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Bachelors thesis

Software Piracy

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Declaration

I declare that I have worked on my bachelor's thesis titled Software Piracy by myself and I have used only the sources mentioned at the end of the thesis.

In Prague on 31st March 2010

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Softwarové Pirátství

Software Piracy

Souhrn

Softwarové pirátství je důležité, avšak nedostatečně projednávané téma současnosti. Ovlivňuje nejen prospěch větších společností na trhu s IT, ale také v návaznosti stát a veřejnost. Tato práce nabízí přehled problematiky spojené s tématem ‚Softwarového pirátství‘, aby bylo možné tématu plně porozumět. Obsahuje stručnou historii počítačů a internetu, která je důležitým milníkem tématu. Dále provádí software samotným, s vysvětlením jeho typů a licencí. Právní pohled na věc samozřejmě není opomenut – autorský zákoník a koncept duševního vlastnictví jsou důrazně prozkoumány. Dále práce nabízí náhled do celosvětového boje proti softwarovému pirátství a stručný přehled situace a jejího vývoje v České republice a zbytku světa. Výzkum se zabývá především definicí softwarového pirátství a způsoby distribuce ilegálního softwaru. Dále vytyčuje jeho ekonomické aspekty a analyzuje důvody pro výskyt problému. Na konci je nabídnuto několik možných řešení situace, s hlavním zaměřením na nabídku alternativ ke komerčnímu softwaru, jakožto náhražku originálního i ilegálního softwaru.

Klíčová slova:

Počítač, software, počítačový program, softwarové pirátství, právo, internet, online, informační technologie, licence, duševní vlastnictví, autorské právo, stahování, zákon, padělání, porušení

Summary

Software piracy is a very important, yet not enough discussed topic of the present day. It affects not only the profits of large companies on the IT market, but also consecutively the country and the public. This thesis gives an overview of the issues connected to its topic of ‘Software piracy’ in order to give a full understanding. That includes a brief history of computers and the internet which pose as important historical milestones regarding the topic. Further, it guides the reader through software itself explaining software types and licenses. The legal point of view is not left out of course – copyright law and intellectual property concept are explored thoroughly. The thesis also offers an outlook on the global fight with software piracy with a brief report on the current situation and its development in the Czech Republic and the rest of the world. The research focuses mainly on exploring and defining software piracy and the ways of the distribution of illegal software, furthermore, pointing out the economical aspects of piracy. More importantly, it also analyses the reasons of the occurrence of the problem and factors which improve the situation. In the end several suggestions for improvement are proposed, with a focus on offering alternatives to commercial software as a possible substitute to both original and illegal software.

Keywords:

Computer, software, computer program, software piracy, law, market, internet, online, information technologies, license, intellectual property, copyright law, downloading, counterfeit, infringement

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1. Introduction

The present world has in the last decade advanced to the point where the new technologies play a significant role in the lives of many people. The use of computers and the internet is spread across the whole world, in households as well as workplaces. Together with the computers, software is used to carry out certain actions, depending on the focus of the user. Computer programs are an essential part of work in most of the spheres of our economy and their advancement is enabling a huge improvement in the efficiency of work, together with an offer of a great time saving factor.

As well as technologies, crime has also developed through the years. The origins of human actions defined as crime reach far into the history. The earliest remarks of crime are dated into the age of Sumerians, who produced the first known written codes of law, as a mean of crime fighting and/or prevention. Thanks to the improving possibilities which have opened up with technological breakthroughs, the modern criminals use computers in order to increase the effectiveness of their actions. Software piracy is becoming a major issue in the field of cybernetic crime and many people around the world are taking a part in this happening on daily basis and some of them are not even aware of it.

I have chosen this topic for my thesis, because the phenomena of software piracy and cybernetic crime are a current, global and yet still not enough discussed topic. It usually makes the headlines in news reports once or twice every year, when a major charge is being held, or when the organizations fighting this type of crime present their shocking yearly reports to the public (and press). As the research of new technologies is advancing, the possibilities and means for digital criminality are not likely to be diminished; on the contrary they will probably spread and make the situation worse in the future.

I have always been interested in information technologies, software and programming, so the topic of software piracy always concerned me. I am aware of its substantial presence among the society. I feel that the lack of knowledge concerning the topic, among the public, is one of the main causes and writing about it is the minimum input which I can offer in order to help the situation.

2. Objectives of the thesis and methodology

2.1. *Main objectives*

The primary objective of this thesis is to give a general overview of the topic, understandable to a person who is not an information technology (IT) or a law expert and to explore software piracy from both the legal and economical points of view.

As for the economical point of view, I would like to analyze the basic economical factors which affect the occurrence of software piracy and impacts of software piracy, with the use of the basic market theories.

Regarding the legal point of view, I would like to give an overview of the legal factors concerned with the topic, mainly licenses, copyright law and intellectual property concept.

With the data collected, I would like to report on the global situation of software piracy. Further, my aim is to analyze the data collected for Czech Republic, in order to comment on the situation here in more detail.

As an outcome of the research, I expect to find and comment on the main reasons for the occurrence of the problem and I would like to propose several possibilities for the improvement of the situation in the end of my thesis.

2.2. *Methodology*

The basic methods used throughout the whole thesis, are qualitative. Mainly in the theoretical parts, these methods comprise of exploratory research, carried out by collecting and studying information from various sources. These sources comprise of books, magazines, publications, and reports, which are available both physically and on the internet.

The qualitative methods are further used in descriptive research, in order to answer the questions where, how and why is software piracy occurring and where and how is it fought with. In order to answer these questions, quantitative methods of research are also used in the evaluation of statistical resources.

The quantitative methods comprise mainly of statistical data evaluation techniques, namely the *trend line analysis* with the *coefficient of determination* and calculations of *coefficient of correlation*. Both of the mentioned methods will be performed in Microsoft Excel.

Trend line analysis is carried out in order to study the way a set of data tends to develop. With the equation of the trend line available, it is possible to calculate possible future development. The coefficient of determination shows the relevance (dependency) of the development of the trend line. The values vary between 0-1, the higher the number, the stronger the dependency.

In our case, the calculation of coefficient of correlation will be carried out in order to analyze the relationship between two sets of data. The value ranges between -1-1. When the value gets near -1, it means that there is a negative relationship – a reciprocal proportion. On the other hand when the value gets near to 1, that means the relationship is positive – continual proportion.

3. Literature Review

3.1. *Historical milestones*

In order to work with the subject of software piracy, we have to consider the roots of software itself. It is therefore essential to give a brief picture of milestones which have mostly affected the development of computers and enabled the expansion of use of software itself.

3.1.1. **First computers**

For our purposes, the technological evolution of the second half of the 19th century is very important. The development of information technologies up to the point when they were set up for mass production and retail distribution was one of the most important milestones regarding the origination of software itself.

As the very first computers, we can refer to the cipher mechanisms *Enigma* (German) and *Colossus* (British) used during the World War II, although they were mostly mechanical, with electronic parts acting only as a support. In order to describe the crucial inventions in the history of information technologies, we must skip to the computers of next generation, from which the best known was *ENIAC* (Electronic Numerical Integrator and Computer). It was built at the University of Pennsylvania; the construction took 2 years until it was finally brought into full operation at the end of 1945. *ENIAC* was used for military purposes, and as well as for other similar projects which were developed at that time, it was very expensive to construct and operate such machine. The possession of such inventions was the privilege of army agencies and research facilities connected to them.¹

From these first computers it was only a short step for companies to realize the potential of the development of computers for commercial purposes; the first *personal computers* were built. The first machines introduced to the market, were produced by IBM in the 1950's. Perhaps the most significant was IBM 650 with over 2000 pieces

¹ The ENIAC Museum Online. University of Pennsylvania. Available at: <http://www.seas.upenn.edu/~museum/index.html> [retrieved 20/2/2010]

sold within 10 years from the introduction in 1953.² The prices ranged up to over \$500,000, which would be over \$4 million³ in today's prices.

Crucial change of development came with the invention of integrated circuit and processors. In the 1960's and 1970's more companies, which play a crucial role in the development of information technologies until now are formed (e.g. Apple, Intel, AMD, Sharp, Nokia, and Western Digital).⁴ From this point on the evolution of computers advances faster and every year the market offers something new. The progress in the development of computers leads to the creation of computers which are smaller, run faster and their production costs less time and money.

In the year 1965 G. Moore (who was one of the creators of the company Intel) said, that the number of transistors in a computer chip will double every 24 months.⁵ In simple words we can say it means that every 24 months the performance of personal computers will double. What has been a simple estimation, is now working in practice for over 40 years.

3.1.2. Introduction of the internet

At the early times of the development of the IT industry, cybernetic criminality was very limited. The reason was simple, it was necessary to physically reach a target personal computer in order to illegally retrieve or enhance data which was on it, because there was no global computer network available as the means of a crime at that time. Cybernetic criminality has therefore been restricted to the form of standard crime as we know it.

In the 1950's American computer scientists had a serious problem to solve. The goal was, to come up with an idea, which would enable cities and army facilities in different states to connect with each other in a way, which wouldn't be vulnerable to nuclear weapon attacks. Yet again, the origins of another technological breakthrough were army related, strongly motivated by the post Cold War era.

² IBM Archives; http://www-03.ibm.com/ibm/history/history/year_1953.html [retrieved 20/2/2010]

³ Calculation of present value according to the US CPI change through the years 1954-2010, Available at: The Bureau of Labor Statistics; <ftp://ftp.bls.gov/pub/special.requests/cpi/cpi.txt> [retrieved 15/2/2010]

⁴ Computer History, Computer Hope; <http://www.computerhope.com/history/196080.htm> [retrieved 20/2/2010]

⁵ Moore, Gordon: Moore's law. Intel Corporation; <http://www.intel.com/technology/mooreslaw/> [retrieved 15/2/2010]

The key idea was to create a network with independent stations (nodes⁶) connected to each other, through which the information would travel. The first notions bringing this idea to life were presented in the early 1960's, independently by two scientists; Paul Baran from Research and Development Corporation (RAND⁷) and Donald Davies from the National Physical Laboratory in the UK.

The concept was described as *'...breaking each message into standardized blocks of data, with each block containing information about its recipient, its origin, the length of time it had been in the network, and its position within the message of which it was a part. A series of blocks would go out into the network and make their way through it in any sequence they could—each one sending back a confirmation from the new node to the previous node—until all the blocks arrived at their destination. If a certain node was not available, a block that was sent to it would bounce back.'*⁸

So even if a part of this network would somehow get damaged, the information would reach its destination. The first project in the world, which followed this concept, was called Advanced Research Projects Agency Network (ARPANET). It was funded by the United States Government's Defense Advanced Research Projects Agency (DARPA⁹) and brought into operation in 1969 with the first 4 nodes: University of California, Los Angeles (UCLA), The Stanford Research Institute's Augmentation Research Center, University of California, Santa Barbara (UCSB), The University of Utah's Computer Science Department.¹⁰

In the following years, ARPANET grew successfully. By the end of the year 1971, there were 15 functioning nodes and by the end of the next year the number grew to 37. From that time on, the number of computers connected to this network grew exponentially, ARPANET became accessible to public and several networks based on

⁶ Node: *a terminal or other point in a computer network where a message can be created, received, or transmitted*; Encarta Dictionary, <http://encarta.msn.com/> [retrieved 20/2/2010]

⁷ RAND Corporation is a nonprofit institution that helps improve policy and decision making through research and analysis, established in 1948 by the US government.; <http://www.rand.org/about/history/> [retrieved 20/2/2010]

⁸ Campbell, Virginia: How RAND Invented the Postwar World, 2004, p.57; <http://www.rand.org/about/history/Rand.IT.Summer04.pdf> [retrieved 23/2/2010]

⁹ DARPA was created in 1958 as the Advanced Research Projects Agency (ARPA). The reason for creating and maintaining such agency is *'to maintain the technological superiority of the U.S. military and prevent technological surprise from harming USA's national security.'*; <http://www.darpa.mil/mission.html> [retrieved 23/2/2010]

¹⁰ Waldrop, Mitch: DARPA and the Internet Revolution; http://www.darpa.mil/Docs/Internet_Development_200807180909255.pdf [retrieved 23/2/2010]

the same technologies were connected to it. Above mentioned blocks of data, traveling through the network later became called packets¹¹ and packet switching¹² became the key to network communication up to the present day. Through the years, ARPANET was enhanced and developed into the form of internet as we know it.

The existence of computer networks enabled the birth of modern cybernetic crime. It was no longer necessary to be present at the crime scene; it became possible to commit a crime in a different part of the world, as the physical boundaries were broken.

3.2. The definition of software and its creation

Before examining software piracy from the legal point of view, it is necessary to understand what software is. When defining it, various sources differ. In the following lines, I am offering two types of definition, in order to give the reader an overview of the topic from different points of view. More importantly, I will specify the term software which I will work with in the rest of my thesis and briefly explain how it is created, so that I can give the reader a fair understanding of it.

I have come across a definition describing the term software as *'anything that is not hardware but is used with hardware, esp. audiovisual materials, as film, tapes, records, etc.'*¹³ If I wanted to work with this definition of software, I would have to take into account a much wider problem that could be called internet piracy in general, comprising of a broad variety of materials which can be distributed illegally over the internet. Such topic would be adequate as a topic for diploma thesis perhaps; I have set my goals a bit lower with a more realistic objective.

The most common definition used and perceived is that software comprises of *'written programs, procedures or rules and associated documentation pertaining to the operation of a computer system and that are stored in read/write memory'*.¹⁴ Because my topic is already very wide, I am going to work with software defined as *'programs*

¹¹ Packet: A message or part of a message packaged as a fixed-size segment of data for transmission through a computer network; Encarta Dictionary, <http://encarta.msn.com/> [retrieved 20/2/2010]

¹² Packet Switching: *Dividing the input flow of information into small segments, or packets, of data which move through the network in a manner similar to the handling of mail but at immensely higher speeds.*; Roberts, G. Lawrence: The Evolution of Packet Switching, Invited Paper, November 1978

¹³ Definition of *Software*, Dictionary.com; <http://dictionary.reference.com/browse/> [retrieved 20/2/2010]

¹⁴ Definition of *Software*, Wordreference.com, English Dictionary; <http://www.wordreference.com/definition/> [retrieved 28/2/2010]

and applications that can be run on a computer,¹⁵ (a simplified version of the previous definition). In my own words, I would express the meaning of the term software as a formula or better said an algorithm which tells the computer what operation it should perform. In the rest of my thesis, I will refer to it as just software or a computer program.

At the base of creation of software stands source code, which is the version of software as it was originally written using a human-understandable programming language (such as Java, PHP, C# and many more), which is chosen in dependency on the expected outcome. In order to be readable by a computer, it must be compiled (translated) into the machine language, referred to as binary or object code, which consists of a sequence of instructions for the computer to perform.¹⁶

Some basic computer programs are made by individuals, but software in present days has developed into very complex creations, which require often a large team to work on them over a long period of time.

3.3. *Software types and licenses*

Generally, two most important types of software are recognized, operating system and application software.

Operating system is *'the essential program in a computer that maintains disk files, runs applications, and handles devices such as the mouse and printer'*.¹⁷ We could say that it is on the border between software and hardware (*'physical parts of a computer'*¹⁸), enabling it to communicate with each other and allowing limited access to the hardware settings.

Application software, on the other hand allows the user to carry out certain specified tasks. There is plenty of different application software available with different purposes.

¹⁵ Definition of *Software*, Encarta Dictionary; <http://encarta.msn.com/> [retrieved 28/2/2010]

¹⁶ *Source Code Definition*, The Linux Information Project; http://www.linfo.org/source_code.html [retrieved 28/2/2010]

¹⁷ Definition of *Operating system*, Encarta Dictionary; <http://encarta.msn.com/> [retrieved 28/2/2010]

¹⁸ Smejkal, V. a kol. *Právo informačních a telekomunikačních systémů*. 2., aktualizované a rozšířené vydání. Praha : C. H. Beck, 2004, page 59

The term license basically means a permit to use and/or do something. In the case of software, it is the absolute privilege of the author to choose what can and cannot be done with the product that he/she has created. The author can be a single person, who has created the piece of software, or a group of people acting on behalf of a company or a programming group. By using a license, the author gives permission to the person who acquires the software to perform certain actions with it. This is realized using a license agreement.

With internet, the forms of software distribution have changed crucially and various types of licenses are used. In the following paragraphs, I will give an overview of the major types of licenses that are used to determine the way of distribution of the software.

3.3.1. Free software concept and the Open Source Initiative

The word ‘free’ in the ‘free software’ concept means freedom of action with the software. The freedom applies to operation, copying, distribution, studying, changing and enhancing of the software. Only programs which fulfill all the mentioned criteria can be marked as ‘free’, but key is the permission of redistribution and modification of it.¹⁹

The concept of free software was introduced in the early 80’s, as computers for commercial distribution were being more widely developed. Early software has been distributed among interested people in a similar way as in the idea of free software today. In the year 1984 Richard Stallman (who first introduced the concept of free software) came up with the *GNU Project*²⁰. Initially, the goal of the project was to create a Unix-like²¹ operation system, which would be free software. The GNU/Linux operating system was developed and today, it is used by millions of people all over the

¹⁹ *The Free Software Definition*, Free Software Corporation, Inc.; <http://www.gnu.org/philosophy/free-sw.html> [retrieved 28/2/2010]

²⁰ ‘The name ‘GNU’ was chosen because it met a few requirements; first, it was a recursive acronym for ‘GNU’s Not Unix’, second, because it was a real word, and third, it was fun to say.’; *Overview of the GNU System*, Free Software Corporation, Inc., <http://www.gnu.org/gnu/gnu-history.html> [retrieved 2/3/2010]

²¹ *Unix-like operating systems are built from a collection of libraries, applications and developer tools, plus a kernel to allocate resources and talk to the hardware*; Free Software Foundation Inc., <http://www.gnu.org/> [retrieved 2/3/2010]

world. In 1985 Stallman establishes *Free Software Foundation*, which still operates in the present day, in order to promote, protect and organize free software and the GNU Project.²²

The first ideas of the Open Source Initiative were presented by Eric S. Raymond in his publication *The Cathedral and the Bazaar* in 1997.²³ The definition is very similar to the previous type of software, but the approach is slightly different. On one hand it is loose and as the name explains, it enables anybody to see and use the source codes, but on the other, it also restricts the users in ways which Richard Stallman rejected as they wouldn't entirely agree to the philosophy of his 'free software'.

It is important to distinguish these two types of software and the following citation enlightens the problem in an understandable manner:

*'The two terms describe almost the same category of software, but they stand for views based on fundamentally different values. Open source is a development methodology; free software is a social movement. For the free software movement, free software is an ethical imperative, because only free software respects the users' freedom. By contrast, the philosophy of open source considers issues in terms of how to make software "better"—in a practical sense only.'*²⁴

Therefore, the major difference lays in the political context of the two terms; free software propagates the freedom of use on the other hand open source concept shows economical advantages of the software.

²² *The GNU Project*; GNU.org, <http://www.gnu.org/gnu/thegnuproject.html> [retrieved 2/3/2010]

²³ *History of the OSI*, Open Source Initiative; <http://www.opensource.org/history> [retrieved 2/3/2010]

²⁴ Stallman, R.: *Why Open Source Misses the Point of Free Software*, 2007; <http://www.gnu.org/philosophy/open-source-misses-the-point.html> [retrieved 2/3/2010]

3.3.2. GNU General Public License and Copyleft

In order to protect free software, from turning it into proprietary software (discussed further in the chapter 3.3.3), the first version of General Public License (GPL) was written in 1989 by Richard Stallman and later it was used with GNU/Linux Operating System software.

GPL is based on the concept of *Copyleft*, which ensures that the copies of all modified versions of a program will remain as free software, so that no conditions restricting users in an unacceptable way would be added. It is based on Copyright law (copyright defined and discussed further in the chapter 3.4); basically, the terms of distribution are added to the software, which must remain unchanged when the program is redistributed or modified. If a program is free, but not protected by the copyleft, it is possible that there will be a modified version available which is not free anymore.²⁵

The scheme of GPL has been slightly changed over the years in order to fit the system, as the distributors often tried to bypass the license for their own benefit.

3.3.3. Proprietary software, shareware and freeware

In the times, when computers became more common, large manufacturers spotted a chance to make profit. They began developing software with a prohibition to enhance and redistribute it. *'Proprietary software is software that is owned by an individual or a company (usually the one that developed it). There are almost always major restrictions on its use, and its source code is almost always kept secret.'*²⁶

In other words, proprietary software could be called the opposite of free software. Users are restricted in modification and distribution of this type of software.

Shareware is usually distributed alternatively; over the internet, or together with other products (magazines, hardware), but there is always a fee involved in order to unlock all the functions of the program. Sometimes, it is possible to use the software fully, but that usage is limited either by time or number of launches. Source codes to most of shareware are not available to the average users; therefore modification is out of

²⁵ *What is Copyleft?*, Free Software Foundation; <http://www.gnu.org/copyleft/> [retrieved 2/3/2010]

²⁶ *Proprietary Software Definition*, The Linux information Project; <http://www.linfo.org/proprietary.html> [retrieved 2/3/2010]

the question. The authors enable the users to try the software legally and free of charge, if the software is good, it is the best way to advertise it.

Freeware, on the contrary to shareware cannot be defined so easily. Because of the name, and availability it is frequently mistaken for free software by the public.²⁷ There is one major difference, as for freeware, there aren't source codes released with the software, so yet again no modifications are possible. Freeware is distributed similarly to shareware, mainly over the internet. Usually it is created as part of campaigns for different products or services, in order to give the creators some sort of profit, but sometimes it is also used by the authors to propagate their work, so that they can make their next creation commercial, or perhaps just modify their work and offer a better version for a fee.

3.3.4. End User License Agreement (EULA)

EULA is the type of license agreement used with all proprietary software. Originally, they were very brief and simple; they contained the warranty and a reminder not to copy and redistribute the software. Nowadays, they are often monstrosities which most of the users do not even bother to read because of their length and complexity.

The concept is similar to the one of GPL, basically, it provides rules of using the software, but the philosophy is completely different. As the EULAs are written by the authors of the products, they are often too restrictive. The following comparison²⁸ of a few points out of the GPL and EULA for Microsoft Windows XP should give a fair picture of the differences of the two types of license.

EULA:

- copying is prohibited
- the software may be used only on only one computer and that computer must have no more than two processors
- updates to the software could change the EULA if Microsoft so desires

²⁷ *Categories of free and non-free software*. Free Software Foundation, Inc.;

<http://www.fsf.org/licensing/essays/categories.html> [retrieved 2/3/2010]

²⁸ *Comparison of Licenses for Proprietary and Free Software*, The Linux Information Project; <http://www.linfo.org/eula.html> [retrieved 2/3/2010]

- the software may be transferred to another user only once
- restrictions are imposed on reverse engineering
- Microsoft is granted the rights to collect information about the user's system and its use and to supply this information to other organizations
- Microsoft is given the right to make changes to the user's computer without requesting permission
- a warranty is provided for the first 90 days
- no warranty is provided for repairs, updates or patches

GPL:

- any user has the right to copy, modify and redistribute the software
- no party may prevent another from having these same rights
- no warranty is provided, as there is no fee
- the user has the rights to sell the software and charge for services for such software
- any patents related to the software must be licensed for everyone's use or not licensed at all
- modified versions of the software must carry no license fees
- the full source code must be made available
- if there is a change in the license, the general terms of the existing one will be maintained
-

Some EULAs went so far as to prohibiting the user to criticize the product without permission. Clearly the limitations have wide possibilities; the owners of the software can really fulfill their needs and insure themselves against almost any potential threat, which is why EULA is the object of large-scale criticism.

3.4. Intellectual property and copyright law in Europe and the Czech Republic

Now that I have given a fair picture about software creation, types and licenses, I can explore it from the legal point of view. Software is regarded to as intellectual property and is protected by copyright law. In this chapter, I am exploring the concept of intellectual property and origins of copyright law, as it was originated in international agreements. I am also providing an overview of European legislation and Czech Copyright Act.

3.4.1. Intellectual property concept

Intellectual property presents intangible assets, which have been created by the inventive activities of a human mind.

*‘Intellectual property refers to creations of the mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce.’*²⁹

The concept is distinguished by several characteristic attributes, which are crucial for the understanding of its legal adjustment and its place on the market (intellectual property on the following lines is referred to as ‘information’):

- *Ubiquity* – the possibility of existence of information at several different places at one exact time
- *Non-exclusiveness* – use of the information by one subject does not exclude its use by another subject at the same time
- The information is *inconsumable* upon use; therefore it can be used over and over again.

It is also important to differentiate the information (or property) itself from the carrier. When consumers buy a CD, they often do not realize that they actually own

²⁹ *What is intellectual property*, World Intellectual Property Organization; <http://www.wipo.int/about-ip/en/> [retrieved 6/3/2010]

only the one CD and not the content on it.³⁰

Intellectual property is divided into two categories: *‘Industrial property, which includes inventions (patents), trademarks, industrial designs, and geographic indications of source; and Copyright, which includes literary and artistic works such as novels, poems and plays, films, musical works, artistic works such as drawings, paintings, photographs and sculptures, and architectural designs. Rights related to copyright include those of performing artists in their performances, producers of phonograms in their recordings, and those of broadcasters in their radio and television programs.’*³¹

For my purposes, most important is the second category, because software is also included under copyright protection. Now that I have mentioned copyright, it is a good time to define the term. If we explore the word itself, we can conclude, that it has been created by the connection of two words: copy and right. It is now important to point out that it does not mean that copying is alright, ‘right’ as a permission from the legal point of view. Copyright is defined as *‘the legal right of creative artists or publishers to control the use and reproduction of their original works’*³²

3.4.2. Protection of intellectual property by international agreements

The protection of intellectual property has roots in the 19th century, the international agreements, which have arisen at that time, would apply to software protection in the present day.

At the beginning of all the agreements stood the *Paris Convention*, from the year 1883, it can be considered as the roots of international relations regarding intellectual property. Not long afterwards, in 1886 the *Berne Convention for the Protection of Literary and Artistic Works* was held. The principles, such as protection of a work without the regard to its form and protection of work even after the author’s death,

³⁰ Wiebe, Andreas. Perspectives of European Intellectual Property Law. *International Journal of Law and Information Technology*. 2006, vol. 8, no. 2, pages 139-165.

³¹ *What is intellectual property*, World Intellectual Property Organization; <http://www.wipo.int/about-ip/en/> [retrieved 6/3/2010]

³² Definition of *Copyright*, Encarta Dictionary. <http://encarta.msn.com/> [retrieved 6/3/2010]

which are known today, were first presented. The convention held in Berne was the first international treaty regarding copyright.³³

Protection of an author's piece of work applies upon its creation. Before the treaty, the laws protecting author's work had only local character, so an author had rights to protect his/her work only within his/her country and could not influence what would happen abroad. The Berne Convention applied the author's right to protect his/her work to all the countries which signed it. Until the present day it went through several revisions, last one in the year 1971 in Paris.³⁴

Next important treaty arises in 1994. The *World Trade Organization Agreement on Trade Related Aspects of Intellectual Property*, also known as *TRIPS*, was a follow-up to the Berne Convention, more importantly; it includes software under copyright protection. It defines new types of protection among which also the distribution over the internet. It also clarifies the procedures of enforcing the law and the process of pursuits. The TRIPS agreement established intellectual property to the sphere of international trade and remains as the most complex adaptation to the present day.³⁵

In order to solve administrative problems, the *United International Bureau for the Protection of Intellectual Property* was created, later it transformed into *World Intellectual Property Organization*, which operates until the present day under the authority of United Nations and it currently has 184 member countries.³⁶

In 1996 the *WIPO Copyright Treaty (WCT)* was adopted, with the main goal of protecting the rights of authors, regarding electronic distribution of data and information. The protection of software, explained in this treaty references directly article 2 of the Berne treaty, and it is emphasized that computer programs should be treated as literary work.³⁷

³³ *WIPO Intellectual Property Handbook*. Second edition. Publication no. 489. WIPO. 2004. Page 241. Available at <http://www.wipo.int/about-ip/en/iprm/> [retrieved 6/3/2010]

³⁴ *WIPO Intellectual Property Handbook*. Second edition. Publication no. 489. WIPO. 2004. Page 262. Available at <http://www.wipo.int/about-ip/en/iprm/> [retrieved 6/3/2010]

³⁵ Goldstein, P.: *International copyright: principles, law, and practice*. Oxford University Press US. 2001. Pages 52-55.

³⁶ *About WIPO*. WIPO. <http://www.wipo.int/members/en/> [retrieved 6/3/2010]

³⁷ *Intellectual Property Handbook*. Second edition. Publication no. 489. WIPO. 2004. Page 269. Available at <http://www.wipo.int/about-ip/en/iprm/> [retrieved 6/3/2010]

*'Computer programs are protected as literary works within the meaning of Article 2 of the Berne Convention. Such protection applies to computer programs, whatever may be the mode or form of their expression.'*³⁸

The protection of software is analyzed in WCT in ways as in no treaty before. It even distinguishes between different implementation of software (source code / binary code). It is considered to be the base of most important agreements regarding software protection; Czech Copyright Act is practically based on these documents.

3.4.3. European Legislation

The fundament of software copyright protection in the European Legislation is the Directive 91/250/EEC of 14 May 1991, being the first of its kind.

Last year the European Parliament and the Council of European Union have amended the Directive from 1991. On 23 April 2009, the document was created and a month later the new Directive 2009/24/EC was released and brought into effect.

I have compared both directives, to find out that only slight changes were made in order to clarify and rationalize what has already been published in 1991. In the following paragraphs I will point out most important points, which are common for both directives, though I will only refer to the new Directive in the rest of this sub-chapter.

In the conformity with the Berne treaty, it states that software is to be protected in the same way as literary work. The protection belongs under the copyright law and applies only to the expression of the authors – the program itself.

*'Protection in accordance with this Directive shall apply to the expression in any form of a computer program. Ideas and principles which underlie any element of a computer program, including those which underlie its interfaces, are not protected by copyright under this Directive.'*³⁹

Onward, the Directive states that the owner of the rights to a program can be either the author, a group of authors or the employer in case where an employee creates a program, unless his/her contract provides different.

³⁸ Buryan, J.: *Ochrana počítačového programu v zahraničí a v EU*. 2003. available at: <http://www.itpravo.cz/index.shtml?x=136835> [retrieved 6/3/2010]

³⁹ Directive 2009/24/EC of 23 April 2009. Article 1. Paragraph 2. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:111:0016:0022:EN:PDF> [retrieved 6/3/2010]

Another important part of the Directive points out that the member states should punish according to their own law anyone who commits any of the following acts:

‘(a) any act of putting into circulation a copy of a computer program knowing, or having reason to believe, that it is an infringing copy;

(b) The possession, for commercial purposes, of a copy of a computer program knowing, or having reason to believe, that it is an infringing copy;

(c) any act of putting into circulation, or the possession for commercial purposes of, any means the sole intended purpose of which is to facilitate the unauthorized removal or circumvention of any technical device which may have been applied to protect a computer program.’⁴⁰

These measures are to be held, unless the action is authorized by the author (which, I think, is not likely to happen), or unless it collides with *‘any other legal provisions such as those concerning patent rights, trade-marks, unfair competition, trade secrets, protection of semi-conductor products or the law of contract.’⁴¹*

3.4.4. Czech Copyright Act

In the previous chapter, I have given an overview of European Legislation, considering copyright law. In the following paragraphs I will do a similar overview of the Czech Copyright Act. It reflects the development of previously described international treaties and the European Legislation of course.

Again, there is one crucial law regarding copyright protection, it is the Act No. 121/2000 of 7 April 2000, being the first to take care of computer programs copyright protection. Yet again, there is a newer version available, the Act No. 216/2006 of 25 April 2006. There were also several amendments in between the two Acts, but most of the changes were made in order to specify the meaning or to improve the formulation.

In the following paragraphs, I will again point out the most important aspects of the Act.

At the beginning the Act defines its scope – which types of work does it apply to and it also defines the author and how the copyrighted work comes to life.

⁴⁰ 2009/24/EC of 23 April 2009. Article 7. Paragraph 1. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:111:0016:0022:EN:PDF> [retrieved 6/3/2010]

⁴¹ 2009/24/EC of 23 April 2009. Article 8. Paragraph 1. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:111:0016:0022:EN:PDF> [retrieved 6/3/2010]

*'The copyright in a work shall arise at the moment when the work is expressed in any objectively perceivable form.'*⁴²

The personal and ownership privileges of the author give him the right to choose what he/she will do with the work, including the way of release, permissions of editing and distribution (sale, rent, public broadcast etc.). The author is also given the right to claim remuneration upon resale of his work.

In the end, infringement is defined, so a person breaks the law if he/she:

- 'a) makes unauthorised use of an author's work, artistic performance, phonogram or audiovisual fixation, radio or television broadcast, or database;*
- b) Infringes copyright in the manner specified in Article 43 Paragraph 1 or 2, or in Article 44 Paragraph 1; Or*
- c) As a trader involved in the sale of an original of a work of art, fails to fulfil the notification duty under Article 24 Paragraph 6.'*⁴³

In order to give a full understanding to the previous citation, I will explain the content of mentioned articles and paragraphs. Article 43 Paragraph 1 or 2, and in the Article 44 Paragraph 1, the characteristics of software infringement are given, basically it consists of any action against the conditions specified by the author. Article 24 Paragraph 6 states, that if any work is resold for more than 1500 EUR, the author has a right to know.

The fines for such actions are specified as up to CZK 150,000,- in clause a), up to CZK 100,000,- in clause b) and up to CZK 50,000,- in clause c).

Clearly, the copyright law is much more specified in the Czech Copyright Act, in comparison with the European Legislation, which is because it must be possible for the member countries to adjust the laws for their own conditions.

⁴² Act No. 216/2006 of 25 April 2006. Article 9. Paragraph 1. Available at: http://www.mkcr.cz/assets/autorske-pravo/vnitrostatni-pravni-predpisy/AZ_2006_-_pln_zn_n_v_anglick_m_jazyce.doc [retrieved 6/3/2010]

⁴³ Act No. 216/2006 of 25 April 2006. Article 105a & 105 b. Paragraph 1. Available at: http://www.mkcr.cz/assets/autorske-pravo/vnitrostatni-pravni-predpisy/AZ_2006_-_pln_zn_n_v_anglick_m_jazyce.doc [retrieved 6/3/2010]

4. Software piracy analysis

4.1. *Software piracy definition and types*

The aim of the theoretical part (literature review) of my thesis was to point out and walkthrough all the important factors and determinants when dealing with software itself and the infringement of copyright law. The reason is simple; I wanted to prepare the ground for this moment, so that when it comes to the moment of defining the hitherto avoided term *software piracy* everything else is clarified to the reader already.

I will offer several definitions from different sources and then I will summarize them together with my viewpoint on the topic based on the information acquired so far.

In various sources, software piracy is described as:

- ‘...the **copying** or use of computer software in violation of its license’⁴⁴
- ‘...the unauthorized copying or distribution of copyrighted software. This can be done by **copying**, downloading, sharing, selling, or installing multiple copies onto personal or work computers.’⁴⁵
- ‘...the illegal **copying** of software for distribution within the organization, or to friends, clubs and other groups, or for duplication and resale.’⁴⁶

The definitions are very similar, and have one important thing in common. I have previously gone through the ways of protecting software, by licenses and the law. Piracy in this case clearly means breaking the rules of the protection in one way or another. The most common and recognized way is **copying**, which when unauthorized is not unlike stealing. The other various types of software infringement will be further described in the next chapter. Because there is no officially given way of categorizing the types of software piracy. Different sources describe the subject from their own point of view, so I have decided to assort the types myself, in a brief manner which will give the reader an understandable overview.

⁴⁴ Definition of *Software piracy*. The Linux Information Project. 2006. Available at: http://www.linfo.org/software_piracy.html [retrieved 9/3/2010]

⁴⁵ *What is software piracy?* Business Software Alliance. Available at: <http://www.bsa.org/Piracy%20Portal.aspx> [retrieved 9/3/2010]

⁴⁶ Definition of *Software piracy*. Software MAG. Available at: http://www.pcmag.com/encyclopedia_term/0,2542,t=software+piracy&i=51693,00.asp [retrieved 9/3/2010]

4.1.1. Counterfeiting

This is the most radical type of software piracy. The process often consists of *hacking*⁴⁷ and *cracking*⁴⁸. The goal of this process is to create or enhance a copy of software which can be then used freely, or to create an additional program which enables the use of that software. Such software is then distributed through the internet. Sometimes the objective of this action is the sale of such counterfeited software in order to make a profit.

Counterfeited software is often referred to as *warez* – a slang term which originated from the word wares (goods) and its enhancement through *leetspeak*⁴⁹.

4.1.2. End-user piracy

End user of a computer program is simply the person who uses it. Therefore end-user piracy refers to illegal use of software.

The simplest way this can happen is by overusing the license. Let's say, you have a legally bought computer program with a license for one computer and the duration of one year. If you choose to use this software on more computers and/or for a longer period of time, you are breaching the terms of the license. Also, if you decide to borrow such software to your friend, it is also against the terms of use of such software and both you and your friend are acting against. This type of infringement also occurs in companies, where software is sometimes installed on more machines than the license allows.

Sometimes, end-user piracy can occur unconsciously, hardware distributors might install software onto their product before selling it to a customer and either forget about it – then both sides unconsciously break the law, or they preinstall the software and then sell the product with the software installed, yet without providing the customer

⁴⁷ *Hacking* means breaking into the storage device of another computer or a server through a network (preferably internet) in order to steal data.

⁴⁸ *Cracking* means breaching the technological protection of software itself, this is nowadays a part of every major piece of software and exists in order to prevent unauthorized use.

⁴⁹ *Leetspeak* is the way of speaking used by certain (gaming and other..) online communities, it consists of changing letters in words in order to phonetically express or emphasize them, also sometimes letters are exchanged for numbers and/or symbols which are similar; e.g.: 1 instead of L, 3 instead of E, 7 instead of T => leet = 1337

with a license – customer then breaches the law unconsciously on behalf of the action of the distributor/manufacturer.

Another way this can occur is by acquiring the software in an illegal manner, such as *downloading*⁵⁰ it without permission from networks and/or websites which offer counterfeited software. Such illegal software can also be bought, therefore it is important to buy from trustworthy sources. Software offered at online auctions or offered by street salesmen can be dangerous in this manner, firstly, the distributor breaches the law, but importantly, once you decide to use such software, you are also acting against the law!

4.1.3. Unauthorized distribution

This type of piracy comprises partly of both previously mentioned types. Renting, selling, *uploading*⁵¹, sending software against the terms of its use is all illegal activity!

The most common way of illegal distribution is through the internet, as there are various possibilities of using the internet in order to spread software illegally:

Upload to distant servers: On the internet, there are several servers which offer the service of uploading files and consecutively sharing the uploaded files with other people. The size and speed of download/upload depends on the type of service, in several cases it is possible to buy a ‘premium account’ which enables the user to operate with larger files at greater speeds. Such services are completely legal, as in their user terms, they state that uploading material in collision with copyright law is not permitted, but there are so many users that it is not possible to check whether all of them are following the rules.

Most widely used are *Rapidshare.com*, *Megaupload.com* and from the Czech ones I can mention *Uloz.to!*

There is also a possibility to upload files to an FTP server and share the address and consecutively the files on the server, but usually this kind of distribution is restricted to small groups of people who share the data among themselves.

⁵⁰ *Downloading* means retrieving data from the internet (distant server) onto the local hard disk.

⁵¹ *Uploading* means recording or sending data onto a distant server through the internet or other network.

Discussion forums: There are various warez oriented discussion forums on the internet with different focus, and available in different languages. Users share the links to uploaded files (on servers explained previously); which they uploaded themselves or links that were uploaded by other users, which they found on the internet. It is usually necessary to register and post a certain number of posts on such forums, in order to keep them running and functioning.

There are really a large number of such forums on the internet, they often use their high *traffic*⁵² in order to generate income by advertising – selling banners on the website, or sending adverts through email to registered users.

Peer to peer networks: On the internet several such networks are functioning. Their principle is based on a large number of users connected to this network. They share data among themselves; everyone can access the data from anyone else who is also connected. Some of the most widely known are *Napster*, *Kazaa*, *Direct Connect*, *eMule*.

Torrents: Torrent is a file type, which contains information about the file, such as name, size and sources of download. Various portals, which operate as search engines and download coordinators, exist. They contain information about availability of different files.

Several different programs can be used as download clients; the principle is similar to peer to peer networks, as users download a file, they automatically share the already downloaded part with other users, so this kind of distribution is mostly used with recently released files, or very popular ones.

Most widely known portal offering search of torrents is definitely *ThePirateBay.org*, or *TorrentReactor.net*. Among the programs used for downloading torrent files, I will mention *Bit Comet*.

⁵² Number of visitors who visit the website, over a period of time

4.2. *The fight against software piracy and its determinant*

As a counterpart to software piracy we can consider the organizations which fight for copyright protection. Although the main goal of these organizations is the fight with crime in the field of copyright law, their authority in the field is only limited. Such organizations, operating in the Czech Republic have so limited options and competence, that they could as well be called consultant experts in the field of copyright protection. Their activities are limited to be of assistance to the competent authorities (namely a state institution – specialized police investigation unit) and they also run anti-piracy campaigns. In this chapter, I am focusing on the most recognized organization – *Business Software Alliance (BSA)*, and how it operates. In the end I will discuss whether it is successful in its fight.

4.2.1. Business Software Alliance

BSA is the most important and recognized commercial organization which operates in the field of software copyright protection in the Czech Republic and the whole world. It operates from the year 1988 and it represents major world software manufacturers (Adobe, Dell, Intel, Microsoft, Siemens and many more) and it operates in more than 80 countries all over the world. Its operation is financed from membership fees.⁵³

The major goal of this organization is to protect and preserve the copyrights of its members. The way it does this is by investigating cases of piracy (and informing the police) and tries to prevent it from happening in the first place. It attempts to educate the public and the companies in the field of software management, copyright protection, safety of information technologies and basically anything to do with the internet and software. BSA operates in more than 80 countries all over the world.

With the assistance of *International Data Corporation (IDC)* BSA releases reports and statistics on global piracy rates. Based on these researches, it launches focused anti-piracy campaigns. In the year 2008, BSA found out that most of the illegal

⁵³ Čížek, J.: *Strašák jménem BSA, víme jak počítá české piráty*. Available at: <http://www.zive.cz/Titulni-strana/Strasak-jmenem-BSA-vime-jak-pocita-ceske-piraty/sc-21-a-141943/default.aspx> [retrieved 15/3/2010]

activity in the Czech commercial sector happened in smaller companies (up to 50 employees), as a reaction to this, they contacted 17,000 such companies with information on software piracy and impacts it could have on companies using illegal copies of software.

BSA operation, at least in the Czech Republic is very controversial. Some methods the organization uses in the fight against piracy are said to be immoral and intimidating. Great controversy was raised for example in 2001, when BSA sent a video⁵⁴ of a fictive police raid, which discover illegal software used in a company and consequently arrested the executive officer, with the slogan 'we know more than you think'. This video recording was sent anonymously to tens of thousands companies.⁵⁵ That is just one of controversial activities of this organization, it is also known for its campaigns which encourage people to report piracy, with a possibility to report it anonymously.

4.2.2. Determinant of software piracy

As I have already mentioned in the previous sub-chapter, BSA with the assistance of IDC carries out research with the aim of measuring software piracy rates in countries where it operates.

Software piracy rate in a country is a determinant of the amount of software piracy within a country or a region, shown as the percentage of illegal software from the total amount of software used in the country. It is necessary to describe the method which is used by IDC to calculate software piracy rates, because I will be using their data in most of my calculations later. All data used by IDC in the calculations is conducted by research in different countries.

The piracy rate is calculated in the following procedure:

1. The number of total software units (TSU) is calculated based on the number of PCs multiplied by the average number of software units (SpPC) used on each PC:

⁵⁴ Available at: <http://www.youtube.com/watch?v=kYurD60TNGc> [retrieved 15/3/2010]

⁵⁵ Stránský, P.: *Jezuité od BSA: Účel světí prostředky*. Available at: <http://www.lupa.cz/clanky/jezuite-od-bsa-ucel-sveti-prostredky-dovetek/> [retrieved 15/3/2010]

$$\text{TSU} = \text{PCs} * \text{SpPC}$$

2. The number of legal software units (LSU) is calculated based on the software market value (SMV) divided by the average price of software per system (PpPC):

$$\text{LSU} = \text{SMV} / \text{PpPC}$$

3. The number of pirated software units (PSU) is calculated simply by subtracting the number of legal software units (LSU) from the number of total software units (TSU):

$$\text{PSU} = \text{TSU} - \text{LSU}$$

4. **Finally, the piracy rate (PR) is calculated by dividing the number of pirated software units (PSU) by the number of total software units (TSU):**

$$\text{PR} = \text{PSU} / \text{TSU} = \underline{\text{rate of piracy in \%}}$$

Several sources⁵⁶ claim that the methodology used by BSA to determine the piracy rates is deceptive, because various important factors are not taken into account, so among other points I will discuss that in the next chapter.

4.2.3. Discussion

As I have stated before, BSA is being continuously criticized for several things, primarily for its ‘gestapo’ techniques - its attempts to educate public and companies spread fear rather than knowledge. Secondly, it is also being criticized for the fact that its policy is not objective due to the fact that it is financed by software manufacturers. Finally, some critics even reach as far as to claiming that the methodology and statistics

⁵⁶ 1. *BSA tradičně mlží, a všichni jí to baští*, Bloc.cz; http://www.bloc.cz/bloccz/internet/art_216/bsa-tradicne-mlzi-a-vsichni-ji-to-basti.aspx 2. *Několik poznámek k „pirátské“ metodice*, Bloc.cz; http://www.bloc.cz/bloccz/internet/art_217/nekolik-poznamek-k-piratske-metodice.aspx 3. *BSA or just BS*, The Economist; http://www.economist.com/research/articlesBySubject/displayStory.cfm?story_ID=3993427&subjectid=1198563&source=login_payBarrier 4. Zeman, M.: *BSA tajemství zbavená*, Lupa.cz; <http://www.lupa.cz/clanky/bsa-tajemstvi-zbavena/>

are deceptive and faulty. So a couple of questions arise and I will discuss them in the following paragraphs.

Who else should be financing such organization, the government, or perhaps the developers of free software?

BSA is not an independent company, which is a fact. It must generate an income in order to finance its operation somehow, so fees for membership are a pretty straightforward and easy way to do so, but do they affect the policy of the organization?

Both of the above questions are very hard to answer. BSA, based on the research carried out by IDC claims that piracy has horrific impact on the economy of a state, namely GDP, amount of taxes generated from software sales and unemployment rates (within IT manufacturing and development). If the numbers are at least approximately true, it would not be a bad idea for the government to think about wider participation in the fight against piracy. More objective approach would definitely bring better results and the money invested would be generated through the improvements in a couple of years. The idea would not be to enforce the police department which investigates software criminality at the moment, but rather create a subject which would educate and enlighten the public and companies in a friendlier and wider manner (discussed further in the chapter 5.1.1).

Is the research data, namely the piracy rates, relevant?

There are several factors which BSA didn't take into account. First off, some sources claim, that while gathering research data for the study, IDC only contacted the major companies operating on the market, which would mean, that they skipped a whole group of smaller retailers selling IT products. It is also a fact, that the same methodology used for different countries is not exactly very good, as the availability of information is not same for example in the USA and in Zimbabwe.

It is also important to realize, that even though the rate of piracy is decreasing, the actual amount of pirated software is increasing, because the amount of computers within a country increases every year, more software units are present, so even though the rate is smaller, the number of pirated units is higher.

There are certainly small flaws in the methodology which BSA uses to report on the piracy rates, but as the data is collected continuously through a long period, and analyzed with the same methods, the trends of development of the data are relevant

even though the exact numbers might not be. Unfortunately, it is the only data available and I do not have a capacity within this thesis to do my own research, so I will have to calculate with the data given even though I assume that it isn't 100% relevant.

4.3. *Economic analysis of software piracy*

In this chapter of my thesis, I am going to explore the economical factors of software analysis, based on the microeconomic theories of market and prices, supply and demand and consumer behavior theory.

4.3.1. *Illegal software market – supply & demand*

A market is *'the collection of buyers and sellers that, through their potential interactions, determine the price of a product or a set of products'*.⁵⁷ Therefore, the market is determined by supply and demand.

On the legal software market, this scheme is straight forward, the side of supply is represented by software manufacturers, who develop and sell the software on the market through retailers, who can operate as ordinary stores on the street, as virtual stores on the internet or the combination of both. The demand side is then represented by the consumers, who visit these stores in order to buy the goods physically, or online. Both of these sides are aware of the copyright law and they are acting in a way which doesn't breach it.

On the other hand, the scheme of illegal software market is rather different. The supply side can be represented by several different types of subjects as is described in the ways of distributing illegal software in the previous chapter. I will summarize them briefly and divide them into 2 groups, based on the size of profit they make from their actions.

1. The first group consists of the **suppliers, who do not make profit** from distribution the illegal software. These suppliers either do not realize the consequences of their actions and they act on behalf of friendship, or their activities are based on their beliefs – they know what they are committing and they do not care, a sort of rebellion against the software manufacturers.

⁵⁷ Pindyck, Robert. S., Rubenfield, Daniel. L.: *Microeconomics, sixth edition*. Page 7.

2. The second group consists of the **suppliers, who do make profit** from their distribution of the illegal software. Definitely, these suppliers know that they are acting against the law, because they do it for the profit.

The demand side of illegal software market is actually quite similar to the one of the legal software market; it is formed by consumers who are willing to buy the goods. I have used 'buy' for a reason, because as I will explain in the next subchapter, even software which is retrieved illegally and which is not actually paid for costs something.

We can observe several features which distinguish these consumers from the ones that buy software legally. In order to explain these, I will again sort out the consumers into 2 groups, this time, based on the nature of the action.

1. First group consists of the **consumers, who are not aware** of software licensing and/or copyright law at all; therefore while acquiring or using the goods, they are breaking the law unconsciously.
2. The second group consists of **consumers who are aware** of copyright law and licensed software, perhaps they even obey the law and follow the licenses, but still, sometimes (or all the time) they acquire it illegally.

The reasons for the illegal activities of the consumers from the first group are clear, they are simply not enough educated, or enlightened in the field. More important, for our purposes are the consumers from the second group, I am going to explore their behavior in the next chapter.

4.3.2. Price of illegal software

When a consumer decides, whether to buy software legally or illegally, he/she always weights the possibilities and/or attributes of both options against each other. The goal is to find the most profitable solution, which is then chosen. That is of course if morality is not taken into account. At first sight, the price of pirated software seems to be null. But several factors must be taken into account. Firstly, the time spent while searching for the source of the software could be interpreted as time that could have been spent at work, therefore it would be compared against hourly wage. In case of downloading the software, price of internet connection must be taken into account. More importantly, when committing a crime, the amount of risk must be weighted

against the amount profit. The amount of risk would consist of either a fine for committing a crime or time spent in prison.

*'The approach taken follows the economists' usual analysis of choice and assumes that a person commits an offense if the expected utility to him exceeds the utility he could get by using his time and other resources at other activities. Some persons become "criminals," therefore, not because their basic motivation differs from that of other persons, but because their benefits and costs differ.'*⁵⁸

In order to compare the prices of legal and illegal software, we have to calculate the price of illegal software first.

I am going to use the concept of expected value⁵⁹ in order to calculate the price, considering one possible outcome – acquiring of the software illegally. The formula for the calculation will look like this:

Probability of capture (PrC) * Punishment (PU) + Costs of acquiring (CA)

I will perform this calculation with data from the year 2008 acquired from the CSÚ⁶⁰, MVČR⁶¹, BSA⁶².

Primarily, I have to calculate PrC. In 2008, there were 5,16 million computer users aged 16+ in the Czech Republic, by using the 2008 piracy rate of 38%, I will get the number of illegal software users. Secondly, I will compare it with the number of cases of copyright infringement from criminality statistics, which was 89 in 2008, in order to calculate the probability of getting caught:

$$\text{PrC} = 89 / (5168459 * 0,38) = 0,000045$$

⁵⁸ Becker, Gary S.: *The economic approach to human behavior*. Page 46.

⁵⁹ Pindyck, Robert. S., Rubenfield, Daniel. L.: *Microeconomics, sixth edition*. Page 155.

⁶⁰ Use of ICT by person, Czech Statistical Office Available at:

[http://www.czso.cz/csu/redakce.nsf/i/vyuzivani_ict_jednotlivci_2005_2009/\\$File/vyuzivani_ict_jednotlivci_05-09.xls](http://www.czso.cz/csu/redakce.nsf/i/vyuzivani_ict_jednotlivci_2005_2009/$File/vyuzivani_ict_jednotlivci_05-09.xls) [retrieved 17/3/2010]

⁶¹ Kriminalita za období od 1.1.2008 do 31.12.2008, Ministerstvo vnitra. Available at:

<http://www.policie.cz/soubor/12-2008-statistiky-prehled-vusc-xls.aspx> [retrieved 17/3/2010]

⁶² *Sixth Annual BSA and IDC Global Software Piracy Study*, Business Software Alliance. Available at: <http://global.bsa.org/globalpiracy2008/studies/globalpiracy2008.pdf> [retrieved 17/3/2010]

When defining the punishment, I will refer to the Czech Criminal Law 140/1961⁶³ and use the maximum stated punishment – 5 years in prison and a fine of CZK 150,000,- (Chapter 3.4.4). For the purposes of my calculation, I will interpret the punishment as money which could be earned during these 5 years – 60 salaries. According to the CSÚ, the average monthly salary for the year 2008 is CZK 23 430,-. Therefore:

$$\mathbf{PU = 60 * 23430 + 150000 = 1555800}$$

Defining the cost of acquiring of pirated software is very hard. I will use the scenario where the consumer downloads the file from the internet. Costs of internet connection will not be taken into account, assuming that as a computer user, the consumer also has an internet connection. In my calculation, the price of acquiring the software will be the crucial part when comparing the prices at the end, so I will estimate a price for acquiring a certain piece of software in order to use its price for comparison later. My choice is Microsoft Windows XP Professional, with the file size of 316.43 MB and internet connection with the speed of 8 Mb/s, the download will take a little over 30 minutes. In our case, the downloadable file is compressed and split into 4 segments, when downloading these, it is necessary to wait 30 minutes before downloading the next segment, which increases the download time to 2 hours. Assuming 20 minutes of searching the file and 10 for extracting it, the time of acquiring the software added up to 2,5 hours maximum. I am going to interpret each hour spent as an hour of potential working with the wage of CZK 146,- (according to the average gross salary divided by 160 – approximately the number of hours spent in work in a full-time job).

With all the data necessary acquired, we can step to the calculation:

$$\mathbf{\text{Price of illegal software} = \text{PrC} * \text{PU} + \text{CA} = 0,000045 * 1555800 + 2,5 * 146 =}$$
$$\mathbf{\underline{435,01,-}}$$

⁶³ Czech Criminal Code 140/1961. Available from:
http://www.lexdata.cz/web/sb_free.nsf/c12571d20046a0b20000000000000000/c12571d20046a0b2c12566d40071eccf?OpenDocument [retrieved 17/3/2010]

Consumers, who economically evaluate the possibilities of acquiring Microsoft Windows XP Professional, should therefore compare this price with the price for which a copy of the software could be obtained legally. The price for a legal copy varies, its price is CZK 3 983,-⁶⁴ at one of the major online retail shops for IT.

Even though I have used the highest possible punishment for acquiring the software, the expected value of illegal software copy of Microsoft Windows XP Professional was almost 10 times smaller, therefore an obvious choice for a consumer.

The calculation was carried out mainly in order to give a picture of the inequality of prices of legal and illegal software. There are several other factors which could be brought into consideration, with these together with more detailed resources the calculation would have been on a completely different level of efficiency. However, as a model of the situation, it should be enough.

4.4. Current situation of software piracy

In this chapter, I will at first briefly report on the global piracy situation, given the data from BSA's reports. Afterwards I will report on the situation in the Czech Republic, where I will also analyze the data in order to find relationships which affect the piracy rate.

4.4.1. Global software piracy situation

According to the *Sixth Annual BSA-IDC Global Software Piracy Study*⁶⁵ from May 2009, global piracy rate has risen from 38% to 41%. The rates improved (in about 52%), or stayed similar (in about 35%) in the majority of studied countries. The increase in piracy rates are due to the situation in the countries with highest piracy rates, because of the rapid improvement of hardware markets in these countries as an increase in the potential means of illegal activity.

⁶⁴ Available at: <http://www.alza.cz/oem-microsoft-windows-xp-professional-cz-ceska-czech-cd-sp2-legalizacni-sada-ggk-d108776.htm> [retrieved 17/3/2010]

⁶⁵ *Sixth Annual BSA-IDC Global Software Piracy Study*. 2009. Available at: <http://global.bsa.org/globalpiracy2008/studies/globalpiracy2008.pdf> [retrieved 17/3/2010]

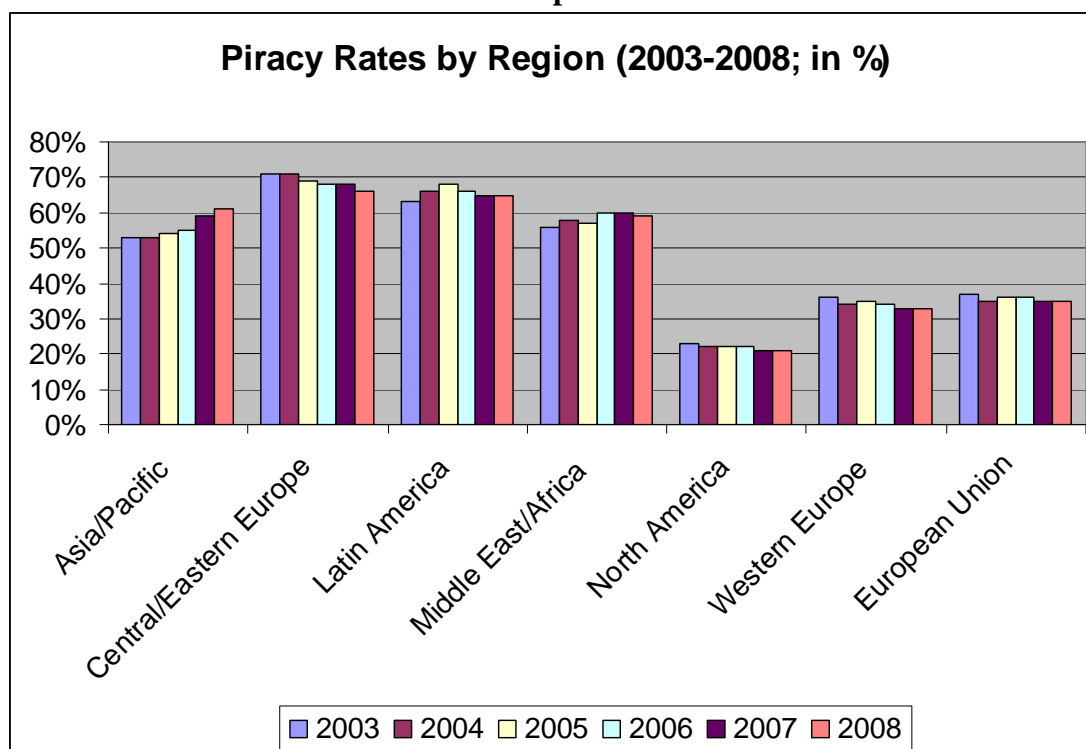
Table 1

10 countries with the highest piracy rate			10 countries with the lowest piracy rates		
#	Country	Piracy rate	#	Country	Piracy rate
1	Georgia	95%	1	United States	20%
2	Bangladesh	92%	2	Japan	21%
3	Armenia	92%	3	Luxembourg	21%
4	Zimbabwe	92%	4	New Zealand	22%
5	Sri Lanka	90%	5	Austria	24%
6	Azerbaijan	90%	6	Belgium	25%
7	Moldova	90%	7	Denmark	25%
8	Yemen	89%	8	Sweden	25%
9	Libya	87%	9	Switzerland	25%
10	Pakistan	86%	10	Australia	26%
-	Average	90%	-	Average	23%

Sources: Piracy rates, BSA.org, 2009; own calculations

As shown on Graph no. 1, the most significant increase in piracy rates in last years is recognizable in the regions of Asia/Pacific and Middle East/Africa. In the rest of the regions, the rates have a rather declining trend. Best off are the regions of North America, Western Europe and the countries of European Union.

Graph 1



Source: Piracy rates by region, BSA.org, 2009

As clearly seen in Table no. 1, the highest-piracy rate countries are Armenia, Bangladesh, Georgia, and Zimbabwe, all over 90%. The situation in these countries mostly affects the global piracy rate, as stated above and is mostly the outcome of the state of the market, which is mostly influenced by the government, as these countries do not incline to have a free market economy.

The lowest piracy rate countries are the United States, Japan, Luxembourg, and New Zealand, all around 20%. These on the other hand do incline into having a free market economy

4.4.2. Situation in the Czech Republic

In this subchapter, I will look at the situation of software piracy in the Czech Republic in more detail. Due to the *Sixth Annual BSA-IDC Global Software Piracy Study*⁶⁶ from May 2009, Czech Republic has a 38% piracy rate at the end of the year 2008, ranking among top 30 countries with the lowest piracy rate. However, the average rate for European Union is 35%, so in comparison to the other EU countries, we still have to improve, not to mention that the average of rates of 10 countries with the lowest piracy rates is 23% - which offers even more space for improvement.

Table 2

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Piracy rate	45%	42%	43%	43%	40%	40%	41%	40%	39%	39%	38%

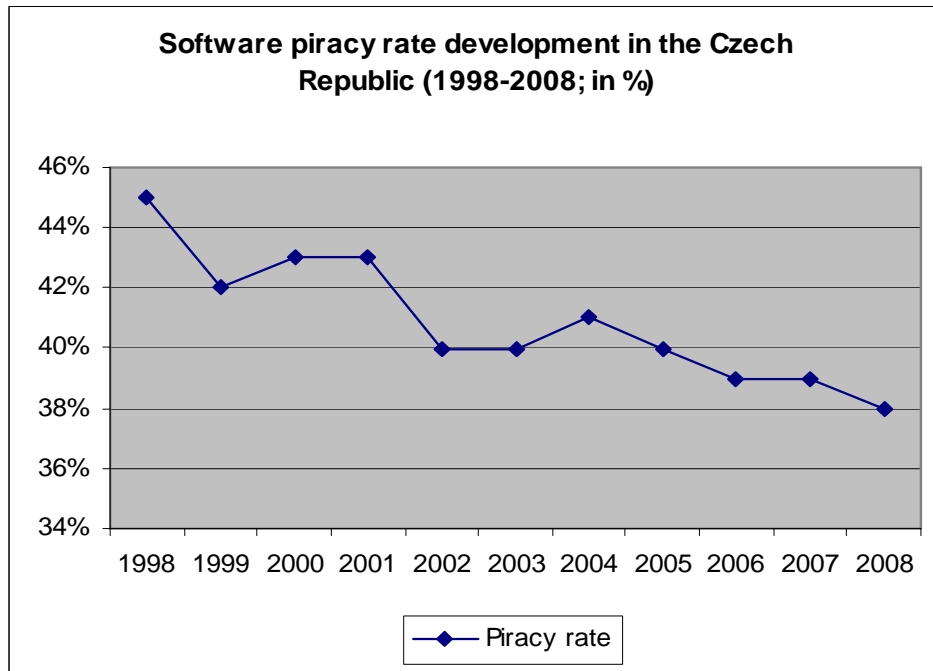
Source: Piracy rates Czech Republic, BSA.org, 2002-2009

I have collected data from all previous software piracy studies⁶⁷ in order to show the development of software piracy in the Czech Republic over the last decade. Over the period, software piracy rate has dropped by 7%, which is less than a percent yearly in average, but a clear declining trend is apparent, as show on the Graph no. 2 and Table no. 2.

⁶⁶ *Sixth Annual BSA-IDC Global Software Piracy Study. 2009. Available at: <http://global.bsa.org/globalpiracy2008/studies/globalpiracy2008.pdf> [retrieved 17/3/2010]*

⁶⁷ Available at: <http://www.bsa.org/globalstudy/> [retrieved 18/3/2010]

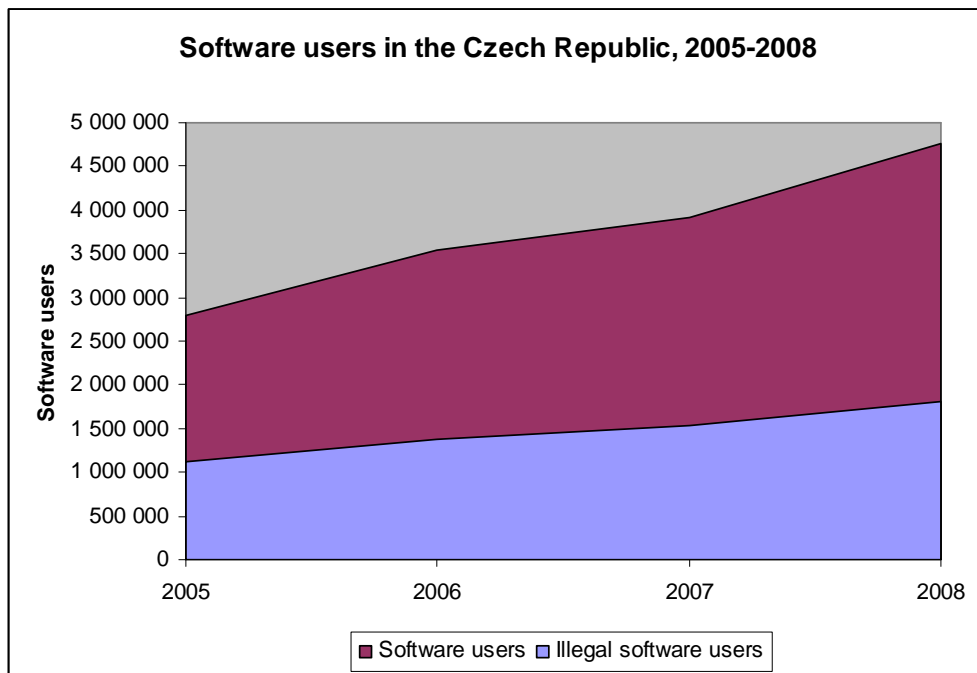
Graph 2



Source: Piracy rates Czech Republic, BSA.org, 2002-2009

It is apparent, that the situation is stagnating, as there are years, where the rates remained the same (2000-2001, 2002-2003) and even years where the piracy rate had risen (2000 and 2004).

Graph 3



Source: GDP development time series, ČSÚ, own calculations

Using the information from the Table no 3., I have plotted a graph (Graph no. 3) showing the amount of software users together with illegal software users. This graph clearly shows that even though the piracy rate has dropped by 2% over the period, the number of illegal software has definitely grown. That is because the decrease of the piracy rate is too slow in comparison with the increase of the software users in the Czech Republic.

Table 3

Year	2005	2006	2007	2008
Software users	2 790 714	3 541 342	3 921 199	4 760 904
Piracy rate	40%	39%	39%	38%
Illegal software users	1116286	1381124	1529267	1809143
Cases	791	354	462	89
Probability	0,071%	0,026%	0,030%	0,005%

Source: Piracy rates Czech Republic, BSA.org, 2009, own calculations

As shown in Table no. 3, I have also calculated the probabilities of getting caught (same method as in chapter 4.3.2) for the period 2005-2008 (unfortunately, I was unable to retrieve user, as well as criminality data from before 2005), in order to try and study the relationship between the probability and piracy rates. Clearly, the piracy as well as the probability of criminals to be caught have a tendency to decline, there is not likely to be any kind of dependency. The probabilities of getting caught are so low, that I doubt that they play any but an insignificant role in the improvement of software piracy rates over the years. I have calculated the *coefficient of correlation* with a result of 0,975652677, which proves that the two data sets have a positive linear relationship, yet only as data sets. If the relationship was brought into practice, it would actually mean that the lowering of probability of getting caught helps lowering the piracy rates, which is absolute nonsense.

Unfortunately, I was not able to retrieve any data regarding the development of legal software prices, it would be interesting to explore whether there is a dependency between them and the piracy rates. I am assuming that as the prices play significant roles in the decision making process of the consumer (as shown in the chapter 4.3.2), I could probably prove a negative linear relationship between software prices and the piracy rates.

Further, I have collected sets of data, of the GDP and average gross monthly salaries for the same period as I have already got the software piracy rates (Table no. 4),

in order to study the relationships of the data. I am using the GDP and consecutively the salaries as determinants of the general state of the economy of our country.

*'GDP is a measure of value of all the newly produced goods and services in a country during some period of time.'*⁶⁸

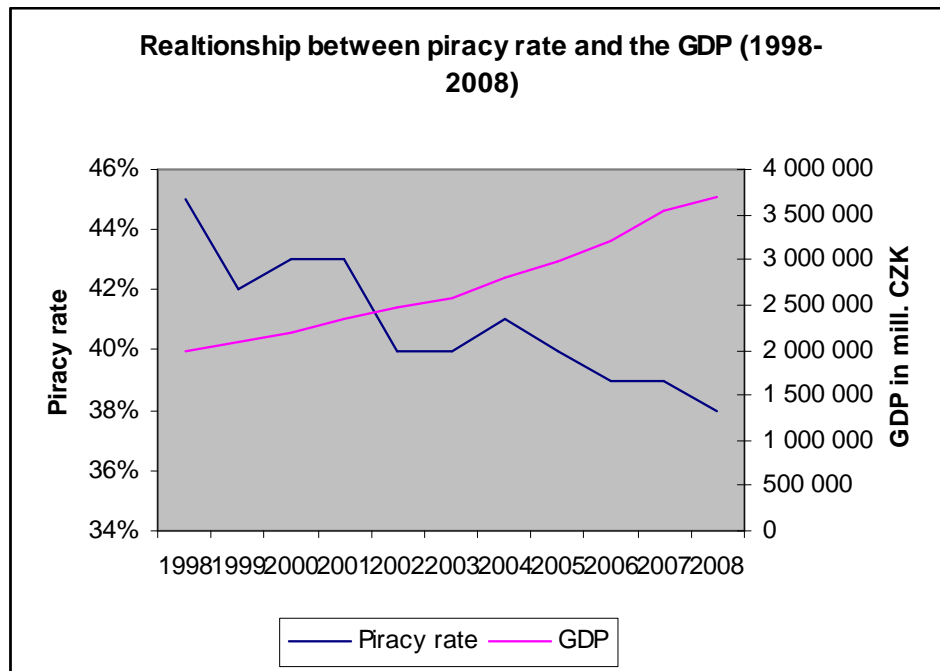
Table 4

Year	1998	1999	2000	2001	2002	2003
Piracy rate	45%	42%	43%	43%	40%	40%
GDP	1 996 483	2 080 797	2 189 169	2 352 214	2 464 432	2 577 110
Gross Salaries	11801	12797	13594	14750	15911	16905
Year	2004	2005	2006	2007	2008	-
Piracy rate	41%	40%	39%	39%	38%	-
GDP	2 814 762	2 983 862	3 222 369	3 535 460	3 696 389	-
Gross Salaries	18025	18940	20158	21621	23430	-

Source: Piracy rates Czech Republic, BSA.org, 2002-2009; GDP and average gross monthly salaries time series ČSÚ

I am assuming, that as the economy improves, the salaries will be higher, offering a larger budget to the consumers and therefore they will be willing to buy more goods⁶⁹ - in this case legal software. Both sets of data should prove to have a negative linear relationship with the piracy rates.

Graph 4



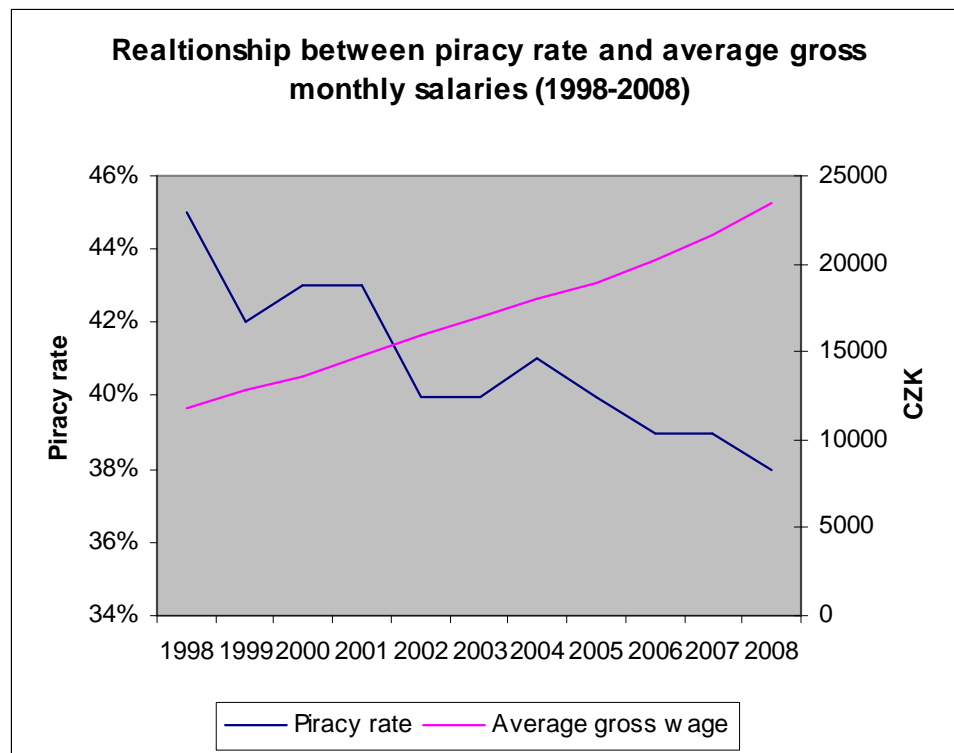
Source: Piracy rates Czech Republic, BSA.org, 2002-2009; GDP time series, ČSÚ

⁶⁸ Taylor, John B., Weerpana, A.: *Economics*. Cengage Learning, 2007

⁶⁹ Pindyck, Robert. S., Rubenfield, Daniel. L.: *Microeconomics, sixth edition*. Pages 79-85.

First, I have compared the development of piracy rates and the GDP (Graph no. 4). I have calculated the *coefficient of correlation*, with a result of -0,872925719, which shows as I have assumed before, a relatively strong negative linear relationship – the higher the GDP, the lower the piracy rate.

Graph 5



Source: Piracy rates Czech Republic, BSA.org, 2002-2009; Average gross monthly salaries time series ČSÚ

Next, I have studied the relationship of the piracy rate and average gross monthly salaries, as shown on the Graph no. 5. I have calculated the *coefficient of correlation* of the two sets of data and the result was -0,906021784, which proves a strong negative linear relationship, very similar to, but slightly stronger than of the piracy rates and the GDP.

There are several factors affecting the software piracy rate in our country. BSA claims⁷⁰ that the improvement of piracy rates is happening mainly due to quality work of police and effectiveness of their anti-piracy campaigns, as these factors definitely

⁷⁰ Press Release regarding the Sixth Annual BSA-IDC Global Software Piracy Report. Available at: http://global.bsa.org/globalpiracy2008/pr/pr_czechrep.pdf [retrieved 18/3/2010]

have some influence on the situation, I tend to think that rather the spread of free software users and improving economical situation of the country have the positive effect, as the probability of getting caught while committing a software fraud is so low, it is hard to believe what BSA claims to be the largest part of the piracy rate decline.

4.4.3. Future forecast of software piracy rates in the Czech Republic

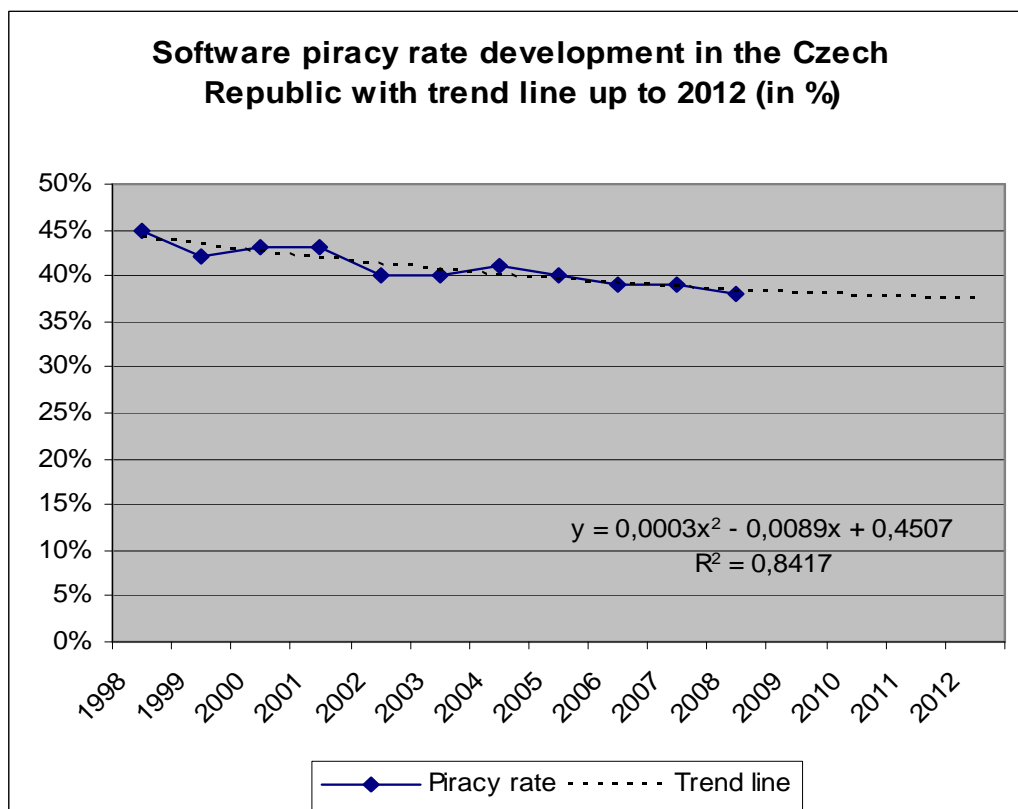
Table 5

Year	2009	2010	2011	2012
Piracy rate estimate	38,71%	38,57%	38,49%	38,47%

Source: own calculations

I have used the data set of software piracy rates from the years 1998-2008, to calculate the data for another 4 years, up to 2012, as seen on Table no. 5. I used the method *trend line analysis*.

Graph 6



Source: Piracy rates Czech Republic, BSA.org, 2002-2009; own calculations

The *coefficient of determination* - R^2 , as shown on the Graph no. 6, shows a rather strong dependency, so the estimate is probably quite accurate. The future piracy

rates in Czech Republic will continue to decline. According to my calculations, they will decline less than 0,1% portion each year, which is likely to grow, because at the moment the global economic crisis definitely influences the piracy rates largely and causes them to stagnate.

5. Conclusions

5.1. *Possible solution suggestions*

One of my initial goals was to present possible solutions or ways of improving the situation. Based on my findings, I have summarized several possibilities of improvement, which are presented in this chapter.

5.1.1. Government funded resources and education

As I have already mentioned previously, one of the possible ways to improve the situation of software piracy in our country is to educate and enlighten people in the problem of software piracy through government funded resources.

The operation of organizations which fight copyright infringement usually only pushes the consumers into buying original copies of software through threatening, rather than education, without even giving them the possibility to choose what they want.

Government funded resources, created with the goal to spread information into both public and commercial sectors would enable spreading of objective information in an acceptable manner.

Another, but certainly rather radical way to enlighten consumers would be the possibility of distributing booklets together with sold hardware components. These booklets would contain information about commercial software and on the other hand also information about free software options, in order to give the consumer a possibility to choose from more legal possibilities.

I feel that the issue of free alternatives to commercial software has a great potential, so I have dedicated a whole sub-chapter (4.5.3) to this topic.

5.1.2. Legalizing software for non-commercial use

A rather radical suggestion, yet it definitely has some potential, as some manufacturers already do have campaigns in which they offer their products or versions of their products with a considerable discount or even free of charge to non-commercial users. It would be worth considering whether the consumer who uses the software for non-commercial purposes needs the whole range of functions – if releasing slightly limited versions of software for less or for free would be popular. Such policy should be considered by all of the major companies. In the following lines I will provide a couple of examples of products already offered with favorable conditions to non-commercial users.

For example, Adobe has recently launched a campaign, offering their products to students with over 90% discount, which is rather significant. Another offer, with actually free use of software for home users has been coming for years now from the company ALWIL Software a.s. Their antivirus software *avast! Free Antivirus* is downloadable from their website free of charge. Of course, it lacks some of the functions of their paid products, but for home users, it is satisfactory. I have been using it myself, for a couple of years now, and I must say that I am very happy with the product.

5.1.3. Adjusting the price and distribution channels of software

As explained in the chapter 4.3.2, the price of software affects the consumer choice (which often results in illegal activity) very much. As well as the supply, the demand for software will rise in the future, as more PCs are bought every year and the technology advancement is unstoppable.

Adjusting the prices of software to more acceptable levels is not as radical as offering them for free and in the long run could actually increase the revenues from sales of the manufacturing companies. Only the initial costs of software development is high, the consecutive production comprises basically just from the costs of media on which the products are recorded.

Lowering the price together with offering new ways of buying software could mean a great change in the piracy rates. Lower prices would give the consumers less motivation for downloading illegal software, furthermore offering commercial software

online, with the possibility to download it straight upon purchase would definitely cause positive reactions. It would slightly reduce the costs of the manufacturers but also it would greatly increase the comfort of the consumers and decrease their costs of acquiring the software.

5.1.4. Alternatives for pirated software

Organizations, such as BSA, which fight against software piracy and counterfeit are formed and financed by large software manufacturing companies, so their policies never propagate free software as a possible solution, because that would make them advertise different products than the ones of their members.

I think that offering alternatives to commercial software is a significant way to improve the situation, because the scheme could be very simple.

This suggestion is very closely connected to the first one (chapter 4.5.1). There are already information resources available for education of the public and companies. One of the important improvements of their effectiveness would be, if next to the information about commercial software, free software would be provided as an alternative. Increasing the awareness of the public about free computer programs as alternatives to commercial software could mean a breakthrough in the situation. The products are already available on the internet, and the only thing left is to promote them, so that people can choose to download free programs, instead of illegally using software which should be paid for. Many people use these programs all over the world, why not make them more popular in order to decrease the number of illegal software copies.

5.2. *General conclusion*

At the beginning of my thesis I have set the objectives of my work, and explained the methods used throughout the thesis, in order to show the expected outcome and how I will attempt to reach it.

In the first, rather theoretical part of my thesis, I have aimed on the introduction of the topic, mainly by providing an overview of important historical milestones and of the key elements which are discussed – software and its creation, licenses and laws concerning software use and distribution in Europe and in the Czech Republic.

In the core of my thesis, I have defined the term ‘software piracy’, based on the knowledge presented in the first part. Also, I have given an insight into the types of software piracy by giving an account of ways in which it can occur. Further, I have explored the ways in which the modern organizations try to fight with the problem and discussed the policy of Business Software Alliance.

In my research, I have focused on the exploration of key factors which affect the occurrence from the economical point of view, by using the basic market mechanisms of supply and demand and by trying to determine the price of illegal software.

Further, I have briefly reported on the situation of software piracy in the Czech Republic and the rest of the world, with a prediction of the future development of the situation.

From the suggestions presented in the previous chapter, I will point out the most important one again. Creating of government funded resources in order to educate the public in the matter of copyright infringement would be a significant way to help the improvement of the situation. The education policy in this matter would be even more effective, if it offered more options to the consumers – pointing out the possibilities of alternative products to pirated software. Seminars in schools would be a way to educate young people in the matter. Educational programs on different topics, such as ecology, are already functioning and young people try to act accordingly to what they learn. When my generation was young, we exchanged software without even knowing that we are committing a crime. I believe that each year more younger kids come into contact with computers and software, therefore to potential crime, it is important to educate them in this manner, in order to improve the future development of software piracy, because they are the future.

I have managed to create a model, in order to determine the price of illegal software and compare it to the price of legal software. The results of the calculation with real data showed, that for an economically thinking consumer, who does not take into account the morality of the actions, the price of illegal software is unmatched in comparison to price for legal software.

The price is one of the factors, which affect piracy rates the most. Primarily, we have the price of illegal software, which is really low. This is mainly due to the really small probability of getting caught, together with low punishments. This could be

solved mainly by increasing the fines, or by focusing more on solving the crimes where software infringement is involved. On the other hand is the price of legal software, which is in comparison high. If it was decreased, the difference between its price and the price for illegally retrieved software would decrease, and therefore the motivation for committing such crime would become lower.

My calculations have also proved that together with the prices, the general economical state of a country definitely affects the development of piracy rates. As determinants I have used the GDP, and consecutively the average gross monthly salaries. The results from the calculation of coefficients of correlation had clearly shown negative proportion relationships to the piracy rates. Which proved that the better of a country is economically, the higher are the salaries and consecutively the budgets for buying the software legally. Therefore more consumers would buy more legal software.

Using the trend line analysis method, I have calculated piracy rates for the period of next four years. The results show that the trend of piracy rate will continue to decrease, even though it will be very slowly. The recent stagnation of the development of the rates is probably caused by the impact of economical crisis.

It is important to realize that the decrease in the piracy rates does not mean an increase in the actual amounts of software used illegally. As the technologies develop, more computers and software are released every year and this kind of development will definitely continue into the future. The decrease in piracy rates is very slow, in comparison with how fast the number of software users grows. In order to really improve the situation, so that not only the ration between legal and illegal software used is better, but also that the actual number of software infringed decreases, it would be necessary to apply drastic changes to policies regarding the fight with software piracy, hopefully the government will realize this soon, so that some measures are taken.

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