to migrate to FOSS OS (109 people) have a rather high experience in Open Office and/or Star Office, representing 78% of the adopter group. On the other hand, 59% of those who will not migrate (100 people) and 61.7% of those who have no any idea about the migration process (167 people) have tried one of these office suite. 20.3% of those who have never tried any FOSS OS (376 people) have an experience with these office suites. And 43.2% of those who have heard of FOSS concepts (753 people) have used one of these office suites. It can be concluded that as the greater the experience of the office suites, the higher the possibility to migrate to FOSS OS.

Most early adopters come from the Faculty of Engineering (33 people), the METU Computer Center (10 people) and the Faculty of Arts and Science (10 people) of 65 people. 40 of them are undergraduates, 9 are master students, and 14 are research assistants.

4.4 Chapter Summary

Two similar web-based surveys were conducted for this research. The first survey was held during 27-28 September 2003 after the examination of exemption for the IS100 course. The second survey was held between 23 March and 24 May 2004 at the whole of the METU campus. This survey was open to all students and academic and non-academic staff with a METU network account. In this section, some of the data of the first survey has been omitted due to the small number of answers compared to the second survey and only the most important data are presented.

There were 402 participants in the first survey and 1224 in the second. The average age for the first survey was 18.8 and 23.2 for the second one. 16.6% of the participants of the second survey are academicians, while 79.9% are undergraduate students.

Participants representing 43.3% of the first survey and 36.9% of the second, showed that they get an aid from their friends whenever a problem is encountered with their PCs. Also, friends constitute the most important routes in obtaining software. Other illegal ways consist of ambulant street vendors (who are in fact just sellers of often pirated software copies) and peer to peer programs. In the first survey, the total percentage of these three sources is 60.3% and in the second, 56.1% of participants.

To find out how FOSS is generally perceived and how the participants might respond to different innovation-decision process led to three Lieckert type propositions, results are given on Table 4.57.

FOSS OS users consisted of the 6.1% (of 65/1063 people) of the second survey's participants and 1.5% (of 8/393 people) of the first survey's. Security is the main reason to use FOSS OS with an inclination The findings reveal that 28.9% of the participants of first survey and 28.9% of the second one have downgraded at least once after having installed a new OS.

FOSS OS users consisted of the 6.1% (of 65/1063 people) of the second survey's participants and 1.5% (of 8/393 people) of the first survey's. Security is the main reason to use FOSS OS with an inclination of 2.78/3 for the second survey.

The awareness of innovation i.e. to the free, open source softwares in the first survey is 40.5% (of 159/393 people), and in the second one, 77.1% (of 823/1068 people).

Among the FOSS aware participants, 37.2% of the first survey (of 58/156 people)

Table 4.57: Three Lieckert Type Propositions

	Number of answers (first survey)	Inclination, over 5 (first survey)	Number of answers (second survey)	Inclination, over 5 (second survey)
Public sector should consider solutions other than software which have a licensing fee.	384	3.69	1060	3.99
As a personal user I should consider other solutions than software which have licensing fees (i.e. Microsoft products) in order to decrease my own expenditure.	385	4.30	1057	3.99
I am afraid of losing data while installing new software on my computer.	381	3.26	1057	3.04

and 50.3% (of 381/757 people) of the second survey, have tried any FOSS OS.

Participants who have tried FOSS OS once and consider migrating constituted 21.1% (of 12/57 people) of the first survey and 29.5% (of 112/380 people) of the second survey. Stability is the first reasons for considering to migrate to FOSS OS with 2.58/3 inclination for the second survey. Those who consider migrating to FOSS OS is waiting to upgrade their PCs.

The percentage of those who did not have any opinion on migration to FOSS OS was rather high however: 45.6% (of 26/57 people) in the first survey and 43.9% (of 167/380 people) in the second survey. Those who do not consider switching was 33.3% (of 19/57 people) in the first survey and 26.6% (of 101/380 people) in the second survey.

The most important reasons not to migrate FOSS is the difficulties of usage with 2.5/3 inclination for the first survey and missing softwares for the second survey with 2.26/3 inclination.

CHAPTER 5

CONCLUSION

The nature of software is different than the hybrid seed corn which was started to be used in 1928 in Iowa farms giving the most influential diffusion study. For most computer users a PC is just another gadget, not unlike a microwave oven or a toaster. The habitual patterns of behaviors involving today's PC users are difficult to affect of modify, especially because they often heavily rely on the familiar software for their routine daily tasks. However there is still a usability problem in the domain of free and open source software which is accepted even by the "early adopters" who have participated in the surveys needed for this research However, with the rising interest amongst the FOSS developers in this field, it is possible to envisage that these problems constitute a part of "history" in the near future.

As expected, Microsoft OS rules within the METU campus. 1.5% of the first survey is participants (who provided 393 valid answers) and 6.1% of the second survey's participants (of 1063 valid answers) use FOSS OS. But according to the surveys there is a large PC user base which could migrate to GNU/Linux system. Older versions of Windows OS which consist of 55.5% for the first survey and 28.8% for the second survey are still very popular but generally their upgrade would require a hardware upgrade as well. If well configured, the migration to GNU/Linux, which does not

require much hardware resource, could be carried out with no complications. By migrating, this user base could acquire the latest versions of software with enhanced security.

Those who are unsatisfied with their installed version of Windows OS also present a great potential for further encouragement of the use of GNU/Linux OS. According to the findings of this thesis, 12.3% of the first survey's participants who mainly use Windows OS, and in the second survey 9.3% who use Windows XP, 15.6% who use Windows 98, and 12.1% who use Windows 2000 were are not satisfied with their OS.

On the other hand, there is also a potential group of users who might migrate to GNU/Linux, i.e. the group which downgrade back to an earlier version of Windows OS, after an upgrade has been made. These users constitutes 29.1% of the first survey and 26.2% of the second one covering the usage of all versions of Windows OS. This downgrade process is probably due to backward incompatibilities among softwares, hardware problems and/or difficulties concerning the change of established habits.

Some Lieckert type propositions were given to all participants; according to these propositions, the process of migration within the public places is welcome greatly with an inclination of 3.69/5 for the first survey and 3.99/5 for the second survey as long as the process is explained on the basis of public economical advantages and gains. The inclination gets stronger for the first survey, 4.30/5 or equal for the second survey with 3.99/5 as this economical gain becomes personal. But personal migration becomes more difficult if the user is provided with no help or guide the installation of any new software; the inclination for this proposition is 3.26/5 for the second survey and 3.04/5 for the second one. Hence it is suggested that such solutions as Live CDs might help the user overcome his/her fear or reluctance for such installations.

The awareness of free and open source software for the first survey is 40.6% and 77.1% for the second one, providing important data and information on the METU's social system. Looking at the PC and Internet users habits, it could be stated that the higher the speed of the Internet connection, the greater the number of GNU/Linux users. Results show that there is also a group of Microsoft OS lock users, who could be persuaded at least to use a cross-platform office-suite like Open Office as a first step to approach FOSS.

As the participants' character-profiles evolve the trialability of FOSS OS increases. In the first survey, 37.2% of those who have heard of the FOSS concept, and in the second survey, 50.3% of those who have tried FOSS OS once. The consideration of migration to a free or open source OS is also high amongst the participants of the second survey. 21.1% of the first survey and 29.5% of the second survey participants, who have tried any FOSS OS at least once, consider migrating to a free or open source OS.

There is an important user base who regularly uses some version of Microsoft OS, but have tried FOSS OS for the first time two or more years before the date of the surveys. If these people have only tried out or experienced what FOSS was at least two or more years earlier, then it is natural to assume that they might have got a false and/or unrepresentative impression of FOSS.

According to the surveys used in this study, use of FOSS OS is still in its early stage, but with appropriate policies their percentage of employment and accessibility would rise, at least decreasing the economical cost of software usage in METU as well as generally with all students who eventually graduate and leave. On the other hand, with its large number of different PC users METU would be an important laboratory

for the design of migration policies from which other institutions in Turkey could also benefit.

The author believes that an informative campaign should be designed openly through the medium of the Internet together with the collaboration of METU's FOSS users. For such a collaboration to take place, some simple initiative could be encouraged or provided especially by the METU Computer Center. This could involve the creation of a site such as http://linux.metu.edu.tr/ which should give some basic and simple tips, hints and links much needed for a potential METU GNU/Linux community. Moreover, the addition of a discussion list solely related to FOSS usage in METU should also be considered.

Furthermore, a Live CD that is based on KNOPPIX but customized for METU might be created and distributed with the help of the METU FOSS users and the METU Computer Center. Hence, the relationship between the METU FOSS users and the METU Computer Center is crucial; if such a relationship is to be based solely within the METU Computer Center's bureaucratic hierarchies, the possible volunteer group would be much less willing to collaborate than hoped. If one is to consider a kind of hierarchy, it should be based on technical excellence and meritocracy, so that a communal feeling among METU FOSS users can be created.

Presentations, seminars and conferences in FOSS which target these decision makers could be held in addition to other presentations focusing more on the technical merits of these softwares. Installation festivals or what is known within the FOSS community as "installfests", where newbies bring their PCs and are helped by experienced users in the installation of a FOSS OS, can be highly effective and successful within the campus. Installfest is a very important means for the possible migration of

users who feel uncertain or even intimidated by the task and idea of the installation of a new operating system.

One of the most important issues is that the Institute of Informatics, which provide the IS100 courses, should consider stopping the use of the Microsoft material alone. Course curriculum should also comprise FOSS and focus more on computer literacy and not on one product array.

A catalog of required softwares for METU's undergraduate courses should be created and the possible FOSS equivalent should be used or at least proposed to students and academicians. This catalog should be designed with the help of METU's FOSS community.

The breaking of monoculture in a network environment is another crucial aspect. Today, viruses and other threats still target one architecture only and no virus-like threats exist which could target different architectures simultaneously. On the other hand, such courses as IS100 should not just use and teach Microsoft materials, because a university is a place where different approaches should be discussed and tried out, and not contribute to a worldly reigning monoculture.

A massive migration would be extremely difficult in the case of a university; a collective innovation-decision especially would be almost impossible and an authority innovation-decision cannot be taken easily. But such initiative could be taken for the university staff who use PCs for their administrative work, electronic correspondence, and son on. However, academicians should not be targeted for the purpose of the authority innovation decision in the same degree or manner. Instead, a slow paced but massive information campaign with an optional innovation-decision might be initiated. Because academicians have other special usage of PC and most crucially, they

are often difficult to be persuaded to use other system or solutions than what they already use. Thus, after a well-defined, and large user base of FOSS is established, academicians might also be persuaded to switch to use FOSS; or, if the "decision makers" are convinced of FOSS, an authority innovation-decision can be implemented with confidence.

However, it is crucial that a strong unifying vision amongst these decision makers is preserved, maintained and developed, as in the example of gnuLinEx project supported by the Extremadura Regional Government of Spain where

> The Local Ministry for Education, Science and Technology policy lies in the application of technological innovation for the promotion of freedom and equal opportunities, taking advantage of and putting at the disposal of everyone, what is nobody's property: the knowledge gathered by Humanity all through History. (Extremadura Regional Government, 2004)

Follow-up research on the diffusion of FOSS is vital for the theory of the diffusion of innovation and for the design of policies for the diffusion of FOSS. The diffusion of OS and other softwares for desktop PCs with connection to their license schemes and the impact of related policies of conduct would be extremely interesting to further pursue and investigate, particularly within the framework of the diffusion of innovation theory of which there does not appear to be any examples in the current literature.

REFERENCES

Aharonian, G. (1996). 1995 Software patent statistics. *Internet Patent News Service http://lpf.ai.mit.edu/Patents/1995-patents.html.*

Bell, D. (1973). *Coming of Post-Industrial Society: A Venture in Social Forecasting.* Basic Books.

Berger, M. (2002). Chinese government raises Linux sail. *Info World, http://www.infoworld.com/articles/hn/xml/02/08/13/020813hnchina.xml.*

Bezroukov, N. (1999). A second look at the cathedral and the bazaar. *First Monday, http://www.firstmonday.dk/issues/issue4_12/bezroukov/.*

Bhattacharya, P. (2002). Government move on to let in Linux. *India Times, http://economictimes.indiatimes.com/cms.dll/html/uncomp/articleshow?artid=32354337.*

Bodnar, L. (2004). Linux Distributions - Facts and Figures. *http://www.distrowatch.com/stats.php.*

Bonaccorsi, A. and Rossi, C. (2003). Why Open Source Can Succeed. *Research Policy*, 32:1243–1258.

Brod, C. (2004). SOLIS, Free Software Co-operative. *http://www.solis.coop.br/.*

Brooks, F. (1975). *The Mythical Man-Month: Essays on Software Engineering.* Addison-Wesley.

Burkey, J. and Kuechler, W. (2003). Web-based surveys for corporate information

gathering: a bias-reducing design framework. *IEEE Transactions on professional communication*, 46(2):81–93.

Castells, M. (2000). *The Rise of the Network Society*. Blackwell Publishers.

Castells, M. (2001). *Internet Galaxy*. Oxford University Press.

Cha, A. (2002). Europe's Microsoft alternative. *Washington Post*.

Cusumano, M. and Selby, R. (1995). *Microsoft Secrets*. Free Press, New York.

Debrard, S. (2004). La France et la Chine poursuivent leurs relations commerciales: L'Open Source en argument de vente. *http://linuxfr.org/2004/10/13/17412.html*.

DeLanda, M. (2001). Open-Source: A Movement in Search of a Philosophy. *http://www.cddc.vt.edu/host/delanda/pages/opensource.htm*.

Dibbel, J. (2004). We Pledge Allegiance to the Penguin. *http://www.wired.com/wired/archive/12.11/linux.html*.

DiBona, C., Ockman, S., and Stone M., editors (1999). *Open Sources: Voices from the Open Source Revolution*. O'Reilly.

Eroğlu, M. and Öngün, M. (2004). Özgür yazılımlarla Merkez Bankası deneyimi (The free software experience in the Central Bank of Turkey). *Free Software & Open Source Days, Bilgi University, Istanbul*.

Extremadura Regional Government (2004). Background. GNU/LinEx (Free Software) is just a part of a bigger project. *http://www.linex.org/linex2/linex/ingles/antecedentes_ing.html*.

Fitzgerald, B. and Tony, K. (2003). Open Source Software can Improve the Health of the Bank Balance - The Beaumont Hospital Experience. *http://opensource.mit.edu/papers/fitzgeraldkenny.pdf*.

Flynn, R. and Preston, P. (1999). The long-run diffusion and techno-economic perfomance of national telephone networks: a case study of Ireland, 1922-1998. *Telecommunication policy*, 23:437–457.

Foucart, S. and Macke, G. (2004). Microsoft contre-attaque face à l'essor des logiciels libres. *Le Monde, http://www.lemonde.fr/web/article/0,1-0@2-3234,36-379924,0.html*.

Geray, H. (2003). *İletişim ve teknoloji*. Ütopya, Ankara.

Geroski, P. (2000). Models of technology diffusion. *Research Policy*, 29:603–625.

Ghosh, R. (2003). Licence fees and GDP per capita: The case for open source in developing countries. *First Monday, http://firstmonday.org/issues/issue8_12/ghosh/index.html*.

Ghosh, R. and Glott, R. (2002). *Free/Libre/Open Source Software Study - Final Report*. MERIT/Infonomics; Berlecon Research.

Ghosh, R. and Prakash, V. (2000). The orbiten free software survey. *http://orbiten.org/ofss/01.html*.

Gonzalez-Barahona, J., Perez, M., de las Heras Quiros, P., Gonzalez, J., and Olivera, V. (2002). Counting potatoes: The size of Debian 2.2. *http://opensource.mit.edu/papers/counting-potatoes.html*.

Hahn, R., editor (2002). *Government Policy toward Open Source Software*. AEI-Brookings Joint Center for Regulatory Studies.

Hertel, G., Niedner, S., and Herrmann, S. (2003). Motivation of software developers in Open Source projects: an Internet-based survey of contibutors to the Linux kernel. *Research Policy*, 32:1159–1177.

Himanen, P. (2001). *The hacker ethic and the spirit of the information age*. Vintage.

Hoch, D. (1999). *Secrets of Software Success: Management Insights from 100 Software Firms Around the World*. Harvard Business School Press.

Interchange of Data between Administrations (2004). Limux - the IT-Evolution. *http://europa.eu.int/ida/en/document/3223/470*.

Jazdzewski, S. and Jazdzewski, C. (1995). Hacker Jargon. http://www.jargon.net/.

Jones, P. (2000). Brooks' Law and open source: The more the merrier? *http://www-106.ibm.com/developerworks/linux/library/os-merrier.html*.

Kelsey, J. and Schneider, B. (1999). The street performer protocol and digital copyrights. *First Monday, http://www.firstmonday.dk/issues/issue4_6/kelsey/*.

Kenwood, C. (2001). A Business Case Study of Open Source Software. Technical report, MITRE Corp.

Koch, S. and Schneider, G. (2002). Effort, Co-operation and Co-ordination in an Open Source Software Project: GNOME. *Information System Journal*, 12.

Krishnamurty, S. (2002). Cave or community? An empirical examination of 100 mature open source projects. *http://freesoftware.mit.edu/papers/krishnamurthy.pdf*.

Lerner, J. and Tirole, J. (2000). The simple economics of open source. *http://www.nber.org/papers/w7600*.

Lettice, J. (2002). Secure Linux desktop begins shipping to UK police force. *The Register, http://www.theregister.co.uk/content/4/27692.html*.

Leyden, J. (2002). Brusels to spend $250,000 on Linux migration study. *The Register, http://www.theregister.co.uk/content/4/27853.html*.

Luyt, B. (2004). Who benefits from the digital divide? *The First Monday, http://firstmonday.org/issues/issue9_8/luyt/index.html*.

Machlup, F. (1962). *The Production and Distribution of Knowledge in the United States*. Princeton University Press.

Madanmohan, T. and Navelkar, S. (2002). Roles and knowledge management in online technology comunities: An etnography study. *http://freesoftware.mit.edu/papers/madanmohan2.pdf*.

Mahler, A. and Rogers, E. (1999). The diffusion of interactive coomunication innovations and the critical mass: the adoption of telecommunications services by German banks. *Telecommunications policy*, 23:719–740.

May, C., editor (2003). *Key thinker for the information society*. Routledge.

Microsoft Corp. (1998). Hallowen document I, Microsoft internal memo. *http://www.opensource.org/halloween/halloween1.html*.

Microsoft Corp. (2003). Microsoft Announces Government Security Program. *http://www.microsoft.com/presspass/press/2003/jan03/01-14GSPrelease.asp*.

Miller, K. (2003). U.S. Brands on the run. *Newsweek*.

MITRE Corp. (2004). MITRE Corp. *http://www.mitre.org/*.

Mockus, A., Fielding, R., and Herbsleb J. (2000). A Case Study of Open Source Software Development: The Apache Server. *In Proceedings of the 22nd International Conference of Software Engineering*.

National Security Agency (2001). National Security Agency Shares Security Enhancements to LINUX. *http://www.nsa.gov/releases/relea00027.cfm*.

Nichols, D. and Twidale, M. (2003). The usability of open source software. *http://www.firstmonday.dk/issues/issue8_1/nichols/index.html*.

Noronha, F. (2003). Free Software Carnival: Latin America Takes to FLOSS in a Big Way. *http://www.linuxjournal.com/article/6915*.

O'Mahony, S. (2003). Guarding the commons: how community managed software projects protect their work. *Research Policy*, 32:1179–1198.

Open Source Initiative (2003a). Advocacy. *http://www.opensource.org/advocacy/*.

Open Source Initiative (2003b). The Open Source Case for Hackers. *http://www.opensource.org/advocacy/case_for_hackers.php*.

Open Source Initiative (2004a). The Open Source Case for Business. *http://www.opensource.org/advocacy/case_for_business.html*.

Open Source Initiative (2004b). The Open Source Case for Customers. *http://www.opensource.org/advocacy/case_for_customers.html*.

Osorio, C. (2002). A Contribution to the Understanding of Illegal Copying Software. *http://opensource.mit.edu/papers/osorio.pdf*.

Perens, B. (1998). The open source definition. *http://perens.com/articles/osd.html*.

Raymond, E. (2002a). *The cathedral & the bazaar*. O'Reilly.

Raymond, E. (2002b). Homesteading the Noosphere. *http://www.catb.org/ esr/writings/homesteading/homesteading/*.

Red Hat Inc. (2004). Red Hat Glossary. http://www.redhat.com/docs/glossary/.

Rogers, E. (1995). *Diffusion of Innovation*. The Free Press, New York.

Scheeres, J. (2002). Peru Discovers Machu Penguin. *http://www.wired.com/news/business/0,1367,51902,00.html*.

Shankland, S. (2003). Governments to see Windows code. *ZDNet, http://news.zdnet.com/2100-3513_22-980666.html*.

Sony Corp. and Matsushita Corp. (2002). Press release of Sony and Matsushita collaboration. *http://www.sony.net/SonyInfo/News/Press/200212/02-1218bE/index.html*.

Spiller, D. and Wichmann, T. (2002). *Free/Libre and Open SOurce Software: Survey and Study*. Berlecon Research GmbH, Berlin.

Stallman, R. (1984). The GNU Manifesto. *http://www.gnu.org/gnu/manifesto.html*.

Stallman, R. (1994). Why Software Should Not Have Owners. *http://www.gnu.org/philosophy/why-free.html*.

Stallman, R. (1996a). The free software definition. *http://www.gnu.org/philosophy/free-sw.html*.

Stallman, R. (1996b). Overview of the GNU Project. *http://www.gnu.org/gnu/gnu-history.html*.

Stallman, R. (1997). Linux and the GNU project. *http://www.gnu.org/gnu/linux-and-gnu.html*.

Stallman, R. (1998a). The GNU Project. *http://www.gnu.org/gnu/thegnuproject.html*.

Stallman, R. (1998b). Why "Free Software" is better than "Open Source". *http://www.gnu.org/philosophy/free-software-for-freedom.html*.

Stallman, R. (2000). What's in a name? *http://www.gnu.org/gnu/why-gnu-linux.html*.

Stallman, R. (2003). Speech at WSIS. *http://www.gnu.org/philosophy/wsis-2003.html*.

STMicroelectronics (2004). STMicroelectronics to Participate in China's Open-Source Computing Initiative. *http://www.st.com/stonline/press/news/year2004/t1534h.htm*.

Suvasa, E. (1996). GNU Head. *http://www.gnu.org/graphics/agnuhead.html*.

Temizlisoy, O. (2003). UlakNet Operasyonel Problemler. *Akademik Bilişim 2003, Adana, http://www.ulakbim.gov.tr/belgeler/ab2003/opprob/*.

The Office of Government Commerce (2004). Open Source Software Trials in Government Final report. *http://www.ogc.gov.uk/oss/Report-v8c.htm*.

Toffler, A. (1989). *The Third Wave*. Bantam Books.

TUENA, T. U. E. A. P. O. (1999). Turkish National Information Infrastructure Masterplan. Technical report, TÜBITAK Bilten.

Webopedia (2004). Webopedia Terminology. http://www.webopedia.com/TERM/E/easter_egg.html.

Webster, F. (2002). *Theories of the information society, 2nd ed.* Routledge.

Wheeler, D. (2001). More Than a Gigabuck: Estimating Linux's Size. *http://www.dwheeler.com*.

wordiq.com (2004). Searchable reference tool on the web. http://www.wordiq.com/.

Zeitlyn, D. (2003). Gift economies in the development of open source software: anthropological reflections. *Research Policy*, 32:1287–1291.

Appendix A

QUESTIONS OF THE FIRST SURVEY

A.1 Questions Given in Turkish for the First Survey

1 - Yaşınız? (14-25)

2 - Cinsiyetiniz? (Erkek-Kadın)

3 - Bitirdiğiniz lise türü alttakilerden hangisidir?

4 - ODTÜ'de ilk seneniz mi? (Evet-Hayır)

5 - Kaç yıldır bilgisayar kullanıyorsunuz?

1 yıldır
2 yıldır
3 yıldır
3 yıldan daha fazla

6 - Bigisayarınızda sorun çıkınca en fazla destek aldığınız 2 seçeneği işaretleyiniz?

Arkadaşımdan
Web'den
Profesyonel destek alıyorum
Üniversite/Okul kütüphanesi'nden
Satınaldığım kitaplardan
Kurulum CD'sindeki belgelerden
Destek aramıyorum
Diğer

7 - Kullandığınız ilk işletim sisteminiz (OS) neydi?

DOS
Win3.1
Win95
Win98
Win2000
XP
Mac
Linux
BSD (Free/Net/Open)
Unix türevi(AIX,HP-UX,Solaris vs.)
Diğer

8 - Şu sırada genelde kullandığınız işletim sisteminiz (OS) nedir? (7. sorunun cevapları ile aynı)

Bu soruya Linux veya BSD cevabı verenler Bölüm A.1.6'e yönlendiriliyor.

9 - Şimdi kullandığınız işletim sisteminden memnun musunuz? (Evet-Hayır-Emin değilim)

10 - İşletim sisteminizin yeni sürümüne geçip, sorun yaşadıktan sonra alışık olduğunuz bir eski sürüme geri döndünüz mü? (Evet-Hayır)

11 - Yazılımları en çok nereden ediniyorsunuz?

Aldığım bilgisayarla geldi
Okulum/iş yerim sağlıyor
Arkadaşlarımdan
Sokaktaki seyyar satıcılardan
Kişisel paylaşım(P2P) programlarından (Kazaa, eDonkey vs.)
Yetkili satıcılardan satın alıyorum
GPL'li yazılım kullanıyorum

12 - Aşağıdaki önermelere ne kadar (kesinlikle evet, evet, fikrim yok, hayır, kesinlikle hayır) katıldığınızı belirtiniz.

a. Devlet sektöründe harcamalrın azaltılması için paralı yazılımlar dışında başka seçenekler de değerlendirilmelidir.

b. Kişisel kullanıcı olarak yazılım harcamalarımı daha düşüreceği için para ödememi gerektiren yazılımlar (ör.Mıcrosoft ürünleri) dışında başka bir seçeneği değerlendiririm.

c. Bilgisayarıma yeni bir program kurarken veri kaybından veya varolan sistemin bozulmasından çekiniyorum.

13 - Özgür yazılım(free software), açık kaynak kodlu yazılım(open source software) kavramlarını duydunuz mu? (Hayır-Evet)

Bu soruya "Hayır" cevabı verenler Bölüm A.1.7, "Evet"cevabı verenler ise Bölüm A.1.1'e yönlendiriliyor.

A.1.1 Kavramları duymuş

14 - Özgür yazılım(free software), açik kaynak kodlu yazılım(open source software) kavramlarını ilk kimden veya nereden duydunuz?

Arkadaş çevremden
Aldığım derslerden
Televizyon'dan
Basılı yayınlardan
İnternet'ten
Radyo'dan
Bilgisayar kursundan

15 - Open Office denediniz mi? (Hayır-Evet)

16 - Star Office denediniz mi? (Hayır-Evet)

17 - Daha önce hiç Açık Kaynak Kodlu işletim sistemi denediniz mi? (Hayır-Evet)

Bu soruya "Hayır" cevabı verenler Bölüm A.1.2, "Evet"cevabı verenler ise Bölüm A.1.3'e yönlendiriliyor.

A.1.2 Microsoft ürünleri kullanıyor ve Linux denememiş

18 - Açık Kaynak Kodlu işletim sistemi denememenizin temel nedenlerini, önemini (çok önemli, önemli, az önemli ve önemsiz) belirterek işaretleyiniz.

Merak etmiyorum
Yardım alabileceğim bir arkadaşım yok
Yardım alabileceğim bir dernek/kurum/öğrenci topluluğu yok
Kendime güvenemiyorum
CD bulamıyorum
İnternet'ten kendi makinama indirmek için network hızım yavaş
Öğrenciye uygun eğitim veren bir şirket yok
Türkçe başlangıç seviyesi kitap bulamadım
Diğer

Bu sorudan sonra katılımcı Bölüm A.1.7'ye yönlendiriliyor.

A.1.3 Microsoft ürünleri kullanıyor ve Linux denemiş

19 - İlk defa herhangi bir Açık Kaynak Kodlu işletim sistemini ne zaman denediniz?

6 ay önce
1 yıl önce
2 yıl önce
2 yıldan daha önce

20 - Açık Kaynak Kodlu işletim sistemine geçmeyi düşünüyor musunuz? (Hayır-Emin Değilim-Evet)

Bu soruya "Hayır" ve "Emin Değilim" cevabı verenler Bölüm A.1.5, "Evet" cevabı verenler ise Bölüm A.1.3'e yönlendiriliyor.

A.1.4 Microsoft ürünleri kullanıyor, Linux denemiş ve Linux'a geçecek

21 - Açık Kaynak Kodlu işletim sistemine geçme isteğinizin temel neden(ler)ini, önemini (çok önemli, önemli, az önemli ve önemsiz) belirterek işaretleyiniz.

Kullanımı kolay
Kararlı, olmadık yerde çökmüyor
Çevremde kullananlar memnun
Öğrenmek istiyorum
Aradığım mesleki programları bulmak daha kolay
Bir şirkete bağlı kalmak istemiyorum
Yazılım maliyetini düşürmek için
Kullandığım makineyi kendime göre biçimlendirmek için
Ulusötesi şirketlere para ile destek vermemek için
Diğer

22 - Ne zaman geçmeyi düşünüyorsunuz?

3 ay içinde
6 ay içinde
1 yıl içinde
2 yıl içinde
2 yıldan sonra

23 - Hala geçmeyişinizin en önemli nedenini işaretleyiniz.

Çevremde yardım alacağım yer yok
Eski dosyalarım hala düzgün açılmıyor
Bilgisayarımı yenileyeceğim
Özel/Kamu yardım birimi kurulunca
Diğer

Bu sorudan sonra katılımcı Bölüm A.1.7'ye yönlendiriliyor.

A.1.5 Microsoft ürünleri kullanıyor, Linux denemiş ve Linux'a geçmeyecek

20 - Açık Kaynak Kodlu işletim sistemine geçmemenizin temel neden(ler)ini, önemini (çok önemli, önemli, az önemli ve önemsiz) belirterek işaretleyiniz.

Kullanımı zor
Yardım alacağım kişi/yer yok
Eğitim/Mesleki programlarım çalışmıyor
Eski dosyalarımı açamıyor
Verilerimi kaybetmek istemiyorum
Maddi yük getirecek
Bilgisayarımı yeterli görmüyorum
Diğer

Bu sorudan sonra katılımcı Bölüm A.1.7'ye yönlendiriliyor.

A.1.6 Açık Kaynak Kodlu İşletim Sistemi Kullanıyor

14 - Özgür yazılım(free software), açık kaynak kodlu yazılım(open source software) kavramlarını ilk kimden veya nereden duydunuz?

Arkadaş çevremden
İnternet'ten
Aldığım derslerden
Televizyon'dan
Radyo'dan
Basılı yayınlardan
Bilgisayar kursundan

15 - Ne zamandır Açık Kaynak Kodlu işletim sistemi kullanıyorsunuz?

6 aydan beri
Yaklaşık 1 yıldan beri
Yaklaşık 2 yıldan beri
2 yıldan daha fazla

16 - Açık Kaynak Kodlu işletim sistemine geçmenizin temel neden(ler)ini, önemini (çok önemli, önemli, az önemli ve önemsiz) belirterek işaretleyiniz.

Kullanımı kolay
Kararlı, olmadık yerde çökmüyor
Okulda/işyerinde kullanmam gerekiyordu
Denemek istiyordum, beğendim
Aradığım eğitim/mesleki programları bulmak daha kolaydı
Bir şirkete bağımlı kalmak istemiyordum
Yazılım maliyetini düşürmek içindi
Kullandığım makineyi kontrol etmek istiryordum
Ulusötesi şirketelere para ile destek vermemek içindi
Diğer

17 - Bilgisayarınıza ilk Açık Kaynak Kodlu işletim sistemini kuran kimdi?

Bilgisayar bilen bir arkadaşım
Kendim
Aldığım bilgisayarla geldi
İş yerindeki bilgi işlem çalışanı

18 - İlk Açık Kaynak Kodlu işletim sisteminizi nereden kurdunuz?

Yazılabilir CD'den
Dergilerin verdiği CD'den
Network üstünden (FTP/NFS/HTTP)
Sokak satıcılarından aldığım CD'den
Orjinal kutulu set

19 - Aşağıdaki önermelere ne kadar (kesinlikle evet, evet, fikrim yok, hayır, kesinlikle hayır) katıldığınızı belirtiniz.

a. Çevrenizdeki bilgisayar kullanıcılarının Açık Kaynak Kodlu işletim sistemine (Linux, BSD vs.) geçmesi gereklidir.

b. Çevrenizdeki bilgisayar kullanıcılarına Açık Kaynak Kodlu işletim sistemi (Linux, BSD vs.) konusunda yardımcı olurum.

c. Bilgisayar kullanan aile fertlerimi/akrabalarımı Açık Kaynak Kodlu işletim sistemine (Linux, BSD vs.) geçirmek isterim.

d. Bilgisayar kullanan aile fertlerime/akrabalarıma Açık Kaynak Kodlu işletim sistemi (Linux, BSD vs.) konusunda yardımcı olurum.

20 - Sizce Açık Kaynak Kodlu işletim sistemlerinde görülen temel eksiklikleri, önemini (çok önemli, önemli, az önemli ve önemsiz) belirterek işaretleyiniz.

Daha kolay kullanımlı olmalı
Türkçe desteği kısıtlı
Aradığımı kolayca bulamıyorum
Kurmak zor geliyor
Profesyonel düzeyde mesleki programları bulmak zor
Bir şirketten profesyonel destek almak zor
Yeterli oyun yok
Bilgisayrım eskisine göre yavaş çalışıyor
Diğer

21 - Açık Kaynak Kodlu işletim sistemlerinde ilk desteği nereden buluyorsunuz?

Arkadaşımdan
WEB'den
İnternet üstündeki tartışma listeleri, forumlar
Bilgi işlem görevlisinden
Profesyonel destek alıyorum
Kütüphanedeki kitaplardan
Kurulum CD'sindeki belgelerden

Bu sorudan sonra katılımcı Bölüm A.1.7'ye yönlendiriliyor.

A.1.7 Son sorular

Alttaki iki soruyu cevaplamadığınız/doldurmadığınız durumda her iki soruya da HAYIR cevabı vermiş olacaksınız.

- Bu anketle ilgili olan tez bittikten sonra sonuçlar hakkında e-posta aracılığı ile haber almak ister misiniz? (Evet)

- Gerekli görülürse e-posta ile daha derinlemesine görüşmeyi kabul eder misiniz?

A.2 Translations of the Questions Given for the First Survey

1 - Age? (14-25)

2 - Sex? (Male-Female)

3 - Please choose the type of your high school?

4 - Is this your first year at METU? (Yes-No)

5 - Since how many years are you using a PC?

1 year
2 years
3 years
More than 3 years

6 - Please tick two of the most important help sources whenever you encounter a problem with your PC.

My friends
The Web
Professional solution providers
University library
Books that has been bought
Documents within the installation CD
Do not need any help
Other

7 - What was the first OS that you have ever used?

DOS
Win3.1
Win95
Win98
Win2000
XP
Mac
Linux
BSD (Free/Net/Open)
Unix (AIX,HP-UX,Solaris vs.)
Other

8 - What is the OS that you are using generally? (Same answer set as the 7th question)

Those answering as Linux or BSD are directed to Section A.2.6.

9 - Are you satisfied with the OS that your are using generally? (Yes-No-Do not know)

10 - Have you ever switched to the previous OS due to the problems encountered after an OS upgrade? (Yes-No)

11 - From where are you procuring needed softwares?

Comes preloaded with the PC
My university/job is procuring them
My friends
Ambulant street vendors
Peer to peer on line sharing softwares (Kazaa, eDonkey etc.)
Authorized vendors
Using GPLed software

12 - Please give your opinion (absolutely yes, yes, no idea, no, absolutely no) to the propositions given below.

a. The public sector should consider other software solutions if it costs less to the public expenditure.

b. As a personnel user I should consider other solutions than software which have licensing fees(i.e. Microsoft products) in order to decrease my own expenditure.

c. I am afraid to damage my PC or loose any data while installing a new software to my PC.

13 - Have you ever heard of free software and/or open source software concepts? (Yes-No)

Those answering as "No" to this questions are directed to Section A.2.7 and those answering as "Yes" are directed to Section A.2.1.

A.2.1 Those who have heard of the concepts

14 - From where have you ever heard the concepts of free software and/or open source software for the first time?

From my friends
From the courses
From the TV
From the printed press
From the Internet
From the radio
From the PC courses

15 - Have you ever tried Open Office? (Yes-No)

16 - Have you ever tried Star Office? (Yes-No)

17 - Have you ever tried once any Open Source operating system? (Yes-No)

Those answering as “No” are directed to Section A.2.2 and those answering as “Yes” are directed to Section A.2.3.

A.2.2 Using Microsoft products and have never tried Linux

18 - What are the reasons for not having tried any Open Source operating system, please state the importance (very important, important, not much important, not important) of your choice(s).

I am not interested
I do not have any friends who can help me
I do not know any student society which can help me
I do not have any self-confidence
I can not find any installation CD
I can not download to my PC due to poor Internet connection
There is not any firm which can give specialized courses
I can not find any entry level book in Turkish
Other

After this question, the participant is directed to Section A.2.7.

A.2.3 Using Microsoft products and tried at least once a GNU/Linux

19 - When have you ever tried your first Open Source operating system?

6 months before
1 year before
2 years before
More than 2 years before

20 - Are you considering to migrate to any Open Source operating system? (Yes-Not sure-No)

Those answering as “No” and those who who are not sure are directed to the Section A.2.5 and those answering as “Yes” are directed to Section A.2.4.

A.2.4 Using Microsoft products, tried at least once GNU/Linux system and will migrate to GNU/Linux

21 - What are the reasons for your migration to an Open Source operating system, please state the importance (very important, important, not much important, not important) of your choice(s).

User friendliness
Stable, do not crash easily
Persons using around me are happy
I wanted to learn it
Easy to find any software that I need
I do not want to be a lock user of any corporate
To decrease my software costs
To configure my PC as I would like it
I do not want to support financially any international corporate
Other

22 - When are you planing to migrate?

In 3 months
In 6 months
In a year
In 2 years
After 2 years

23 - What are the reasons for not having migrated yet?

After this question, the participant is directed to Section A.2.7.

There is no where where I can found any help
I can not open my old files yet
I will renew my PC
When a public or private support, hot-line team is constructed
Other

A.2.5 Using Microsoft products, having tried at least once a GNU/Linux system and will not migrate to GNU/Linux

20 - What are the main reasons for not migrating to Open Source operating system, please give the importance (very important, important, not much important, not important) of your answer.

Difficulties of usage
There is no one, no where where I can found any help
My old files can not be opened
I am afraid of loosing any data
Will bring financial burden
My PC is not sufficient
Other

After this question, the participant is directed to Section A.2.7.

A.2.6 Using Open Source operating system

14 - From where have you ever heard the concepts of free software and/or open source software for the first time?

From my friends
From the courses
From the TV
From the printed press
From the Internet
From the radio
From the PC courses

15 - Since when are you using Open Source operating system?

6 months
One year approximately
2 years approximately
More than 2 years approximately

16 - What are the reasons for using an Open Source operating system, please state the importance of (very important, important, not much important, not important) your choice(s).

Ease of use
Stability, resistance to crashes
I should have use it at school/office
I wanted to use it and I like it
Easiness to find professional software
Independence over firms
To decrease software expenditure
Flexibility to configure and control a PC
Not to support financially transnational corporates
Other

17 - Who was the first person to install an Open Source operating system?

An experienced friend
Myself
Preloaded with the PC that I bought
IT staff

18 - From where have you installed/procured your first Open Source operating system?

19 - a. I would aid people around me to adopt FOSS OS.

b. I would be glad to help on FOSS to people around me.

Writable CD
CDs from magazines
Network install
CD from ambulant street vendors
Original boxed set

c. I would aid my relatives to adopt FOSS OS.

20 - What are the main problems of Open Source operating systems, please state the importance (very important, important, not much important, not important) of your choice(s).

User friendliness
Limited Turkish support
Difficulties to find any answer
Easier installation
Difficulties to find a professional grade software
Difficulties to find professional support
Not enough games
My PC has become slower due to GNU/Linux
Other

21 - What is your first source of help whenever you encounter a problem with your Open Source operating system.

My friends
Web
Discussion lists, forums
IT staff
Professional help
Library
Documents within the installation CDs

After this question, the participant is directed to Section A.2.7.

A.2.7 Final questions

If you do not answer the questions below it will be supposed that you have answered as NO.

- Do you wish to receive any results of this survey?
- Would you accept to answer any further questions through e-mail if required?

Appendix B

QUESTIONS OF THE SECOND SURVEY

B.1 Questions Given in Turkish for the Second Survey

1 - Yaşınız?

2 - Cinsiyetiniz? (Erkek-Kadın)

3 - Ünvanınız alttakilerden hangisidir? Bkz. Ek Ünvan

4 - Bağlı olduğunuz birim aşağıdakilerden hangisidir? Bkz. Ek birim

5 - Yaklaşık olarak kaç yıldır bilgisayar kullanıyorsunuz?

6 - ODTÜ'de veya evde program yükleyip, yapılandırmasını değiştirebildiğiniz bir bilgisayarınız var mı?

7 - Bigisayarınızda sorun çıkınca en fazla destek aldığınız 2 seçeneği işaretleyiniz?

Arkadaşımdan
Bölüm bilgisayar koordinatörü/ODTÜ Bilgi İşlem D. Bşk.dan
Web'den
Profesyonel destek alıyorum
ODTÜ kütüphanesi'nden
Satınaldığım kitaplardan
Kurulum CD'sindeki belgelerden
Öğrencilerden Destek aramıyorum
Diğer

8 - Genelde hangi işletim sistemini (OS) kullanıyorsunuz?

Win3.1
Win95
Win98
Win2000
XP
Mac
Linux
BSD (Free/Net/Open)
Diğer

Bu soruya Linux veya BSD cevabı verenler Bölüm B.1.6'e yönlendiriliyor.

9 - Kullandığınız işletim sisteminden memnun musunuz? (Evet-Hayır-Emin değilim)

10 - İşletim sisteminizin yeni sürümüne geçip, sorun yaşadıktan sonra alışık olduğunuz bir eski sürüme geri döndünüz mü? (Evet-Hayır)

11 - Yazılımları en çok nereden ediniyorsunuz?

Aldığım bilgisayarla geldi
Üniversite sağlıyor
Arkadaşlarımdan
Sokaktaki seyyar satıcılardan
Kişısel paylaşım(P2P) programlarından (Kazaa, eDonkey vs.)
Yetkili satıcılardan satın alıyorum
GPL'li yazılım kullanıyorum

12 - Aşağıdaki önermelere ne kadar (kesinlikle evet, evet, fikrim yok, hayır, kesinlikle hayır) katıldığınızı belirtiniz.

a. Devlet sektöründe harcamalrın azaltılması için paralı yazılımlar dışında başka seçenekler de değerlendirilmelidir.

b. Kişisel kullanıcı olarak yazılım harcamalarımı daha düşüreceği için para ödememi gerektiren yazılımlar (ör.Mıcrosoft ürünleri) dışında başka bir seçeneği değerlendiririm.

c. Bilgisayarıma yeni bir program kurarken veri kaybından veya varolan sistemin bozulmasından çekiniyorum.

13 - Özgür yazılım(free software), açık kaynak kodlu yazılım(open source software) kavramlarını duydunuz mu? (Hayır-Evet)

Bu soruya "Hayır" cevabı verenler Bölüm B.1.7, "Evet"cevabı verenler ise Bölüm B.1.1'e yönlendiriliyor.

B.1.1 Kavramları duymuş

14 - Özgür yazılım(free software), açik kaynak kodlu yazılım(open source software) kavramlarını ilk kimden veya nereden duydunuz?

Arkadaş çevremden
Aldığım derslerden
Televizyon'dan
Basılı yayınlardan
İnternet'ten
Radyo'dan
Bilgisayar kursundan

15 - Open Office veya Star Office yazılımlarından birini denediniz mi? (Hayır-Evet)

16 - Daha önce hiç Açık Kaynak Kodlu işletim sistemi denediniz mi? (Hayır-Evet)

Bu soruya "Hayır" cevabı verenler Bölüm B.1.2, "Evet" cevabı verenler ise Bölüm B.1.3'e yönlendiriliyor.

B.1.2 Microsoft ürünleri kullanıyor ve Linux denememiş

17 - Açık Kaynak Kodlu işletim sistemi denememenizin temel nedenlerini, önemini(çok önemli, önemli, az önemli ve önemsiz) belirterek işaretleyiniz.

Merak etmiyorum
Yardım alabileceğim bir arkadaşım yok
Yardım alabileceğim bir dernek/kurum/öğrenci topluluğu yok
Kendime güvenemiyorum
CD bulamıyorum
İnternet'ten kendi makinama indirmek için network hızım yavaş
Uygun eğitim veren bir şirket/kurum yok
Türkçe başlangıç seviyesi kitap bulamadım
Diğer

Bu sorudan sonra katılımcı Bölüm A.1.7'ye yönlendiriliyor.

B.1.3 Microsoft ürünleri kullanıyor ve Linux denemiş

18 - İlk defa herhangi bir Açık Kaynak Kodlu işletim sistemini ne zaman denediniz?

6 ay önce
1 yıl önce
2 yıl önce
2 yıldan daha önce

19 - Açık Kaynak Kodlu işletim sistemine geçmeyi düşünüyor musunuz? (Hayır-Emin Değilim-Evet)

Bu soruya "Hayır" ve "Emin Değilim" cevabı verenler Bölüm B.1.5, "Evet" cevabı verenler ise Bölüm B.1.3'e yönlendiriliyor.

B.1.4 Microsoft ürünleri kullanıyor, Linux denemiş ve Linux'a geçecek

20 - Açık Kaynak Kodlu işletim sistemine geçme isteğinizin temel neden(ler)ini, önemini (çok önemli, önemli, az önemli ve önemsiz) belirterek işaretleyiniz.

Kullanımı kolay
Kararlı, olmadık yerde çökmüyor
Daha güvenli
Çevremde kullananlar memnun
Öğrenmek istiyorum
Aradığım mesleki programları bulmak daha kolay
Bir şirkete bağlı kalmak istemiyorum
Yazılım maliyetini düşürmek için
Kullandığım makineyi kendime göre biçimlendirmek için
Ulusötesi şirketlere para ile destek vermemek için
Diğer

21 - Ne zaman geçmeyi düşünüyorsunuz?

3 ay içinde
6 ay içinde
1 yıl içinde
2 yıl içinde
2 yıldan sonra

22 - Hala geçmeyişinizin en önemli nedenini işaretleyiniz.

Çevremde yardım alacağım bir arkadaşım yok
Eski dosyalarım hala düzgün açılmıyor
Bilgisayarımı yenileyeceğim
Özel/Kamu yardım birimi kurulunca
Özel/mesleki programlarım çalışmıyor veya benzeri yok
Diğer

Bu sorudan sonra katılımcı Bölüm B.1.7'ye yönlendiriliyor.

B.1.5 Microsoft ürünleri kullanıyor, Linux denemiş ve Linux'a geçmeyecek

20 - Açık Kaynak Kodlu işletim sistemine geçmemenizin temel neden(ler)ini, önemini (çok önemli, önemli, az önemli ve önemsiz) belirterek işaretleyiniz.

Kullanımı zor
Yardım alacağım kişi/yer yok
Güvenli değil
Eğitim/Mesleki programlarım çalışmıyor veya benzeri yok
Eski dosyalarımı açamıyor
Verilerimi kaybetmek istemiyorum
Maddi yük getirecek
Bilgisayarımı yeterli görmüyorum
Diğer

Bu sorudan sonra katılımcı Bölüm B.1.7'ye yönlendiriliyor.

B.1.6 Açık Kaynak Kodlu İşletim Sistemi Kullanıyor

14 - Özgür yazılım, açık kaynak kodlu yazılım kavramlarını ilk kimden veya nereden duydunuz?

Arkadaş çevremden
İnternet'ten
Aldığım derslerden
Televizyon'dan
Radyo'dan
Basılı yayınlardan
Bilgisayar kursundan

15 - Ne zamandır Açık Kaynak Kodlu işletim sistemi kullanıyorsunuz?

6 aydan beri
Yaklaşık 1 yıldan beri
Yaklaşık 2 yıldan beri
2 yıldan daha fazla

16 - Açık Kaynak Kodlu işletim sistemine geçmenizin temel neden(ler)ini, önemini (çok önemli, önemli, az önemli ve önemsiz) belirterek işaretleyiniz.

Kullanımı kolay
Kararlı, olmadık yerde çökmüyor
Daha güvenli
Okulda/işyerinde kullanmam gerekiyordu
Denemek istiyordum, beğendim
Aradığım eğitim/mesleki programları bulmak daha kolaydı
Bir şirkete bağımlı kalmak istemiyordum
Yazılım maliyetini düşürmek içindi
Kullandığım makineyi kontrol etmek istiryordum
Ulusötesi şirketelere para ile destek vermemek içindi
Diğer

17 - Bilgisayarınıza ilk Açık Kaynak Kodlu işletim sistemini kuran kimdi?

Bilgisayar bilen bir arkadaşım
Kendim
Aldığım bilgisayarla geldi
ODTÜ Bilgi İşlem çalışanı
Bölüm bilgisayar koordinatörü
Diğer

18 - İlk Açık Kaynak Kodlu işletim sisteminizi nereden kurdunuz?

Yazılabilir CD'den
Dergilerin verdiği CD'den
Network üstünden (FTP/NFS/HTTP)
Sokak satıcılarından aldığım CD'den
Orjinal kutulu set
ODTÜ Bilgi İşlem'den aldığım CD'den

19 - Aşağıdaki önermelere ne kadar (kesinlikle evet, evet, fikrim yok, hayır, kesinlikle hayır) katıldığınızı belirtiniz.

a. Çevrenizdeki bilgisayar kullanıcılarının Açık Kaynak Kodlu işletim sistemine (Linux, BSD vs.) geçmesi gereklidir.

b. Çevrenizdeki bilgisayar kullanıcılarına Açık Kaynak Kodlu işletim sistemi (Linux, BSD vs.) konusunda yardımcı olurum.

c. Bilgisayar kullanan aile fertlerimi/akrabalarımı Açık Kaynak Kodlu işletim sistemine (Linux, BSD vs.) geçirmek isterim.

d. Bilgisayar kullanan aile fertlerime/akrabalarıma Açık Kaynak Kodlu işletim sistemi (Linux, BSD vs.) konusunda yardımcı olurum.

20 - Sizce Açık Kaynak Kodlu işletim sistemlerinde görülen temel eksiklikleri, önemini (çok önemli, önemli, az önemli ve önemsiz) belirterek işaretleyiniz.

Daha kolay kullanımlı olmalı
Türkçe desteği kısıtlı
Aradığımı kolayca bulamıyorum
Kurmak zor geliyor
Profesyonel düzeyde mesleki programları bulmak zor
Bir şirketten profesyonel destek almak zor
Yeterli oyun yok
Bilgisayrım eskisine göre yavaş çalışıyor
Diğer

21 - Açık Kaynak Kodlu işletim sistemlerinde ilk desteği nereden buluyorsunuz?

Arkadaşımdan
WEB'den
İnternet üstündeki tartışma listeleri, forumlar
Bölüm bilgisayar koordinatörlerinden ODTÜ Bilgi işlem görevlisinden
Profesyonel destek alıyorum
ODTÜ kütüphanedeki kitaplardan
Kurulum CD'sindeki belgelerden
Öğrencilerden
Diğer

Bu sorudan sonra katılımcı Bölüm A.1.7'ye yönlendiriliyor.

B.1.7 Son sorular

Alttaki iki soruyu cevaplamadığınız/doldurmadığınız durumda her iki soruya da HAYIR cevabı vermiş olacaksınız.

- Bu anketle ilgili olan tez bittikten sonra sonuçlar hakkında e-posta aracılığı ile haber almak ister misiniz? (Evet)
- Gerekli görülürse e-posta ile daha derinlemesine görüşmeyi kabul eder misiniz? (Evet)

B.2 Translations of the Questions Given for the Second Survey

1 - Age?

2 - Sex? (Male-Female)

3 - Your title?

4 - The section that you belong to?

5 - Since how many years have you been using a PC?

1 year
2 years
3 years
More than 3 years

6 - Do you have a PC at home or at METU which you can configure as you wish?

7 - Please tick two of the most important help sources whenever you encounter a problem with your PC.

My friends
The Web
Professional solution providers
University library
Books that has been bought
Documents within the installation CD
Do not need any help
Other

8 - What is the OS that you are using generally?

DOS
Win3.1
Win95
Win98
Win2000
XP
Mac
Linux
BSD (Free/Net/Open)
Unix (AIX,HP-UX,Solaris vs.)
Other

Those answering as Linux or BSD are directed to Section B.2.6.

9 - Have you ever switched to the previous OS due to the problems encountered after an OS upgrade? (Yes-No)

10 - From where are you procuring needed softwares?

Comes preloaded with the PC
My university/job is procuring them
My friends
Ambulant street vendors
Peer to peer on line sharing softwares (Kazaa, eDonkey etc.)
Authorized vendors
Using GPLed software

11 - Please give your opinion (absolutely yes, yes, no idea, no, absolutely no) to the propositions given below.

a. The public sector should consider other software solutions if it costs less to the public expenditure.

b. As a personnel user I should consider other solutions than software which have licensing fees(i.e. Microsoft products) in order to decrease

my own expenditure.

c. I am afraid to damage my PC or loose any data while installing a new software to my PC.

12 - Have you ever heard of free software and/or open source software concepts? (Yes-No)

Those answering as "No" to this questions are directed to Section B.2.7 and those answering as "Yes" are directed to Section B.2.1.

B.2.1 Those who have heard of the concepts

13 - From where have you ever heard the concepts of free software and/or open source software for the first time?

From my friends
From the courses
From the TV
From the printed press
From the Internet
From the radio
From the PC courses

14 - Have you ever tried Open Office or Star Office? (Yes-No)

15 - Have you ever tried once any Open Source operating system? (Yes-No)

Those answering as "No" are directed to Section B.2.2 and those answering as "Yes" are directed to Section B.2.3.

B.2.2 Using Microsoft products and have never tried Linux

16 - What are the reasons for not having tried any Open Source operating system, please state the importance of your choice(s).

I am not interested
I do not have any friends who can help me
I do not know any student society which can help me
I do not have any self-confidence
I can not find any installation CD
I can not download to my PC due to poor Internet connection
There is not any firm which can give specialized courses
I can not find any entry level book in Turkish
Other

After this question, the participant is directed to Section B.2.7.

B.2.3 Using Microsoft products and tried at least once a GNU/Linux

17 - When have you ever tried your first Open Source operating system?

6 months before
1 year before
2 years before
More than 2 years before

18 - Are you considering to migrate to any Open Source operating system? (Yes-Not sure-No)

Those answering as "No" and those who who are not sure are directed to the Section B.2.5 and those answering as "Yes" are directed to the Section B.2.4.

B.2.4 Using Microsoft products, tried at least once GNU/Linux system and will migrate to GNU/Linux

19 - What are the reasons for your migration to an Open Source operating system, please state the importance of your choice(s).

User friendliness
Stable, do not crash easily
Increased security
Persons using around me are happy
I wanted to learn it
Easy to find any software that I need
I do not want to be a lock user of any corporate
To decrease my software costs
To configure my PC as I would like it
I do not want to support financially any transnational corporate
Other

20 - When are you planing to migrate?

In 3 months
In 6 months
In a year
In 2 years
After 2 years

21 - What are the reasons for not having migrated yet?

There is no where where I can found any help
I can not open my old files yet
I will renew my PC
When a public or private support, hot-line team is constructed
Used software are not supported or does not have any equivalent
Other

After this question, the participant is directed to Section B.2.7.

B.2.5 Using Microsoft products, having tried at least once a GNU/Linux system and will not migrate to GNU/Linux

20 - What are the main reasons for not migrating to Open Source operating system, please give the importance of your answer.

Difficulties of usage
There is no one, no where where I can found any help
Not enough secure
My old files can not be opened
I am afraid of loosing any data
Will bring financial burden
My PC is not sufficient
Other

After this question, the participant is directed to Section B.2.7.

B.2.6 Using Open Source operating system

14 - From where have you ever heard the concepts of free software and/or open source software for the first time?

From my friends
From the courses
From the TV
From the printed press
From the Internet
From the radio
From the PC courses

15 - Since when are you using Open Source operating system?

6 months
One year approximately
2 years approximately
More than 2 years approximately

16 - What are the reasons for using an Open Source operating system, please state the importance of your choice(s).

Ease of use
Stability, resistance to crashes
Increased security
I should have use it at school/office
I wanted to use it and I like it
Easiness to find professional software
Independence over firms
To decrease software expenditure
Flexibility to configure and control a PC
Not to support financially transnational corporates
Other

17 - Who was the first person to install an Open Source operating system?

An experienced friend
Myself
Preloaded with the PC that I bought
METU Computer Center staff
Department PC coordinator
Other

18 - From where have you installed/procured your first Open Source operating system?

Writable CD
CDs from magazines
Network install
CD from ambulant street vendors
Original boxed set
Installation CDs prepared by the METU Computer Center

19 - a. I would aid people around me to adopt FOSS OS.

b. I would be glad to help on FOSS to people around me.

c. I would aid my relatives to adopt FOSS OS.

20 - What are the main problems of Open Source operating systems, please state the importance of your choice(s).

User friendliness
Limited Turkish support
Difficulties to find any answer
Easier installation
Difficulties to find a professional grade software
Difficulties to find professional support
Not enough games
My PC has become slower due to GNU/Linux
Other

21 - What is your first source of help whenever you encounter a problem with your Open Source operating system.

My friends
Web
Discussion lists, forums
METU Computer Center staff
Department PC coordinator
Professional help
METU Library
Documents within the installation CDs
Students
Other

After this question, the participant is directed to Section B.2.7.

B.2.7 Final questions

If you do not answer the questions below it will be supposed that you have answered as NO.

- Do you wish to receive any results of this survey?
- Would you accept to answer any further questions through e-mail if required?