



APPLICATION OF REVERSE ENGINEERING
AS FAIR USE EXCEPTIONS

BY
MS. PITCHAYA DHARMPIT

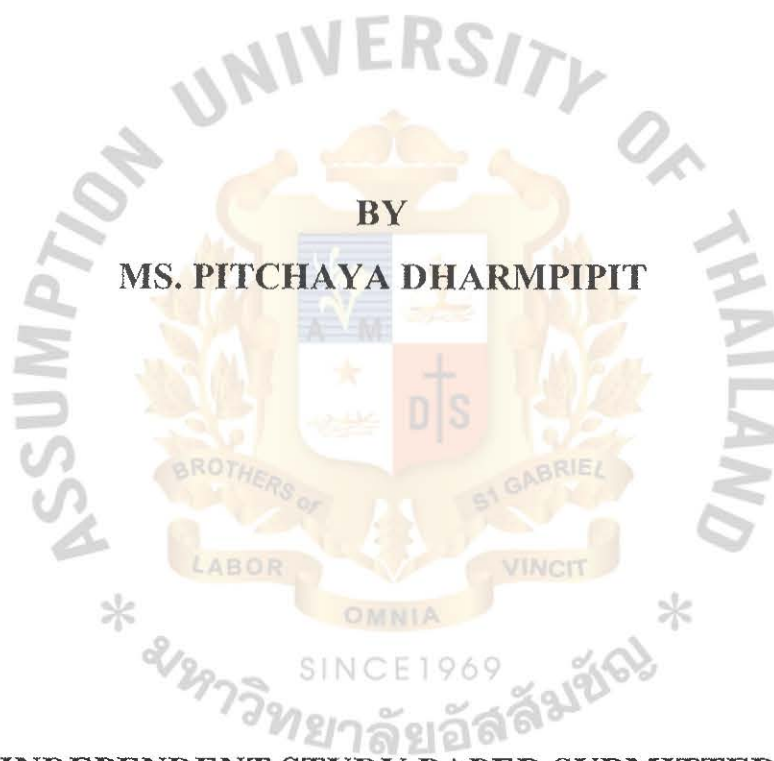
AN INDEPENDENT STUDY PAPER SUBMITTED IN
PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR THE DEGREE OF MASTER OF LAWS
(BUSINESS LAW)

GRADUATE SCHOOL OF LAW
ASSUMPTION UNIVERSITY

DECEMBER 2010

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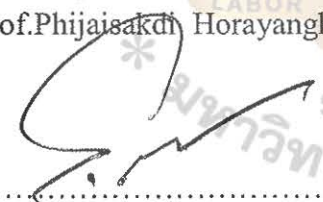
Independent Study Paper Title : Application of Reverse Engineering as Fair Use
Exceptions
Author : Ms.Pitchaya Dharmpipt
Major : Master of Laws (Business Law)
Advisor : Dr. Wariya Lamlert


Faculty of Law, Assumption University approves this Independent Study Paper as the partial fulfillment of the requirement for the Degree of Master of Laws.


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ABSTRACT

The study is aimed at analyzing the application on the use of reverse engineering towards fair use exceptions in Thai Copyright law by analytically comparing to United States copyright regimes. Nowadays, the digital technologies and network have dramatically developed and it has a tremendous impact on the creation, reproduction, and dissemination of copyright works. Computer program became a multi-functional tool for programmers to innovate new technologies and enhances software industry for the economic progress. The technology industry needs to be continuously developed in order to be in line with developed countries and one of a process which helps developing countries to achieve such goal is the application of reverse engineering.

This study shows that the application on the use of reverse engineering have an impact to both copyright owners and the users. In the process of reverse engineering, copying the program's object code and disassembling it to source code must be made. It surely constitutes copyright infringement but the fact that reverse engineering benefits public interest as much as it erodes the owner's exclusive rights, the copyright law should not recognize reverse engineering as copyright infringement as long as it is used for non-commercial purpose which does not conflict with a normal exploitation of the copyright work and does not unreasonably prejudice the legitimate rights of the owner. Thus, to balance interest between these two groups, it must consider the clear cut scope in determining which fair use is fair and which is not by using the four factors under U.S. copyright law together with other predominant factors such as inner intention of person who reverse engineers.

In order not to limit this country's progression and avoid developed countries from taking advantage of, it is recommended that Thai Copyright Act B.E. 2537 (1994) should permit reverse engineering as fair use exception by adding reverse engineering clause in section 35 and the court should strictly consider the four factors under the U.S. copyright law together with the other factors in determining fair use defense on the case-by-case basis. This way, the application of reverse engineering will bring about the utmost benefits upon digital technology, software industry and economic progression respectively.



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Table of Contents

	Pages
Abstract	iii
Acknowledgement	v
Table of Table	ix
Table of Chart	x
Chapter 1 Introduction	
1.1 Background and General Statement of the Problems	1
1.2 Hypothesis of the Study	2
1.3 Objectives of the Study	3
1.4 Study Methodology	3
1.5 Scope of the Study	3
1.6 Expectation of the Study	4
Chapter 2 General Principle, Concept and function of Reverse Engineering under Copyright Regime	
2.1 Copyright Law and Its Exception for Private Use	5
2.1.1 Computer and Copyright Law	5
2.1.2 Fair Use Principle	10
2.2 Computer Program	18
2.2.1 Reverse Engineering Analysis	20
2.2.2 The Difference between Reverse Engineering and Adaptation	23
2.2.3 Reverse Engineering Applied in Other Laws	24
2.3 Scope of Protection for Computer Program	30
2.3.1 Right Holder	30

Pages

2.3.2 Infringement.....	30
Chapter 3 Provisions Relating to Reverse Engineering in International Convention and United States Copyright Law	
3.1 Conventions.....	32
3.1.1 The Berne Convention for the Protection of Literary and Artistic Works (Berne Convention).....	32
3.1.2 The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs).....	36
3.1.3 World Intellectual Property Organization Copyright Treaty (WIPO Copyright Treaty).....	40
3.2 The United States Copyright Law.....	42
3.2.1 The United States Copyright Act 1976.....	42
3.2.2 Digital Millennium Copyright Act (DMCA).....	49
3.2.3 Perspective on Application of Reverse Engineering as Fair Use Exception.....	53
3.3 Provision Relating to Reverse Engineering in Other Countries.....	59
Chapter 4 Problem Analysis on the Application of Reverse Engineering	
4.1 Problem on Reverse Engineering Deemed as Fair Use.....	62
4.2 Implementation of Reverse Engineering under Fair Use Doctrine.....	70
Chapter 5 Conclusion and Recommendation	
5.1 Conclusion.....	75
5.2 Recommendations.....	78
5.2.1 Adding Reverse Engineering Exception in Section 35 of the Copyright Act B.E. 2537 (1994).....	78
5.2.2 Adding Reverse Engineering Exception in Fair Use Manual Guide.....	79

	Pages
Bibliography.....	81
Appendix.....	90



Table of Table

Table		Pages
1	Extent of Commercial Exploitation.....	45
2	Purposes Allowed for Reverse Engineering.....	72



Table of Chart

Chart	Pages
1 Making an Adaptation in Relation to a Computer Program.....	67
2 Copyright infringement charges.....	74



Chapter 1

Introduction

1.1 Background and General Statement of the Problems

Evidently, the digital technologies and network nowadays have dramatically developed so much and it has an enormous impact on the creation, reproduction and dissemination of copyright works. The more competitive atmosphere among those of competing firms occurs, the more innovative development arises. A company tries to create or produce better products to compete with the other companies in order to survive in the fair competitive atmosphere. That is the reason why reverse engineering plays an important role in every country's copyright system. Reverse engineering can be defined as a process of discovering the technological principles of a device, object or system through analysis of its structure, function and operation. It can be applied to all copyrighted works as specify in section 6 of Copyright Act B.E. 2537. However, computer programs are unlike other works of copyright. Ideas and principles underlying or incorporated into or expressed in computer programs are, in most cases, not transparent. They are not readily available to a person using the program. In the case of a literary or dramatic work or an artistic work, the plot, idea, concept or message that the author of the work intended to develop or convey is apparent. It is nearly impossible for the users to analyze and develop the owner's computer program without accessing into copyrighted part of the work which may constitute copyright infringement. Thus, this paper focuses its analysis to the area of computer program due to the fact that software copyright cases have better exemplified the fundamental issues regarding software proprietors seeking for a protection over their programs beyond the confinement of the law.

Copyright law has long time served as the principal source of legal protection for copyrighted work. The right holder has the exclusive rights to exploit over their created work and to restrict unauthorized user's accessibility. Nevertheless, the restriction of an unauthorized accessibility must be clearly defined to undercut the right holder's absolute power. Thus, owing to an underlying ground for balancing the

gain and loss between the benefit of the public and the interest of the copyright holders over their exclusive rights, there constitutes a “Fair Use” doctrine where the users have the privilege to use copyrighted material of the copyright owner in a reasonable manner without the owner’s consent while, at the same time, not unreasonably prejudiced the legitimate right of the right holder. Whether reverse engineering will meet the requirements of the fair use exception or it will be a copyright infringement, in developed country like United States, there still appears an unsettled argument regarding the determination of the dynamics of fair use in which the court will determine the facts on a case-by-case basis to see whether the reason is equitable or not.

Whereas, section 35 of the Copyright Act B.E. 2537 does not provide any exceptions to protect reverse engineering over computer programs as fair use, it undermines an incentive of creators to invent, innovate and develop new inventions to the societies. Besides, many of an individual copyright owner in Thailand turns to use licensing agreement to claim revenue they could have earned from their copyrighted works, ignoring the fair use exception barren. Therefore, this paper analyzes the range of application of reverse engineering and the impact of reverse engineering on fair use doctrine in Thailand, and propose the solution in order to solve an insufficient provision concerning reverse engineering as fair use exception in Thai Copyright Act B.E. 2537. In addition, this paper studies the differences between the provision concerning reverse engineering on fair use exception in copyright scheme of Thailand and United States in order that the analysis of the pros and cons of the application can eliminate drawback with the solution proposed.

1.2 Hypothesis of the Study

Reverse Engineering is considered as one of copyright infringement exception according to fair use doctrine. Thailand, however, has not yet applied such protection to those users who make “fair use” of the original copyrighted work. If users reverse engineer in good faith to advance knowledge originating from the copyrighted works, such users will not be protected under Thai copyright Act B.E. 2537. Therefore, in order to be in line with other countries, Thai copyright Act B.E.

2537 should impose “Reverse Engineering” as one of exceptions in section 35 as it will enhance the knowledge of people in the societies, and gain an utmost benefit to the public.

1.3 Objectives of the Study

1.3.1 To define characteristics and functions of reverse engineering in the scope of copyrighted work including legal provisions relating reverse engineering under international convention, Thai and United States copyright law.

1.3.2 To demonstrate the concept and the purpose of fair use exception in copyright scheme of Thailand and United States.

1.3.3 To examine the problems of the application on the use of reverse engineering towards fair use exception in Thailand and United States.

1.3.4 To propose a solution in order to solve an insufficient provision concerning reverse engineering as fair use exception in Thai Copyright Act B.E. 2537.

1.4 Study Methodology

This research paper will be analyzed and researched by the method of documentary research through textbooks, articles, documents and electronic information regarding copyright. It also includes related conventions, law and regulations on copyright in Thailand and United States.

1.5 Scope of the study

This research paper studies the application of reverse engineering in copyright works and fair use exception by analyzing the range of the application and impingement of reverse engineering on fair use doctrine in Thai and United States copyright system as provided by related conventions, namely the Berne Convention, the TRIPS agreement and the WIPO Copyright Treaty (WCT), including national copyright laws namely United States Copyright Act 1976, Digital Millennium Copyright Act (DMCA) and Thai Copyright Act B.E.2537.

1.6 Expectation of the study

1.6.1 To know characteristics and functions of reverse engineering in the scope of copyrighted work including legal provisions relating reverse engineering under international convention, Thai and United States copyright law.

1.6.2 To understand the concept and the purpose of fair use exception in copyright scheme of Thailand and United States.

1.6.3 To identify the problems of the application on the use of reverse engineering towards fair use exception in Thailand and United States.

1.6.4 To recommend a solution in order to solve an insufficient provision concerning reverse engineering as fair use exception in Thai Copyright Act B.E. 2537.



Chapter 2

General principle, Concept and function of Reverse Engineering under Copyright Regime

2.1 Copyright Law and Its Exception for Private Use

2.1.1 Computer and Copyright Law

“Copyright” is a set of exclusive rights granted by the law of a jurisdiction to the author or creator of an original work, including the right to copy, distribute and adapt the work.¹ The copyright term is the life of author plus 50 years. When the author is a legal entity or an anonymous person, the copyright term is 50 years from the date of publication. There are 9 various copyrighted works protected under Thai copyright law namely literary, dramatic, artistic, musical, audiovisual, cinematographic, sound recording, sound and video broadcasting work or any other works in the literary, scientific or artistic domain.

Disputes are first heard in the Intellectual Property and International Trade Court (IP&IT Court).² At least two judges and one associate Judge shall be present to form a quorum for the adjudication. Copyright is automatically protected and does not need registration, however, it can be filed with the Department of Intellectual Property (DIP).

Thai copyright law protects the expression of ideas, not the idea itself, by way of giving a set of exclusive rights to the copyright owner. Copyright owners can licence or permanently transfer or assign their exclusive rights to others. The exclusive rights are as follows;

1. Reproduction or adaptation

¹ Jason Matthews, Types of Intellectual Property, at <http://hubpages.com/hub/Types-of-Intellectual-Property-and-Legal-Protection>, (last visited 16 September 2010).

² IP System of Thailand, Department of Intellectual Property, at <http://www.ipthailand.go.th>, (last visited 16 September 2010).

2. Communication to public
3. Letting for hire of the original or the copies of a computer program, an audiovisual work, a cinematographic work and a sound recording
4. Giving benefits accruing from the copyright to other persons
5. Licensing the right of reproduction or adaptation; communication to public; or letting for hire of the original or the copies of a computer program, an audiovisual work, a cinematographic work and a sound recording

The legal protection for computer programs is statutorily recognized to four different forms of intellectual property law which are trade secret law, copyright law, trademark law, and patent law.³ There are many reasons why computer programs are revisable to so many forms of legal protection. Computer programs can operate both as a part of a machine and as a means of communicating with other human beings, so they are eligible for patent and copyright protection. Because programs that are publicly distributed in object code form can concurrently be kept secret in source code form, they may also be acceptable for trade secret protection.⁴ The screen displays of computer programs may be separately protected as copyrightable literary works, and they may contain adequately distinctive product features to qualify for trademark protection, or may even be eligible for design patent protection if they possess a new and non-obvious ornament design for an article of manufacture.

At the beginning, the vagueness of which law will govern computer program was still in doubt. In United States, under previous statutes, including the Copyright Law of 1909, protection was extended only to “copies which were perceptible to humans—things written or printed...in intelligible notation,” where the Supreme Court put it in *White-Smith v. Apollo Co.* held that a piano roll was not a “copy” of the song it embodied and reasoned that, to be a “copy”, a work must be

³ Charles R. McManis, “Intellectual Property Protection and Reverse Engineering of Computer Programs in the United States and The European Community,” 8 *High Tech. L.J.* 25 (1993): 26-31.

⁴ Pamela Samuelson and Suzanne Scotchmer, *The Law and Economics of Reverse Engineering*, at <http://www.shell-storm.org/papers/files/454.pdf>, (last visited 1 November 2010).

encoded in “intelligible notation.”⁵ Then, World Intellectual Property Organization (WIPO) had set up the committee, the National Commission on New Technological Uses of Copyrighted Works (CONTU)⁶, and come to an agreement that it is protected as literary work. Such an agreement was subsequently stipulated in TRIPs Agreement under article 10 (1).⁷ Many countries as a member states have to implement their domestic law in consistence with the TRIPs Agreement. Nevertheless, since copyright subsisted in computer program in which source code or object code(literal elements) was protected, there still a difficulty of copyright protection in the case where the non-literal element such as its structure, sequence of operations, functions, interfaces and methodologies was left unprotected.

Every computer program copyright case treats the copyright in the source code and the object code as equivalent. That is likely because they were decided at a time when there was essentially a one-to-one correspondence between the source code and the object code. The source code was written in assembly

⁵ White-Smith v. Apollo, 209 U.S. 1 (1908). The Supreme Court held that a piano roll was not a “copy” of the song it embodied and reasoned that, to be a “copy”, a work must be encoded in “intelligible notation.”

⁶ Lee A. Hollaar, Final Report of the National Commission on New Technological Uses of Copyrighted Works (CONTU), at <http://digital-law-online.info/CONTU/contu2.html>, (last visited 1 November 2010); Congress created the National Commission on New Technological Uses of Copyrighted Works (CONTU) in 1974. The Commission was assigned to make a national policy recommendation that would provide adequate legal protection for the intellectual property work embodied in new technologies while ensuring access to those technologies. The Commission conducted hearings and received expert reports beginning in May 1976. The final report was concluded on July 31, 1978, which recommended that full copyright protection be extended to all forms of computer software.

⁷ Article 10 TRIPs Agreement

Computer Programs and Compilations of Data

“1. Computer programs, whether in source or object code, shall be protected as literary works under the Berne Convention (1971).”

language, with each line of the source code corresponding to a single machine instruction.

Thus, with respect to software, this typically means that the computer program, in both human-readable and machine-executable form (source code and object code), and the related manuals are eligible for copyright protection, but the methods and algorithms within a program are not protected expression.

The first of the new era of cases to have carefully interpreted the 1980 computer software copyright law and firmly established the copyrightability of computer programs is the *Apple Computer, Inc. v. Franklin Computer Corp.*⁸ case. Franklin copied, with minor variation, the system identically from the Apple's ROM in which it was embedded. It permitted Franklin's ACE Computer to use the vast number of application programs written for the Apple II Computer. The court faced with three basic issues about the scope of protection for computer programs: (1) whether copyright can exist in a computer program expressed in object code; (2) whether copyright can exist in a computer program embedded in a ROM; and (3) whether copyright can exist in an operating system program. The court answered all three issues that copyright protection is available for an operating system program in object code form even when it is stored in ROM, reaffirming and expanding the scope of protection for computer programs.⁹

Under Thai Copyright Act B.E. 2537, the definition of computer program is specified under section 4, reads as follows:

“Computer program means instructions, set of instructions or anything which are used with a computer so as to make the computer work or to generate a result no matter what the computer language is”.

It is categorized as literary work stipulated under section 4 giving the meaning that “literary work means any kind of literary work such as books, pamphlets, writing, printed matters, lectures, sermons, addresses, speeches, including computer programs”. The exclusive right spontaneously remains that of the creator

⁸ *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240 (3d Cir. 1983).

⁹ Marshall Leaffer and Metthew Bender, *Understanding Copyright Law*, 2nd ed. (United States: Times Minor Books, 1995), p. 77.

as soon as the work is accomplished, without the need for registration. The copyright owner has the exclusive rights of reproduction or adaption, communication to public, letting of the original or the copies of a computer program, giving benefits accruing from the copyright to other persons, and licensing all the mentioned rights with or without conditions provided that the said conditions shall not unfairly restrict the competition, as stipulate in section 15 of the Copyright Act B.E. 2537.

The prerequisites of originality and expression of idea for a computer program must be presented as subject matter of copyright in order to achieve copyright protection. Original works of authorship must be independently created by the author (as opposed to copy from other woks).¹⁰

Copyright law protects expression of idea but not the idea itself. This appears in Thai Copyright Act B.E. 2537 section 6 paragraph 2, which specifies “The Copyright Work by virtue of this Act means a work of authorship in the form of literary, dramatic, artistic, musical, audiovisual, cinematographic, sound recording, sound and video broadcasting work or any other work in the literary, scientific or artistic domain whatever may be the mode or form of its expression. Copyright protection shall not extend to ideas or procedures, processes or systems or methods of use or operation or concept, principles, discoveries or scientific or mathematical theories.” Conforming to principle in Thai’s Copyright law, it explicitly states in Copyright Act of 1976 section 702 (b) that “In no case does copyright protection for an original work of authorship extent to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.”¹¹ This principle is called “Idea Expression dichotomy”,¹² which adopted from U.S. court decision.

¹⁰ Feist Publication, Inc. v. Rural Telephone Service Co., 499 U.S. 340 (1991).

¹¹ U.S. Copyright Office, Copyright Law of the United States, at <http://www.copyright.gov/title17/92chap1.html>, (last visited 9 October 2010).

¹² Bandit Limsakul, The Scope of Computer Program Protection Under Copyright Law (Bangkok: Chulalongkorn University press, 2004), p. 335-336.

2.1.2 Fair Use Principle

Copyright is not just a law for copyright owner but aims at creating balance between the interest of the authors, by giving them an incentive to create their copyright works, and the public interest in allowing them to have optimal access to the knowledge and creative arts whereas the principal mechanism for the public interest in a copyright regime is “fair use exception”.

Having served as a balancing mechanism for mediating among the interests of authors, publishers, and the public,¹³ fair use provides the copyright owner with the exclusive rights of reproduction or adaptation; dissemination to the public; renting; granting benefits accruing from the copyrights or licenses to others¹⁴, together with allowance for users to use copyrighted work in a reasonable manner under the law protection without the permission and payment owing to the copyright owner (stipulated in consistence with the basic principle of copyright law and complied with the Berne Convention). For instance, copyright owner cannot prevent others from using the work for the purpose of research, personal benefit, judicial proceedings, criticism, etc.

Fair use exception is important to copyright systems around the world including national copyright laws and international treaties. To give the copyright owner enjoying the exclusive rights without boundary is equals to an absolute power of the copyright owner which fully restricts users from accessing to knowledge and inventions. The misappropriate balance of the interest will undermine the progress of science and the useful arts which is the purpose of the copyright law. Therefore, fair use exception is a key factor to public interest of each country in promoting the access of knowledge and the creative arts. It enables individuals to access copyrighted works and the information and the ideas embedded in them without fear of intellectual property lawsuits. This way, it ensures that new technologies can be developed and used, and students, researchers, teachers, and education institutions can access to the rich store of knowledge products.

¹³ Pamela Samuelson, “Fair Use for Computer Programs and Other Copyrightable Works in Digital Form: The Implication of Sony, Galoob and Sega,” Journal of Intellectual Property Law 1 (1993): 49, 51.

¹⁴ Section 15 Copyright Act B.E. 2537(1994), Part 3, Copyright Protection.

1. General Exception

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“Fair use” exception is provided in section 32-43 of the Copyright Act B.E. 2537(1994) meeting the obligations under TRIPs Agreement and Berne Convention. The law limits fair use exceptions into 12 sections specifies in Part 6 – Exceptions from Infringement of Copyright.

Like the fair use principle in the US Copyright Act 1976 (section 107), section 32 paragraph 1 of Thai Copyright Act is the general limitation which is the prerequisite before applying with the whole Part 6.¹⁵ Section 32 paragraph 1 states that “An act against a copyright work by virtue of this Act of another person which does not conflict with a normal exploitation of the copyright work by the owner of copyright and does not unreasonably prejudice the legitimate right of the owner of copyright shall not be deemed an infringement of copyright.” There are two requirements in this section that must be satisfied to be eligible for fair use exception. First, the reproduction must not conflict with a normal exploitation of the copyright work by the copyright owner. Second, such reproduction must not unreasonably prejudice the legitimate right of the copyright owner.

In addition, it must take into account that section 32 paragraph 2 affixes to the condition of “provided that the act is not for profit” in sub-provision (1), (6), and (7) to limit the extent of fair use defense.

To what extent the proportion of the act against copyright work should be deemed as fair use, it should consider on the case-by-case basis with discretion of the judiciary where significant elements in determining what act is eligible for fair use exception are; (1) Purpose and character of the use; (2) Nature of the work; (3) The proportional amount and substance of the use; (4) The effect on the original author’s economic market; and (5) Parody, Burlesque, and satire.¹⁶

¹⁵ Jumpol Pinyosinwat, “Fair Use: Enforcement in Thailand and U.S.,” *The Intellectual Property and International Trade Law Forum*, Fifth Special Issue 2002 Anniversary, (2002): 596.

¹⁶ Arthur R. Miller and Michael H. Davis, *Intellectual Property Patent, Trademarks, and Copyright in a Nutshell*, 3rd ed. (United States: St. Paul, Minn.: West Group, 2000), p. 358-367.

2. Exception concerning reverse engineering

In principle, computer program is protected as literary work under section 4 of Thai Copyright Act B.E. 2537. Copyright owners have the exclusive rights to exploit over their copyrighted work where the owner can determine the conditions on the use of his work e.g. remuneration may or may not be collected. However, to give the owner's rights with no boundary is forbidden as it will oppose to the intellectual property principle where the rights of copyright users and public interest to access to knowledge must be appropriate. Thus, in order to balance the interest between the users and the right holders, Thai copyright law enacted the exception of copyright infringement pertaining to computer program conform to fair use doctrine.

Computer programs are unlike other works of copyright. Ideas and principles underlying or incorporated into or expressed in computer programs are, in most cases, not transparent. They are not readily available to a person using the program. In the case of literary or dramatic work or an artistic work such as painting, for example, the underlying ideas and principles are available to a person reading, watching or studying work. The plot, idea, concept or message that the author of the work intended to develop or convey is apparent, although in some circumstances with difficulty, for example, in the case of abstract art.

To access into the substance of computer program, ideas and essence underlying in the work cannot perceive immediately like when you open and read a book. Instead, computer program is encrypted in diskette in a form of object code which is a machine-readable language commanding computer directly to operate, while human readable language is kept secret in "source code" form. Users cannot perceive or read the substance of computer program in diskette unless it is operated in computer. For this reason, transferring of technology does not occur like normal literary work when you use a computer.¹⁷

In writing a program, programmers can either initially write source code in high-level language or "source code" for example, COBOL, FORTRAN, PASCAL or BASIC or low-level language which is in a form of "assembly language" such as L 80. Then, in order for a computer to function, compiler will

¹⁷ Bandit Limsakul, op.cit., p. 355-361.

transform high-level language or assembly language to object code, a machine-readable language, in which the process of transforming respectively called compiling and assembling. Such transforming process is deemed to be “adapting and making copies” under Thai Copyright Act B.E. 2537 as computer must first “copy” high-level or low-level language into Main Memory or Random Access Memory (RAM). Later, compiler will transform them to object code which is adequate enough to constitute “adapting” as same as translating a literary work thereof. Reverse engineering is the process of retracing the process of compiling and assembling which calls decompilation and disassembling process. Thus, reverse engineering is deemed to be adapting and making copies under Copyright Act B.E. 2537.

On the other hand, although reverse engineering constitutes copyright infringement, the ultimate products transformed by reverse engineering might originate new invention which benefits societies so much that it outweighs the loss of the copyright owner, or in another case, an individual might reverse engineer for non-profit educational purpose or personal use which does not conflict with a normal exploitation and unreasonably prejudice the legitimate right of the owner. Thus, reverse engineering shall be exempted from copyright infringement and deemed as fair use exception. The following cases exemplify reverse engineering deemed as fair use.

In research community, it may need various devices to control experiments in laboratories in order to make an operating system more useful or analyze data at a high level of precision by extending other's operating system with additional devices, such as clocks, analog-to-digital converters, tone generators, etc. The process of extending an operating system certainly involves reverse engineering which it is deemed to be a copyright infringement. But for the purpose of education, reverse engineering is legal owing to an infringement exception under the Copyright Act.

It is also legal to adapt the computer program for the purpose of obtaining information necessary to enable the owner or licensee to make independently another program (the new program), or an article, to connect to and be used together with, or otherwise to interoperate with, the original program or any other program. Nevertheless, the purpose for making an adaption must be for the

purpose of achieving software to hardware interoperability or to make the product work with a device with absolutely no wish to compete in device/driver markets.

Reverse engineering takes part in the study and research of products available in the marketplace, commonly engaged in by scientists and engineers around the world. The factor as to decide whether or not reverse engineering is a fair use is “the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes.”¹⁸

Hence, reverse engineering is not always done for the commercial purpose, it can also, at the same time, benefits societies and enhance the science and useful arts. The Copyright Act B.E. 2537 specifies copyright infringement exception concerning computer program consistent with fair use doctrine in section 35 and section 32 paragraph 1, reads as follows;

“An act against a computer program which is a copyright work by virtue of this Act in the following cases is not deemed an infringement of copyright; provided that the purpose is not for profit and Section 32 paragraph one is complied with:

- (1) research or study of the computer program;
- (2) use for the benefit of the owner of the copy of the computer program;
- (3) comment, criticism or introduction of the work with an acknowledgement of the ownership of the copyright in the computer program;
- (4) news reporting through mass media with an acknowledgement of the ownership of copyright in the computer program;
- (5) making a reasonable quantity of copies of a computer program by a person who has legitimately bought or obtained the program from another person so as to keep them for maintenance or prevention of loss;
- (6) reproduction, adaptation, exhibition or display for the benefit of judicial proceedings or administrative proceedings by authorized officials or reporting such proceedings;
- (7) use of the computer program as part of questions and answers in an examination;
- (8) adapting the computer program as necessary for use;

¹⁸ 17 U.S.C. § 107 (1).

(9) making copies of the computer program so as to keep them for reference or research for public interest.”¹⁹

Section 32 states that “An act against a copyright work by virtue of this Act of another person which does not conflict with a normal exploitation of the copyright work by the owner of copyright and does not unreasonably prejudice the legitimate right of the owner of copyright is not deemed an infringement of copyright.

Subject to paragraph one, any act against the copyright work in paragraph one is not deemed an infringement of copyright; provided that the act is each of the followings:

- “(1) research or study of the work which is not for profit;
- (2) use for personal benefit or for the benefit of himself and other family members or close relatives;
- (3) comment, criticism or introduction of the work with an acknowledgement of the ownership of copyright in such work;
- (4) news reporting through mass media with an acknowledgement of the ownership of copyright in such work;
- (5) reproduction, adaptation, exhibition or display for the benefit of judicial proceedings or administrative proceedings by authorized officials or reporting such proceedings;
- (6) reproduction, adaptation, exhibition or display by an instructor for the benefit of instruction provided that the act is not for profit;
- (7) reproduction, adaptation in part of a work or abridgement or making a summary by an instructor or an educational institution so as to distribute or sell to students in a class or in an educational institution provided that the act is not for profit;
- (8) use of the work as part of questions and answers in an examination.”²⁰

¹⁹ Section 35 Copyright Act B.E. 2537 (1994).

²⁰ Ibid., Section 32.

In overall picture of the two sections above, Thai Copyright Act 1994 deals with decompilation in an implied manner in article 35(1)²¹. Reverse engineering is allowed as long as it is done with non-commercial purpose, does not conflict with the normal exploitation and not prejudice the legitimate right of the right holders. However, the provision does not give exemption regarding reverse engineering in a clear cut way. Besides, the prerequisites of the fair use exception seem to be more stringent than those used in the European Community and the judicial interpretation of Section 107 of the US Copyright Act. Article 35 sets up the test containing 3 conditions i.e. first, the act in question shall not conflict with the normal exploitation of the copyright holder; second, such act shall not unreasonably prejudice the legitimate rights of the copyright holder, and last, it shall not be done for profit purpose.²² The last condition make it hard for the courts to determine whether or not fair use defense that is asserted is fair because in business nature, the final product transformed by reverse engineering process will eventually be used for the commercial purpose. This condition conflicts with the nature of business and is inapplicable. Therefore, section 35 should be more specific about reverse engineering exception and the context should favour such exception in order to applicably apply with the real situations whereas recommendations regarding this matter will be discussed in depth in chapter 5.

²¹ Article 35(1) of the Copyright Act of Thailand: “An act done to the computer program granted copyright by virtue of this Act shall not be deemed an infringement if it is not done for profit and is in compliance with the first paragraph of Article 32 in the following cases: (1) Research or study such computer program...” It should be noted that the first paragraph of Article 32 states the broad principle for exception similar to that embodied in Article 9(2) of the Berne Convention and Article 13 of the TRIPS Agreement, namely, the act in question is subject to the two criteria, first, non-conflict with normal exploitation, and second, non-prejudice to the legitimate rights.

²² Weerawit Weeraworawit, WIPO Seminar for ASIA and the Pacific Region on the Internet and the Protection of Intellectual Property Rights, at http://www.wipo.int/edocs/mdocs/mdocs/en/wipo_int_sin_98/wipo_int_sin_98_6.pdf, (last visited 10 October 2010).

Everything has its advantages and disadvantages, so does reverse engineering. On the negative side, reverse engineering a computer program consumes lots of resources e.g. money, time, human labour, etc., and in some cases, the owner of the product does not have adequate supply to make a successful manufacture or operating in the market of particular products. To avoid such loss, the owner of computer program grants a licence to a third party to depend on his/her acumen, knowledge, experience to operate, manufacture and market the product in a certain territory on behalf of the product's owner and receiving continuing royalties throughout the duration of the licence.²³ Moreover, the owner can still enjoy the benefit of still owning the intellectual property, whereas reverse engineering may bring about unreasonably prejudice to the right holder's interests.

Practically, the owner of computer program mostly distributed their product by copying their computer program in a form of "object code" for users to licence it with royalties. Anyone who wishes to use computer program with numerous computers for instance, university or large organization use, such person have to pay royalty higher than a normal rate fee.

A licensing agreement is essentially a contract conferring on someone the legal right to use intellectual property rights owned by another person.²⁴ It is permissible for the copyright owner to licence their rights to the licensee within the agreed scope of licensing agreement as provided under section 15 of Copyright Act. The licensor's similar venture, limited resource, and potential of licensee will be the determination in selecting types of licensing agreement. In order to maintain the integrity of the product and reap the most benefit without suffering from the licensee, it is necessary to protect the product and wisely choose which types of licensing agreement should be undertaken. There are three basic types of licensing agreement categorized by the nature of the licence. They are Exclusive, Sole, and Non-Exclusive licensing agreement. Exclusive type is best suits where only the licensee will market/manufacture/ operate the product itself. While Sole type is used when the

²³ Royalty figures are usually calculated based on the number of licensed product sold.

²⁴ Carson McDowell, Licensing, at <http://www.docstoc.com/docs/2135355/types-of-licensing-agreements>, (last visited 10 October 2010).

licensor agrees not to grant any other licences but retain the right to market/manufacture/operate himself. Last, Non-Exclusive type is appropriate where the licensor can grant any number of licences and may market/manufacture/operate the product himself.²⁵

The right holder must know that in which case licensing would help them securing the full benefit of the product by considering whether or not they could simply market/manufacture/operate the product themselves. With an appropriate type of licensing, inventors can exploit their product to its full value and maximize their return without forsaking title to it.

In conclusion, although reverse engineering has a benefit in customization and feature enhancement, the process consumes a lot of resources (for example e.g. time, money, human resource). If resources are limited, license always a better choice for most organization. In normal business, no one wants to involve in the area that they do not have an experience with. Then, it is almost impossible for the company that does not have a strong background in reverse engineering process to make a decision of not buying a license.

Only in the rare cases when there are serious needed in special features or purposes, the legally reverse engineering might be proper. The cost of reverse engineering is not limits to the cost of software development, but it also extend to the cost of other issues such as, patent fee, licenses for some small portions of software.

2.2 Computer Program

A “computer program” is a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result.²⁶ A

²⁵ Carson McDowell, op.cit.

²⁶ In 1980, the definition of “computer program” was added to section 101 and placed at the end. Pub. L. No. 96-517, 94 Stat. 3015, 3028. The Intellectual Property and High Technology Technical Amendments Act of 2002 amended section 101 by moving the definition for computer program from the end of section 101 to

computer requires programs to function, typically executing the program's instructions in a central processor.²⁷ The program has an executable form that the computer can use directly to execute the instructions. The same program in its human-readable source code form, from which executable programs are derived (e.g., compiled), enables a programmer to study and develop its algorithms.

Computer source code is often written by computer programmers. Source code is written in a programming language that usually follows one of two main paradigms: imperative or declarative programming. Source code may be converted into an executable file (sometimes called an executable program or a binary) by a compiler and later executed by a central processing unit. Alternatively, computer programs may be executed with the aid of an interpreter, or may be embedded directly into hardware.²⁸

Computer programs are unlike other works of copyright. Ideas and principles underlying or incorporated into or expressed in computer programs are, in most cases, not transparent. They are not readily available to a person using the program. In the case of literary or dramatic work or an artistic work such as painting, for example, the underlying ideas and principles are available to a person reading, watching or studying work. The plot, idea, concept or message that the author of the work intended to develop or convey is apparent. Hence, by its nature of computer program, users cannot perceive or read the substance of computer program in diskette unless it is operated in computer, copyright law was therefore permitted reverse engineering to access to the original idea embedded as such. What is “reverse engineering” will be discussed in the next topic.

be in alphabetical order, after “compilation.” Pub. L. No. 107-273, 116 Stat. 1758, 1909.

²⁷ Abraham Silberschatz and Peter B. Galvin, Grey Gagne Operating System Concepts, 7th ed. (New Jersey: J. Wilson & Sons Inc., 1994), p. 58.

²⁸ ProgramInstructions.com, at <http://www.programinstructions.com/>, (last visited 30 September 2010).

2.2.1 Reverse Engineering Analysis

“Reverse engineering” is the process of discovering the technological principles of a device, object or system through analysis of its structure, function and operation. It often involves taking something (e.g., a mechanical device, electronic component, or software program) apart and analyzing its workings in detail to be used in maintenance, or to try to make a new device or program that does the same thing without using or simply duplicating (without understanding) any part of the original.²⁹ The Supreme Court has also defined reverse engineering as a means of “starting with a known product and working backward to define the process which aided in its development or manufacture.”³⁰

In general, reverse engineering can be adopted with anything from any products to a large organization. It can happen so easily in our daily life, for instance, when you enter in some game shop and have your eye-catching on one game, then you tell your friend that you want to sell the exact same game as the game in that shop with him, or it can happen when you unexpectedly see a chair in a department store and you have an idea of altering it into a more comfortable and better utilitarian functions embodied in that chair, reverse engineering can be an answer to reform a new product. Roughly speaking, reverse engineering is the method of reversing processes of how other people’s systems work. Instead of starting from an initial idea of creating something till it reaches an ultimate product, on the contrary reverse engineering method starts from an ultimate product back to an original idea. This paper will focus on reverse engineer a computer program since computer program has its sophisticated characteristic in transferring ideas and principle unlike any other types of copyrighted works.

It is an undeniable fact that reverse engineering became more and more important owing to the need for changing existing software has been with us since the first programs were written. In a perfect world, all software systems, past and

²⁹ Mamta Garg and Manoj Kumar Jindal, “Reverse Engineering – Roadmap to Effective software Design,” International Journal of Recent Trends in Engineering (IJRTE) 1 (May 2009): 186., at <http://www.academypublisher.com/ijrte/vol01/no02/ijrte0102186188.htm>, (last visited 16 September 2010).

³⁰ *Kewanee Oil Co. v. Bicron*, 416 U.S. 470,476 (1974).

present, would be developed and maintained with the benefit of well structured software engineering guidelines. In the real world, most systems are not perfectly well-designed, so reverse engineering is therefore an answer to technological development and educational purpose.

Software reverse engineering can be done to retrieve the source code of a program because the source code was lost or to retrieve the lost documentation due to the fact that the documentation of a particular device has been lost (or was never written), and the person who built it is no longer available.

Reverse engineering can also involve the identification or recovery of program requirements and/or design specifications that can aid in understanding and modifying the program. The main objective is to discover the underlying features of a software system including requirements, specification, design, and implementation. In other words, it is to recover and record high-level information about the system including the following:

1. The system structure in terms of its components and their interrelationships expressed by the interfaces;
2. Its functionality in terms of what operations are performed on what components;
3. The dynamic behavior of the system, or how input is transformed to output;
4. Its rationale (the design process that decides between a number of alternatives at each design step);
5. Its construction, modules, documentation, and test suites.³¹

Further, reverse engineering is used to study how the program performs certain operations, how a product works more comprehensively than by merely observing it, what components it consists of, and what is an estimate costs. Meanwhile, in achieving interoperability, it requires reverse engineering as one of its process, for instance, a software development manager releases a desktop publishing program called “Express Publisher”. This Express Publisher has the qualification to

³¹ Hongji Yang and Martin Ward, Successful Evolution of Software Systems (Norwood, MA, USA: Artech House, Incorporated, 2002), p.29., at <http://site.ebrary.com/lib/abaclaw/Doc?id=10081931&ppg=45>, (last visited 28 September 2010).

understand other files created with a word processing program. But how can Express Publisher know how to read such program's data file? A software development manager needs to have the other's file format specifications in order to achieve interoperability. In case of unavailable of a full specification, reverse engineering will apply to figure out by looking at how lots of different memos were stored. No new product can enter an existing category unless it can read data files created by its leading competitors. If there is no ability to read, the cost of converting from the old format to the new will be much too high to risk on a newcomer that is not well established.³²

There are many times when software companies close down their business or cease producing particular software because the old one is no longer applicable and obsolete. When there is some change relating to the code in the program, a minor change, or there is an error in the program which some users had bought and operated it long time ago, a company refuses to fix such program with any reason whatsoever, for example, the programmer has no longer work in that company or if you can find him/her, and even if you can find that person, you have to pay top dollar for the privilege of patiently waiting until the programmer gets around to fixing it. Reverse engineering would be an answer to avoid paying a large sum of money and long waiting for a minor change in a program.

Others different uses of reverse engineering can be;

1. improving the performance of a program;
2. fixing a bug (correct an error in the program when the source code is not available);
3. identifying malicious content in a program such as a virus or to adapt a program written for use with one microprocessor for use with another;
4. studying the design principles of a product as a part of an education in engineering;
5. evaluating one's own product to understand its limitations, determining whether someone else has literally copied elements of one's own technology;

³² Kaner, ARTICLE 2B and REVERSE ENGINEERING, p.3., at <http://www.kaner.com/pdfs/RevEngShort.pdf>, (last visited 30 September 2010).

6. transforming obsolete products into useful ones by adapting them to new systems and platforms.

In conclusion, there are several purposes for undertaking reverse engineering as a part of digital evolution. They can be separated into the quality issues (e.g., to simplify complex software, to improve the quality of software that contains errors, and to remove side effects from software), management issues (e.g., to enforce a programming standard and to enable better software maintenance management techniques), and technical issues (e.g., to allow major changes in a software to be implemented, to discover and record the design of the system, and to discover and represent the underlying business model implicit in the software). It is seen that reverse engineering is an activity that neither changes the subject system, nor creates a new system based on the reversed engineered subject system. It is the process of examining and understanding the object system and of recording the results of that examination and understanding.³³

Reverse engineering appears to be an answer to an intense competition in the digital industry which programmers build directly upon the works of others. Besides, when the role of interoperability or compatible program is needed to operate simultaneously with the other programs or computer, reverse engineering is perfectly a great tool to assist the process of developing products which are interoperable with the existing industry standards.

2.2.2 The Difference between Reverse Engineering and Adaptation

The definition of “adaptation” regarding computer program specifies in section 4 subsection 2 giving the meaning that “a reproduction by transformation, improvement, modification or emulation of the essential part of an original work without creating a new work, whether in whole or in part;

“(2) concerning a computer program, it must include a reproduction by means of transformation, improvement or modification of the program of the essential part without creating a new work;

...”

³³ Yang and Ward, op.cit.

The provision clearly points out that to constitute an adaptation, first, there must be a reproduction, second, the target computer program must be transformed, improved or modified in the substantial part (whether in whole or in part), and last, such transformation, improvement or modification must not originate new work. For instance, Anet company and Bnet company are producer of computer software. Bnet company bought Anet's program named A-Icon, Adobe Reader program which cannot be edited. Bnet modified some part of A-Icon source code which enabled the original program to edit the file text, changed the name to B-Exon and sold it in the same market. Bnet company constitutes adaptation because the company reproduced the target program (A-Icon) which was modified and improved in a subject matter by Bet company.

On the contrary, reverse engineering is the method of reversing processes of how other people's systems work. It contains no reproduction and alteration of the essential part of the original software whether in whole or in part. Therefore, it can be deduced that reverse engineering is an activity that neither changes the subject system, nor creates a new system based on the reversed engineered subject system. It is the process of examining and understanding the object system and of recording the results of that examination and understanding. Thus, reverse engineering has nothing in common with adaptation whatsoever.

2.2.3 Reverse Engineering Applied in Other Laws

1. Trade Secret

Unlike patent law, which only protect inventions that meet statutory requirements, or copyright law, which only protects the expression of an idea, and not the idea itself, trade secret law can protect a wide variety of intellectual property, including, ideas, information, and know-how, whether or not embodied in a tangible form.³⁴ Besides, compare to protection in other fields of intellectual property law, it has an advantage of eternal protection as long as they are not publicly disclosed for any reason (including the widespread publication of the information on the

³⁴ Michael D. Scott, Scott on Information Technology Law, 3rd ed. (United States: Aspen publishers, 2007), pp. 6-3.

internet.)³⁵ There are three elements which make a trade secret viable. A trade secret must be information that (1) is not generally known to the public; (2) confers some sort of economic benefit on its holder (where this benefit must derive specifically from its not being generally known, not just from the value of the information itself); and (3) is the subject of reasonable efforts to maintain its secrecy.³⁶ On the other hand, protection of trade secret can also be lost in the case where one did not use reasonable efforts to maintain secrecy, the trade secret information is generally known or readily ascertainable, the trade secret is learned through independent discovery, or the trade secret is lawfully acquired through reverse engineering.³⁷

In the United States, as long as the product is obtained lawfully, reverse engineering and dependent discovery of the technical information within a product are considered legally in making another's trade secret inapplicable. It is not a violation of trade secret law to disassemble and examine products that are available to the public. Learned via this manner, trade secrets can be freely used and their protection is lost once the information becomes publicly known.³⁸ For instance, Silky Company and Sleeky Company sell competing shampoo products. Sleeky Company creates a new herbal shampoo with a sense of Sapindus and Kaffir Lime. The formula of the new herbal shampoo is a trade secret. Silky company purchases a bottle of new herbal shampoo and hands it over to one of Silky's chemists to examine the product, subject it to testing, learn its formula and disclose it on the internet. Sleeky Company will be unable to protect its formula under existing nondisclosure agreement because of the formula is no longer a trade secret.

Trade secrets are protected under state law, not by federal law like in trademarks or patents. Many states, accept Massachusetts, New York, New Jersey,

³⁵ Samuelson Law - Technology and Public Policy Clinic, Frequently Asked Questions (and Answers) about Reverse Engineering, at <http://www.chillingeffects.org/reverse/faq.cgi#QID209>, (last visited 21 October 2010).

³⁶ WordIQ.com, Trade Secret Definition, at http://www.wordiq.com/definition/Trade_secret, (last visited 21 October 2010).

³⁷ NDA, Confidentiality, Trade Secret & Nondisclosure Agreement, at <http://www.ndasforfree.com/TradeSecretsCannotProtect.html>, (last visited 21 October 2010).

³⁸ Ibid.

North Carolina, and Texas, have adopted the 1979 Uniform Trade Secret Act, and some guidance from the 1995 Restatement of Unfair Competition.³⁹ The Restatement gives the definition of a trade secret as “any information that can be used in the operation of the business or other enterprise and that is sufficiently valuable and secret to effort an actual or potential economic advantage over others”⁴⁰ and states that the purpose for protecting trade secret is to hinder from disclosure or discovery “by improper means”⁴¹

Mostly, the famous reasons why it needs to reverse engineer under manufacturing industry surroundings are to be able to catch up with competing products in the same market field and make new inventions to gain profits while at the same time benefits consumers. In some circumstances, on account of the resources (such as, time, money or energy) dedicated in analyzing products and subsequently earning rights to the information they have learnt, the creators may consider licensing agreement as an option in preventing termination of trade secret from reverse engineering of a third party.

In Thailand, trade secret is an intellectual property which does not need to be registered with the State Agency, only the requirements which constitute trade secret are fulfilled with the owner’s intention and measurement of protecting the information, such information is protected under Trade Secret Act. To intentionally know other’s trade secret is illegal because it is an act of disclosure or deprivation of trade secrets without the consent of the owner in a manner contrary to honest trade practices. However, such disclosure is not an infringement to the owner if it appears that the disclosure or use of trade secrets is obtained by a person through a transaction without knowing or having reasonable cause to know that the other party to the transaction obtained the trade secrets through the infringement.

Under Thai Trade Secret Act B.E. 2545, a provision concerning reverse engineering is specified in section 7(4). It reads

³⁹ The American Law Institute, Restatement of the Law - Unfair Competition, at <http://www.ali.org/index.cfm?fuseaction=publications.ppage&node-id=58>, (last visited 21 October 2010).

⁴⁰ Trade Secret Act B.E. 2545 (2202), § 39.

⁴¹ Ibid., § 40.

“Any of the following acts against trade secrets shall not be considered an infringement:

(4) Reverse engineering i.e. discovery of a trade secret belonging to others by means of evaluation and analysis of a widely-known product with the intention to discover the method by which such product is invented, manufactured or developed, provided that the product was obtained in good faith by the person who conducted the evaluation and analysis.

The act under (4) cannot be raised as a justification if the person who conducted reverse engineering expressly agreed otherwise with the owner of trade secrets or seller of the product.”⁴²

Trade Secret Act allows certain acts in section 7(4) as follows;

1) discover in an ordinary course of act, for instance, Shiny factory produces ceramic enamel in purple-indigo and the formula has been protected as trade secret. Later, without knowing that this color had already been created, Wrinkle factory accidentally creates the same color as Shiny’s. It is deemed not to be trade secret infringement due to the fact that Wrinkle itself discovers such formula.

2) reverse engineering. If A factory produces a special odor of essential oil calls “A essential oil.” B factory purchases A’s essential oil and have B’s chemist team analyze its ingredients. Hence, such act is not a trade secret infringement.

3) some trade secret disclosure requires registration to state agency for the sake of sanitarian and agricultural interests, namely agricultural chemicals, delicatessens, drugs. These products are necessary to inform their ingredients prior to distribution, while at the same time, such information is still a trade secret.

2. Patent

Although software programs had normally not been granted patents in the past, it is now changed as software program plays an important role in many areas of industry. At present, software program is protected under patent law whereas those programs must meet the requirements of usefulness, novelty, and non-obviousness.

⁴² Section 7 Trade Secret Act B.E. 2545 (2002).

Computer program advancement can be one of indicators that indicates the progress of a country. The more computer program in a country can develop, the more welfare of a country has, and computer program reverse engineering can be an answer to every country's development. It is known that reverse engineering is a process of analyzing a subject system to create representations of the system at a higher level of abstraction.⁴³ With this process, it advantages us in many ways.

Reverse engineering helps determine whether or not the patented inventions are being used in the industry by other company. A product will be purchased and disassembled in order to understand how it was built, how it works and what it is made of. Reverse engineering processes usually involve multiple types of analysis. Which type of reverse engineering to apply is determined by the type of technology and the industry the patented invention is being used in.⁴⁴ Reverse engineering includes:

- 1) Circuit analysis, which identifies how devices work — delayer to the transistor level, then extract interconnections and components to create schematics and netlists;
- 2) Process analysis, which identifies how devices are built and what they are made of - analysis of patented semiconductor, optical and MEM processes, packaging and/or layout features; and
- 3) System analysis, which identifies how devices are used together — may include analysis of signals and software inside or between chips using sniffers, probing, data capture or literature.

Systems reverse engineering is mostly used in finding evidence of patent infringement in the communications/networking, computing, consumer electronics and wireless sectors. Patent infringement in these industries, which are largely standards driven, has historically been identified based on literature. With technology convergence, multiple suppliers and increased competition, finding

⁴³ Elliot J. Chikofsky and James H. Cross II, "Reverse Engineering and Design Recovery: A Taxonomy in IEEE Software," IEEE Computer Society 7 (January 1990): 13-17.

⁴⁴ Julia Elvidge, Using Reverse Engineering to Discover Patent Infringement, at <http://www.photonics.com/Article.aspx?AID=44063>, (last visited 1 November 2010).

patent infringement for standards-based products is evolving from standards-based documentation to more complex reverse engineering techniques.⁴⁵

Reverse engineering has also taken part in pharmaceutical business. Pharmaceutical formula reverse engineering is the most important in the situation where developing countries are unable to access the drugs they deficient. Reverse engineering of pharmaceutical formulations may be required for a variety of reasons namely, intellectual property issues (viz. patent infringement); analytical issues (viz. matrix extraction); stability issues; safety issues; and generic formulation design and development. Reverse engineering of a formulation can be done using public domain information about the composition of a drug product, and applying knowledge and experience of formulation science to develop an approximation to the quantitative formula and likely manufacturing process.⁴⁶

At present, India, who engages in considerable patenting activities in OECD markets, is a large source of generic drug production. The strength of the Indian pharmaceutical industry is in reverse engineering by utilizing the provisions under compulsory licensing and exceptions to exclusive rights, unlike in United States where U.S. pharmaceutical is leading an assault on India to prevent the poorest from receiving lifesaving drugs.⁴⁷

No reverse engineering right, as such, exists in patent law.⁴⁸ In theory, there should be no need to reverse engineer a patented invention to get information about how to make it because the patent specification should inform the relevant technical community of how to make the invention, and indeed the best mode of making it.⁴⁹ But the fact that a patent does not teach technologists everything they want to know, it is clear that some reverse engineering activities are

⁴⁵ Julia Elvidge, op.cit.

⁴⁶ FinnBrit Consulting, at http://www.finnbrit.com/SubPages/Formulation/reverse_engineering.html, (last visited 1 November 2010).

⁴⁷ Doctors Without Borders, As Novartis Challenges India's Patent Law, MSF Warns Access to Medicines Is Under Threat, at http://www.doctorswithoutborders.org/pr/2006/09-26-2006_1.cfm (last visited 1 November 2010).

⁴⁸ Pamela Samuelson and Suzanne Scotchmer, op.cit., p. 1584.

⁴⁹ 35 U.S.C. § 112.

needed and such act will not be a patent infringement. The purchaser of a machine embodying a patented invention, for example, is generally free to disassemble and study how it works under the first sale principle of patent law. In addition, a person who tries to make a patented invention to satisfy scientific curiosity may assert an experimental use defense to patent infringement.⁵⁰

In international arena, the TRIPs Agreement is an important convention in supporting developing countries access to medicines and plays significant role in pharmaceutical industry. The TRIPs Agreement introduced minimum standards for protecting and enforcing patents which every WTO member states is obliged to implement their domestic law to the minimum standards of IPR protection.

2.3 Scope of Protection for Computer Program

2.3.1 Right Holder

Under Copyright regime, the rightholders have the rights to exploit over their copyrighted work. Thai Copyright Act B.E. 2537 confers on the copyright owner the exclusive rights in section 15. They are;

1. reproduction or adaption
2. communication to public
3. renting of the original or the copies of a computer program
4. giving benefits accruing from the copyright to other persons, and
5. licensing all the mentioned rights with or without conditions provided

that the said conditions shall not unfairly restrict the competition Copyright owners can licence or permanently transfer or assign their exclusive rights to others.

2.3.2 Infringement

Section 27 “Any of the following acts against a copyright work by virtue of this Act without authorization in accordance with Section 15(5) is deemed an infringement of copyright:

- (1) reproduction or adaptation;
- (2) communication to public.”

⁵⁰ Pamela Samuelson and Suzanne Scotchmer, op.cit., p. 1585.

An infringement occurs when one adapts or reproduces, or communicates to public other's copyrighted work without the owner's permission.

Section 31 "Any person who knows or should have known that a work is made by infringing the copyright of another person and commits any of the following acts against the work for profit is deemed to infringe the copyright:

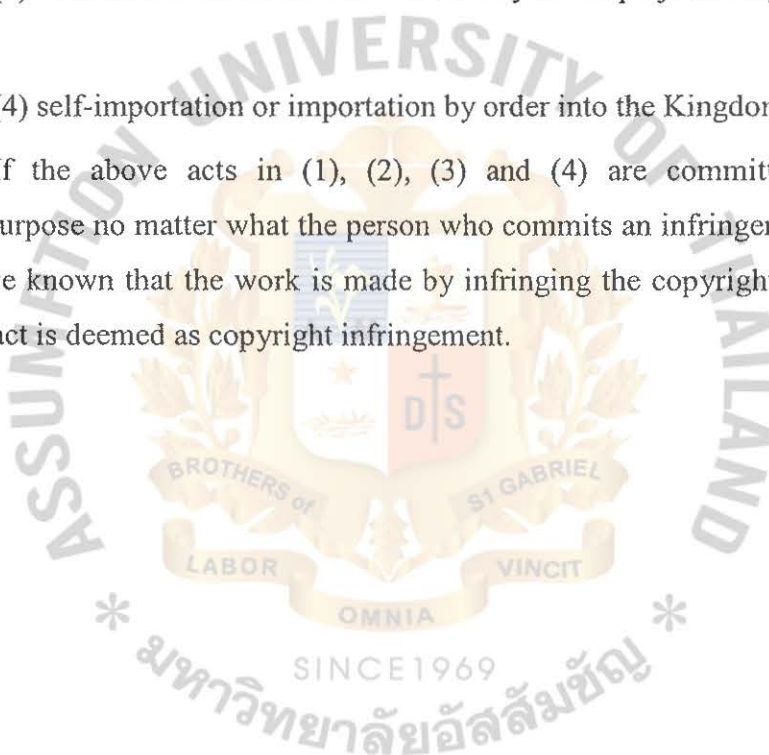
(1) selling, occupying for sale, offering for sale, letting for hire, offering for letting for hire, selling by hire purchase or offering for hire purchase;

(2) communication to public;

(3) distribution in the manner which may affect prejudicially the owner of copyright;

(4) self-importation or importation by order into the Kingdom."

If the above acts in (1), (2), (3) and (4) are committed for the commercial purpose no matter what the person who commits an infringement knows or should have known that the work is made by infringing the copyright of another person, such act is deemed as copyright infringement.



Chapter 3

Provisions Relating to Reverse Engineering in International Convention and United States Copyright Law

3.1 Conventions

3.1.1 The Berne Convention for the Protection of Literary and Artistic Works (Berne Convention)

The Berne Convention has long time served as an international copyright community which was revised many times. It was established in 1886 in Berne⁵¹, Switzerland, in order to protect international copyright through mutual cooperation.⁵² In late twentieth century as the technological development dramatically built up, the Stockholm Act of 1967 and the Paris Act of 1971 were revised to meet new technological developments such as photography, radio, cinematography, and television.⁵³ Contracting State is obliged to implement their domestic law to the Berne Convention for the protection of copyrighted work among the state members. Each contracting state must provide certain minimum protective requirements. The United States is a signatory member country to the Berne Convention on March 1, 1989. The current text, the one to which the United States adhered, is that of Paris, 1971. Either the Copyright Act 1976 or the Digital Millennium Copyright Act (DMCA) was enacted after the Berne Convention. This

⁵¹ The Berne Convention, signed Sept. 9, 1886, was supplemented by the Additional Act and Declaration signed at Paris, May 4, 1896. The Convention was revised at Berlin, Nov. 13, 1908; Rome, June 2, 1928; Brussels, June 26, 1948; Stockholm, July 14, 1967; Paris, July 24, 1971, and was amended in 1979.

⁵² IndiaisIT, International Conventions, at <http://www.nasscom.in/Nasscom/templates/NormalPage.aspx?id=6256>, (last visited 14 October 2010).

⁵³ Piengpen Butkatanyoo, "Copyright in the Digital Networked Environment: Some Implications for Thai Copyright Law," (LL.M. Thesis, Graduate School, University of Wisconsin, 2000), p. 94.

demonstrates that both of the U.S. copyright laws are consistent with the Berne Convention owing to the minimum standard that member countries are obliged to implement to their domestic law. So does Thailand which adhered to the convention on July 17, 1931.

The minimum requirements include: (i) national treatment (whether or not a work is published), (ii) the granting of certain moral rights to authors with regard to the exploitation of their works, (iii) the granting of certain "economic rights" (such as exclusive rights of translation, reproduction, performance or adaptation with respect to protected works) and (iv) the adoption of certain minimum terms of protection (generally the life of the author plus 50 years) for various works. Moreover, the Berne convention provides copyright protection without requiring that any formalities, e.g. prerequisites prior to bringing infringement law suits.⁵⁴

The Berne Convention protects computer program as literary work in form of its expression in whatever mode or form as stipulated in article 2(1).

"(1) The expression "literary and artistic works" shall include every production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression, such as books, pamphlets and other writings; lectures, addresses, sermons and other works of the same nature; dramatic or dramaticomusical works; choreographic works and entertainments in dumb show; musical compositions with or without words; cinematographic works to which are assimilated works expressed by a process analogous to cinematography; works of drawing, painting, architecture, sculpture, engraving and lithography; photographic works to which are assimilated works expressed by a process analogous to photography; works of applied art; illustrations, maps, plans, sketches and three-dimensional works relative to geography, topography, architecture or science."⁵⁵

⁵⁴ Fenwick & West LLP, International Legal Protection for Software, Copyright Protection, at <http://www.softwareprotection.com/copyright.htm>, (last visited 14 October 2010).

⁵⁵ Article 2(1) Berne Convention for the Protection of Literary and Artistic Works.

With regard to enforcement measure of legislation in domestic law, Contracting State can determine whether to protect official texts or not. This is provided for in Article 2(4) as follows:

“(4) It shall be a matter for legislation in the countries of the Union to determine the protection to be granted to official texts of a legislative, administrative and legal nature, and to official translations of such texts.”

This leaves it to national legislation to decide (a) whether such texts are to be protected at all, and (b) if so, to what extent. This permits a high degree of flexibility, enabling member countries to give effect to their differing views of the public interest—at one extreme, they are free to leave such texts entirely in the public domain; at the other, they may accord them complete protection as literary or artistic works; or they may grant qualified protection, subject to generous rights of use on the part of the public. The third course may, in fact, be the most prudent, as a government may wish to retain control over the reproduction of its official texts (so as to guarantee their accuracy and authenticity), while satisfying the public interest in having ready and immediate access to these documents by the grant of a general license to members of the public to make private copies.⁵⁶

Of all provisions relating to limitations and exceptions, article 9(2) is at the core of copyright law which contains a three-step test to provide a general formulation. Article 9(2) of the Berne Convention provides the following standard for granting exception to the reproduction right:

“It shall be a matter for legislation in the countries of the Union to permit the reproduction of such works in certain special cases, provided that such reproduction does not conflict with a normal exploitation of the work and does not unreasonably prejudice the legitimate interests of the author.”

The three-step test was introduced in 1967 as a general criterion for determining under which circumstances the right of reproduction may be curtailed in

⁵⁶ Sam Ricketson, standing committee on copyright and related rights, WIPO Study on Limitations and exceptions of copyright and related rights in the digital environment, Ninth Session, at http://www.wipo.int/edocs/mdocs/copyright/en/sccr_9/sccr_9_7.pdf, (last visited 19 October 2010).

national law.⁵⁷ It imposes on signatories to the treaties constraints on the possible limitations and exceptions to exclusive rights under national copyright laws. The idea was to strike a balance between public and private interests in the use of copyrighted works to resolve the problem of photocopying.⁵⁸ Under such convention, the Contracting States could themselves decide whether their own laws complied with the three-step test. The three steps are (1) certain special cases which (2) do not conflict with a normal exploitation of the work, and (3) do not unreasonably prejudice the legitimate interests of the author. Furthermore, the three-step test merely applies to the right of reproduction, not to all exclusive rights.

Despite the Berne Convention doesn't say anything about reverse engineering of software or interoperability, it guidelines the words "certain" and "special" suggest that there must be limits to any exception to the reproduction right that is made under article 9(2).⁵⁹ Thus, the WTO had consulted and confined the definition of the word "certain" stated that "...an exception or limitation in national law must be clearly defined. However, there is no need to identify explicitly each and every possible situation to which the exception could apply, provided that the scope of the exception is known and particularized. This guarantees a sufficient degree of legal certainty."⁶⁰

The WTO Panel, as to the meaning of "special", noted that the definition must cover ad hoc circumstance. It reads "...than a clear definition in order to meet the standard of the first condition. In addition, an exception or limitation must be limited in its field of application or exceptional in its scope. In other words, an exception or limitation should be narrowed in quantitative as well as in a qualitative sense. This suggests a narrow scope as well as an exceptional or

⁵⁷ Kamiel J. Hoelman, Fixing the Three-Step Test, at <http://SSRN-id924174.pdf>, (last visited 14 October 2010).

⁵⁸ Marshall Leaffer, "The Uncertain Future of Fair Use in a Global Information Marketplace," Ohio State Law Journal 62 (2001): 5., at http://moritzlaw.osu.edu/law_journal/issues/volume62/number2/leaffer.pdf, (last visited 14 October 2010).

⁵⁹ Ricketson, op.cit.

⁶⁰ WTO Panel, p. 33.

distinctive objective. To put this aspect of the first condition into the context of the second condition (“no conflict with a normal exploitation”), an exception or limitation should be the opposite of a non-special, i.e., a normal case.”⁶¹ These two words, accordingly, ought to be clearly defined and narrow in its scope and reach.

Reverse engineering involves copying procedure which constitutes copyright infringement. Nevertheless, if the three-step test is fulfilled and it is done for a reasonable reason, such as educational purpose or for the benefit of the owner of the copy of the computer program, which does not conflict with a normal exploitation of the work and does not unreasonably prejudice the legitimate interests of the author, reverse engineering is deemed consequently as fair use under the Berne Convention.

3.1.2 The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs)

With the substantive protection of the Berne Convention, the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs Agreement) brings together a broad range of intellectual property rights based fundamentally on the Berne Convention. The word so-called “Berne and Paris-plus agreement” is sometimes refers to when we discuss about the TRIPs agreement. An underlying reason for the cause of this word is due to the deficiency of the Berne and Paris Convention which lack of universal minimum standards and effective enforcement mechanisms. Major exporter country of intellectual property products, under leading of United States and European Union, therefore tried to seek an alternative strategy to enhance the international protection mechanism.⁶² As the consequence, there emanated a substantial number of additional obligations on matter which the pre-existing conventions are silent or were seen as being inadequate

⁶¹ WTO Panel, p. 33.

⁶² Laurence R. Helfer, “Regime Shifting: The TRIPs Agreement and New Dynamics of International Intellectual Property Lawmaking,” *Yale Journal of International Law*, 29 (2004): 1., at http://papers.ssrn.com/sol3/papers.cfm?Abstract_id=459740&rec=1&srcabs=578577, (last visited 14 October 2010).

and vague⁶³ such as requiring WTO members to regulate the rental of sound recordings, computer programs, and motion pictures.

Under the TRIPS Agreement, the principles of national treatment, automatic protection and independence of protection also bind those World Trade Organization (WTO) Members which are not party to the Berne Convention. In addition, the TRIPS Agreement imposes an obligation of “most-favored-nation treatment,” under which advantages accorded by a WTO Member to the nationals of any other country must also be accorded to the nationals of all WTO Members. It is to be noted that the possibility of delayed application of the TRIPS Agreement does not apply to national treatment and most-favored-obligations.⁶⁴

With Berne baseline, The TRIPS agreement ensures that computer programs will be protected as literary works under the Berne Convention and outlines how databases should be protected. Article 10 which reads “Computer programs, whether in source or object code, shall be protected as literary works under the Berne Convention.”,⁶⁵ TRIPs requires signatories to protect computer program as literary works, and to protect compilations of data or other material which rise to the level of intellectual creation because of the selection or arrangement of the contents. However, TRIPs does not clearly designate how exactly to distinguish protectable from non-protectable elements in literary works by courts and domestic legislatures. Thus, all WTO member states must grant the same privilege as domestic copyright owner in other countries⁶⁶ copyright protection to computer program within the system founded on the Berne Convention.

⁶³ World Trade Organization, TRIPs: A More Detailed Overview of the TRIPs Agreement, at http://www.wto.org/english/tratop_e/trips_e/intel2_e.htm, (last visited 26 October 2010).

⁶⁴ Helfer, op.cit.

⁶⁵ Article 10 TRIPs Agreement.

⁶⁶ It should be noted that although the TRIPs Agreement incorporates substantive provision of the Berne Convention, it does not cover the moral rights, the right of authors to have their authorship acknowledged and to prevent their work from being changed, provision of the Convention.

Besides, it also expands international copyright rules to cover rental rights. Authors of computer programs and producers of sound recordings must have the right to prohibit the commercial rental of their works to the public. A similar exclusive right applies to films where commercial rental has led to widespread copying, affecting copyright-owners' potential earnings from their films.⁶⁷

Pertaining to limitations and exceptions under the TRIPs Agreement, article 13 reflects the basic norm in which the potential proliferation of exceptions and limitations in the laws of nations with poor records of copyright enforcement is the crucial goal in developing an international trade agreement. The three-step test in Article 13 was slightly modified from that of article 9(2) of Berne Convention provided as follows:

“Members shall confine limitations and exceptions to exclusive rights to certain special cases which do not conflict with a normal exploitation of the works and do not unreasonably prejudice the legitimate interests of the right-holder.”

With its new minimum standard, the TRIPs agreement formulation of the three-step test under article 13 applies to all exclusive rights.⁶⁸ The language in TRIPs Agreement test is restrictive in intent since article 13 explicitly restricts allowable limitations and exceptions to those that comply with its standards, unlike the Berne Convention where article 9(2) merely allows member states to provide for limitations on copyright in certain circumstances.⁶⁹

⁶⁷ Reporting Copyright Infringements & Piracy, Intellectual property: protection and enforcement, at <http://www.copynot.com/Pages/Trips.html#top>, (last visited 14 October 2010).

⁶⁸ With respect to the Berne Convention, the compliance with Article 9(1) of TRIPs required that members will comply with Article 1-21 of Berne, regardless of whether the country in question is a Berne member (this obligation does not extend to moral rights, which are protected under Article 6bis of Berne). This can be construed that article 13 applies to all exclusive rights listed in Berne including that of reproduction, as well as the rental right in TRIPs which applies only in particular cases.

⁶⁹ Leafler and Bender, *op.cit.*, p. 6.

From the above mentioned, it can be implied that TRIPS allows for reverse engineering of computer programs by honest avenues. This means that, although wholesale copying of computer programs is prohibited, the practice of re-implementing functional components of a protected program in “clones” is not. Second comers can imitate these functional aspects of the program. Programs that are independently coded and that yet deliver essentially the same functional performance or behaviour as the originator’s own software do not infringe the former’s rights.⁷⁰ This may boost competition and innovation by firms in all countries, including in developing countries where some capabilities for the production of software already existed.⁷¹

For states dissatisfied by the weak intellectual property laws of their fellow WTO members, TRIPS promised high levels of treaty adherence through two new institutions: the Council for TRIPS (TRIPS Council), which conducts transparent reviews of national implementation measures and provides members with a forum for consultations on compliance issues; and a Dispute Settlement Body (DSB), one of the most prominent features of TRIPS, with the power to sanction treaty violations.⁷² The Dispute Settlement Body is a built-in enforcement mechanism for dispute resolution in case when a member state believes that the national legislation of WTO countries does not comply with article 13. A member state can file a

⁷⁰ The critical issue is that the coding of the program was carried out *independently*. In that case, the idea underlying the program is expressed in a way that differs from the way in which the originator of the program has expressed this idea. The new code thus constitutes the expression (of the underlying idea) that may only be attributed to the person having reverse engineered the original program. It is thus the independence of the expression (i.e. the code) that matters, not the similarity of the result.

⁷¹ United Nations Conference on Trade and Development, International Centre for Trade and Sustainable Development, Resource Book on TRIPS and Development (United States: Cambridge University Press, 2005), p. 156., at <http://books.google.co.th/books?id=xADQoT9YwFMC&pg=PA156&lpg=PA156&dq=%22#v=onepage&q&f=false>, (last visited 26 October 2010).

⁷² Helfer, op.cit.

complaint, if conciliation and mediation efforts fail to settle the problem within certain period of time, to ask the DSB which consists of all WTO members to establish a panel of experts to examine the case.

3.1.3 World Intellectual Property Organization Copyright Treaty (WIPO Copyright Treaty)

The WIPO Copyright Treaty of 1996 is a special agreement to the Berne Convention and requires compliance with Berne. The Berne Convention does not explicitly mention computer programs in its illustrative list of copyright works. Consequently, the first international treaty to do so is TRIPS. In 1996, two additional copyright treaties were negotiated under the auspices of the World Intellectual Property Organization (WIPO). These treaties, namely the WIPO Copyright Treaty (WCT) and the WIPO Performances and Phonograms Treaty (WPPT), were directed specifically to the effects of the digital revolution on copyright.⁷³

With regard to computer programs, the WCT is the second international treaty to explicitly address copyright protection. This treaty makes explicit that computer programs are protected as literary works under Berne. It also states that compilations of data for which the selection or arrangement of the contents are sufficiently original are protected as compilations. The WCT Article 4 states: "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." The reference to the Berne Convention suggests that, as a matter of international law, the requirements for copyright works under Berne Convention Article 2 will apply, *mutatis mutandis*, to computer programs protected under the provisions of the WCT. Thus, even though the WCT does not explicitly mention the idea/expression dichotomy, it is rational to assume that the idea/expression principle extends to the scope of copyright protection recognized for computer programs by WCT Article 2.⁷⁴

With respect to rental right, software makers are granted a right to control rentals of computer programs. One of the most software-oriented provisions

⁷³ United Nations Conference on Trade and Development, op.cit., p. 156.

⁷⁴ Ibid.

requires treaty nations to provide adequate and effective protection against the circumvention of technical measures that restrict the ability of others to exercise the rights owned by the copyright owner.

To maintain a fair balance of interests between the owners of rights and the general public, the treaties further clarify that countries have reasonable flexibility in establishing exceptions or limitations to rights in the digital environment. Countries may, in appropriate circumstances, grant exceptions for uses deemed to be in the public interest, such as for non-profit educational and research purposes. Article 10 of the WCT reads as follows:

“Contracting Parties may, in their national legislation, provide for limitations of or exceptions to the rights granted to authors of literary and artistic works under this Treaty in certain special cases that do not conflict with a normal exploitation of the work and do not unreasonably prejudice the legitimate interests of the author.”

Article 10 emphasizes that the scope of the limitations and exceptions must be consistent to that of the Berne Convention. As the consequence, the three-step test application is the condition for any limitations and exceptions to the rights granted by the treaties either provided in article 9(2) of the Berne Convention and in article 13 of the TRIPs Agreement pertaining to all kinds of right. Nonetheless, the language of the three-step test under the Berne Convention and article 13 of the TRIPs Agreement proposes no guidance as to what constitutes a “special case,” a “normal exploitation of the work,” or a “legitimate interest of the author.” This brings more uncertainty to the case involving use of work in the digital network environment.

At the Diplomatic Conference, with mainstay countries like the United States and the European Committee, the overall tone of the application of the three-step test turned out to emphasize the feature of its constriction. The WIPO Copyright Treaty has the provision protecting the owner of the copyright from easy violation by enacting the provision against dismantle equipments which are protected for copying and accessing copyrighted work data. To reverse engineer computer programs, programmers are now face the issue of illegitimacy of reverse engineering since it

requires the decompiler program to copy the studying program and access through the anti-copying equipments before all processes could begin.⁷⁵

Therefore, the said provision has disabled researchers from copying computer programs which have anti-copying equipments installed because the reverse engineering, the decompiler program, the anti-copying equipments must be unlocked first so that the decompiler program can start. So, the fact that WCT has the said provision, there might be a problem that the reverse engineering cannot be performed.

Because the Berne Convention allows the application of the three-step test for the definite limitations and exceptions as an interpretation tool, licensing copyrighted works can result in curtailing a great many fair uses of copyrighted works of user's privileges. To assert fair use where a licence is available would not be a certain special case under the three-step test and this defense may conflict with the normal exploitation of a protected work.

At the present time, protected works are available only for those who can afford to pay. The language of the treaty tends to monopolize the dissemination of copyrighted works of the owners. Promoting the dissemination of creative works to the public might be substitute with an interpretation of copyright law that privileges private ownership and controls.

3.2 The United States Copyright Law

3.2.1 The United States Copyright Act 1976

The Copyright Act of 1976, which became effective on January 1, 1978, made it clear that Congress intended software to be copyrightable including computer software, that is "fixed in a tangible medium of expression" and which

⁷⁵ Proposals for Amendment of Copyright Law with Regard to Reverse Engineering of Computer Programs Under the Framework of the WIPO Copyright Treaty, at <http://dlibrary.spu.ac.th:8080/dspace/bitstream/123456789/1538/1/34%20%E0%B8%A7%E0%B8%B5%E0%B8%A3%E0%B8%9E%E0%B8%B1%E0%B8%92%E0%B8%99%E0%B9%8C%20%E0%B8%9E%E0%B8%A5%E0%B8%A8%E0%B8%A3%E0%B8%B5.pdf>, (last visited 26 October 2010).

contains a "modicum of originality." The definition of literary works in Section 101 states that they are works, other than audiovisual works, expressed in words, numbers, or other verbal or numerical symbols or indicia, regardless of the nature of the material objects, such as books, periodicals, manuscripts, phonorecords, film, tapes, disks, or cards, in which they are embodied.

The House Report discussing the Act states "The term "literary works" includes catalogs, directories, and similar factual, reference, or instructional works and compilations of data, but does not connote any criterion of literary merit or qualitative value. It also includes computer data bases, and computer programs to the extent that they incorporate authorship in the programmer's expression of original ideas, as distinguished from the ideas themselves."⁷⁶

Apple Computer, Inc. v. Franklin Computer Corp. is an important precedent in determining the scope of protection for computer programs. Apple brought a suit against Franklin claiming the defendant copied Apple's operating system from the ROM in which it was embedded. The court decided that operating system program which embedded in ROM in a form of object code was protected under Copyright law.

The five exclusive rights of reproduction, adaptation, distribution, performance, and display create boundaries of copyright ownership, and their violation constitutes copyright infringement. However, to balance the interests among authors, publishers, and the public in order to fulfill the purposes of copyright law, fair use doctrine allows some use of copyrighted work without permission of the copyright owner. The mentioned exclusive rights are therefore subject to a series of limitations set forth in §§107-120 of the U.S. copyright Act 1976.⁷⁷

The provisions concerning fair use exception are codified in three sections which are section 107, 108 and 117 of the U.S. Copyright Act 1976. Unlike the most other exceptions to the copyright owner's exclusive rights, fair use is a dynamic standard. As a statement of legislative policy, the fair use doctrine is

⁷⁶ Legal Protection of Digital Information, Chapter 2: Copyright of Computer Programs, at <http://digital-law-online.info/lpdi1.0/treatise48.html>, (last visited 26 October 2010).

⁷⁷ Leaffer and Bender, *op.cit.*, pp. 175-176.

undeniably vague. Section 107 of the Copyright Act states that “the fair use of a copyrighted work is not an infringement of copyright.” It also provides a non-exclusive list of six examples of fair use (criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research) and four nonexclusive factors for courts to consider in applying the doctrine.⁷⁸

Fair use is a case-by-case basis situation depending on the fact of each case, predominantly determined by four-part balancing test established in section 107 of the Copyright Act 1976. Section 107 reads as follows:

“Notwithstanding the provisions of sections 106 and 106A, the fair use of a copyrighted work, including such use by reproduction in copies or phonorecords or by any other means specified by that section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include:

- (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
- (2) the nature of the copyrighted work;
- (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
- (4) the effect of the use upon the potential market for or value of the copyrighted work.

The fact that a work is unpublished shall not itself bar a finding of fair use if such finding is made upon consideration of all the above factors.”

The statute does not provide a strict definition of the doctrine. Instead, it sets forth in its preamble the kind of uses which usually prompt the defense, followed by four criteria which must all be applied to determine whether the defense

⁷⁸ Matthew Sag, “God in the Machine: A New Structural Analysis of Copyright’s Fair Use Doctrine,” Michigan Telecommunications and Technology Law Review, 11 (2005): 19., at <http://ssrn.com/abstract=713802>, (last visited 26 October 2010).

exist.⁷⁹ In applying fair use, a court must finally decide whether the interest in dissemination outweighs possible harm to the economic incentives to produce copyrighted works. Courts appear to concentrate on two dimensions better than others in determining fair use cases which do not always explicitly send its message of justifying fair use. These dimensions are (1) the public benefit of the defendant’s use, whether the use is productive or reproductive; and (2) the harm to the market for the copyrighted work, whether the use is commercial or non-commercial.⁸⁰ This consideration is demonstrated by the following chart:

Table 1 Extent of Commercial Exploitation⁸¹

Extent of Commercial Exploitation			
Public Benefit of the Use		Non-commercial	Commercial
	Productive	Strongest case for Fair Use	Hard cases, e.g., Parody
	Reproductive	Hard cases	Weakest case for Fair Use

The easiest cases to justify on fair use ground are those where defendant has made a productive and non-commercial use of plaintiff’s work. For instance, a scholar writing an article for a learned journal quotes from plaintiff’s copyrighted work. Such use is not inconsistent with the purpose of Copyright law in serving public interests which is to encourage the amount of production and dissemination

⁷⁹ Leaffer and Bender, op.cit., p. 345.
⁸⁰ Ibid., p. 346.
⁸¹ Ibid, p.347.

the works of authorship. Also access to plaintiff's work can be build on by users and at the same time produce another work of authorship. The market of such work is not harmed and the incentives of authors are not destroyed. The other easiest case against fair use arises when reproductive and commercial use is made. The fair use cannot be justified as an infringement has occurred.

Level of difficulty is increase in determining the fair use issues when defendant has made a reproductive but non-commercial use of plaintiff's work. In this circumstance, fair use and new technology are frequently interacting results in adding other factors to be considered. Fair use will often be found in the interest of dissemination of the copyrighted work, especially when the copyright owner would gain little from prohibiting access to his work and it would be impractical for the defendants to negotiate for the use of copyrighted work. Furthermore, implicit in these cases is an awareness of effects of the ruling on a new technology.

Another more difficult issue in fair use analysis happens when defendant's use is productive but commercial. The courts will look, here, to the nature of copyrighted work, the amount, and substantiality of the use. Parody is an apparent example represents this situation. It is to be concerned that how much of plaintiff's work is needed to be used to conjure up the original for the purposes of parody. Thus, in the mix of productive and commercial use, if a parody builds on but does not supplant the original through excessive use, the public is benefited. It has received a net increase in information available, a new work of authorship, and possible harm to the economic incentives for future creation is not sufficient to offset the use.⁸²

In terms of reverse engineering and fair use, the law tends to favour the reverser. Reverse engineering is a time-honored practice expressly permitted by various intellectual property law statutes. Although the total ban on decompilation has been strongly demanded by the right holders in the developed countries, the implementation of their respective copyright laws seems to move in the opposite direction. Recent decisions in the U.S. have held that reverse engineering of computer software is not an infringement of copyright when performed for a

⁸² Leaffer and Bender, *op.cit.*, p. 348.

legitimate purpose such as interoperability.⁸³ For example, in the US, the courts in four different federal circuits have found decompilation to be a permitted fair use in the cases of *Sega v. Accolade*,⁸⁴ *Atari v. Nintendo*⁸⁵, *Bateman v. Mnemonies*⁸⁶, *DSC Communications v. DGI Technologies*.⁸⁷

The case law in the US also uses other approaches in giving effect to decompilation. For example, the famous case of *Lotus v. Borland*⁸⁸ in which Lotus failed to protect the menu command hierarchy of its “1-2-3” spreadsheet against Borland, who duplicated it (using its own code) and provided for the transmission of the user’s own Macros from the Lotus. The court clearly held that interface specifications are not protected as copyright by reasoning that because a computer menu command hierarchy is an uncopyrightable “method of operation” within the meaning of Section 102(b)⁸⁹ of the Copyright Act, “original developers are not the only people entitled to build on the methods of operation they create; anyone can.”

⁸³ Jonathan Band and Edward Durney, Protection of Computer Programs under Japanese Copyright Law, at <http://www.policybandwidth.com/doc/JBand-JapaneseSoftware.pdf>, (last visited 29 October 2010).

⁸⁴ *Sega Enterprises Ltd. v. Accolade, Inc.*, 977 F. 2d 1510 (9th Cir. 1992). The court held that under Section 107 of the Copyright Act, “a party in rightful possession of a computer program may undertake necessary efforts, including disassembly or decompilation, to gain an understanding of the unprotected functional elements of the program, at least where there is a legitimate reason for doing so and no other means of access to the unprotected elements exists.”

⁸⁵ *Atari v. Nintendo*, 975 F. 2d 832 (Fed. Cir. 1992).

⁸⁶ *Bateman v. Mnemonies*, 79 F. 3d 1532 (11st Cir. 1996).

⁸⁷ *DSC Communications v. DGI Technologies*, 898 F. Supp. 1183 (N.D.Tex. 1995), affirmed, 81 F.3d 597 (5th Cir.1996).

⁸⁸ *Lotus Development v. Borland International* 49 F. 3rd 807 (1995).

⁸⁹ Article 2(b) of the US Copyright Act: “In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.”

Another example is the use of the abstraction-filtration-comparison methodology as postulated for the first time in the case of *Computer Associates v. Altai*.⁹⁰ To allow the copying of user interface by holding that copyright protection does not extend to those design elements of a computer programmer's freedom of choice is circumscribed by external considerations.

While making a copy of an original work generally constitutes copyright infringement, the very nature of computer software requires the making of a copy of original elements every time a program runs. In order to solve this problem, Congress included specific exemptions within copyright law outlining the permitted uses of a computer program. Section 117 of the Copyright Act provides that:

"It is not an infringement for the owner of a copy of a computer program to make or authorize the making of another copy or adaptation of that computer program provided:

1. that such a new copy or adaptation is created as an essential step in the utilization of the computer program in conjunction with a machine and that it used in no other manner, or
2. that such new copy or adaptation is for archival purposes only and that all archival copies are destroyed in the event that continued possession of the computer program should cease to be rightful."

⁹⁰ *Computer Associates international, Inc. v. Altai, Inc.*, 982 F.2d 693 (2d Cir. 1992). The court used a very stringent test to distinguish ideas from expressions. It first analyzed the "level of abstraction" of the plaintiff's program, starting from its final expression in object code. It retraced and mapped the program designer's steps back from implementation to formative conception. It was then in a position to exclude from consideration those elements taken from the public domain and those which could be expressed only in one way (elements dictated by "efficiency" and by "external factors", where expression must be regarded as confounded into ideas-the "merger doctrine"). By that process, the court arrived at a "core of protectable expression" and on the facts the defendant was found not to have copied the core of protectable expression. There have been 11 cases adopting the same approach in the Circuit Courts.

In concision, as Prof. Melville B. Nimmer (California University) and Prof. Paul Goldstein (Stanford University) mentioned about, in outweighing an importance of public interests that will enhance the development of technology and upgrade quality of life, although the facts in copyright infringement case is ineligible to the fair use criterion, the act of copyright infringement will become a fair use if it relates to public interests with an appropriate manner in using those protected works under the Copyright Act.

3.2.2 Digital Millennium Copyright Act (DMCA)

The Digital Millennium Copyright Act was put into place in 1998 in order to make any service or device with purpose of undermining or removing DRM (Digital Rights Management) copyright infringement. The Act forbids any service or device from being designed to circumvent, or even being marketed to circumvent any DRM. Nevertheless, the DMCA made an effort to recognize the value of interoperability to competition and innovation and included an exemption expressly allowing reverse engineering in order to preserve a healthy market in the information technology industry.⁹¹ It is therefore illegal for private individuals to break protected code to copy material, but Congress specifically allows for, and considers fair use, the breaking of this code for purposes of reverse engineering. The Federal Circuit's ruling permitting parties to contract around reverse engineering law is inconsistent with federal law, which allows private individuals to hack protective code for the purpose of reverse engineering.

The provision concerning reverse engineering under the DMCA appears in section 1201(f). It allows software developers to circumvent technological protection measures of a lawfully obtained computer program for the purpose of "the elements necessary to achieve interoperability of an independently created computer program with other programs." An individual may reverse engineer the lawfully acquired computer program only where the elements necessary to achieve interoperability are not otherwise readily available and reverse engineering is otherwise permitted under the copyright law. Section 1201(f) states the following:

“Reverse engineering.-

⁹¹ Samuelson Law, op.cit.

1. Notwithstanding the provisions of subsection (a)(1)(A), a person who has lawfully obtained the right to use a copy of a computer program may circumvent a technological measure that effectively controls access to a particular portion of that program for the sole purpose of identifying and analyzing those elements of the program that are necessary to achieve interoperability of an independently created computer program with other programs, and that have not previously been readily available to the person engaging in the circumvention, to the extent any such acts of identification and analysis do not constitute infringement under this title.

2. Notwithstanding the provisions of subsections (a)(2) and (b), a person may develop and employ technological means to circumvent a technological measure, or to circumvent protection afforded by a technological measure, in order to enable the identification and analysis under paragraph (1), or for the purpose of enabling interoperability of an independently created computer program with other programs, if such means are necessary to achieve such interoperability, to the extent that doing so does not constitute infringement under this title.

3. The information acquired through the acts permitted under paragraph (1), and the means permitted under paragraph (2), may be made available to others if the person referred to in paragraph (1) or (2), as the case may be, provides such information or means solely for the purpose of enabling interoperability of an independently created computer program with other programs, and to the extent that doing so does not constitute infringement under this title or violate applicable law other than this section.

4. For purposes of this subsection, the term 'interoperability' means the ability of computer programs to exchange information, and of such programs mutually to use the information which has been exchanged.⁹²

The exception allows reverse engineering of computer programs if the person who reverse engineers lawfully obtains the program, seeks permission from the copyright owner, only uses the results of their efforts to create an interoperable

⁹² Legal Protection of Digital Information, Chapter 3: Copyright of Digital Information, at <http://digital-law-online.info/lpdi1.0/treatise48.html>, (last visited 1 November 2010).

computer program and does not publish the results. United States case law applying the fair use doctrine to reverse engineering considers interoperability justifications, but focuses more broadly on the need for access to uncopyrightable functional principles embodied in computer software. The DMCA's reverse engineering exemption more closely resembles the European Directive on the Legal Protection of Computer Programs, which allows reverse engineering only for interoperability purposes.⁹³

It is apparently that the qualification of fair use related to reverse engineering in section 1201(f) is suffice to fair use doctrine because the interoperability purpose is a certain special case under minimum standard of the Berne Convention which does not conflict with a normal exploitation of the work, that is, it is used not for a non-commercial purpose, and lastly, does not unreasonably prejudice the legitimate interests of the author because of the use for interoperability of an independently created computer program with other programs must have an underlying purpose and intention to develop technologies to enhance the public welfare.

The DMCA narrow the fair use doctrine, both because it reverses the traditional presumption of fairness that attaches to non-commercial uses, and because it bans the technologies that are likely to be necessary to make fair use of technologically-protected works. The DMCA does not address the fact that the prevailing legal climate supports eroding the traditional boundaries of fair use wherever new technologies allow licencing markets to form. Neither Congress nor the courts, however, appear willing to eliminate fair use entirely. In addition, U.S. copyright law has constitutional underpinnings that may, and should, be invoked to prevent the doctrine from being narrowed too far.

In addition, the prohibitions contained in section 1201 are subject to a number of exceptions. The applicability of the exemption is determined through a periodic rulemaking by the Librarian of Congress, on the recommendation of the Register of Copyrights, who is to consult with the Assistant Secretary of Commerce for Communications and Information. The six additional exceptions are as follows:

⁹³ Julie E. Cohen, WIPO Copyright Treaty Implementation in the United States: Will Fair Use Survive?, at <http://www.law.georgetown.edu/faculty/jec/wipotreaty.pdf>, (last visited 2 November 2010).

1. Nonprofit library, archive and educational institution exception (section 1201(d)). The prohibition on the act of circumvention of access control measures is subject to an exception that permits nonprofit libraries, archives and educational institutions to circumvent solely for the purpose of making a good faith determination as to whether they wish to obtain authorized access to the work.

2. Reverse engineering (section 1201(f)). This exception permits circumvention, and the development of technological means for such circumvention, by a person who has lawfully obtained a right to use a copy of a computer program for the sole purpose of identifying and analyzing elements of the program necessary to achieve interoperability with other programs, to the extent that such acts are permitted under copyright law.

3. Encryption research (section 1201(g)). An exception for encryption research permits circumvention of access control measures, and the development of the technological means to do so, in order to identify flaws and vulnerabilities of encryption technologies.

4. Protection of minors (section 1201(h)). This exception allows a court applying the prohibition to a component or part to consider the necessity for its incorporation in technology that prevents access of minors to material on the Internet.

5. Personal privacy (section 1201(i)). This exception permits circumvention when the technological measure, or the work it protects, is capable of collecting or disseminating personally identifying information about the online activities of a natural person.

6. Security testing (section 1201(j)). This exception permits circumvention of access control measures, and the development of technological means for such circumvention, for the purpose of testing the security of a computer, computer system or computer network, with the authorization of its owner or operator.

Each of the exceptions has its own set of conditions on its applicability, which are beyond the scope of this study.⁹⁴

⁹⁴ U.S. Copyright Office Summary, The Digital Millennium Copyright Act of 1998, at http://www.sharpearthfdn.qwestoffice.net/supplement/B-1_The-Digital-Millennium-Copyright-Act-of-1998-US-Copyright-Office-Summary.pdf, (last visited 2 November 2010).

In my opinion, to allow domestic software industry to compete in the global market and enhance the public welfare, the writer, myself, has a positive view point towards the provision in section 1201(f) under the DMCA in allowing reverse engineering as fair use exception for the purposes of promoting competition and innovation which was a primary purpose of the interoperability. It simultaneously qualifies the criterion of fair use under the Copyright Act 1976 which are reverse engineering must be used for the purpose of a noncommercial nature or for nonprofit educational purposes; scrutinize the nature of the copyrighted work; calculate the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and determine the effect of the use upon the potential market for or value of the copyrighted work.

3.2.3 Perspective on Application of Reverse Engineering as Fair Use Exception

The United States is a signatory member country to the Berne Convention (Paris Act 1971) on March 1, 1989. Either the Copyright Act 1976 or the Digital Millennium Copyright Act (DMCA) was enacted after the Berne Convention. This demonstrates that both of the U.S. copyright laws are consistent with the Berne Convention owing to the minimum standard that member countries are obliged to implement to their domestic law.

Reverse engineering is permissible as fair use in the United States with the condition that such infringement does not conflict with a normal exploitation of the original work and does not unreasonably prejudice the legitimate rights of the author. This seems to be in line with the Berne Convention because reverse engineering is a certain special case as stipulated in article 9(2). The perspective towards reverse engineering supports the Berne Convention thereof.

1. Use of an Individual

The doctrine of fair use is a judicially created defense to a suit for copyright infringement which allows a third party to use a copyrighted work in a reasonable manner without consent of the copyright owner. Although codified in the 1976 Act, the doctrine of fair use has retained its nature as an equitable rule of reason

to be applied where a finding of infringement would either be unfair or undermine “the progress of science and the useful arts.” The Act sets forth fair use in section 107 which contains a preamble, giving examples of fair use contexts, followed by four broad criteria which must all be applied to determine whether a use is “fair.”⁹⁵

Reverse engineering is the scientific method of taking something apart in order to figure out how it works. Reverse engineering has been used by innovators to determine a product's structure in order to develop competing or interoperable products. Reverse engineering is also an invaluable teaching tool used by researchers, academics and students in many disciplines, who reverse engineer technology to discover, and learn from, its structure and design.⁹⁶

Although some reverse engineer techniques require making a copy of the software being investigated, an act that would otherwise be considered a copyright violation, copyright law has allowed these reverse engineering copies as a form of “fair use.” Further justification for the law’s recognition of a right to reverse engineer likely derives from the fact that the product is purchased in the open market, which confers on its owner personal property rights, including the right to take the purchased product apart, measure it, subject it to testing, and the like. The time, money, and energy that reverse engineers invest in analyzing products may also be a way of “earning” rights to the information they learn thereby.⁹⁷ Moreover, the competitive reality of reverse engineering may act as a spur to the inventor to develop patentable ideas.

To determine whether or not reverse engineering deems as fair use, there are the four factors codified in section 107 that are taken into consideration in determining whether the use is fair. Section 107 states:

“In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include —

⁹⁵ Leaffer and Bender, *op.cit.*, p. 317.

⁹⁶ Samuelson Law - Technology and Public Policy Clinic, Reverse Engineering, at <http://webcache.googleusercontent.com/search?q=cache:WsZbHwRAwOQJ.www.chillingeffects.org/reverse/+reverse+engineering+in+fair+use&cd=1&hl=th&ct=clnk&gl=th>, (last visited 1 November 2010).

⁹⁷ Samuelson and Scotchmer, *op.cit.*, p. 2.

- (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
- (2) the nature of the copyrighted work;
- (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
- (4) the effect of the use upon the potential market for or value of the copyrighted work.

The fact that a work is unpublished shall not itself bar a finding of fair use if such finding is made upon consideration of all the above factors.”

This exception is, however, determined on a case-by-case basis to fulfill the goal that is, not merely to incorporate the past, but also to allow for a flexible and dynamic future. The courts must go beyond a very broad statutory and be free to adapt the doctrine to particular situations which all four enumerated factors must be adopted to determine fair use. Section 107 is intended to restate the present judicial doctrine of fair use, not to change, narrow, or enlarge it in any way.⁹⁸ The inquiry, however, need not be limited only to those factors. The language “shall include” indicates that the court can, in its discretion, consider other factors as well, for instance lack of good faith and industry custom or practice.⁹⁹

Regarding to the reverse engineering process, it typically leads to the discovery not only of protected elements that cannot be legally used, but of non-protected elements that can be. In light of this fact, shouldn't reverse engineering be protected as a fair use, as long as it does not lead to the use of protected elements? The U.S. Courts of Appeals for the Ninth Circuit and the Federal Circuit have both answered yes, and they were correct to do so. The two leading cases, *Atari Games Corp. v. Nintendo of America, Inc.* and *Sega Enterprises v. Accolade, Inc.*, both involved the same issue: Can a video game author legally reverse engineer software contained in computer game consoles, in order to decipher the unprotected security codes necessary for game cartridges to operate on the consoles?¹⁰⁰

⁹⁸ Section 107, Chapter 1, Title 17, United States Code.

⁹⁹ Leaffer and Bender, op.cit., p. 322.

¹⁰⁰ Chris Sprigman, Should Software Companies be able, Through Contracts, to Prevent Competitors from "Reverse Engineering" Their Products?, at

Referring to Sega case, Sega is the venerable Genesis Video Game System. Accolade is a developer and distributor of video games, and they wanted to develop games for the Genesis system. However, Genesis is not an open system, and in order for a game to work on the system, the game has to know the proprietary interface component of Sega's Genesis system, particularly the password that needs to be incorporated on any video game cartridge played on the Genesis system. The only way that Accolade could determine the password was by de-compiling the object code of one of Sega video games to produce a translation of the source code. As a necessary step in this reverse engineering procedure, Accolade had to copy the Sega object code. Sega sued Accolade for copyright infringement based on the copying of the object code. Accolade argued that its copying was a fair use as allowed by the Copyright Act. Section 107 allows copies of a copyrighted work to be made for purposes such as criticism, comment, or research.

The court looked at the fair use implications of reverse engineering. The four part test for fair use looks at the purpose of the use, nature of the work being copied, amount copied, and market for the copied work.¹⁰¹ Because Accolade needed to copy and disassemble Sega's copyrighted video game to obtain the necessary interface requirements, the court held that where reverse engineering copies a work as the only way to access the ideas and the functional elements of the work, such copying is a fair use if a legitimate reason for the use exists. The court thus held that a copyright in a work cannot protect un-copyrightable ideas and functional elements with that work.¹⁰² In the *Atari* case, however, the court nonetheless denied the defendant fair use protection, because it had procured Nintendo's source code under false pretenses.

http://writ.news.findlaw.com/commentary/20020926_sprigman.html, (last visited 2 November 2010).

¹⁰¹ George H. Pike, "Reverse Engineering a Controversy: Technology and Content," (University of Pittsburgh, School of Law), *Information Today*, 22 (January 2005): 17.

¹⁰² Copyright Website, *Sega v. Accolade*, at <http://www.benedict.com/Digital/Software/Sega/Sega.aspx>, (last visited 2 November 2010).

2. Licensing Agreement

Generally, the exclusive rights granted by the United States Copyright Act may be exercised as the copyright owner sees fit. If an author does not want the manuscript to be published or distributed, the author as the copyright owner can prevent publication and distribution. Similarly, these rights can be controlled through technology licenses where contract clauses forbidding reverse engineering can be included. Sometimes sellers include these clauses in "shrink-wrap," "click-wrap," or "browse-wrap" licenses without enabling the user to negotiate the terms of such a license. In many instances, users are not even aware of the terms to which they are binding themselves.

While the validity of licensing prohibitions of reverse engineering has not yet been decided by courts, the conflict between state laws that would enforce these provisions and Federal intellectual property law has been addressed. When considering cases where breach of contract or trade secret misappropriation is claimed (both state law claims), courts must first determine whether or not intellectual property law preempts those contracts enforced by the individual state. Preemption occurs when courts determine that federal intellectual property law must be considered in order to address the issues involved in the particular provisions.

Section 301 of the Copyright Act provides that a state law claim is preempted if:

"(1) the work to be protected comes within the subject matter of copyright; and

(2) the state-created right forming the basis of the state law claim is equivalent to any of the exclusive rights within the general scope of copyright."

In order for the claim to be preempted it must first pass this equivalency test, which determines whether the state-created rights in upholding the contract are merely alternative articulations of the exclusive rights of copyright law. If the court determines that the contract provisions contain an "extra element" that require analysis of the contract to be preempted by copyright law, the courts generally proceed to an analysis of the possible infringement or exemption under fair use of the activities of the reverse engineer.¹⁰³

¹⁰³ Samuelson Law, op.cit.

Even if copyright law itself allows the decompilation or disassembly of computer programs, right owners may try to include clauses prohibiting these acts into their licences.¹⁰⁴

In theory, although consumers have some fair use rights that survive in a digital licensing environment, they can agree to sign away these rights. Rights management systems do not bargain, however. Instead, they operate by requiring the user to consent to the usage restrictions before being granted access to the work. In theory, such “shrinkwrap” or “clickwrap” restrictions could enable publishers of copyrighted work simply to opt out of the copyright system en masse. If this occurs, then the courts, and possibly Congress, will need to consider whether copyright policy permits this result.

Many courts in the United States have held that “shrinkwrap” licence terms not disclosed to the purchaser beforehand are not enforceable and do not become part of the contract.¹⁰⁵ However, under proposed Article 2B of the Uniform Commercial Code, Shrinkwrap terms would become part of the contract as long as the user has the opportunity to review them, and is required to manifest assent, before first use of the product.¹⁰⁶

In *Bower*¹⁰⁷ case, the Court claimed the license term preempted reverse engineering and that fair use was null. Now, companies can easily put a similar prohibition in their license agreements, which will effectively end reverse engineering. When all companies can contract away reverse engineering rights, little

¹⁰⁴ Ansga Ohly, Reverse Engineering: Unfair Competition or Catalyst for Innovation?, at <http://ssrn.com/abstract=1523649>, (last visited 2 November 2010).

¹⁰⁵ Mark A. Lemley, “Beyond Preemption: The Federal Law and Policy of Intellectual Property Licensing,” California Law Review 87 (January 1999): 9. (collecting cases).

¹⁰⁶ Uniform Commercial Code, Art. 2B: Licenses, § 2B-208 (Proposed Draft November 1998).

¹⁰⁷ *Bowers v. Baystate Tech. Inc.*, 101 F. Supp. 2d 53, 54 (D. Mass. 2000).

merit remains in the Court's distinction on the basis that the contract terms only affect individuals rather than society as a whole.¹⁰⁸

These license agreements also affect innocent third parties, who are now unable to benefit from the knowledge to be gained from reverse engineering. Also, like any other adhesion contract, the only choice offered to the purchaser is to avoid making the purchase in the first place. This problem is compounded by the fact that when a company is able to keep its product features secret, the monopoly is extended to the idea or process, thus ultimately restricting choice.¹⁰⁹

Copyright law is set up by the federal government as a delicate balance of providing just enough protection to foster creativity and innovation by rewarding achievements with monopoly powers in exchange for public dissemination of ideas and expressions. Allowing companies or creators to restrict reverse engineering via licensing agreement could create new rights in the individual and destroys this balance in which companies or creators are able to maintain secrecy and monopoly power without disclosure of important information to the public. Thereafter, if courts continue to cut back the fair use doctrine of the Copyright Act and allow individuals to create new rights of protection through state contract law, the purpose of the Copyright law would be undermined and fair use doctrine could be stifled eventually.

3.3 Provision Relating to Reverse Engineering in Other Countries

Apart from United States copyright system that permits reverse engineering as fair use exception, in Europe, Asia, Australia's copyright system, for instance, they as well have amended their copyright laws to permit reverse engineering in different legislative processes and statutory approaches, yet ended up in similar places for similar reasons.

¹⁰⁸ Jonathan Wilson, "Can a Copyright Holder Prevent Reverse Engineering? The Federal Circuit Court Holds that the Federal Copyright Act Does Not Preempt "No Reverse Engineering" Clause. *Bowers v. Baystate Tech. Inc.*," Computer Law Review and Technology Journal 8 (September 2004): 472.

¹⁰⁹ Ibid.

In Singapore, at the beginning, its copyright law allowed reverse engineering only in the case of research or private study specified in section 35(1) of the Singapore Copyright Act (SCA). Section 35(5) defined “research” as excluding “industrial research, research carried out by bodies corporate...or bodies or persons carrying on any business.” This demonstrated that to merely indeed confine reverse engineering for educational use, it surely did not aid others who want to design and market non-infringing competition programs which interface or are inter-operable with the basic programs to develop, put together and arm with the knowledge for new inter-operable programs development. It went against the aim of allowing domestic software industries to compete in the global market. Thus, Singapore amended its Copyright Act by deleted section 35(5) thereby allowing the courts to interpret research and private study to include commercial reverse engineering. At present, Singapore, therefore, permits software reverse engineering as fair use to the extent permitted by the U.S. fair use doctrine.¹¹⁰

Turning to European Union, the European Union’s 1991 Software Directive on the Legal Protection of Computer Program (“the EU Software Directive”) allows decompilation if it is essential to achieve interoperability of an independently created program with other programs and is confined to those parts of the original program which are necessary to achieve interoperability¹¹¹ under article 6, reads as follows;

“Article 6 – Decompilation

1. The authorization of the rightholder shall not be required where reproduction of the code and translation of its form within the meaning of Article 4(a) and (b) are indispensable to obtain the information necessary to achieve the

¹¹⁰ Jonathan Band, Software Reverse Engineering Amendments in Singapore and Australia, at <http://www.policybandwidth.com/doc/JBand-AustSingRevEng.pdf>, (last visited 11 July 2010).

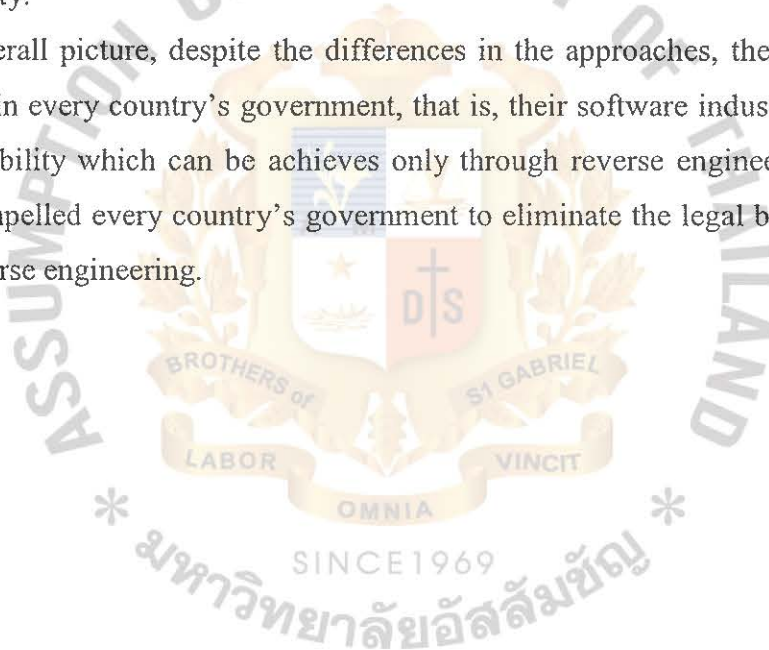
¹¹¹ Cristina Cifuentes and Anne Fitzgerald, Reverse Engineering of Computer Programs: Comments on the Copyright Law Review Committee’s Final Report on Computer Software Protection, at <http://www.cs.uq.edu.au/~cristina/jlis95.ps>, (last visited 5 November 2010).

interoperability of an independently created computer program with other programs...”

Besides, article 9(1) of the EU Software Directive expressly states that the reverse engineering clause cannot be excluded by contract and that any attempt to do so will be void. Article 9(1) states that “any contractual provisions contrary to Article 6 or to the exceptions provided for in Article 5(2) and (3) shall be null and void.”

Instead of an easy flexible case by case fair use approach of the United States, Australia chose to follow the more certain civil code approach of the EU Software Directive by enacted Copyright Amendment (Computer Programs) Act, No.105 of 1999 intended to permit the reverse engineering necessary to achieve interoperability.

In overall picture, despite the differences in the approaches, the same basic facts remain in every country’s government, that is, their software industries depend on interoperability which can be achieves only through reverse engineering. These basic facts impelled every country’s government to eliminate the legal barriers upon software reverse engineering.



Chapter 4

Problem Analysis on the Application of Reverse Engineering

4.1 Problem on Reverse Engineering Deemed as Fair Use

Fair use is neither black nor white. In determining of what fair use is, this arises grey line between private use and copyright infringement since there is no definite criterion adjudicating certain act that deems or not deems to be fair use. As United States perspective towards copyright law was generally felt that to a great extent public interest superseded the author's claim to the work, especially works of foreign authors, the country scrutinizingly enacted the law to eliminate the legal barriers to bestow fair use doctrine. The four-part balancing test, established in section 107 of U.S. Copyright Act, was therefore adopted to clarify the grey actions of copyright users particularly over the case that involves new method of producing, distributing and consuming copyright materials facilitated by the emergence of digital technology. The courts will determine particular situations on a case-by-case basis. The test facilitates noninfringing certain uses of copyrighted material that might "technically violate the statute, but which do not violate the statute's basic purposes."¹¹² This section, however, does not define fair use doctrine, but it does illustrative fair use purposes and factors, providing for the courts to examine in each case.¹¹³

The four factors of section 107, which are the heart of the fair use determination, states:

¹¹² Wendy J. Gordon, "Fair Use as Market Failure: A structural and economic Analysis of the Betamax Case and Its Predecessors," Columbia Law Review 82 (December 1982): 1600.

¹¹³ William F. Patry, The Fair Use Privilege in Copyright Law, 2nd ed. (United States: BNA Books, 1995), p. 594.

“In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include —

- (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
- (2) the nature of the copyrighted work;
- (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
- (4) the effect of the use upon the potential market for or value of the copyrighted work.”

First Factor (purpose and character of the use): In analyzing the first factor, the courts normally clarify the meaning of fair use by concentrating on the distinction between commercial and non-profit educational use. A non-profit educational use is more likely to be a fair use because it tends to be less harm to the market for the copyrighted work than would a commercial use.¹¹⁴ The emphasis on the economic impact of the use illustrates this factor relates to the fourth factor, the effect of the use on the potential market for the copyrighted work. Certainly, there is no presumption against fair use in case that the copyright users reverse engineer for the purpose of identifying and analyzing those elements of the program that are necessary to achieve interoperability of an independently created computer program with other programs. On the contrary, if it is dubious whether or not a particular use of copyrighted works is for commercial gain, the fair use doctrine is challenged.

The purposes of the use are what the courts consider to be more important than whether the use is a commercial or non-profit educational use. For instance, a use done in bad faith is less likely to be assumed as fair use. Knowingly transform the copyrighted work by adding something new into it makes the purpose and character of the use conduce to the commercial use which tends to be less presupposed as fair use.

Second Factor (nature of the copyrighted work): The underlying reason of this factor is to support the public interest that there should be greater access to any kinds of works than others. It must take into account the type of work whether what purpose does it created for (e.g. courseware or particular designs), who is the target

¹¹⁴ *Wihtow v. Crow*, 309 F.2d 777 (8th Cir. 1962).

users group (e.g. students or writers), the amount of the target users group, availability for public access or prevalence of copyrighted works, so on and so forth. The fair use privilege may not be available at all for certain kinds of works particularly vulnerable to harm from mass reproduction. All copying for study or teaching from consumables such as workbooks, answer sheets, and standardized tests are precluded and any substantial amount of copying of those materials in teaching situations would ruin the only available market for these works.

Third Factor (amount and substantiality taken): In scrutinizing this third factor, one must distinguish this third factor from the question of substantial similarity since the fair use defense arises only "after" infringement is approved. This factor properly focuses on whether the defendant has taken more than is necessary to satisfy the specific fair use purpose. However, the "quality" of the portion taken is analyzed under this factor as well as the "quantity." It is possible that copying a small amount of copyrighted works could exceed the purpose of use if the material taken constitutes the heart of the work. If this were the case, this third factor might lead to a conclusion of no fair use. Thus, the element that should be considered with is whether that work is separately cognizable or self-contained. In copying or adapting self-contained work is considered more likely to be fair use if small amount of copyrighted work is taken, but it is definitely not fair use when multiple copying or repeated reproducing is made.

The third fair use factor has an obvious connection with the fourth factor. Fair use is less likely when an entire work is reproduced, because excessive copying may displace the need for the original and ruin its market.¹¹⁵

With respect to the use of computer program, Congress stipulated the mainstream of the use that is determined as fair use as follows:

1. To reproduce not more than one copy of computer program for a back up or archival purposes.
2. To adapt computer language into another language for viable operation.
3. To add compatible elements for better performance.
4. To adapt computer program in order to match with a particular use.

¹¹⁵ Fisher v. Dees, 794 F.2d 432, 437 (9th Cir. 1986).

Fourth Factor (effect on potential market for protected work): Courts have stated that this is the most important factor in the fair use analysis. The reason is easy to understand. The incentives for creativity that the copyright monopoly is designed to encourage will not work if the market for the copyright owner's work is harmed.¹¹⁶ For example, to copy regardless of whole or parts in the essence of the work of the copyrighted works where such works are easily accessible in the market (e.g. work book or exercise) is not deemed as fair use due to the demand upon the copyright holder's work is marketable deducted.

The fourth factor is related in one way or another to the other three factors, but perhaps most closely to the first factor where presumption of harm occurs from commercial uses of the copyrighted work.¹¹⁷

It should be noted that actual harm need not to be shown, although proof of quantifiable harm is the best evidence of harm to the market for the work. But the fact that the copyright owner does not actually market copies of the work does not matter under the potential market language of section 107(4). To prove potential market effect, plaintiff need only show a meaningful likelihood of future harm by a preponderance of the evidence.

In conclusion, the four factors are split but the courts would generally review this analysis and determine that, on the whole, the four factors weigh toward a finding of fair use,¹¹⁸ and it must be considered together with the law which concerns the rights to criticize, comments, reporting of the news, and teaching. In addition, fair use constitutes an "affirmative defense"¹¹⁹ to copyright infringement.

¹¹⁶ Leaffer and Bender, op.cit., p. 328.

¹¹⁷ Sony Corp. of America v. Universal City Studios, 464 U.S. 417 (1984).

¹¹⁸ Fair Use in Copyright, at http://www.bitlaw.com/copyright/fair_use.html, (last visited 2 November 2010).

¹¹⁹ Bryan A. Garner, Black's Law Online Dictionary, at http://www.ildn.us/courts.gov/robainfo/answer_response_events/affirmative-defense.htm, (last visited 2 November 2010); "Affirmative defense" means a defendant's assertion raising new facts and arguments that, if true, will defeat the plaintiff's or prosecution's claim, even if all allegations in the complaint are true, for example; duress and contributory negligence in a civil case and insanity and self defense in a criminal case.

To compare the Thai fair use exception with the U.S.'s in the matter of computer program, Thai fair use exception has two steps requirement in section 35 which have to carefully consider together with section 32 paragraph one. For the other type of copyrighted works, they merely have to fulfill the criterions under section 32. While the U.S. stipulates the exception in section 107 which applies to all copyrighted works including computer program, and related sections are section 108 (a)(1) and section 117.

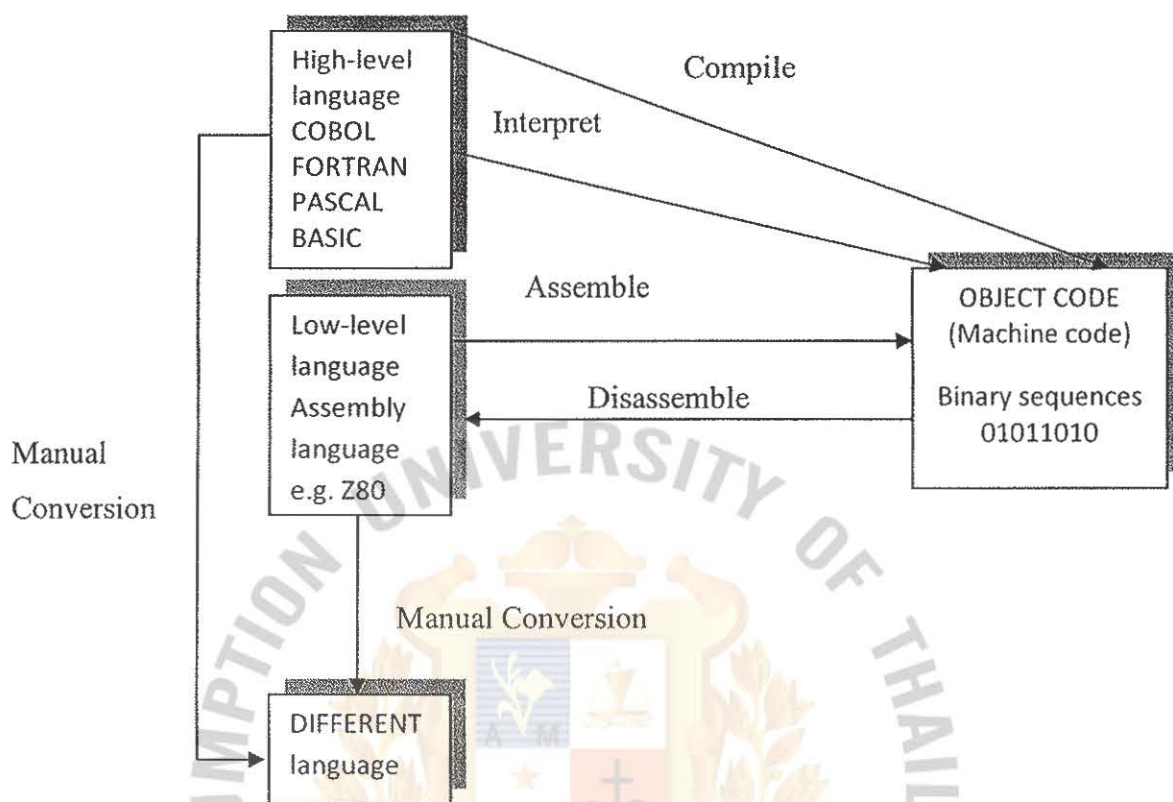
Balancing the interest between the copyright owner and public interest is the aim of fair use doctrine. Thailand and U.S. recognize the same first factor. If commercial use creates a presumption of unfair copyright exploitation or it is found that users have bad faith, it is more possibly not recognized as fair use.

A little difference manifests in the third factor where U.S. takes into consideration both the amount and substantiality of the portion used in relation to the copyrighted work as a whole. Whereas, section 32 of Thai Copyright Act B.E 2537 only addresses "does not unreasonably prejudice the legitimate right of the owner of copyright," which what to be considered is merely "the amount" used. The courts have to make attentive discretion upon each case whether such uses is done for private use or commercial purpose. An individual can make a copy of computer program whether in whole or parts and use one's discretion upon the fact that making "a copy" does not unreasonably prejudice the legitimate right of the owner of copyright. The fourth factor is recognized under Thai and U.S. Copyright Law.

Thailand acknowledges three out of the four factors regardless of the second factor which renders more flexibility in applying fair use doctrine in favor of the users.

Turning to reverse engineering of computer program, to gain access to the functional elements of a software program by a method of reverse engineering, it typically requires that a copy be made of the program's object code and disassemble to source code. Programmers could reverse engineer a program by using a disassemble or decompiler as a tool to interpret the electronic signals while other's program is operating. Accordingly, the process of disassembly or decompilation constitutes copyright infringement since it neither permitted by the copyright owner nor contracted under the licence to use the computer program.

Chart 1 Making an Adaptation in Relation to a Computer Program¹²⁰



Despite a copy made during the process of reverse engineering, the Thai copyright law by virtue of section 35 together with section 32 paragraph 1 specifies copying or adapting computer program is not copyright infringement as long as it is done with non-commercial purpose which does not conflict with a normal exploitation of the copyright work and does not unreasonably prejudice the legitimate rights of the owner. Nonetheless, in some cases, situation is ambiguous upon the use that entails unclear reverse engineering purpose and intention.

Court in U.S. laid down decision concerning reverse engineering as fair use exemplified by the two leading cases, *Sega Enterprises v. Accolade, Inc.* and *Atari Games Corp. v. Nintendo of America, Inc.* Both cases involved the same issue: Can a video game author legally reverse engineer software contained in computer game consoles, in order to decipher the unprotected security codes necessary for game cartridges to operate on the consoles?¹²¹

¹²⁰ Leaffer and Bender, op.cit., p. 294.

¹²¹ Spigman, op.cit.

In Sega case, the defendant reverse engineered object code in order to access the plaintiff's source code and was not done for non-profit educational purpose, but for developing the computer program to compete with the original program. The Ninth Circuit found that the intermediate copying of the object code of a copyrighted computer program as necessary to disassemble the program to view its expression was a fair use under section 107 of the copyright laws. The court held that under Section 107 of the Copyright Act, "a party in rightful possession of a computer program may undertake necessary efforts, including disassembly or decompilation, to gain an understanding of the unprotected functional elements of the program, at least where there is a legitimate reason for doing so and no other means of access to the unprotected elements exists."

In Atari case, court used the same criterion of consideration as in Sega's. The court nonetheless denied the defendant fair use protection, because it had procured Nintendo's source code under false pretenses.

From cases mentioned above, we can understand that the U.S. courts examine the four factors strictly as guideline to analyze whether the particular use is fair. However, what is more important is the intention of the person who reverse engineers. It is true that reverse engineering for commercial purpose or to compete with original program conflicts with fair use, but it is more important to maximize the public interest in allowing free flow of information in order to develop new digital technology.

In granting reverse engineering as fair use exception, we must take into account to what extent and whether or not the owner's right of enjoying exclusive rights is erode. The key question is how the threat of reverse engineering affects incentives to innovate. If reverse engineering actually occurs and erodes market power and reduce the innovator's profit to an extent determined by the costliness and time required for reverse engineering,¹²² this means that such exception benefits user too much— it will destroy creator's incentive and stifle progress of digital technology upon the society which will go against the purpose of the Copyright law which is to promote the progress of science and useful arts. Thus, even if fair use helps balancing interest between the user or the public and the owner, we must

¹²² Samuelson and Scotchmer, op.cit.

simultaneously consider that restriction of the copyright holder's profit will not go too far.

On the other hand, if the owners enjoys their exclusive rights too much, the owner will have absolute right to control and monopolize the market which affects the societies in not getting enough standard right to access information as they deserve. Moreover, some reverse engineering requires adaption of a small portion of computer program in order to operate with the particular work which the program is incapable of functioning. To ask for the company to adapt it, this may require a great fortune or the company may even refuse to do so. Therefore, this is the part when fair use exception plays an important role in limiting the owner's exclusive rights.

In conclusion, it is an undeniable fact that making use of exclusive rights by the owner is torn down by the doctrine of fair use. Anyhow, it is also crucial to consider what does the law really protects (intention of the law). The aim of fair use is to balance the interest between the user and the owner. So, the four factors under section 107 does not define fair use doctrine, but it merely illustrate fair use purposes and factors providing for the court to examine in each case. Eventually, no matter what results of fair use turns out, the intention of the law prevails.

Alternatively, one can choose to exploit their copyrighted work by licensing. It is one of the methods which can avoid reverse engineering and increase creator's incentive. The problem, however, raises upon the context specify in the agreement. In case of licensing agreement clearly specifies the clause prohibiting reverse engineering, if the licensee does not comply with the agreement, it will inevitably constitute breach of contract which the licensee has to responsible for the violation. On the contrary, if licensing agreement silence about the clause prohibiting reverse engineering, does it imply that the right holders allow users to reverse engineer? This circumstance can affect two results. First, if such silence is deemed to be imply consent, then the owner's exclusive rights will be erode and therefore, fair use exception is adopted. Second, if it does not deem as imply consent, reverse engineering establishes breach of contract.

Another problem arises concerning the application of reverse engineering. The context "the purpose is not for profit" in section 35 of the Copyright Act B.E. 2537 is inconsistent with the nature of business, and will not be practicable. Reverse

engineering is per se non commercial educational purpose, but creating new program originated from reverse engineering process for distribution is of course commercial purpose which fair use exceptions under section 35 will not be applicable at all. This would bar most researches from enjoying the foreign document, especially for the necessary fields, and will paralyze the development of individual researches.¹²³ Practically, no one wants to put an effort to reverse engineering merely for non-commercial educational purpose. Mostly, once companies decide to reverse engineer, they anticipate in reaping the benefit out of the reverse engineering product by nature of the business. For this reason, conditions of reverse engineering should not be confined to such narrow scope as it will bar opportunities to study those programs from developed countries.

Thailand, as a developing country, is definitely still in need of technology development from other countries which have higher technology than we do. With a few potential of our programmers in Thailand, we are not strong enough to develop the whole new computer program by ourselves. Reverse engineering is therefore the best answer for the situation because it helps transferring computer technology from those developed countries. Information necessary to achieve interoperability is therefore very significant to Thai programmers.

As the courts in Thailand have not adjudicated any cases relating to reverse engineering, we need U.S. court decisions and their principle, in determining to what extent reverse engineering is allowed, to guide the way in order to enhance digital technology to be in line with other developed countries.

4.2 Implementation of Reverse Engineering under Fair Use Doctrine

It is true that the rights holder's interest has been lessened by the fair use doctrine, but does it worth for the copyright holders to face such restriction? In protecting Intellectual Property, the law certainly protects those who require their labour, skill, and knowledge put into their work to develop and create new invention by conferring on owner the exclusive rights of a copyrighted work. However, it is

¹²³ Samuelson and Scotchmer, op.cit.

impossible to allow the copyright owner to enjoy such exclusive rights in all situations because the copyright owner will have an absolute power upon the work so much that those who cannot afford to pay will lose opportunities to study the rich source of information. With this reason, Intellectual Property Law stipulates Free Trade Competition and aim for the benefit of the societies as main element to be considered along with the monopoly right of the copyright owners by exempting copyright infringement of the users to be fair use exception in certain special cases including reverse engineering.

Reverse engineering is exempted when it helps enhancing software industry and is used for personal interest without affecting right holder's interests. For instance, reverse engineering, in some cases, creates better new work originated from the original copyrighted work, the person who reverse engineers will have the privilege of owning that work since one had put enough effort into one's work with skill, judgement and labor, which constitutes a whole new product. This means that the new copyrighted product also benefits the societies, so, it is reasonable for the copyright law to authorize reverse engineering. In the same situation, minor computer program producers will have opportunity to arise more in the market when reversers are permissible to reverse engineer in parts of the program and does not prejudice the right of the owner.

Small portion of computer program can be reverse engineered in order to operate with the particular work which the original program is incapable of functioning. To ask for the same company to adapt it, this may require a great fortune or the company may even refuse to do so because the person who reverse engineered the program is not working in the company anymore or whatever reasons it may be. Thus, this would also be another case that reverse engineer should not establish copyright infringement.

Reverse engineering for interoperability is another important purpose for developing country in access information to work with the other eminent program. It helps domestic software industry to compete in the global market. Thai programmers still have a few potential to develop the whole new computer program. Thus, information necessary to achieve interoperability is very significant to Thai programmers.

Granting reverse engineering as a fair use defense towards the owner's exclusive rights would be rational as long as the right holder's interest does not excessively erode. The underlying reason of this situation would be the right holder's interest is inferior to public interest. In order to have both the copyright owner and societies gain benefits, Thailand should consider reverse engineering permissible under Thai Copyright Act.

For many reasons mentioned above, many countries permit reverse engineering as fair use exception in different approaches in order to boost competition and innovations, and preserve a healthy market in the information technology industry. The following chart demonstrates the comparison between United States and European Union who allow reverse engineering as fair use exception (exception for copyright infringement) in certain special cases.

Table 2 Purposes Allowed for Reverse Engineering

Reverse Engineering	Fair Use Exception	Copyright Infringement
U.S. Copyright Act 1976	<p><u>Section 107</u>: Educational purposes</p> <p><u>Section 117</u>: Such a new copy or adaptation is created as an essential step in the utilization of the computer program in conjunction with the machine. Such a new copy or adaptation is for archival purposes only and that all archival copies are destroyed in the event that continued possession of the computer program should cease to be rightful. Machine maintenance or repair <u>Court decisions</u>: Interoperability purpose</p>	Commercial purpose which conflict with the normal exploitation and unreasonably prejudice the legitimate right of the copyright owner

Table 2 Purposes Allowed for Reverse Engineering (continued)

Reverse Engineering	Fair Use Exception	Copyright Infringement
U.S. DMCA	<u>Section 1201(f): Interoperability purpose</u> <u>Section 1201(d): Non-profit library, archive and educational institution purpose</u> <u>Section 1201(g): Encryption research</u> <u>Section 1201(h): Protection for minors</u> <u>Section 1201(i): Personal Privacy</u> <u>Section 1201(j): Security testing</u>	Commercial purpose which conflict with the normal exploitation and unreasonably prejudice the legitimate right of the copyright owner
EU Software Directive	<u>Article 6: Interoperability purpose</u>	Commercial purpose which conflict with the normal exploitation and unreasonably prejudice the legitimate right of the copyright owner

From the chart, United States and European Union ended up in similar principle for similar reasons where reverse engineering for the purpose of interoperability is allowed. Intention of the person who reverse engineers is the most important elements in considering whether or not reverse engineering is “fair”. If the only way to access thought, expression of idea or other program elements which are both protected and unprotected elements is to reverse engineering, it is permissible as long as there is enough appropriate reason to justify regardless of confliction of fair use. Court decision supports this basic principle that “a particular unauthorized use should be considered ‘more fair’ when there is no ready market or means to pay for the use, while such an unauthorized use should be considered ‘less fair’ when there is a ready market or means to pay for the use.”¹²⁴

¹²⁴ American Geophysical Union v. Texaco Inc., 60 F.3d 913, 931 (2d Cir. 1994).

However, if copyrighted work which was reverse engineered for educational purpose is later taken for distribution, is it still considers “fair”? It depends. For the former purpose, it is deemed as fair use because reverse engineering is done for educational purpose. For the latter purpose, it is up to the purpose of distribution. If the distribution can be justified under the purposes permitted by the copyright law, such distribution is not a copyright infringement. On the contrary, if it cannot be justified, such as, the amount of copies are excessive compare to the amount used in educational institution, the reverser will face with copyright infringement charges.

Chart 2 Copyright infringement charges



It can be deduced that fair use will override the copyright owner’s interests when reverse engineering one way or another has some part helps domestic software industry grows. However, we must also consider that to what extent the law should permit the users in access information, by reverse engineering, as they deserved without destroying creator’s incentive. The four factors under the U.S. Copyright Act 1976 must be strictly scrutinized. This will guarantee the right holders to know exactly what they are entitled of. To reverse engineer in an appropriate reason and necessary amount which does not conflict with the right holder’s interest and use with good faith is therefore deemed as “fair use.” At present, the digital age makes the decision more complex which it leaves to the decision of the courts to cautiously differentiate copyright infringement from those who assert fair use defense. To adhere in the copyright law’s objective is the ultimate goal in adjudicating fair use cases.

Chapter 5

Conclusion and Recommendation

5.1 Conclusion

“Reverse engineering” is the process of discovering the technological principles of a device, object or system through analysis of its structure, function and operation. It often involves taking apart and analyzing its workings in detail to be used in maintenance, or to try to make a new device or program that does the same thing without using or simply duplicating (without understanding) any part of the original. Generally, reverse engineering can be adopted with anything from any products to a large organization.

Reverse engineering is an activity that neither changes the subject system, nor creates a new system based on the reversed engineered subject system. It can benefit us in many ways. The purposes for undertaking reverse engineering are simplify complex software; improve the quality of software that contains errors; enforce a programming standard; enable better software maintenance management techniques; allow major changes in software to be implemented; help editing program when source code or person who created it is no longer available, etc. *

To gain access to the functional elements of a software program by a method of reverse engineering, it typically requires that a copy be made of the program's object code and disassemble to source code. Programmers could reverse engineer a program by using disassemble or decompiler as a tool to interpret the electronic signals while other's program is operating. Accordingly, the process of disassembly or decompilation constitutes copyright infringement. But the fact that sometimes reverse engineering benefits public interest more than erodes the owner's exclusive rights, the Copyright law does not recognize reverse engineering as copyright infringement as long as it is used for non-commercial purpose which does not conflict with a normal exploitation of the copyright work and does not unreasonably prejudice the legitimate rights of the owner.

The doctrine of fair use developed over many years as courts tried to balance the rights of copyright owners with society's interest in allowing copyright infringement in certain, limited circumstances. This doctrine has at its core a fundamental belief that not all infringement should be banned, particularly in socially important endeavors such as criticism, news reporting, teaching, and research.

Limitations and exceptions to the exclusive rights set forth under Thai law are in line with the international treaties to maintain the balance between the interest of copyright owners and the public. Fair use doctrine helps supporting free flow of knowledge, ideas and information from developed countries to developing country. It permits the users to use copyright works without the permission and payment to foster education, free communication and scientific advancement. Thailand, as a developing country, is definitely still in need of technology development from other countries which have higher technology than we do. Reverse engineering is a great tool in helping technologies transfer, so it should be permitted as copyright infringement exception.

Reverse engineering with the non-commercial purpose may be defensible as a fair use as long as it does not conflict with a normal exploitation of the work and does not unreasonably prejudice the legitimate interests of the author. As the courts in Thailand have not adjudicated any cases relating to reverse engineering, we need U.S. court decisions to guide the way, and utilized those principles underlying in the decisions to help clarifying the grey line between copyright infringement and fair use exception. Under the Copyright Act 1976 (section 107) the courts adopted the four factors in making determination whether a particular fair use defense is "fair" on the case-by-case basis. However, the four factors does not define fair use doctrine, but it does illustrative fair use purposes and factors, providing for the courts to examine together with other predominant factor such as inner intention of person who reverse engineers. The four factors are split but the courts would generally review this analysis and determine that, on the whole, the four factors weigh toward a finding of fair use.

In granting reverse engineering as fair use exception, we must take into account to what extent the owner's exclusive rights are eroded. The key question is how the result of reverse engineering affects the creator's incentive to innovate. If

such exception tends to benefit users more than the creators, it will destroy creator's incentive and stifle new technologies from development which will go against the purpose of the Copyright law (to promote the progress of science and useful arts). Thus, we must consider that such exception will not go beyond the purpose of copyright law as well.

On the other hand, if the copyright owners enjoy their exclusive rights too much, the owner will have absolute right to control and monopolize the market which also affects the balance of fair use. The societies will not get enough standard right to access information as they deserve. Moreover, some reverse engineering requires adaption of a small portion of computer program in order to operate with the particular work which the program is incapable of functioning. To ask for the company to adapt it, this may require a great fortune or the company may even refuse to do so. Therefore, prohibiting the users from reverse engineering will go against fair use doctrine since the legitimate rights of the right holders have not been prejudiced.

Another problem arises regarding the context "the purpose is not for profit" in section 35 of the Copyright Act B.E. 2537. Reverse engineering is per se non-commercial educational purpose, but in realistic, the final product transformed by reverse engineering process will eventually be used for commercial purpose. The mentioned context will be inconsistent with the nature of business and reverse engineering exception will be inapplicable. This would bar most researches from enjoying the foreign document, especially for the necessary fields, and will paralyze the development of individual researches. Practically, no one wants to put an effort to reverse engineering merely for non-commercial educational purpose. Mostly, once companies decide to reverse engineer, they anticipate in reaping the benefit out of the reverse engineering product by nature of the business. For this reason, conditions of reverse engineering should not be confined to such narrow scope as it will bar opportunities to study those programs from developed countries.

In conclusion, despite the owner's exclusive rights are diminished by the doctrine of fair use, interpreting of reverse engineering exception must not exceedingly prejudice the exclusive rights till creator's incentive is vanish. The aim of fair use is to balance the interest between public at large and the owners, but at the

same time, it must not disregard intention underneath the copyright law (what the law really protects). Thus, the four factors under section 107 should be strictly applied in determining reverse engineering fair use cases like many ways that serve fair use doctrine and the most important thing is that the intention of the law must not be forgotten and always counts.

5.2 Recommendations

At present, Thailand has no specific provision concerning reverse engineering as fair use exception. Even though section 35 (1) mentions about “research or study of the computer program” as an exception of copyright infringement, it is not a clear cut exception regarding reverse engineering. Consequently, copyright users will face the problem of legitimacy in reverse engineering and cannot access into the technological information necessary for interoperability. Fair use manual guide specifically mentions and explains reverse engineering as fair use exception would be considerably started to subserve reverse engineering in Thai Copyright Act B.E. 2537 (1994) so that such clarification can really enforce and apply on copyright owners and users. Therefore, the recommendations provided here are divided into two situations. First, the researcher recommends adding the reverse engineering clause as fair use exception in section 35 of the Copyright Act B.E. 2537, and second, adding the reverse engineering exception in the Fair Use Manual guide in clear cut criterions.

5.2.1 Adding Reverse Engineering Exception in Section 35 of the Copyright Act B.E. 2537 (1994)

Thailand adopted the three-step test to limit the right holder’s exclusive rights from an absolute control over computer program under section 35 as the Berne Convention, the TRIPs Agreement and the WIPO Copyright Treaty instructed. However, it does not include reverse engineering as a fair use exception which plays an important role in developing the digital industry in Thailand.

Reverse engineering involves transferring computer technology from developed countries to developing countries in a non competitive way which renders

opportunities to study the root of knowledge in developing computer programs. With a few potential of our programmers in Thailand, we are not strong enough to develop the whole new computer program by ourselves. It is therefore necessary that we need to develop our software industry by writing program that can operate with the others leading programs in the market. Information necessary to achieve interoperability is therefore very significant to Thai programmers. Thailand should add reverse engineering clause as a fair use exception under section 35 of Thai Copyright Act. Besides, amending the Copyright Act would be too arduous for the parliament.

Under the context of reverse engineering of computer program, Thai copyright law should permit reverse engineering only when the copy of a program is obtained lawfully and the courts should take into account the four factors of fair use doctrine mentioned in chapter 4 together with intention of the person who reverse engineers in adjudicating the case.

Besides, the restriction of “not for profit making” context affixes to section 35 of Thai Copyright Act B.E. 2537 (1994) should be excluded due to the fact that once company decided to reverse engineer a computer program which would take a great fortune, it will not only be for non-commercial educational purpose. A company will anticipate in reaping the most benefit out of the reverse engineered product by nature of the business. For this reason, if such context is not to be removed, reverse engineering exemption under section 35 will be barren and a dead letter, and conditions of reverse engineering will be confined to such narrow scope as it will bar opportunities to study those programs from developed countries and stifle Thai domestic software industry.

5.2.2 Adding Reverse Engineering Exception in Fair Use Manual Guide

Reverse engineering is used for many purposes, such as, interoperability, lost documentation, product analysis, digital update/correction, removal of copy protection, academic purpose and so on. It benefits copyright users in many ways. In some cases, reverse engineering creates better new work originated from the original copyrighted work which benefits domestic software industry. Moreover, it gives small producers the opportunities to have active role in the competitive market which will arouse other producers in creating more new

inventions. The beneficiary is, of course, the users. For these reasons, if Thailand does not address any exception clause permitting reverse engineering, we will lose many chances in benefit from such exception.

In order to avoid profusion of fair use defense concerning reverse engineering, the researcher recommends setting up clear cut criterion on reverse engineering in the Fair use manual guide. Now, Thailand already has the Fair use manual guide to facilitate and clarify the content for copyright user to better understanding the Copyright Act. Clearer scope of the reverse engineering context should be added in fair use exception based on the case-by-case basis. The criterion should base on the fair use exception under section 32 which reverse engineering must not conflict with the normal exploitation and not reasonably prejudice the legitimate right of the copyright owner, and permit reverse engineering only when the copy of a program is obtained lawfully which court should take into account the other factors appears in the four factors of fair use doctrine together with intention of the person who reverse engineers in adjudicating the case. Such scope will not prevent accessing the copyright works under fair use doctrine. This way, the application of such context will not be dead letter and can practically apply to the real situations.

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Berne Convention	=	Berne Convention for the Protection of Literary and Artistic Works
Central IP&IT Court	=	The Central Intellectual Property and International Trade Court
Computer Program	=	A set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result.
CONTU	=	National Commission on New Technological Uses of Copyrighted Works
DIP	=	Department of Intellectual Property
DMCA	=	Digital Millennium Copyright Act
DRM	=	Digital Rights Management
DSB	=	Dispute Settlement Body
EU Software Directive	=	European Union's 1991 Software Directive on the Legal Protection of Computer Program
Fair Use	=	A limitation and exception to the exclusive right granted by copyright law to the author of a creative work. It is a doctrine that allows limited use of copyrighted material without requiring permission from the right holders.
IT	=	Information Technology
OECD	=	Organisation for Economic Co-Operation and Development
Reverse Engineering	=	The process of discovering the technological principles of a device, object or system through analysis of its structure, function and operation.
SCA	=	Singapore Copyright Act
TRIPS Agreement	=	Agreement on Trade-Related Aspects of Intellectual Property Rights
WCT	=	WIPO Copyright Treaty
WIPO	=	World Intellectual Property Organization
WTO	=	World Trade Organization

