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LEGAL PROTECTION OF SOFTWARE

master thesis

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Introduction

The relevance of the master thesis. Legal protection of software at the starting point of 20 century becomes the necessary and predictable measure. Software protection is a crucial and fundamental task of the 21st century. It is no secret that future trade, logistics, and the internal market are connected with new technologies and the heart of this is software code and software algorithms.

This topic is relevant because we still do not have a unified and effective preventive means of software protection research.[1] Additionally, the relevance of the topic is also proved by the Copyright in "Digital Single Market Directive on April 15, 2019"[2] and scientific positions regarding Directive 2009/24/EC called "Software directive", raising the new number of uncertainties for the copyright holders, end users and online platforms how the balance between them shifts within such legal and technological developments.[3] One of the main relevant fields of this is the principle of territoriality under the Berne Convention and its inability to provide real protection for software.

A characteristic element of the software is its extraterritoriality. In this master thesis, I will show how relevant it is now to protect software code and computer programs, will compare various EU Directives, the Digital Millennium Act and national software protection legislation, and the impact of torrent trackers on software protection. Also, fulfil any gaps with a contradictive position of common law system and continental regarding software protection with examples of how easily other countries can directly affect to economy and IP software fraud.[4] This paper has a crucial role now in the further development of software protection and efforts to making truly effective legal remedies and procedural measures to protection of this new and economically valuable IP right. There is a need for new approaches or adaptation of legal acts due to past or ongoing social changes for efficient protection of software.

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[1] "Organization for Economic Co-operation and Development, Enquiries into Intellectual Property's Economic Impact, Copyright in The Digital Era: *(Country Studies*, 2015), accessed September 15, 2020, https://www.oecd.org/sti/ieconomy/Chapter5-KBC2-IP.pdf

[2]"Directive (EU) 2019/790 of the European Parliament and of the Council of 17 April 2019 on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC (Text with EEA relevance.)", accessed September 19, 2020, https://eur-lex.europa.eu/eli/dir/2019/790/oj.

[3] BAUER, MATTHIAS, "Why the EU's digital single market raises wrong expectations?" *(American Enterprise Institute*, 2017), 15-20. Accessed September 21, 2021. http://www.jstor.org.skaitykla.mruni.eu/stable/resrep03276.

[4] "China theft of technology is biggest law enforcement threat to US, FBI says", (*The Guardian newspaper,* 2019), accessed September 22, 2020, https://www.theguardian.com/world/2020/feb/06/china-technology-theft-fbi-biggest-threat.

In this research, proposing is own relevant approach to ensuring the effective and successful protection of software, considering both EU users and users who violate and directly negatively affect the EU economy by piracy, copying, and modifying internal computer codes.

Scientific research problem. The scientific research problem of this master thesis is the lack of scientific proposals and solutions of software protection. The scientific issue of this work redefining classic approaches of software protection as a whole and combined object of IP, but not as only software code. Further, this paper describes attention and raises scientific research questions: **Do harmonization processes in the area of software protection in the European Union effective? How to protect open and closed-source algorithms? Is it enough to protect only top tier software code or we need the protection of software as the whole and complex IP object?** For these strategic questions I will prepare and introduce this scientific work.

Level of the analysis of the research problem. The scientific papers and copyright legislation of United States of America, European Union, Ukraine and International Agreements should be used mainly for research on this topic. For this thesis, comprehensive scientific research was provided by scientists: Prof. Chris Reed from Queen Mary University of London, Rosa Maria Ballardini, Hanken School of Economics, Department of Accounting and Commercial Law, Ralph Oman, Harvard Law School, also worth mention that defining the essence of a computer program and software code as object of intellectual property was studied by such scientists as: K.O. Zerov[5], Y.E Atamanova, V.I Berezanskaya, E.P Gavrilov, P. Kasperavičius, I.E Mamiofa, E. Michurin, S.A Petrenko, Y.I Plotnikov, O.R Shishka, M.I Yatsenko, etc., but given the activity of the development of legislation that regulates this area, these studies did cover this topic.

Scientific novelty of the master thesis. These topics have been previously considered by scientists, but only partially, so it should be noted that the refinement and discovery of new problems and ways to protect software solutions will be important to the scientific community to solve the problems of piracy. Computer software has an increased number of unique characteristics that have been hard for the legal community, scientists and legislators to perceive. First, the primary source of the program it's behaviour, not a code or text. Second, software code with full behaviour is independent and can be written by a developer who has never seen full code or original code. Third, how to prevent infringement if someone rewrites code by a different language of coding or rewrites absolutely differently, but graphical user interface design would be completely the same?[6] These proposals and answers will be presented in this master thesis.

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[5] Zerov K. "Copyright protection for computer programs", (*Theory and practice of Intellectual property law*, №6, 2020), 5-14, accessed September 25, 2020, https://issuu.com/constantinezerov/docs/5-14.

[6] Chris Reed, *Computer Law*, 7th ed. (New York: Oxford University Press, 2011), 217.

The law enforcement and legislative practice of most countries of the world have followed the path of protection of computer programs by the rules of intellectual property law and civil law.[7] This provision has occurred only in the fact that the protection of computer programs by copyright and through its prism is a much cheaper way to solve the problem. The peculiarity is that the program does not have a material form of expression and a characteristic feature is the dynamics. It can be modified, rewritten, or compiled, or modified by an unscrupulous use.[8]

The aim of the master thesis. The aim is to determine the conceptual notion of software, computer program, their complexity as an object of intellectual property rights, resolve software protection issues in the EEA, Ukraine, and common law models.

The objectives of the master thesis. According to the desired aim, I propose the following types of objectives:

1) Identify the essence of the definitions of software and homogeneity with computer program. Compare legal concepts of software and computer program, determine graphical-user interfaces, as part of software. Identify theoretical approaches and define computer machinery;

2) Analyze the doctrinal positions of scientists on reforming the protection of computer programs, software to ensure legal certainty and the absence of conflicts that cause these problems. Analyze historical background and define stages of software protection and computer programs;

3) Provide research on case law to identify new procedural imperfections, in the protection of software, computer programs and find ways to solve them, analyze Directive 2009/24/EC and raise concrete conclusions about their effectiveness.

The practical significance of the master thesis. The current research will be useful for academic community and scholars, practitioners who work in area of intellectual protection of computer codes, software protection and especially for future framework draft regarding reforming these areas. The Master Thesis can also be useful for students studying Intellectual Property Law of European Union and cross-border proceedings, cases of software protection. The urgency of the problem is the intensive development of information technology and causes a new consideration of the established model of the copyright for the legal protection of computer programs. At the same time, every month, year, the cost of producing new software increases, which in some cases significantly exceeds the cost of creating technical devices (tablets, phones,

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[7] Karl de Leeuw and Madeleine de Cock Buning, *5 The History of Copyright Protection of Computer Software the Emancipation of a Work of Technology toward a Work of Authorship*, in *The History of Information Security: A Comprehensive Handbook* (Amsterdam, Netherlands: Elsevier, 2007), pp. 121-140.

[8] Jessica Hu et al., "Copyright vs. Napster: The File Sharing Revolution" (*University of California Irvine Law Forum Journal* Vol. 2 Fall 2004), accessed September 27, 2020 https://www.socsci.uci.edu/lawforum/content/journal/LFJ_2004_compilation.pdf

and other gadgets).[9] Most of the world protect programs solely through the prism of copyright, but there is also a minority in terms of patent law protection.[10] Numerous discussions in almost all countries and research leave this question uncertain. This thesis will be important for Parliament of Ukraine and scientific community.

Research Methodology. In the master's thesis have been using the following methods:

Historical method for determining the chronological stages of software development and computer programs. Their various legal protection, patent, copyright, inclusive. Comparative legal method for identifying the main legal acts in the field of software protection and their comparison to improve software protection. Analytically-predictable method for determining possible legal protection tools and further ways to develop stable and effective protection for software and computer programs. The systematic method for generalizing and structuring doctrinal and judicial practice in the field of GUI's, software, computer machinery.

The structure of Master Thesis. It consists from several parts:

1. In the first part, I will present in general terms the protection of software in the breath of the uncertainty of terminology, namely through scientific concepts and software security threats.

2. In the second part, the special part will present historical and legislative background of software development, specific and national remedies, case law and my own suggestions for rethinking software protection.

3. In the third part, propose and made conclusions with Ukrainian and European legislative framework and increase measures of software protection.

The defense statements. The concept of legal protection software broad and uncertain. Master thesis defines software through the prism of copyright and possibilities of patent protection. Indicates the homogeneity of the term's computer program and software, provides legal mechanisms to protect software not only through classical remedies of copyright, but also through patent.

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[9] "Understanding Technology Costs," (*Network Alliance*, 2018). Accessed October 1, 2020, https://networkalliance.com/understanding-technology-costs/.

[10] Dr Mohan Dewan, "Protection of IPR in Software – Copyright Registration a Viable Alternative," (*Lexology*, June 3, 2013), Accessed October 5, 2020, https://www.lexology.com/library/detail.aspx?g=d81790fc-a746-4136-b777-a7f7a416b711.

LIST OF ABBREVIATIONS

AG – Advocate General

APC Authority of protection Software

CJEU – the Court of Justice of the European Union

EU/EEA – the European Union, European Economic Area

U.S. – United States of America

SCOTUS – Supreme Court of the United States

EOM – Computing machinery, industrial computers, software

SP – Software protection

UK – United Kingdom of Great Britain and Northern Ireland

UA – Ukraine

DMCA – Digital Millennium Copyright Act

WIPO – World Intellectual Property Organization

WCT – WIPO Copyright Treaty

FOSS – Free Open-Source Software

IT – Information Technology

MS – Microsoft Corporation

WTO – World Trade Organization

TRIPs – Agreement on Trade Related Aspects of Intellectual Property Rights

EULAs – End-User License Agreements

WIPO – World Intellectual Property Organization

WPPT – WIPO Performances and Phonograms Treaty

IPR – Intellectual Property Right

LEGAL PROTECTION OF SOFTWARE

1. THE ESSENCE OF THE DEFINITION OF A COMPUTER PROGRAM AND SOFTWARE

1.1. The value of the informational program in public relations of intellectual property law

Effective development of a knowledge-based society, accelerated integration of economies around the world are not possible without the active use of the intellectual property law and proper regulation of legal relations for the creation and use. Improving the system of the legal protection of these objects, including software, computer programs, has not only legal, but also economic, scientific, technical, and socio-educational significance. Resolving this issue is one of the tasks on the way to Ukraine's integration into European Union.

An important point in the study of legal relations that arise in the process of creating and using a computer program, as well software is the disclosure of its essence as an object of intellectual property law.

Today, the basic definitions of computer science and their use in legal doctrine, as well as in regulations are not characterized by consistency, and their content does not always correspond to each other and is even contradictory. In addition, legislators in different states use different terms to refer to the same object of intellectual property – a program that controls the work of software based at solving certain tasks. The most common of these are computer programs, computer algorithms, and software.

The formation and development of the information society in the world and the rapid spread of information and communication technologies have transformed and supplemented the list of objects protected by intellectual property rights.

A special place among the objects of intellectual property rights belongs to the software, which is a set of programs (software component of the information system), which provide the implementation of information processes by devices of the information system (hardware component of the information system).

This conceptual inconsistency needs to be resolved in the process of harmonization of Ukrainian legislation with the EU, and the integration of country into the European Union. An unambiguous and accurate understanding of the terminological apparatus is also of practical importance, for example, when concluding contracts for the development, use of computer program, as well as when transferring rights to it between legal entities and individuals of different countries.

1.2. Legal concept and definition of "Software"

Software consists of programs, routines, and procedures that can be executed by a computer system, as well as documentation related to it. The definition of "software" covers information objects such as an application and package of concrete application.[11] That is, from the definition of the term "software" it follows that the program serves to provide something, namely: the work and functionality of the computer (hardware). The software can also include operating system – a set of programs that can fully control parameters of a computer system, control the operation of the computer as a whole.

The legislation and framework of Ukraine on the protection of intellectual property rights does not operate with the concept of "software" and does not define it. However, the definition of software is contained in international intellectual property law. Thus, in 1978 WIPO Model regulations, software means either a computer program, or description of a program, or supporting material, or any combination of these objects. WIPO's guidelines clarify the following definition: "The term software means computer programs and other materials designed for use computer, which include description of programs explanatory material on the use of computer programs, such as task description and user instructions".

At the same time, computer programs are an important part of the software". The definition of software is contained in the US Federal Standard 1037C. Telecommunications: Glossary of Telecommunication terms", which not only coincides with the given explanation but also expands its conceptual understanding.[12]

Besides, Software –

1. A set of computer programs, procedures, and related documentation relating to operational data processing systems, compilers, library sets, user instructions, and interconnection diagrams.

2. Information (usually copyrighted) that can provide (be leaked): instructions for the computer; data for documentation; sound, images, and music for entertainment and learning. It should be noted that the proposed definition of "software" contained in international legal acts and US Standards applies primarily to open object-oriented systems, programs, and open-source development environments.

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[11] Arnold Bedet, Diana Burdhardt and Alina Kamming, *Hlossaryi komputernyh terminow*, (Moscow: Izdatelskyi dom "Willams", 2002), 16.

[12] Arnold Bedet, Diana Burdhardt and Alina Kamming, *Hlossaryi komputernyh terminow*, (Moscow: Izdatelskyi dom "Willams", 2002), 300-301.

Importantly to understand, that software is computer program or a set of programs that the user could change, modify, adapt without infringing copyright. That's why, along with computer program, the developer provides him with a description of the program, supporting materials, etc.[13]

In addition, individual components of the software may be considered as separate objects of Copyright. For example, user manual, music, and graphics used in computer programs, etc. Thus, the definitions of software considered by author in accordance with these regulations and do not correspond to the existing definitions in the field of informational technology and computer science, because they relate to only one of the variants of aggregate object, which is defined in specialized terminology for programming (dictionaries, glossaries) as a software. This situation is explained by the dynamics of software development as an object of intellectual property law, that unable often change terminology. Consequently, any existing term and the definition of the concept it denotes may become obsolete in a relatively short time.

Besides, subject to certain conditions, "software" in its entirely falls within the definition of "computer program".[14] Based on above, author can conclude that in order to avoid possible conflicts and inconsistences between the definition of the "Software" and "computer program", as well as their explanation, it is necessary to legislate the concept of "software" in such editors: "Software is a set of computer programs and information objects necessary for their operation of a computing device to solve certain tasks. Explanatory and auxiliary materials on software debugging and use may be added to the software."

It is in the form of software that modern programs often reach users of computers and other electronic computing devices, which indicates that this object of informational technology has acquired the attributes of commercially valuable product. Also, the concept of "software" indicates the purpose of programs and indirectly – their functionality. This definition of software combines computer objects and programmable devices that exist today and may be created in future.

One of the priority vectors of implementation activities in the national legislation of Ukraine is the integration process aimed at an association with the European Union, international institutions of the European Economic Area, in general, to improve the Ukrainian system of national law in terms of protection of intellectual property relations, including legal protection of Software and enforcement. The latter occupies a prominent place among the copyrighted objects

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[13] Hryhorii Yakimenko, *Osnovy intelektualnoi vlasnosti,* (Kyiv: Yurydychne vydavnytstvo «In Yure», 1999), 543.

[14] Daniel de Santiago Villagrán, "Software Patent protection under the European patent Convention*"*, (Master Thesis, University of Helsinky, 2013), 11. Accessed October 7, 2020, https://helda.helsinki.fi/bitstream/handle/10138/42528/MASTER_THESIS_UNIVERSITY_OF_HELSINKI_Daniel de Santiago 25.11.2013.pdf?sequence=2&isAllowed=y.

because in the dynamic development of legal and technical public relations, software is increasingly used in various sectors of economy and some extent may even be part of the issues of national security of the Ukraine.
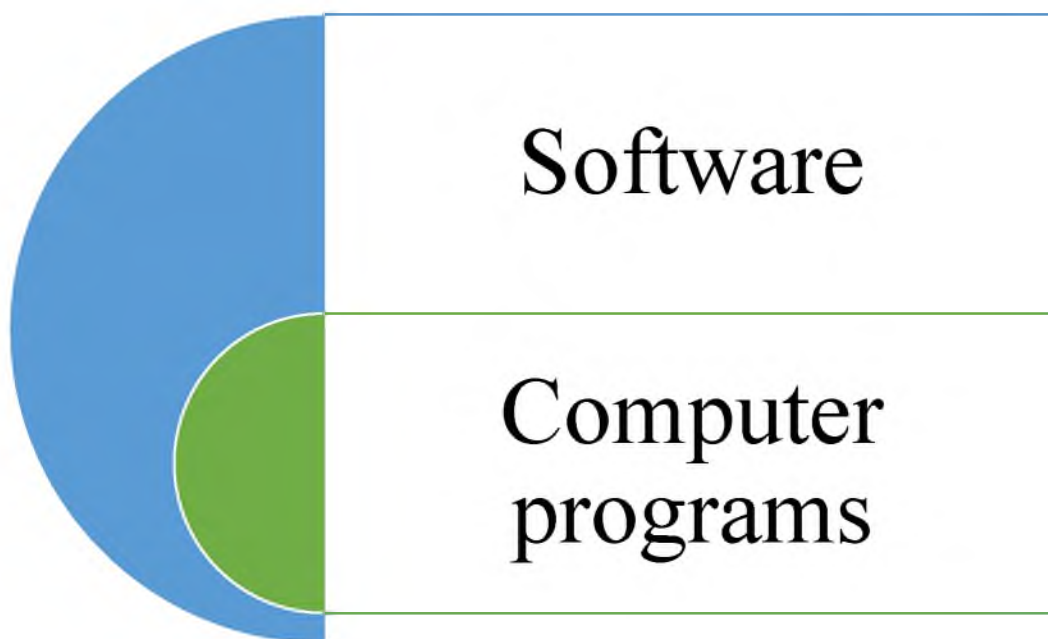
(Figure No.1 Correlations and doctrinal approaches to understanding the concept of software and computer program)

Article 1 of the Law of Ukraine "On Copyright and Related Rights" of December 23, 1993, № 3792-XII provides a legal understanding of the term "computer program", which defines a set of instructions in the form of words, numbers, codes, diagrams, symbols or in any other form, expressed in a computer-readable form that drives it to achieve a specific goal or result (this concept covers source or object code). At the same time, Ukrainian legal science has developed somewhat differently from the legislative definition of this definition.

In particular, E. Michurin and O. Shyshka interpret a computer program as a logically ordered sequence of commands used to solve problems.[15]

Scholars like – A. Muzyka and D. Azarov believe that a computer program is a classifier of information that contains the relevant data, which are formed by structural features - a system of computer-readable information and at the same time establish the regulation of digital electronic information processes, networks, which in turn are aimed at fulfilling the tasks.[16] Thus, author and scholars have formulated the basic conceptual and categorical apparatus that serves in the application of computer programs in intellectual property relations.

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[15] Jevheniy Michurin and Olga Shyshka, *Cyvil'ne* pravo, (Kharkiv: Faktor, 2013), 450.
[16] Andiy Muzyka, "Pro ponjattja zlochyniv v sferi komp'juternoi' informacii", *Pravo Ukrainy*, no. 4 (2003): 86-89.

1.3. The concept of "computer programs", similarity of definitions

In computer science, "program means a consistent and accurate description in a certain formal language of the process of information processing to solve problems on a computer (hereinafter – computer)".[17] In the field of informational technology, the term "computer program means a complete set of operators that can be processed by a computer to solve a specific problem".[18]

These special technical definitions make it possible to identify the following characteristics of a computer program:

1) The program is a description of the process of information processing;

2) This description must be perceived by a computer (software) and actualise it to solve a specific task (task).

The computer program is defined in a slightly different way by national law. Yes, in accordance with Art. 1 of the Law of Ukraine "On Copyright and Related Rights": "Computer program – set of instructions in the form of words, numbers, codes, diagrams, symbols or in any other form, expressed in a form suitable for computer reading, which actuates it to achieve a specific goal or result (this concept covers both the operating system and the application program, express in source or object code).

In this normative definition, a computer program is characterized by much larger number of features, in contrast to technical definitions. Let's try to analyse the characteristics of a computer program enshrined in the Law of Ukraine "On Copyright and Related Rights":

1) "a set of instructions in the form of words, numbers, codes, diagrams, symbols or in any other form" – is characteristic of a computer program in a source code, i.e., written in a particular programming language, and program in object code and executable code. The expression of a set of instructions "in the form of diagrams" is a characteristic of an algorithm of the program. But in accordance with the legislation of Ukraine and European Union, in particular, the preamble of Directive 91/250/EEC[19] and consolidated version of Directive 2009/24/EC[20] – the algorithm is no subject to legal protection. At the same time, "in the form of diagrams" can be presented and a description of the program, i.e., a complete postoperative statement in verbal or

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[17] Leonid Krysin, *Tolkovyi slovar'inoazichnyh slov,* (Moscow: Eksmo, 2003), 564.

[18] Arnold Bedet, Diana Burdhardt and Alina Kamming, *Hlossariy komputernyh terminow,* (Moscow: Izdatelskiyi dom "Williams", 2002), 243.

[19] Volodymyr Drobiazko and Anatoliy Dovgert, *Avtors'ke pravo i sumizni prava. Yevropeyskiy dosvid: u 2 knygah, knyha 1,* (Kyiv: Vydavnychyi Dim In Yure", 2001), 76.

[20] "Directive 2009/24/EC, Computer programs directive", accessed October 15, 2020, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32009L0024.

another form, detailed the extent sufficient to determine a set of commands that make up the content of the computer program from the expressions "instruction set".[21]

Under such conditions, the description of the program is transformed into a detailed algorithm. That is, the desire to indicate all possible variants of the expression "set of instructions" creates a contradiction in the external form a computer program:

2) "instruction set..., expressed in computer-readable form" – characterized a computer program in a source code, object code, and executable code. "Reading" means the process of introducing a program into machine-readable environment. With the help of the necessary software, the computer is able to "read" the program in the source code and compile it. In object code and executable code, computer "reads" the program and runs it. This section specifies and limits the forms of the expression of computer program, namely: a computer program in a source, objects codes, and executable code. In addition, the set of instructions in the source, object, and executable codes cannot be represented as "schemas, scheme". Therefore, in the above definition, computer readable forms of expression of the program do not correspond to the specified options to its objective representation.

M. Selivanov believes that from the definition of a computer program, which is enshrined in the legislation of Ukraine, it follows that the "set of instructions" becomes a computer program only if the form of its expression suitable for reading by computer with software-based algorithm. Therefore, the indication of the suitability of a computer program for computer reading cannot be recognized as mandatory for all possible forms of its objective expression.[22] One can completely agree with this opinion;

3) "a set of instructions – which put it (computer) into action to achieve a certain goal or result." Here are the criteria for the operation and functionality of a computer program. The essence and purpose of the instruction set do not change. The form its expression changes. In source code, it cannot "trigger" a computer simply through the form of its expression, and in object code or executable code, it can. That is, a feature of a computer program is that at least one form of its expression, as a set of instructions, must activate the computer to achieve a certain goal or result. But due to the grammatical construction of the definition under consideration, this thesis does not have unambiguous interpretation. Therefore, the definition of a computer program must include the specification of the form of objective expression of the program in which it is able to

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[21] Aleksandr Helb, *Sovremennoie sostianiie problemy pravovoy zaschity programnogo obesoechenie EVM,* (Tallin: Centr nauch Informacyii po obchestvennim naukam, 1983), 93.
[22] Mykhailo Selivanov, *Zashchita na kompuiternuie programmu: teoriia I praktika,* (Kharkiv: Espada, 2004), 43-44.

activate the computer with certain operational system to achieve the computer to achieve a certain goal or result;

4) "this concept covers both the operating system and the application program, expressed in source or object code." An operating system is program or software that control the operation of a computer as a whole.[23] An application is a computer informational system designed to perform specific task (such as accounting reports, text editing) that would need to be performed even if computers did not exist at all.[24]

From the definition of the terms "operating system" and "application program" it follows these objects, although they can be embodied in one program, today they are usually embodied in set of programs, libraries, databases which protected completely under *sue generis* principle, etc. Without knowledge of the definitions of the terms "operating system" and "application program", this provision is not obvious.

In addition, the question arises as to whether the normative definition of a computer program covers the results of human intellectual activity in the field of programming that do not fall under the classification of operating systems or applications? The answer to this question is important for the attribution of these results of human intellectual activity to the objects of copyright.

Thus, the definition of "computer program" in the Law of Ukraine "On Copyright and Related Rights", although it contains certain provisions that do not contradict its definition in terms of informational technology, but may in some way misinform about:

1) the impossibility of applying copyright protection to the algorithm;

2) assigning a description of a computer program to one of the forms of its expression, which is protected by copyright;

3) the conditions for obtaining a computer program protection, depending on the form of expression, functionality, feasibility, computer readability, as well as the relationship between these features.

In addition, the considered legislative definition does not give a clear idea of the limits of protection of software, as a bunch of computer programs, but, taking into account the content of Art. 18 of the Law of Ukraine "On Copyright and Related Rights", in general, gives rise to many misinterpretations. For example, quoting a computer program or its creative nature.[25]

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[23] Arnold Bedet, Diana Burdhardt, Alina Kamming, *Hlossariy komputernyh terminow*, (Moscow: Izdatelskiyi dom "Williams", 2002), 301.

[24] Arnold Bedet, Diana Burdhardt, Alina Kamming, *Hlossariy komputernyh terminow*, (Moscow: Izdatelskiyi dom "Williams", 2002), 16.

[25] Serhei Glotov, *K voprosu o citate i citirovanie kak osnove prava na svobodu vyrazhenie*, *Intelektualniy capital*, no. 4 (2005): 31-40.

The legislator, aiming to cover in the normative definition of the term's "software" and "computer program" all types and forms of its expression, did not pay attention to the substantive part of the definition, which reveals technical essence of the software. As a result, legal definition missed difference between software and computer program and it's not characterized by simplicity, accuracy, unambiguity, and reliability of terminological construction, which, in turn, creates problems in law enforcement practice.

Thus, it can be concluded that the definition of a computer program, enshrined in the Law of Ukraine "On Copyright and Related Rights", does not fulfil the main purpose of the definition – one of the means of legislative technique.

Ukrainian scholars, such S. Azarov[26] and O. Burov[27] believe that main emphasize that due to the lack of the latest interpretation of the definition of "computer program" in the legal field of Ukraine there are number of terminological issues that can complicate the solution of judicial and procedural problems, which are an indicator of the civilization of the legal society. In this case, the new definition should be technologically independent, i.e., one that reflects in a fairly generalized form the features of the object, based on its nature, it should not go into technological details. Unfortunately, these normative definitions of the term "computer program" do not have these characteristics.

The definition of "computer program" is also contained in the World Intellectual Property Organization Model (hereinafter – WIPO Model) regulations for the Protection of Computer Programs and Computer based Software, published in 1978. This advisory document attempts to combine the provisions of copyright, patent law, and, in part, how to develop special mechanism (*sue generis*) system for the legal protection of computer program.[28]

Thus, in the Typical Provision, a computer program is defined as a set of commands pre-recorded on a machine-readable medium that can cause a machine to process information, perform a function, achieve a result, or solve a problem.[29]

The advantage of this definition is the conciseness of defining any form of expression of a computer program (set of commands) and emphasizing the purpose of a computer program. Also,

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[26] Serhii Azarov, *Informaciyne suspilstvo I pravova Sistema, Intelektualna vlasnist,* no. 11 (2004): 42-51.
[27] Oleksandr Burov, "Kompiternie programy I bazy danyh yak obiektu patentuvannia: metodolohichnyi aspect", *Intelectualniy capital,* no. 2 (2003): 11-15.
[28] World Intellectual Property Organization, "Model provision of protection computer software", *WIPO publication no. 814,* Geneva, 1978. Accessed October 21, 2020, https://www.worldcat.org/title/model-provisions-on-the-protection-of-computer-software/oclc/6357283.
[29] Aleksandr Helb, *Sovremennoie sostianiie problemy pravovoy zaschity programnogo obesoechenie EVM,* (Tallin: Centr nauch Informacyii po obchestvennim naukam, 1983), 93.

this definition of a computer program indicates a mandatory relationship between computer program (a set of commands), a machine-readable medium, and the ability of a computer to solve a specific task (software task).

At the time of the development of the WIPO Model Regulation for the Protection of Computer Programs, the expression of a computer program in the form in which it controls the operation of a computer was inseparable from its content and media (e.g., punched tapes, cards). To date, there is no such link between the content, the form of expression of a computer program and the media. The author noted this in this study, in particular, when considering the normative definition of a computer program.

WIPO's guidelines in this regard state that computer program controls the operation of a computer only if it is included in a machine-readable environment.[30] This environment is created by software and hardware based, and is characterised by a machine-friendly data presentation format. In this case, a computer program is defined as a set of commands that allow their inclusion in a machine-readable environment to force a machine that has ability to process information, perform a certain function, task, get a certain result and publish information about it.

Thus, being machine-readable environment, a computer program is able to perform its function. A prerequisite for this is the expression of a computer program in a form that is understandable to the machine data presentation format. That is, a computer program in object code and executable code.

In addition, the definition of a computer program contained WIPO Model Provisions for the Protection Computer Programs clearly shows the following features of a computer program:

1) the program is a set of commands;

2) protection should apply to any form of expression of the program;

3) a computer program can only be a program that really works.

The definition of a computer program was incorporated in 1992 (Copyright Amendments Acts No. 125 of 1992) by amending the 1978 WIPO Copyright Act No. 98. Thus, in the introductory part of this Law, a computer program defined as a set of commands that have any way to capture or save, which, when used directly or indirectly in a computer, control its actions to achieve the expected result.

This definition, in a contrast to previous ones, outlines the forms of expression of a computer program and emphasized not only any way of fixing it on a tangible medium, but also any way of storing it. Definition reflects the current development of technology of transmission

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[30] Hryhorii Yakimenko, *Osnovy intelektualnoi vlasnosti*, (Kyiv, Yuruducne vydavnitstvo "In Yure", 1999), 526.

and storage information, as well as takes into account the technical possibilities of storing a copy of a computer program in computer memory (RAM) during this operation.

However, this definition contains an atypical indication of how a computer program is used on a computer – direct and indirect use. Roy Smith explains this by saying that a program that is used directly on computer is program written in object code on machine-readable hardware. Such hardware can be SSD, magnetic floppy (which is old for today), hard discs, etc.[31] A program that is used indirectly on computer is program written in "source code" that can be read by both a machine and human. For authors point of view, should be noted that this explanation dates back to 1986, but in 2021 interpret different. Therefore, from the point of view of the modern development of informational technologies, the above ways of using a computer program should be interpreted somewhat differently:

1) direct use – use in the object code in the program, which is completely finished and suitable for its function;

2) indirect use – the use of program source code. In this, reference to the ability to be read by the machine characterized the source text as suitable for the compilation process.

In large explanatory dictionary of the modern Ukrainian language, the compliance defined as:

a) writing a work, scientific work on the basis of other people's materials without independent research and elaboration of sources;

b) A work of scientific work was written in this way. Private or official publication (collection) of laws. Special processing of a program written in any programming language into another program, to some extent equivalent to the original, in another programming language, usually machine or close to PC.

In the doctrine of copyright, the compilation of traditional objects means the combination of individual works, their fragments or data into one collective work. However, for computer programs, the term has slightly broader meaning. Compilation of a computer program is purely technical process that not only combines individual fragments of the program from source to object. That is when you compile a computer program, the form of expression changes.

Generally, it can be noted that at the international level, the definition of computer program repeats the existing modern definitions in the field of informational technology and programming. This, in author opinion, indicates an unambiguous approach to the definition of concepts outlined in non-legal terms in the field of informational technology, in regulations on intellectual property rights.

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[31] Roy Smith, *Software licensing:* USA, (*Les Nouvelles,* no.1 (1986)): 39.

The concept of a computer program is also contained in the legislation of European Union in accordance with Directive 91/250/EEC "On the legal protection of computer programs" of May 14th 1991 and after with consolidated and full version of Directive 2009/24/EC. However, the Directive does not define computer program and the proposed "open" definition.

This approach is explained, firstly, by the fact that in the EU a computer program is understood as a program in any form of expression aimed at maintaining interaction with other components of the computer system and with the user for their joint action.

Secondly, computer programs include programs that are recorded (snitched, embedded) in hardware, as well as all preparatory materials obtained during the development of the program, if the result of their use is the creation of future computer program.

Third, Copyright can be protected by a computer program in any form of expression, provided it is original. It should be noted that in definitions of computer program, which are enshrined in the national legislations and international legal acts of WIPO, the criterion of originality is not mentioned. The reason for this position is that compliance with criterion of originality is not mentioned. For this position is that compliance with criteria of originality as one of the prerequisites for obtaining Copyright protection, including computer programs.

Of particular note is the inclusion in the computer program of preparatory materials, the result which is the creation program in the future. Author believes that in this context, the preparatory materials could be considered as another form of expression of computer program if its complete postoperative presentation in verbal, schematic, or any other form, sufficiently detailed to determine the list of commands for the computer, which makes up the content of the corresponding computer program. One type of preparatory material is description of the program (WIPO Standard Provisions for the Protection of Computer Software Programs, 1978).

The national legislation of the EU countries on the legal protection of computer programs is harmonized with the provisions of Directive 2009/24/EC. For example, Copyright law in Latvia and the United Kingdom does not contain definition of a computer program[32], guided by the definition contained in abovementioned Directive.

Worth mentioned, after withdrawal UK from the EU, it's unclear how software will be protected. Paragraph 5 (17) of the Slovak Copyright Law defines a computer program as set of commands and instructions that are used directly or indirectly to work with computer. Commands and instructions can be written or expressed in a source or machine program (source or object code of program). An integral part of computer program is preparatory material needed to obtain a

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[32] "Opinion of Advocate General Bot in Case C-406/10, "*SAS Institute Inc. v World Programming Ltd.*", (delivered on 29th of November 2011), Accessed October 27, 2020, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:62010CC0406:EN:HTML.

software product that can obtain legal protection under copyright as a literary work, if it meets the general provisions on the conditions of acquisition of copyright works set forth in paragraphs 6 (1) and 15 (1) of the Slovak Copyright Law.[33]

The previous definitions of a computer program stated that it must control the operation of computers in order to achieve certain result. The "open" definition in Directive 91/250/EEC "On the legal protection of computer programs" expands the scope of the functional purpose of computer program – it is not only management but also the joint action and relationship between different hardware and software of modern computer system, as well with user. This approach corresponds to current level of computer program that have a graphical interface and contain signs of interactivity.

The definition of a computer program proposed by scholars V. S. Dmytryshyn[34] and V. I. Berezanska is a combination of the normative definition of a computer program and certain provisions of the "open" definition of Directive 2009/24/ EC "On the legal protection of computer programs". : "A computer program is a set of instructions created by the creative work of an individual in the form of words, numbers, codes, diagrams, symbols or in any other form, set out in natural or encoded language, and embodied on media of any kind (electronic, paper, etc.), for use in automatic information processing devices, or other equipment based on digital technology to activate it to achieve a specific goal or result.

This concept covers both the operating system and the application program, expressed in source code or object code, as well as auxiliary and intermediate development materials that lead to the creation of a computer program if the essence of these materials is such that they result in the creation at the next stage of the computer program.

It is clear that in creating this definition, the authors, instead of generalizing the characteristics of a computer program, followed the path of detailing them. This has narrowed the scope of the computer program concept. When researching the definition of a computer program as an object of copyright, to fully disclose the essence of this concept, it is advisable to explore the American experience on this issue.

Unlike in EU Member States, the U.S., legislature takes a slightly different position on the legal protection of computer programs, as it allows them to obtain both copyright and patent protection. The U.S. Copyright Act defines: "A computer program is a set of instructions or commands that, directly or indirectly, can be used on a computer to produce a specific result.

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[33] "Act on copyright and rights related to copyright (Copyright Act)", (IndrovSk legal base), accessed November 4, 2020,
https://www.indprop.gov.sk/swift_data/source/pdf/legislation/pravo_03618.pdf.
[34] Volodymyr Dmytryshyn, *Intelektualna vlasnist na prohramne zabezpechennia v Ukraini*, (Kyiv, 2005), 68-69.

That is, the definition of a computer program in the U.S. Copyright Act is identical to that enshrined in the typical WIPO Copyright Act. US Federal Document "Federal Standart 1037C. Telecommunications: Glossary of Telecommunication Terms "was adopted on August 7, 1996,[35] in order to balance the legal and technical spheres regarding the terminological unambiguity of the objects of legal protection in the field of information technologies and programming".

Therefore, according to this document, a computer program:

1. Plan (instructions, schedule, path, procedure) for solving problems using a computer. In this case, data processing, which is carried out to prepare the program for execution, also belongs to the execution of the program and can be carried out using an assembler, compiler, interpreter, or translator. A sequence of instructions that may contain commands and necessary statements.

2. A sequence of instructions used by a computer to perform a specific job or solve a specific task.

3. A tool used to develop, write, and test a program. The above definition of a computer program does not have a complete technological dependence and does not contain technological details and details of program creation. At the same time, it corresponds to the conceptual specific features of the technology of creating and using a computer program.

According to its content, this definition provides an expanded definition of a computer program, which is enshrined in the US Copyright Act.[36] The stated approach of the legislator has a positive value, as it does not overload the regulations with special technical vocabulary and detailed definitions of other fields of knowledge. Besides, according to the American approach, the definition of a computer program is not tied to the criteria of protection under a particular regime of legal protection.

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[35] "US Federal Document "Federal Standart 1037C. Telecommunications: Glossary of Telecommunication Terms", (7th of August 1996), Federal Legal online base, Accessed November 10, 2020,
http://thehowlandcompany.com/pdf/FED-STD-1037C.pdf.
[36] "Copyright law of the United States, paragraph 117 (a)", (copyright.gov.us database), page 115, Accessed November 13, 2020, https://www.copyright.gov/title17/title17.pdf

1.4. Graphical user interfaces as part of software
(GUI's)

At starting point of 1960 of 20 century Ivan Sutherland developed Sketchpad in 1963, which could tell us the first graphical software design program which helps create design objects in real-time with a light pen. After that inventor of Stanford University Doug Engelbart augmentation of human intellect at the Stanford Research Institute with the project name "Online-Line System, or NLS" and according to the research contained software with hardware and give a born of basic GUI software.[37]

The graphical user interface, or GUI (hereinafter GUI), is the software part, intangible that allows users to interact through the visual icons, tabs, pictures, swipe and up menus, etc. Selecting this menu through taps of a mouse, keyboard, or touchpad on a laptop.[38]

From the author's point of view, worth mentioning that GUI only a visual representation of software, it's not callosal object code, source code. This chapter focuses on GUI protection in US and EU legal regimes and raises topical issues of GUI in software.

A lot of software developers trying to protect their GUI through the prism of copyright, but not everything could be protected which lie aside from the source code of the software. It becomes significant in IPR's protection. The graphical user interfaces in the software application or computer program valuably unprotected under current U.S. Intellectual property and EU Law. Software designers lose millions of incomes of piracy and reverse engineering of GUI.[39]

The main GUI represents visually in operating systems such the latest Microsoft Windows 10, macOS Big Sur or Catalina, or much smaller devices such a tablet, smartphones with system Android 7 or IOS 13, computer programs such Microsoft Word or Mykolas Romeris University design of some internal applications.

In 2021 GUI is a significant part of any legal entity, persons, website, and even public authority. European Union law contains tree basic principles of protection:

1. Developers' property regime that includes copyright protection with registered designs;
2. Unfair competition protection and unregistered designs;

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[37] DRUCKER, JOHANNA. "Reading Interface." (PMLA 128, no. 1 (2013)): 213-20. Accessed November 20, 2020. http://www.jstor.org.skaitykla.mruni.eu/stable/23489280.

[38] "COMPILATION OF THE REPLIES TO THE QUESTIONNAIRE ON GRAPHICAL USER INTERFACE (GUI), ICON AND TYPEFACE/TYPE FONT DESIGNS", (WIPO, Thirty-Sixth Session, Geneva, October 17 to 19, 2016), accessed November 27, 2020, https://www.wipo.int/edocs/mdocs/geoind/en/sct_36/sct_36_2_rev_2.pdf

[39] Thomas Dubuisson, "IP protection for graphical user interfaces in the EU, US and China", *Oxford Journals* (2015), 767-774, accessed December 2, 2020, https://academic-oup-com.skaitykla.mruni.eu/jiplp/article/10/10/767/830150?searchresult=1

3. Trade secret law, (which ineffective when GUI revealed to the public).

Through part of Directive 2009/24/EC, Graphical interfaces only protect visual elements of concrete software application, patent protection of GUI excluded, according to Art. 52 (b) of the European Patent Convention. According to point of view of EU patentability eligibility, the invention must consist of novelty and new technical solutions, technical nature.

Purpose of the GUI consisting of design, figures, lines, and paler of colors that give to average user understanding and clarification of using concrete app and software which he/she prefer more.

According to the US approach, they give the possibility of patent protection of GUI (Dinwoodie/Janis/2010, p-14-24, 41 ff.) Guidelines provide concrete and exhaustive rules of design patent protection, only if an application claims a computer-generated icon shown on a computer screen, monitor, TV, or display panel thereof. US approach mainly falls under patent protection rules.

On the other side the US provides a strong distinction between "utility patent" and "design patent" and for software designers and developers could easily fine a patent application as a design patent to the United States Patent and Trademark Office and protected exactly what visually represented under (35 USC &101 and 35 USC & 171).[40]

According to EU position, patent protection is excluded from registration and protection for GUI in order to Arts. 52 (2) and (3) of the European Patent Convention. The only way to GUI is protected lies with Copyright protection. Copyright protection allows prohibiting users to reproduce, copy, or reverse engineered GUI of certain software. Directive 2009/24 in Art. 1(1), (2), and (3):

> "*Member States shall protect computer programs, by copyright, as literary works within the meaning of the Berne Convention ... A computer program shall be protected if its original in the sense that is the author own intellectual creation. No other criteria shall be applied to determine eligibility for protection.*"

The issue here that when developers and designers work on certain software and design, they even could not see the whole product, because in software industries every work and specialization very strict and accurate. A group of designers could work on a small spectrum of GUI design in-app and here arises issues with ownership GUI design protection.

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[40] Koukal, Pavel, "*GRAPHICAL USER INTERFACES AND THEIR PROTECTION IN THE EUROPEAN UNION*", *ResearchGate online legal base*, (2019), 145-160, accessed December 14, 2020,
https://www.researchgate.net/publication/330452786_GRAPHICAL_USER_INTERFACES_AND_THEIR_PROTECTION_IN_THE_EUROPEAN_UNION.

From the author's point of view Court of Justice of the European Union (hereinafter CJEU) provides a valuable legal judgment in case "*Bezpecnosti software associate*", CJEU did not consider GUI as a form of expression of computer program within the terminology of Directive 2009/24.[41] Besides, GUI does not lie on copyright protection under the above-mentioned Directive but gives only one option that is available under "*InfoSoc*" Directive, 2001/29.

Generally speaking, for GUI to achieve valuable and effective protection clearly not easy under the current EU legal regime. GUI will be always a part of certain software and need to be protected as well as computer programs. It's worth mentioning that GUI is in rise because of big corporations such as Apple and Microsoft, and focus on user experience, GUI its always part of company prestige, a distinguishing characteristic which needs to be protected and uses with connecting to consumers.
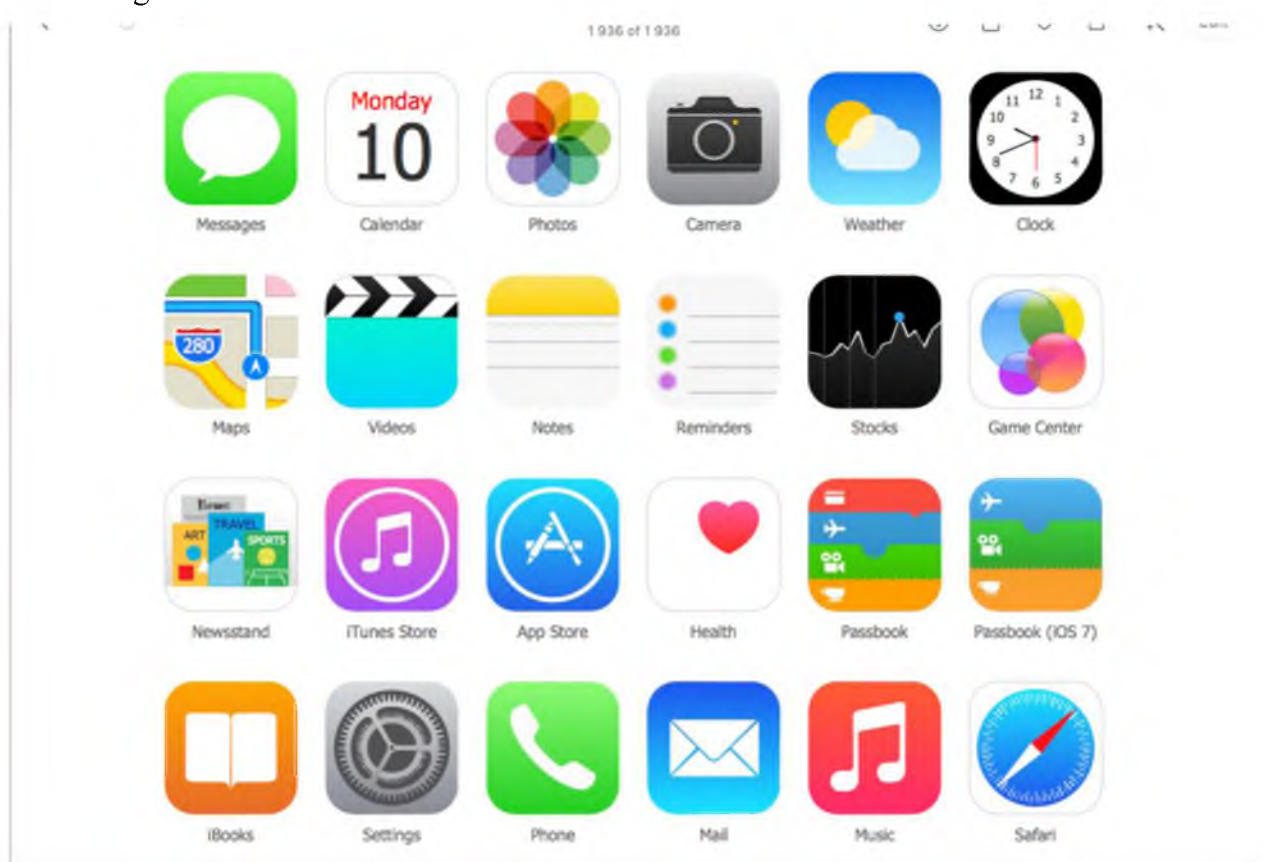
(Figure No. 2, Graphical user-interface of Apple Corporation, IOS 14.0, accessed 3 of April

2021,

https://www.apple.com/)

41 (C-393/09) [2011] E.C.D.R.3 "*Bezpecnostni Softwarova Asociace - Svaz Softwarove Ochrany v Ministerstvo Kultury*" (22 December 2010), accessed December 21, 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:62009CJ0393_SUM&from=LT

1.5. Uncertainty in legal terminology of computer machinery

The concept of "computer machinery" or (hereinafter – EOM) is not contained in the legislation of Ukraine. A program for EOM is an objective form of representation of a set of data and commands designed for the operational of electronic computers and other software-based devises to obtain specific result, including preparatory materials obtained during the development of the program, as well as audio-visual images, which are created by it. Based on the above definition of computer program, we can identify the following features.[42]

The first feature is an "objective form of representation". This feature is required for copyright protection. The content of the objective form of expression of a computer program is existence separately from the author, his consciences, in a form through which the program can be read by an indefinite number of people. Given the principles of copyright, the form of expression of a computer program reflects the result of the creative activity of its author. However, the very forms of expression associated with specific features of the program are not specified. This positive difference from the definition of "computer program" more adapted to the development of informational technology associated with the future creation of new forms of program expression and AI (Artificial intelligence) as independent creator of work.

The second feature is the "representation of set of data and commands". This sign indicates that protection does not apply to individual and developers without accompanying data. Based on the doctrine of copyright, it would be logical to assume that such a set of data and commands, to obtain copyright protection, must meet the criterion of originality.

The third feature is the "purpose for the operation of EOM electronic computers and other computer devices." This sign indicates the purpose of the program. At the same time, the Russian legislator is not limited to computers, which expands the scope of programs. That is, an EOM program is not only a program designed to operate computers (traditional computers), it can also be used by individual devices similar to a computer. The Russian legislature's approach meets the requirements of the WIPO Model Provisions for the Protection of Computer Programs.[43]

In these terms, a computer program is a program for any machine capable of processing information. Such machines and devices may also include telephones, industrial computers, devices of automated control systems, network equipment, etc.

The fourth feature is the purpose of the computer program: "manage to obtain a certain result." This feature does not set restrictions on the form and content of the program. However, in

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[42] "Civil Code of Russian Federation, (Гражданский кодекс РФ (Moscow, 2020)", accessed December 21, 2020, http://www.fips.ru/npdoc/law/gk4.HTM#1.

[43] Aleksandr Helb, *Sovremennoie sostoianiie problemy pravovoi zashchity programmnogo obespecheniia EOM,* (Tallin: Centr nauch. Informacyii po obshchestvennym naukam, 1983), 93.

combination with the third feature, it establishes a certain specific criterion for the protection of the computer program. This suggests that if a set of data and instructions is not able to control the operation of a computing device and/or a certain result is not achieved, then such an object cannot be recognized as a computer program.

That is, the fourth feature indirectly establishes a technical constraint that the program must meet to obtain protection. Among the positive features of the definition contained in the Russian legislation, there is an indication that the preparatory materials obtained in the process of developing the program should be considered as one of the forms of its expression. This is in line with modern approaches in European intellectual property doctrine and legislation.

This definition of the term "computer program" in its content becomes similar to the concept of "software"[44], which will be discussed later.[45] The lack of a statutory level, such as the Law of Ukraine "On Copyright and Related Rights", defining the term "preparatory materials" raises the question: do preparatory materials include those that accumulate in the programmer at the stage of program development, or is it just a description program, which has already been discussed in the study of the concept of "computer program".

Unfortunately, national legislation does not provide an unambiguous answer. Based on the research, "preparatory materials", as one of the forms of expression of a computer program, is a complete postoperative presentation in any form of its content, detailed enough to determine the list of necessary commands. All other developments in the creation of a computer program should be considered as separate objects of intellectual property rights, including copyright.

Under the EOM program for the computer, the Russian legislator also understands the audio-visual images which are created through the program. This position is quite controversial and needs to be concretized. The controversy is that there is a clear link between the execution of the program code and the audio-visual images created by it.

Thus, if in the process the program uses individual files containing audio or graphic information in digital form and then uses them to create an audio-visual image, then such an image cannot be considered a form of expression of a computer program (for example, the graphical interface of Windows all audio-visual effects). In essence, images and sounds exist independently of the operating system and are electronic copies of certain objects.

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[44] "Difference between Software and Computer Programs," (*pixel.cottage.co.uk* , 2018), accessed January 5, 2021, https://www.pixelcottage.co.uk/blog/differences-between-software-programs-and-applications/.

If, on the other hand, audio-visual images are created solely as a result of the execution of program code, then only under such conditions can a close connection be traced between the protected form of expression and the unprotected content of the program?

Therefore, in this case, the computer program can be considered to be created by her audio-visual images. An analysis of the concept of "computer program" enshrined in Russian law allows us to conclude that it contains several characteristics that are missing in the definition of a computer program in national law, and which would be appropriate to borrow. The following provisions must be enshrined directly in national intellectual property law:

1) not to specify the form of expression of a computer program due to the peculiarities of its creation;

2) to expand the hardware scope of a computer program used by introducing the term "electronic computing device" into the definition;

3) extend legal protection to preparatory materials as one of the forms of expression of a computer program. A comparative study of the terms "computer machinery" and "computer program" makes it possible to conclude that they are similar in content and define the same object of intellectual property.

However, the term EOM "computer" is broader than the term "personal computer" but does not cover all the variety of devices that run computer programs or use them in their work. The above conclusion must be taken into account when forming a conceptual series and terminological apparatus for intellectual property in the field of information technology.

2. THE GENESIS OF THE LEGAL PROTECTION OF COMPUTER PROGRAMS AND DIFFERENT LEGAL MECHANISMS USED BY DEVELOPED COUNTRIES

2.1. Theoretical and practical approaches to the legal protection of software and computer programs

The history of human development shows that any society cannot exist without legal regulation of its social, economic and political relations. Such regulation is carried out by the relevant legal norms that form the legal system of the state. Changes in these relations lead to the emergence of new processes in society and the emergence of new objects of law.

The nature of human intellectual activity, as well as the essence of scientific and technological progress determines the existence of a system of legal protection of intellectual property. Due to this, the legal protection of the results of human creative activity was constantly improved, changed, supplemented, covering new objects of human activity.[46]

Only in the rules of law the result of intellectual activity of man acquires its legal form. The constant development of technologies for creating a computer program, expanding the boundaries of its functional use and features of the program as an object of legal protection, is the reason for the constant discussion about choosing an effective system of its legal protection.

Scholars are generally divided on the possibility of extending copyright, industrial property law or developing special rules that take into account the specifics of computer programs, the relationship associated with the creation and use of these objects.

Thus, V.M. Antonov[47] in his work on intellectual property and copyright in the field of computer technology, focuses on the formation and development of Ukrainian legislation in the field of information relations, the legal status of legal entities and legal relations arising in the process of creating and using programs as objects of copyright.

However, the essence of the computer program is not disclosed either from the standpoint of copyright or from the standpoint of informational law.

Scholars I. A. Nosova, M. P. Kozadyorov[48] in their work propose to use not only copyright protection, but also protection within the framework of patent law, as well as the dissemination of provisions for a reliable legal mechanism of protection of both the form and content of a computer

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[46] Aleksandr Helb, *Sovremennoie sostoianiie problemy pravovoi zashchity programmnogo obespecheniia EVM*, (Tallin: Centr nauch. Informacyii po obshchestvennym naukam, 1983), 5.

[47] Valerii Antonov, *Intelektualna vlasnist i kompiuterne avtorske pravo*, (Kyiv: KNT, 2005), 520.

[48] Yryna Nosova, *Prohrammnoe obespechenye: pravovie problemu, puty ykh reshenyia*, (Moscow: KompiuterPress, 1998), 320

program. trade secret and trademark laws. V.D. Bazylevych holds a slightly different point of view.[49]

Considering the legal protection of computer programs, the author notes that one of the debatable problems of the information society is the relationship of two subsystems in the implementation of legal protection of computer programs: patent and copyright and the introduction in this regard or cumulative or separate, or an intermediate legal system for the protection of these intellectual property.

S. P. Grishayev[50] also emphasizes in his work that there is no unambiguous opinion in the doctrine of intellectual property on the need to extend to a computer program the legal protection of existing institutions of intellectual property law or the creation of special regulations for this purpose.

Examining the legal protection of computer programs and databases, the author gives a general description of the specified object of copyright, focusing mainly on the subjects of copyright in computer programs, as well as the protection of their exclusive property rights. S.I. Karpukhina[51] in his work, analyzing the case law of the United States, notes that the development of legal protection of computer programs in the world is mainly in accordance with the provisions of copyright. It should be noted that in the last 10 years, most scientific studies have not paid comprehensive, detailed attention to the issue of extending civil law protection to a computer program.

Thus, O.V. Dzera, D.V. Bobrova, A.S. Dovgert[52] and others in their collective work do not consider a computer program as an object of civil law protection. A similar situation can be traced in the works on intellectual property law edited by O. A. Pidopryhora and O. D. Sviatotsky.[53][54] In the scientific work edited by Y. M. Shevchenko[55], the authors, presenting the section on civil law protection, note that the computer program belongs to the objects of copyright,

[49] Viktor Bazylevych, *Intelektualna vlasnist*, (Kyiv: Znannia, 2006), 298-301.

[50] Serhei Hryshaev, *Intellektualnaia sobstvennost*, (Moscow: Yurystъ, 2004), 238.

[51] Svetlana Karpukhyna, *Zashchyta yntellektualnoi sobstvennosty y patentovedenye*, (Moscow: Mezhdunar. otnoshenyia, 2004), 400

[52] Oleksandr Dzera, *Tsyvilne pravo Ukrainy : pidruchnyk : u 2-kh kn. Kn.1*, (Kyiv: Yurinkom Inter, 2004), 736.

[53] Opanas Pidopryhora, Oleksandr Sviatotskyi, *Osnovy pravovoi okhorony intelektualnoi vlasnosti v Ukraini : [pidruch. dlia stud. neiuryd. vuziv*, (Kyiv: Kontsern «Vydavnychyi Dim «In Yure», 2003), 236.

[54] Opanas Pidopryhora, Oleksandr Sviatotskyi, *Право інтелектуальної власності : [підруч. для студ. вищих навч. закл.*, (Kyiv: Kontsern «Vydavnychyi Dim «In Yure», 2002), 624.

[55] Yaroslav Shevchenko, *Tsyvilne pravo Ukrainy : akademichnyi kurs : pidr. u 2 t. T. 2*, (Kyiv: Vydavnychyi Dim «In Yure», 2006), 696.

and also briefly mention, with reference to the rules of legislation, about basic provisions regarding free modification and decompilation of the program.

Issues of legal protection of a computer program as an object of intellectual property law, its free use, modification and decompilation were the subject of consideration and scientific and practical research of S. O. Dovgy, V.S. Drobyazko, V.O. Zharov and others.[56] In this study, these issues were considered only in terms of coverage of the provisions enshrined in regulations.

I.O. Pankeev[57] in his work on copyright, in outlining the features of the legal protection of computer programs, pays attention only to free copying, modification of the program, building his research on citing current legislation.

The main provisions of protection of computer programs in accordance with the norms of copyright are given in the scientific-practical research edited by M.V. Paladiya, N.M. Mironenko, V.O. Zharova. P.M. Tsybulov,[58] V.P. Chebotaryov, V.G. Zinov, Y. Sweeney in their study mention a computer program only in the list of copyright objects.[59] A similar approach is followed by Russian scientists LN. Borokhovich, A.A. Monastyrska and M.V. Trokhova.[60]

Instead, V.V. Belov, [61] G.V. Vitaliev, G.M. Denisov, based on European and Russian legislation, investigate the sources of the right to a computer program, property and non-property rights to the specified object of intellectual property rights, as well as the subjects of these rights. The authors discuss in detail the transfer of rights to a computer program and the conclusion of relevant agreements.

S.A. Sudarikov[62] considers the protection of computer program depending on its type, form of expression, and programming language in which it is created. The author also provides a list of doctrinal and debatable issues regarding protection of the texts of computer program, adaptation, decomplication, and free use of the program, the possibility of its protection within the framework of Patent Law.

The study emphasizes the need to develop a legal mechanism to protect against the creation and use of programs that are dangerous, by setting certain instructions.

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[56] Oleksandr Sviatotskyi, *Intelektualna vlasnist v Ukraini : pravovi zasady ta praktyka : nauk.-prakt. vyd. u 4-kh t. T.2*, (Kyiv: Vydavnychyi Dim «In Yure», 1999), 460.
[57] Yvan Pankeev, Avtorskoe pravo : [kurs lektsii], (Moscow: Yzdatelstvo «VK», 2005), 270.
[58] Pavlo Tsybulov, *Upravlinnia intelektualnoiu vlasnistiu : monohrafiia*, (Kyiv: «K.I.S.», 2005), 448.
[59] Myroslav Paladii, *Pravo intelektualnoi vlasnosti : nauk-prakt. komentar do Tsyvilnoho kodeksu Ukrainy*, (Kyiv: Parlamentske vyd-vo, 2006), 432.
[60] Liudmyla Borokhovych, *Vasha yntellektualnaia sobstvennost*, (SPb: Piter, 2001), 416.
[61] Vladymyr Belov, *Yntellektualnaia sobstvennost. Zakonodatelstvo y praktyka eho prymenenyia*, (Moscow: Yurystъ, 2002), 288.
[62] Serhei Sudarykov, *Yntellektualnaia sobstvennost*, (Moscow: Yzd-vo delovoi y uchebnoi lyteratury, 2007), 800.

V.S. Dmytryshyn and V.I. Berezanska[63], researching general theoretical issues of the legal protection of computer program as an object of copyright, analyze practical aspects of acquisition, transfer registration, and protection of software rights and lawful use of copies of computer programs. The paper analyzes the civil, administrative, and criminal liability for copyright infringement developed recommendations for the implementation of preventive measures and the cessation of offences in this area, and bringing violators to justice.

Thus, in the given scientific-theoretical and practical researches their authors are limited either to citing provisions of the legislation in the field of protection of the rights software developers or state, also the fact that the computer program is the object of copyright. However, the discloser of the essence of the program as an object of the law was not the subject of study by these authors.

At the same time, computer programs are characterized by strong dynamics of their development, although they have a very small historical age compared to other intellectual property. As noted by L.F. Aptee, A.G. Vetrov, and T.A. Dorofeeva, the information environment is one of the most rapidly developing industries. Therefore, it needs adequate legal regulation.[64]

Each new stage of development of a computer program objectively required an adequate mechanism of its legal protection as a specific object of intellectual property rights.

What was quite suitable for effective protection yesterday seems to be an anachronism today that does not meet the requirements and needs of the owners of the intellectual property rights. Therefore, to identify and study the factors shaping the mechanism of the legal protection of a computer program, it is necessary to conduct a retrospective analysis of its development.

Such an analysis can make it possible to predict not only the directions of further development of legal protection of computer programs but also to formulate the main proposals and recommendations for legislation that would meet the requirements of modern and further development of information technology.

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[63] Volodymyr Dmytryshyn, *Intelektualna vlasnist na prohramne zabezpechennia v Ukraini*, (Kyiv, 2005), 304.

[64] Liudmyla Aptee, Defynytsyy v ynformatsyonnom zakonodatelstve, *Zakonodatelnaia defynytsyia: lohyko-hnoseolohycheskye, polytyko-yurydycheskye, moralno-psykholohycheskye y praktycheskye problemы : materyalы mezhdunarodnoho «kruhloho stola»*, 2006, 600

2.2. The first chronological stage of legal protection of software

The first stage in the development of legal protection of a software began in the late 50s of the twentieth century, when the first computers appeared. The purpose of the computer program was to ensure the efficiency of these machines. According to Alain N. Dixon, computer programs were developed by computer manufacturers to their standards.[65]

Such programs were an integral part of specific computer technology. Besides, computers were a new, expensive phenomenon at the time, had a narrow purpose and were not widespread. At that time, the field of programming was in its infancy and was taking its first steps. Computers and computer programs for them were created and used to solve applied problems of a mathematical nature in research and development.

That is, electronic computers and programs for them were considered as a whole - software and hardware. The lack of compact means and convenient methods of transferring and storing information, its introduction into a machine-readable environment, the complicated process of copying computer programs not only limited their scope, but also did not create conditions for their illegal use. The buyer of the computer was "hostage" to its manufacturer not only in terms of the use of computer programs, but also in terms of service.

This allowed developers to easily control the distribution of their computer programs. At that time, to regulate the legal relationship for the creation and use of computer programs, the rules of existing legal institutions were used. For example, the contract law of the Anglo-American legal system and trade secret law have been used in the United States to protect the interests of computer software manufacturers.[66] The absence of a special separation of rules of law that would regulate these social relations and take into account the peculiarities of computer programs lasted until the mid-60s of last century.

This stage is characterized exclusively by the initial development and complete uncertainty of what is a computer and for what purposes it can be used, but even more so its legal protection. This is the very initial stage from which the development of software began, which gave impetus to a lot of research and opinions of legal practitioners.

[65] Anatolii Dovhert, *Avtorske pravo i sumizhni prava. Yevropeiskyi dosvid : u 2-kh knyhakh. Kn. 2*, (Kyiv: Vydavnychyi Dim «In Yure», 2001), 338.
[66] M. E. Johnson, "The uncertain future of computer software users' rights in the aftermath of MAI Systems", (*Duke law journal*, 1994, vol. 44, no. 2), 327–328.

2.3. The second stage of development of legal protection of software, possibilities of patent protection

Scientific and technological progress has created the conditions for the emergence of the second stage of development of legal protection of computer programs. The impetus for changes in the mechanism of the legal protection of computer programs was a new way of fixing the program for controlling a computer with punch cards or punch tapes. A similar technique was used, for example, to control a jacquard loom in the nineteenth century.

At the same time, the computer program and the software usually continued to be considered as one. Under such conditions, legal protection could be obtained by a device or method that includes a computer program and utilizing which a certain technical result is achieved. That is, the programs in combination with the electronic computing device were considered as an object of patent protection.

But in 1964, the U.S. Copyright Office first began registering computer programs, which certainly influenced the further development of the object's legal protection mechanism. At that time, the United States had a copyright law of 1909. According to this law, work had to meet two criteria to receive copyright protection: to be published and to be suitable for visual perception (reading with the eyes).[67] Thus, the U.S. Copyright Act of 1909 could not take into account the specifics of computer programs and therefore did not contain relevant provisions for their protection as a specific object of copyright. In addition, not every developer of the program sought to publish the results of their work, and therefore, to publish the source text of the program.

This situation has contributed to the formation of well-founded doubts among software developers about the effectiveness of copyright provisions in the protection of computer programs. At the same time, IBM (USA), in the mid-1960s, was actively obtaining security documents for its programs under copyright law. Statistics show that in the United States, between 1964 and 1966, 52 computer programs received copyright protection, and in 1969 - 100 programs.[68]

However, software developers still more often turned to patent protection of their products. Thus, the patent offices of the United States, Great Britain, Germany, and some other European countries have successfully issued and continue to issue patents, the names of which use such concepts as "algorithm", "program". The conformity of inventions based on computer programs to the criteria of patentability is also confirmed by the case-law of that time. For example, the U.S. Patent Office has begun to receive applications for "software-like inventions." However, the same

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[67] Aleksandr Helb, *"Sovremennoie sostoianiie problemy pravovoi zashchity programmnogo obespecheniia EVM"*, (Tallin: Centr nauch. Informacyii po obshchestvennym naukam, 1983), 41.
[68] Aleksandr Helb, *K probleme tselesoobraznosty y vozmozhnosty patentovanyia alhorytmov y prohram ЭVM*, (Tallin, 1973), 64.

patentability criteria were applied to such inventions as to traditional patent law objects. At the same time, there have been many cases where the US Patent Office has refused to grant a patent for "software-like inventions."[69]

As a result, such a decision of the Patent Office was overturned by a decision of the U.S. Customs and Patent Court of Appeal. A vivid illustration of the above can be the case of "Prater" (1968). Prater applied to an invention of an analog device that used a computer program in its work. The US Patent Office rejected the application for the device on the grounds of non-compliance of the claimed technical solution with the criteria of patentability, as well as due to the lack in the application materials of a clear definition of the subject of the invention.

The U.S. Customs and Patent Court of Appeal overturned the decision of the Patent Office and recognized the computer with the new program as the object of the invention. In its judgment of 14 August 1969, the United States Customs and Patent Court of Appeal stated the following position: claims for a device or method that are sufficiently broad and cover the operation of a universal programmable electronic computing device.[70]

In another case, the U.S. Customs and Patent Court of Appeals recognized a patentable claim for a computer-implemented method involving comparison, registration, and bit-counting operations. The application for the present invention was previously rejected by the U.S. Patent Office based on § 112 of the U.S. Patent Law to include in the claims both machine and mental operations that are not patentable objects.

Thus, due to the lack of regulation of the patentability of computer programs, the U.S. Customs and Patent Court of Appeals set precedents because the patent law system was not ready, but to some extent incapable of providing legal protection for programs. In order to adapt the patent system to "program-like inventions", a special Presidential Commission was established in April 1965.

The purpose of this commission was to develop recommendations for changing the patent system. In 1966, the commission concluded that the computer program was a non-patentable object. In the same year, the U.S. Patent Office issued a temporary injunction allowing certain programmable algorithms to be recognized as patentable objects.[71] However, in 1967, based on

[69] Nimtz, Robert, "Development of the Law of Computer Software Protection", *Journal of the Patent Office Society*, v. 61. no. 1, (January 6, 1979), 3–43.

[70] "In re Chiron and Ulrich, 442 F.2d 985, 169 USPQ 723", (CCPA 1971).

[71] "Razvytye zakonodatelstva po okhrane prohrammnoho obespechenyia EVM v SShA", *Yzobretatelstvo. (Patentnoe delo. Patetnaia ynformatsyia*, 1980), no. 2, 15–17.

the commission's findings, the Johnson administration submitted a new patent law to Congress that explicitly stated that the programs were not patentable.[72]

The draft met with serious objections and was rejected. Senator Dirksen then proposed changes to the draft patent law that would allow the Department of Commerce (which reports to the U.S. Patent Office) to decide on the patentability of the program when considering individual cases. The result of these actions was the introduction in October 1971 in the US patent classification of a new 444 class "Programmable data processing devices, methods, and procedures for data processing."

Although patents were granted for this class during 1972–1976, many of them were obtained by a court decision after lengthy court proceedings. Thus, the protection of computer programs within the framework of patent law was carried out mainly by court decisions in accordance with US case law. In the UK in the '60s, the issuance of patents for computer programs was carried out quite freely. The position of the Patent Office and the Patent Appeals Tribunal of this country on the patenting of computer programs can be illustrated by the following example. Slee & Harris's 1966 patent application for a computer control method was used to control a computer using a computer program.[73]

The expert of the Patent Office proposed to amend the claims and further consider the claimed technical solution not as a method, but as a device – a computer that performs the operations specified in the claims on the method in the original version of the application. With such changes, the device could receive legal protection by patent law, as it met the criteria of novelty and usefulness. A similar situation developed with the application for the invention of the firm "Chavers" (1969).

Thus, the original formula for the programming method was converted into a formula for a data processing device. The patent was issued for a computer, which differed from its prototype

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[72] "Patentosposobny ly prohrammy dlia EVM", *Patentnoe delo za rubezhom : ref. sbornyk*, (1973), no. 4, 5–6.

73 "REPORTS OF PATENT, DESIGN AND TRADE MARK CASES", *Lee & Harris's Application (Manner of Manufacture C.G.)*, NO. 4, 1966, accessed February 23, 2021, https://watermark.silverchair.com/83-9-194.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAp8wggKbBgkqhkiG9w0B BwagggKMMIICiAIBADCCAoEGCSqGSIb3DQEHATAeBglghkgBZQMEAS4wEQQMvQSA_AgBDcS9kc7NA gEOgIICUoZrDTpyPyh_GzGX7ieNhDNgNwKISPcjvkJ4vrOz0vdUJnF1ZFPfsrrXyC5zNB_9k0Au7HW3QY3LxR 09NsBZlLlo70sBcKIfzubOEyoy622wyRlm5ZMPH87yyN1VNst1BA1YntyI3BxL9gIfiKDhYT_VPSUscyvuW3sJ_ XbnxWbC_yEi-UUKCvlazz8P4SbXK-0lA6LyXgfh4_TpMDOKrfkqNaFrl85KJGMOpiR31K430K-HkpARHivFhh2Zz5afusnC35hCHWrY0SwQeebf7rbX5GzP7SCtJXM1RZO9a_dfrLglaAfBM_h9t-3XRsri4BVCtq2mqrlVV5thVGC4Y8bo1kF078k8JPWlEjAB3Lu6J8NRGI8iKkx_WtANrG_R55F-Wd-0RRmMxKBrn6tix3gz_CZBLdAhyZ37e172H5JLGBn2WLAeAm6nDbWQJBh9FV8dMiNQR2RZ_ZTjvs4-2VCHXqI-YrMkuhSGt-OrLvVBdwn2e1YtLK1vuR_emQ4lzfB4xVb4K0pNAh94fuOzMZ6__svfVDT9lMNefqRE8twUR6ZntoJsw8ZuXjJ v8skbTSEDWTAJuxSfBifu89zgWW4fcFoZIPcYtGMefHu1ql0dUWa09gqsI_RMKJGoUriLgUaCn1uI-uOZ-DghZv3VdhoyGDOAoHcnR_BmgK6On39Oq7f6xC_zD93pd2CvHW8oEy2qE95MZcNyzI1nOe-i4BoFrmSiQxiVeowUSXz7smvG0PiNkrwZccl33OElaKddpan7HZtQtn7x95MzAobyDfntcg.

by the presence of a certain computer program, which was implemented by this machine. The application for the invention of the firm "Badger" (1970) concerned the method of automatic design of pipeline systems.[74]

The applicant considered the result of the application of such a method - a drawing. When considering the application, the expert of the patent office noted that the result of the method is not drawings as such, but computer-processed data that characterize the relationship of the pipeline lines. The only distinguishing feature of the claims, in this case, was the method of controlling the computer. The patent was issued for a computer, which was guided in a certain way.

In determining compliance with the patentability criteria of software such as punch cards or magnetic tapes, the UK Patent Appeals Tribunal has stated that they are not patentable in the case of the equivalent of a sheet of paper with marks on it.[75]

This is since under such conditions, the only distinguishing feature of such software is only a special way of applying characters, which allows these characters to be read by a computer. Therefore, these software tools were considered not separately, but as a whole with a computing device and those that allow the latter to work in a certain mode. On these grounds, the UK Patent Office has accepted applications for inventions in which the computer program is part of the invention through a direct connection either with the computer or with the production process, which in turn is controlled by the computer.

Thus, the second stage of the development of legal protection of computer programs was characterized by the fact that these specific objects of law could, in addition to copyright protection. At the same time, there was no unequivocal position on the choice of a single system of legal protection for a computer program in the United States or European countries.

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[74] "Appeal Tribunal of the US, Badger Co. Inc. application, RPC", 1970, accessed February 27, 2021, https://watermark.silverchair.com/87-2-36.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercv7Dm3ZL_9Cf3qfKAc485vsgAAApwwggKYBgkqhkiG9w0B BwagggKJMIIChOIBADCCAn4GCSqGSIb3DQEHATAeBglghkgBZQMEAS4wEQQMFaPSTvqNxW8aLbEYAg EOgIICTvSsSGl1OGafgROVFZekvSOuvvhGGv8cGRrJKUtGw8Tcv-A6eKRT-QsBMwDzZ01Tlj6o2Kddzp2aqPP2vujexmfvCBN5MOE-t5v7_haMBFVRDIzY6znXNzaLEuez0tAcGWXkbnx-rbkiJPU5qe3tPnGGv2BqQn4Ijbsn3cTcxUD5MqbgkmuVL9vwJl8KO75vxXkkh7ovt9sc1ihC5oIln5vaiF-qbvDrxG4SPLaV3ahaFOWX1RZmFhVksIC_orpkrKmDmbR8C7eLguk1PwvOT4C5QS_mVkFESDfW-Mif8X7Tt3r5bRWN1fh5jH8I56aswQWfiTvPeW6qD0Fen_5hDPXGNTt7bmIwfrnbZf5mISfMQgdgfLRp1e_-60ihic1JXEvvfDepM2F5vCXd6gDh_OIxHTe_lBrx2tPoY1cTOnglXOkpvfoXdMzRK6RWAOsdoom5Yf6Xli5HUp iBvMxcvdbma0cffel60CRISb1At0U4GYwrlcXeQl_EIBWtLu04dcPRr--QZrgSwBFgiJbW-72xmGNj_GT5fnQJREAxVMt2zgF4Fa17dQhLiw1vRC6KWkrFr5PeEwvHozUGvdkFb_e3XhfTVbzfxNbFBfUbt Ulf-0tAdoMEdikODOUxwuQvrYT2orpv_IMg_q_lKIC8cQIQ6XrruNhiqeWL4F39dEtz6dVUTt1a6_m6-D-0e4rEvfjVYuFntOKUrUpkrzfah_sebUE1hMJEmNdjCRgTkrvhXgNqIL-zhKK80sMTkFfV8KNb7AvJsiUwGu3jl4-R7A.

[75] Fisk, Dale, "Article about the programming culture that developed around use of the punched card, following Fisk's experience of "learning the craft" from people around him." *(2005). Retrieved 2008-11-1.* Accessed January 28, 2021, *"Programming With Punched Cards: A Programmer's Memories of Learning the Craft in 1973"* (PDF)

2.4. The third stage of legal development of software and technological advance of PC

The beginning of the third stage of the development of legal protection of the computer program is connected with Benson's case (USA)[76]. The court considered the question of classifying the method of converting binary-decimal numbers to binary to the "process" within the meaning of US patent law. The procedure designed to solve this type of mathematical problem was recognized by the court as an algorithm. Based on this, the Supreme Court of the United States on November 20, 1972, in the case of Benson ruled to deny a patent for the method of converting binary-decimal numbers to binary.[77]

The intellectual property law doctrine expressed the view that the decision of the US Supreme Court in the Benson case became a barrier to the protection of inventions in the field of programming. However, in comments to the court's decision, Chief Justice Douglas said that the decision in the Benson case could not be extended to the patentability of the programs. By its decision, the court prevented the emergence of a monopoly on mathematical laws and mathematical algorithms. At the same time, non-mathematical algorithms continued to be recognized as patentable.

Thus, the possibility of protecting inventions in the field of programming was limited. In this regard, the question of the application of other means of legal protection to a computer program outside of patent law has become relevant again. Otherwise, a similar situation developed in Europe. Almost simultaneously with the decision of the Supreme Court of the United States in the Benson case, patents for similar inventions were issued in some European countries. Among these countries, in particular, Sweden, Norway, Denmark, Germany.[78]

For example, on May 28, 1973, the Federal Patent Court of Germany issued a positive decision on the patentability of the method of converting binary-decimal numbers into binary numbers. The court found that the subject of the patent application is not a mathematical method of converting numbers, but (instruction) instructions for planned activities, the implementation of which occurs through the use of natural forces and through which a significant result is achieved.[79]

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[76] "Gottschalk v. Benson, 409 U.S. 63" (1972), *Justia online US database*, accessed February 9, 2021, https://supreme.justia.com/cases/federal/us/409/63/.

[77] "In re Sherwood, 613 F.2d 809, 204 USPQ 532", 1980.

[78] Painter, "Recent Developments in the Protection of Computer Software: Patent Cases Going to Supreme Court", *Datamation*, (1971), Nov, 54.

[79] "Zur patentrechtlichen Grenzziehung zwischen Rechenregel und technischer Erfindung", *GRVR*, (1974), no. 6, 305–313.

Under the forces of nature, in this case, means the action of an electrical circuit for the implementation of the method, namely the transformation of numbers occurs without the intervention of human creative forces.

Thus, the court concluded that the subject of the application for the invention is a technical solution, which means the use of technical means to achieve a technical goal. Somewhat later, Judge of the Federal Patent Court of Germany A. Huber[80] outlined some general principles for the recognition of patentable software objects:

a) not only the instruction of construction of electronic means of the computer but also the instruction of construction of the computer program cannot be patentable;

b) may be patentable construction of special equipment and its equivalent program creation, which is based on the same algorithm;

c) patent protection is granted as a result of the implementation of the algorithm - device or method of operation;

d) pure algorithm, not related to computers, is non-patentable and belongs to scientific works;

e) mathematical rule in its pure form is non-patentable. The patent offices of France, Austria, Switzerland, and Australia have taken a fundamentally negative position on the patent protection of computer programs.

Besides, based on the above, the third stage of development of legal protection of computer program is characterized by the lack of a common position on their patentability in both the countries of case law and in the countries of the continental legal system. No patent office has unequivocally stated its position on this issue. In most cases, a court decision was made when deciding on the patentability of a computer program.

In general, it can be concluded that in the third stage of development of the legal protection of the computer-based software, the rules of both patent (characteristic of technologically advanced countries) and copyright were applied, while strengthening the position of the latter.

The situation regarding the legal protection of software, as a multiple of computer programs would not have changed significantly, if there had not been a rapid development of microelectronics in the late 70s of the twentieth century. This development led to the emergence of personal computers and marked the beginning of the fourth stage of the development of legal protection of computer programs.

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[80] Huber A. "Computer-Patentrechtliche und Software-Engineering in patentrechtlicher Sicht", *Mitteilungen*, (1975), no 6, 101–107.

2.5. The fourth stage of development legal protection of software and complete shift to Copyright protection

The advent of personal computers has made electronic computing available to the general public and severed the rigid link between the manufacturer of electronic computing and the computer programs it has developed. In other words, computer technology and software for its operation have ceased to be used by a narrow circle of people to solve a limited range of tasks. The methods and techniques of copying and storing information have also changed.

Thus, punched tapes, punched cards, bulky magnetic disks, and coils with magnetic tape were replaced by ordinary audio cassettes, and later 5 and 3.5-inch floppy disks. The style of computer products has also changed. This change can be defined as the transition from "old" systems, which had a narrow-firm mono computer nature, to "new" information systems, which are based on international standards and easily combined. These technological changes have created favorable conditions for the development of the computer software market.

Operating systems and application software for computers began to be created not only by computer manufacturers, as before, but also by various independent companies such as Microsoft Corporation, Digital Reach Ink, Lotus Development Corporation, etc.[81] A computer program has acquired the characteristics of a separate, independent of a computer, commercially valuable, and competitive product. At the same time, scientific and technological advances in computer technology and programming have opened up the possibility of easy, illegal use and distribution of computer programs. In the field of computer programs, there is such a thing as "piracy", because of which programs do not bring the expected profits to their developers.[82]

As a result, the interest of software developers in creating and promoting new computer programs has diminished. Another important obstacle to the development of the software market was the lack of a unified approach to their protection in regulations of different countries, in the practice of patent offices and courts, as well as the lack of international law. Thus, the above factors have contributed to the creation of objective conditions for the search for and implementation of effective mechanisms for the legal protection of computer programs, both at the national level of different countries and internationally.

The problem of the legal protection of computer programs was brought to the attention of the United Nations, which in 1970 addressed WIPO with a request to investigate the possibility of providing international legal protection to computer programs, as well as to develop adequate ways

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[81] Anatolii Dovhert, *Avtorske pravo i sumizhni prava. Yevropeiskyi dosvid : u 2-kh knyhakh. Kn. 2*, (Kyiv: Vydavnychyi Dim «In Yure», 2001), 338.

[82] Danaher, Brett, Michael D. Smith, and Rahul Telang. "Piracy and Copyright Enforcement Mechanisms.", *Innovation Policy and the Economy* 14, no. 1 (2014): 25-61. Accessed February 16, 2021 through MRU EZProxy system, *JSTOR*, doi:10.1086/674020.

to protect programs that take into account their specifics. As a result of the three sessions of the WIPO Advisory Group in 1974, 1975, and 1976, two documents were drafted: The Model Law on Computer Software Protection and the International Agreement on Computer Software Protection.

At a meeting of the WIPO Advisory Group in 1976, it was decided to further focus on improving the first document. This decision is explained by the fact that at the national level, testing the effectiveness of the mechanism for protecting a computer program can quickly reveal its advantages and disadvantages, and this will have a positive impact on the creation of the relevant international legal action.

The issue of the legal protection of a computer program has also been discussed by the International Industrial Property Association. Thus, at the XXIX Congress of the Association in San Francisco in 1975, a decision was made to develop a special system of the legal protection of computer programs within the framework of national copyright laws. Subsequently, at the 1977 session of the WIPO Advisory Group, the final version of the Model Regulations for the Protection of Computer Software (hereinafter referred to as the WIPO Model Regulations), adopted in June 1978, was adopted. These WIPO Model Regulations are the first international attempt to develop a special system for the legal protection of computer programs, combining copyright and industrial property law to protect against unfair competition. The main purpose of the WIPO Model.

Provisions as an international legal act is to help states improve their legislation on the protection of the rights to a computer program, taking into account its specifics. WIPO's standard provisions were universal and aimed:

a) promoting the further development of existing national legislation on copyright and patent law;

b) development of special clarifications or legislation on the protection of rights to computer programs;

c) consistency with the existing legal systems in the field of intellectual property. Thus, the adoption of the WIPO Model Provisions laid down two relevant basic approaches to the legal protection and protection of computer programs:

1) use of the existing national system of legislation taking into account the peculiarities of the computer program;

2) development of new legal acts governing the protection and use of a computer program.

The XXX Congress of the International Industrial Property Association, held in Munich in 1978, praised the work of the WIPO Advisory Group. The resolution of the XXX Congress not only invites the national groups of the International Industrial Property Association to draw the

attention of member governments to the Model Provisions but also provides several advantages regarding the need to base these provisions on national computer protection legislation[83].

The first session of the group of experts on the legal protection of computer programs took place in Geneva from 27 to 30 November 1979, with the participation of 20 member states of the Paris and Bern unions. During the discussion, the participants of the session repeatedly stressed the uncertainty of the legal situation regarding the protection of computer programs at both the national and international levels. In particular, it was noted that the provisions of the Paris and Bern Conventions could not guarantee effective legal protection of computer programs.

The only way is to develop special legislation on the protection of computer programs at both the national and international levels. It was agreed that the protection of computer programs should be based on the provisions of copyright law, trade secrets, laws on protection against unfair competition, or special legislation similar to the WIPO Standard Provisions for the Protection of Computer Software. This indicates the lack of a clear understanding at the fourth stage of the development of legal protection of computer programs on the further development of legislative protection of programs at both national and international levels. There is also no consensus in the intellectual property doctrine on how to develop a mechanism for the legal protection of a computer program.

Thus, Z. Kitagawa[84], based on the analysis of the development of legal protection of computer programs in different countries, offers two possible options for the legal protection of these objects.

Option I – regulate the legal relationship related to the creation and use of computer programs by applying the provisions enshrined in copyright law and, if necessary, reforming these provisions. This path was chosen by such industrialized countries as the United States, Germany, Great Britain, Australia, and others. At the same time, in the legal doctrine of Germany, there was a point of view on the expediency of developing a mechanism of special legal protection for a computer program.

In Australia, copyright law was seen as a temporary, intermediate form of protection for a computer program pending the development and entry into force of a special law. A similar path was chosen by Japan - the Ministry of Japan has developed a bill that regulates the legal relationship related to the creation and use of computer programs, taking into account their specifics.

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[83] „Der XXX Kongress der Internationalen Vereinigung für gewerblichen Rechtsschutz in München", *GRUG Int*, (1978), no, 11/12, 430–446.
[84] Kitagawa Z. Allgemeiner, „Urheberrechtsschutz oder Sonderrecht für Computerprogramme in Japan Ein Zwischenbericht", *GRUR Int*, (1985), no. 3, 173–176.

Option II – creation of special legislation on protection of computer programs. This path was chosen by Brazil, Canada, and partly Japan. For example, in Canada in the early 1980s, the prevailing view in legal doctrine was the expediency of developing a fundamentally new mechanism of legal protection for a computer program. At the same time, in order to create special legislation on the protection of computer programs (software copyright), it was proposed to take as a basis the general provisions enshrined in copyright law.

According the special legislation on the protection of rights to a computer program, compared to traditional objects of copyright, the term of the legal protection of programs was reduced to 5 years from the date of their creation. At the end of this period, the computer program became public domain. Unfortunately, further development of the draft special law of Canada on the protection of computer programs did not go due to the lack of mechanisms for its implementation.[85]

In Brazil, a bill was drafted in 1984 to introduce special protection for computer programs. A similar draft law on the protection of computer software was developed by the Ministry of Industry and Foreign Trade of Japan, which was considered as an alternative to the draft Law "On Amendments to the Copyright Law", developed by the Ministry of Japan.

An attempt to regulate by a special law the legal relations related to the creation and use of a computer program was made in 1979 also in the former "People's Republic of Bulgaria". Unlike copyright law, this special law paid special attention to the regulation of legal relations related only to the implementation of the author of the program of its rights to use it but did not address the right of third parties to copy a computer program.[86]

Thus, the Standard Provisions for the Protection of Computer Software have not been widely implemented in practice in the national special laws on the protection of computer programs of WIPO Member States. Most national bills on special protection for computer programs have not been finalized.

The reason for this development in the legal protection of computer programs is related to the rapid, dynamic development of the computer programming industry. The rapid qualitative and quantitative change in computer programs and technologies for their creation has made it difficult

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[85] SCASSA, TERESA. "Acknowledging Copyright's Illegitimate Offspring: User-Generated Content and Canadian Copyright Law." In the Copyright Pentalogy: How the Supreme Court of Canada Shook the Foundations of Canadian Copyright Law, edited by GEIST MICHAEL, (*University of Ottawa Press*, 2013) 31-54. Accessed February 18, 2021. http://www.jstor.org.skaitykla.mruni.eu/stable/j.ctt5vkcpr.18.

[86] Nikolov A. „Rechtsschutz für Programme in der VR Bulgarien", (*Rechentechnik Datenverarbeitung)*, 1982, no. 6, 58.

to develop and adopt new, special legislation that would regulate relations in the field of creation and use of computer programs.

This conclusion is confirmed by the fact that most economically developed countries have gone by adapting their copyright law to the requirements of high technology used in the creation of computer programs, as well as taking into account the specifics associated with the use of this intellectual property.

The main factors that have influenced the regulation of relations related to the creation and use of computer programs within the framework of copyright include:

1) the process of creating computer programs, which is similar to the process of creating a literary (scientific) work;

2) acquisition of copyright protection, which is easy, fast, and does not require formalities (in accordance with the provisions of the Berne Convention);

3) a significant term of copyright protection (according to Article 7 of the Berne Convention, the property rights of authors must be protected during their lifetime and for at least 50 years after the death of the author).

In the United States, the United Kingdom, and European Union, copyright protection of a computer program has also been driven by the goal of combating software piracy. Thus, as a result of the study of the existing doctrinal legal approaches to the protection of computer programs, as well as taking into account trends in national legislation, in most countries, the computer program was classified as copyright.[87][88] The first country to include a computer program in copyright was the Philippines, wherein 1972, as a result of changes in copyright law, a computer program was classified as a scholarly work.

Among the developed nations, the United States was the first to provide copyright protection for computer programs. Work on the new US Copyright Act began in 1976, and on January 1, 1978, the Act came into force.

However, two years later (December 12, 1980), the law was supplemented by several provisions (Articles 101, 117) that took into account the specifics of the relationship associated with the creation and use of computer programs. Let us dwell on one rather interesting provision of this US copyright law.

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[87] Ariel Katz. "A Network Effects Perspective on Software Piracy." (*The University of Toronto Law Journal 55, no. 2* (2005)): 155-216. Accessed February 22, 2021. http://www.jstor.org.skaitykla.mruni.eu/stable/4491643.

[88] McGowan, Matthew K., Paul Stephens, and Dexter Gruber. "An Exploration of the Ideologies of Software Intellectual Property: The Impact on Ethical Decision Making." (*Journal of Business Ethics* 73, no. 4 (2007)): 409-24. Accessed February 28, 2021, . http://www.jstor.org.skaitykla.mruni.eu/stable/25075433.

Thus, two conditions for the protection of copyright objects were excluded from the law:

1) publication;

2) readability.

According to the new version of the law, work can be expressed in words, numbers, or other verbal or digital symbols, signs, regardless of the nature of the material object on which they are represented or fixed.

The main thing is that from this material object they can be reproduced or perceived in any way, both directly and indirectly with the help of a machine or device. According to N. Boorstin[89], due to these changes, copyright extends to any form of presentation of a computer program, regardless of the material medium and in what form the program is recorded: on paper, on a punch tape, on a punch card, on a magnetic disk, etc.

That is, protection does not extend to the idea, but the form of expression of the idea. The example and experience of the United States, a leader among developed countries in the development of computer programs, has been supported by special commissions and research organizations in Australia, Germany, the United Kingdom, and other countries dealing with the legal protection of computer programs.[90]

New versions of copyright laws or corresponding amendments to old versions were adopted in Australia in 1984; France, Germany, Japan, Great Britain 1985; Spain 1987; Canada 1988; China 1990.

Thus, in economically developed countries there is a steady trend to specify at the legislative level the mechanism of the legal protection of computer programs by copyright. It is from this period that the fifth stage of the development of legal protection of computer programs begins, which continues to this day.[91]

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[89] Boorstyn N. *Copyrights, Computer, and Confusion,* (*JPOS,* 1991, no. 5), 276–287.

[90] Ulmer E. *Der Urheberrechtsschutz von Computerprogrammen,* (*GRUR, Int,* 1982, no, 8/9), 489–500.

[91] Bainbridge, David I. "*The Scope of Copyright Protection for Computer Programs.*" (The Modern Law Review 54, no. 5 (1991)): 643-63. Accessed March 1, 2021, http://www.jstor.org.skaitykla.mruni.eu/stable/1096902.

2.6. The fifth stage of the legal protection development of software and computer programs in the new age, redefined standards

The analysis of the development of legal protection of software in the former USSR should be considered separately. Until the 1970s, the software was considered an integral part of the computer system. Active discussion of the theoretical foundations of a possible form of the legal protection of software, according to V.V. Belov, G.V. Vitaliev, and G.M. Denisov, began only in 1971, when economically developed countries were in the third stage of development of legal protection of computers. computer programs.[92]

The All-Union Association of Patent Employees of Cybernetics Institutes was established to exchange experiences and widely discuss issues of the legal protection of computer programs. The essence of the discussion between scientists and computer program developers in the former USSR was similar to that which took place in the economically developed countries of the world throughout the process of development of legal protection of programs, but practical actions were subject to the general principles of the socialist society.

For example, in 1979 the resolution of the State Committee for Science and Technology "On improving the efficiency of operation and use of the State Fund of Algorithms and Programs (hereinafter - GosFAP)" № 581. This resolution created a single system of GosFAP, to which developers were required to transfer their computers computer programs together with documentation. The Foundation had the right to transfer these programs to any person free of charge upon request. The authors of the programs did not receive any additional remuneration, because it was considered that their remuneration was the salary at the main place of work.

The experience initiated in 1965 at the Institute of Cybernetics of the USSR Academy of Sciences (now the V.M. Glushkov Institute of Cybernetics of the National Academy of Sciences of Ukraine) is interesting.

The head of this institution, V.M. Glushkov, set the task of maximum protection of the institute's developments. To solve this problem, a research patent department was created, which existed from 1965 to 1980. Specialists of the department have developed a number of methods, including the protection of inventory law algorithms for programs. According to this method, the algorithmic actions of the program were "materialized" in the form of a method of information processing or specialized devices, which made it possible to obtain the USSR Copyright Certificate for the invention.

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[92] Vladymyr Belov, *Yntellektualnaia sobstvennost. Zakonodatelstvo y praktyka eho prymenenyia*, (Moscow: Yurystъ, 2002), 288.

Therefore, the implementation of any computer program in its work patented list of algorithmic actions automatically led to the use of the corresponding patented method. For the development of algorithms, which were protected by the Author's Certificates of the USSR for inventions, their creators, in addition to wages, could receive additional royalties.

It should be noted that the practice of patenting algorithms has been criticized by the State Committee for Science and Technology, but this did not prevent the Institute of Cybernetics of the USSR Academy of Sciences to continue to obtain copyright certificates for such inventions. Subsequently, the situation regarding royalties changed in favor of the creators of computer programs after the adoption in February 1984 of the resolution of the State Committee for Science and Technology № 41. This resolution equated computer programs to new technology, i.e., developers could receive bonuses to 6 salaries.

However, computer programs were still not considered copyrighted. In 1987, the USSR State Committee for Computer Science and Informatics (hereinafter - DKOTI) was established. On the initiative of this Committee adopted a resolution of the Council of Ministers of the USSR "On improving work in the field of computer software and informatics" from 22.04.88 № 511.

In pursuance of this resolution were adopted a number of departmental regulations governing the legal protection of computer programs, including the copyrights of their developers. In this case, the programs were considered both as an object of copyright and property rights. In 1989–1990, a series of research works were carried out at the Algorithm NGO at DKOTI, as a result of which a new provision was formulated, according to which computer programs were considered as objects of copyright.

This provision was not approved at the level of the Council of Ministers in connection with the collapse of the USSR in late 1991, but it certainly had an impact on the formation of national legislation of independent states (former Soviet republics) on the legal protection of computer programs.

The intensive development of economic and integration processes in the world in the field of information technology unconditionally required effective legal regulation of relations on the creation and use of computer programs not only at the national but also at the international level.

The accumulated experience in improving the mechanism of the legal protection of computer programs at the national level has created all the prerequisites for its generalization, as well as the development and adoption on this basis of international treaties and conventions, which enshrine the protection of computer programs by copyright.

Besides, the generalized experience of the legislative practice of WIPO countries is reflected in the WIPO Treaty of 20 December 1996, in the European Community Directive on the legal protection of computer programs 2009/24/EC, in the WTO Agreement on Trade-Related

Aspects of Rights, intellectual-property (hereinafter referred to as the TRIPS Agreement) of 1 January 1995.[93]

However, international measures have not resolved all issues related to the legal protection of computer programs. In particular, the issues of objective expression of the program as a protected object of copyright, as well as the protection of the way the idea is implemented, remain unresolved. In addition, the computer program, unlike other classic objects of copyright, does not directly meet the aesthetic and information needs of man.

The program is a guide for the device, which, solving a practical problem, can meet the above needs of the individual. According to scholar O.P. Sergeev, the protection of the content of new solutions to practical problems is provided by patent law. The need to protect the content of the software solution for the computer, the way of the software implementation of a certain idea forced software developers to seek opportunities for the full legal protection of their developments, in particular, using the rules of patent law.

Thus, the full copyright protection of the computer program did not satisfy the interests of their developers, which is explained by the following grounds:

a) the desire of computer software developers to have the fullest possible protection of their intellectual property, which is traditionally inherent in the protection of intellectual property by patent law;

b) computer program, despite the existing discussions in legal doctrine, does not fall under the protection of traditional objects of copyright due to its specificity and complexity as an object of legal relations. In addition, the development of information technology deepens this trend. Based on the above, today there is a situation in which "de jure" computer program belongs to the objects of copyright, and "de facto".

c) there is a constant not only scientific but also practical search for new mechanisms of its legal protection and protection, in particular, the norms of patent law both separately from the copyright and in combination with it;

d) Based on the case-law of the United States and EU countries where case law exists, computer software developers in these countries continue to obtain patents for technical solutions related to the use of these programs.

Today, in the doctrine of intellectual property law, there are two dominant opposing views on the development of the legal protection system of computer programs in the world. They are a

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[93] Styrcula, Keith A. "*THE ADEQUACY OF COPYRIGHT PROTECTION FOR COMPUTER SOFTWARE IN THE EUROPEAN COMMUNITY 1992: A CRITICAL ANALYSIS OF THE EC's "DRAFT DIRECTIVE".*" (Jurimetrics 31, no. 3 (1991)): 329-48. Accessed March 3, 2021, http://www.jstor.org.skaitykla.mruni.eu/stable/29762224.

reflection of two concepts of computer software (open source and closed source) and the differences in patent law between the two systems of intellectual property law, European Union and North America.[94]

These regions are the leaders in the development and distribution of software products. According to the first point of view, the protection of a computer program should be based on copyright law. This view is officially held by the European Patent Office and legislators of European countries, including Ukraine. The United States holds a different view, according to which the use of patent protection of computer programs can strengthen their copyright protection, not excluding the latter. This situation most characterizes the confrontation between developers of programs with "open" and "closed" source code.[95]

The reason for this confrontation is the economic gain associated with the markets for computer programs. The protection of open-source computer programs is based solely on copyright law. The concept of creating open-source programs is that its source code is available to other developers.

A person who rightfully owns "open source" can modify, improve, modify, adapt, etc. at its discretion, create software products based on it. The main thing is not to infringe the copyright of the developer of "open source". Under such conditions, none of the developers of open-source programs has a financial advantage over other developers due to the lack of monopolization of the right to familiarize themselves with the source code of the program.

At the same time, large programs are based not only on source code as such but also on ideas, algorithms, methods, techniques, and specific structures, which distinguishes them from other similar works. This allows monopoly companies with a significant turnover of money to patent the technical implementation of the idea, creating for competitors with "open source" difficult conditions for the development of their own software products, which protects the results of their creative activities.

For example, patent law is actively used to protect the development of certain procedures and protocols by Microsoft, Hewlett-Packard, IBM, Apple. These corporations, carrying out a mutually beneficial exchange of licenses for these developments, have the opportunity to produce interoperable software, i.e., one that can work with different software products on different logistics. Of course, such software is in greater demand in the market, limiting access to it by

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[94] Fitzgerald, Brian. "The Transformation of Open-Source Software." *(MIS Quarterly* 30, no. 3 (2006)): 587-98. Accessed March 4, 2021. doi:10.2307/25148740.

[95] MANBECK, HARRY F., and THOMAS G. FIELD. "Software Patents." (*Issues in Science and Technology* 8, no. 2 (1991)): 20-22. Accessed March 5, 2021. http://www.jstor.org.skaitykla.mruni.eu/stable/43311158.

companies that develop open-source software. One of the monopolists in the computer software market is Microsoft and Apple, a developer of closed source computer software.

Analysts estimate that the operating systems it develops run about 90% of all personal computers in the world. Open-source computer programs are moving much slower in the market than closed source computer programs. The main reason for this is the receipt by computer programs with a "closed" code of patent protection. This is confirmed by the Open-Source Initiative (OSI), which has officially acknowledged that "licensing has become a significant barrier to the distribution of open-source software" ("License Proliferation").

Realizing this, open-source software companies, on the one hand, are taking steps to counter the existing "closed" code monopoly, and on the other hand, are increasingly inclined to apply the mechanism of patent protection of computer programs in order to eliminate existing licensing conflicts. Thus, the current demands of the computer software market are forcing open-source software developers to apply patent protection for their products. As already mentioned, there are different approaches to the possibility of applying patent protection for computer programs.

Therefore, the issue of creating the same mechanism for protecting computer programs in different countries is relevant today. One of the EU's latest steps has been to try to align its patent law with that of its main competitor in the software market, the United States.

The European Commission has developed a draft EEC Directive "On the patentability of computer-implemented inventions." The directive aimed to protect the intra-European market and European software companies. Therefore, the European Commission, considering "compliance", did not provide for the transition to American standards on the criteria of patentability (any functional (utilitarian) invention is subject to patenting).[96]

Thus, the draft Directive enshrines more stringent (European) criteria for the patentability of inventions than those in the United States, which will not allow American computer software developers to easily obtain the protection of their intellectual property in the EU, on the one hand, and on the other - patent restrictions would restrict US free access to the use of European developments.

However, EU Member States have reacted ambiguously to the possibility of the European Parliament adopting the directive - the interests of large open-source software companies have

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[96] Pila, Justine. "SOFTWARE PATENTS, SEPARATION OF POWERS, AND FAILED SYLLOGISMS: A CORNUCOPIA FROM THE ENLARGED BOARD OF APPEAL OF THE EUROPEAN PATENT OFFICE."
The Cambridge Law Journal 70, no. 1 (2011): 203-28. Accessed March 8, 2021. http://www.jstor.org.skaitykla.mruni.eu/stable/41300949.

again clashed with the interests of small producers, who will not be able to compete with patent holders if the directive is adopted.[97]

The negative impact on the development of small and medium-sized businesses in the field of computer technology was crucial for the European Parliament's decision on the future of the Directive.

For example, on June 21, 2005, the European Parliament decided to suspend consideration of the draft Directive on the patentability of computer-related inventions. That is, the arguments for and against the EU Directive lay in the purely economic sphere, not in the patentability of inventions related to computer programs. At present, at the legislative level, the issue of patent protection of computer programs in European countries remains unresolved.

Ukrainian scientist M.V. Selivanov notes that soon computer programs will be mainly protected by the institute of copyright. Of course, this point of view can be taken into account. However, this does not mean that copyright is the only effective mechanism for the legal protection of computer programs.

The conducted historical and legal analysis of the development of legal protection of legal protection of software allows me to state that the main factors of its formation are:

1) harmonization of legislation of industrialized countries in the field of protection of intellectual property;

2) stable development of the information technology market in the world;

3) expanding the scope of computer programs;

4) rapid updating of technologies in the field of programming with extensive use of object-oriented programming;

5) the world's only approach to standards and protocols for storing and exchanging information. On the example of the EU, it can be concluded that the mechanism of the legal protection of a computer program is gradually going beyond copyright.

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[97] Opinion of the Economic and Social Committee on the "*Proposal for a Directive of the European Parliament and of the Council on the patentability of computer-implemented inventions*" (COM(2002) 92 final — 2002/0047 (COD)) *Official Journal C 061 , 14/03/2003 P. 0154 – 0163.* Accessed March 10, 2021, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52002AE1031

2.7. Software piracy and License misuse
2.7.1. U.S. region statistic report

According to data BSA (The Software Alliance, U.S.), software piracy is a common issue that exists in every area of human life, schools, businesses, even universities, stolen applications, and reverse-engineered source code to recreate original software.[98]

The Software Alliance, which has headquarters in U.S., Washington D.C, regulates and access data from the whole world and international organizations representing leading developers and software designers and cooperating with governments for strength protection.

Generally, issuing report once per 2 years, but pandemic COVID-19 makes changes in the area, and the last and full report issued only in 2019. According to the report found the use of unlicensed software, downloaded from popular (illegal) torrent trackers, etc. Unlicensed software booming, according to private software developers in 2020.

Definition of software piracy – describe that users and legal entities using unlicensed copies of computer programs. Illegally downloaded or upload into the torrent trackers with cracks malware, (modified source code) that seeing that its legal and licensed copy.

The United States of America use 5 federal acts to Legal Protection of Software:

1) Senate Bill S893, signed by former President J. Bush in October 1992, elevated protection from a misdemeanor (which less punishable crime) to a first-degree felony:

"if 10 or more illegal copies of software are made within six months, and if the copies are worth a total value of over $2,500. The first offense is punishable by five years in prison and a fine of $250,000. The second offense is punishable by up to 10 years in prison."[99]

2) United States Copyright Act, 1976, punish hackers for illegal reproduction, according to civil law procedure up to 100,000 $ per one infringed title[100];

3) No Electronic Theft Act[101], the federal law passed in 1997, main points of software protection down below,

"The NET Act made criminal the willful infringement of copyrighted works, specifically by electronic means, even when the infringing party derives no direct financial benefit from

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[98] "The Software Alliance Report", (U.S. online database), accessed March 12, 2021, https://reporting.bsa.org/r/report/add.aspx?src=us&ln=en-us.

[99] "Senate Bill S893, A bill to amend title 18, United States Code, to impose criminal sanctions for violation of software copyright", (original online base of U.S. Congress, 102nd Congress 1991-1992), accessed March 13, 2021, https://www.congress.gov/bill/102nd-congress/senate-bill/893.

[100] "United States Copyright Act, Title 17, contained in U.S. Code, 1976", accessed 27th of March 2021, https://www.copyright.gov/title17/.

[101] "No Electronic Theft Act, 111 STAT. 2678", December 16th 1997, original online base of U.S. Congress, accessed March 13, 2021, https://www.congress.gov/105/plaws/publ147/PLAW-105publ147.pdf.

the infringement. Through this act, somebody who made copies of software and distributed them through a web site, for example, was now liable for damages. If the copyrighted works copied had a total retail value of over $1,000, the infringing party could be imprisoned for up to 6 years."

4) Digital Millennium Copyright Act, is 1998 federal law and one of the most effective legal tools for protection software in U.S. law. The law, makes illegal code-cracking, modifying without consent and resell hacked software and upload to websites, torrent trackers, etc.[102]

5) Law enforcement of preventing copyright infringement, Federal Bureau of Investigation special unit and U.S. Attorney division[103],

"The Justice Department has created a Computer Crime and Intellectual Property Section and designated procedures in every U.S. Attorney's Office to handle software piracy cases. The FBI has formed high-tech crime units in a number of regions (including Silicon Valley, home to the largest high-tech crime unit in the country) and is cooperating with local law enforcement officials in order to combat computer crime."

According to the official statement of the Software Alliance (BSA), research shows nearly 35-40% percent of all computer applications, IOS/Android apps, and software is not licensed and legal entities losing approximately US$46 billion per year due to illegal use, statement BSA to E-Commerce Times.

Revenera Compliance Intelligence, published in 2019 essential report that gives full view and scale of copyright piracy. This company is collecting evidence of unlicensed software use from 194 of 195 countries (only North Korea is the only country without piracy data).[104]

Revenera compliance provides the best data according to the illegal use of unlicensed products and pirated software products.

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[102] "United States. Congress. Senate. Committee on the Judiciary. The Digital Millennium Copyright Act Of 1998" : Report Together with Additional Views [to Accompany S. 2037). [Washington, D.C.] :[U.S. G.P.O.,], 1998, accessed March 20, 2021, https://www.copyright.gov/legislation/pl105-304.pdf

[103] "Federal Bureau of Investigation, Official information about White-Collar Crimes, IP Theft, 2012", accessed March 23, 2021, https://www.fbi.gov/investigate/white-collar-crime/piracy-ip-theft.

[104]"Revenera Compliance Intelligence", published on website in 2018, accessed March 24, 2021, https://www.revenera.com/blog/software-monetization/software-piracy-stat-watch/.

Down below you can see a list of top 20 the most software pirated countries, according to Revenera data.

Top 20 Software License Misuse and Piracy Hotspots

Based on aggregate data from Revenera Compliance Intelligence, these are the top 20 countries using pirated software as of Q2 2019:

(Figure No. 3, from Revenara compliance report 2019, accessed March 24, 2021, https://www.revenera.com/blog/software-monetization/software-piracy-stat-watch/)

According to data the top 3 the most piracy countries – China, Russia and U.S., as well as Ukraine in top 5, which gives direct purpose of changing Ukrainian legislation and prevent users from use pirated products and protect software developers.

Back in 2015, the Ukraine 2020 Sustainable Development Strategy defined a reform of intellectual property protection based on the security vector, protection of IP'rs, software and computer programs, focused on ensuring the security of the state, business, and citizens, security of investments, and intellectual private property. On June 1, 2016, the Cabinet of Ministers of Ukraine approved the Concept of reforming the state system of the legal protection of intellectual property in Ukraine.

The concept, among other things, provided for the replacement of the three-tier system of public administration in the field of intellectual property with a two-tier one.

In 2019, a draft National Strategy for the Development of Intellectual Property was presented, emphasizing, in particular, the need for institutional reform of intellectual property. As part of the implementation of the Concept, on June 16, 2020, the Verkhovna Rada of Ukraine

adopted the Law of Ukraine №703-IX "On Amendments to Certain Legislative Acts of Ukraine Concerning the Establishment of a National Intellectual Property Body" (hereinafter - the "Law").

On October 14, 2020, this Law entered into force. The two-tier system of the legal protection of intellectual property in Ukraine introduced by the Law provides for the establishment of:

1) the National Intellectual Property Authority of Ukraine (NIPO) - a state organization exercising powers in the field of intellectual property and public functions (authorities) for the implementation of state policy (for example, the issuance of protection documents for objects of intellectual property rights), will ensure the formation and implementation of state policy in the field of intellectual property;

2) High Court of Intellectual Property, only one jurisdiction, which review every IP case in Ukraine with 21 highly qualified judges.

(Figure No. 4, from Revenara compliance report 2018, accessed March 25, 2021, https://www.revenera.com/blog/software-monetization/software-piracy-stat-watch/)
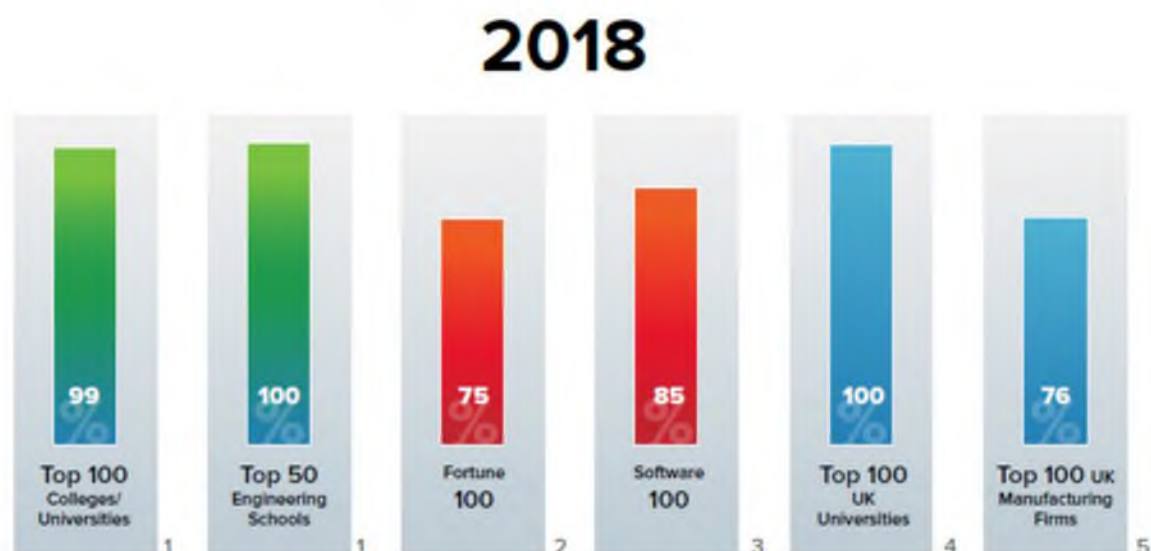
Figure No. 4 from the Revenera report, described the percentage of the most illegally used software, not by individual users, but legal entities and educational institutions, even Universities.

Basically, it's Technical Schools, engineer specialties, or architectural, which need direct use of expensive software. Even basic products such as Microsoft Office + Microsoft Windows 10 cost more than 150 euro per software unit. The crucial price for software products pushes education institutions to use illegal copyright activators, (which activate such products with hack algorithm, "KSM", "ActivatorTool", and other illegal programs of copyright infringement).

2.7.2. EUIPO software piracy report, comparison and thoughts

EUIPO in December 2020 publishes a huge analytical report: *"Online Copyright Infringement in the European Union"*. The report gives a title-level study of infringement in the EU by countries, users, and losses of software developers.[105]

According to an analytical team of EUIPO, piracy remained a significant problem, more in some Members than in others. From 2017 to 2018, piracy decreased by 15%.

The situation in the EU slightly better in comparison to the U.S. Better level of protection and enforcement agencies by the Member States provides efficient protection of the software developers, designers, and online films, music, and entertainment industries.

Figure 1. The trend in EU piracy 2017-2018
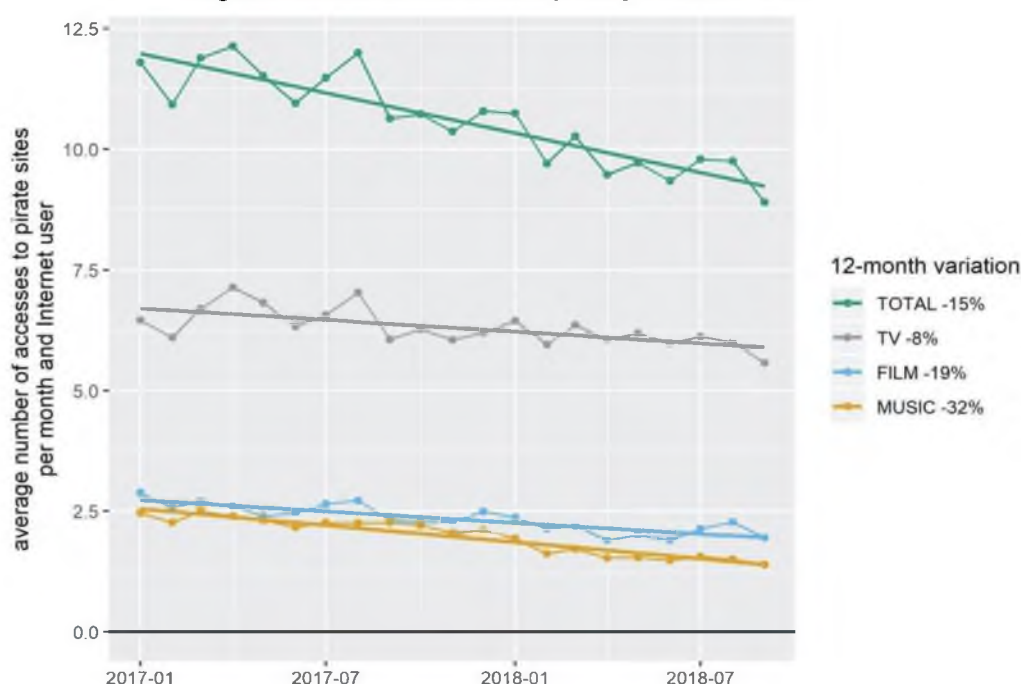
(Figure No. 5, EUIPO Copyright Infringement data, December 2020, accessed March 26, 2021,https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/reports/2020_Online_Copyright_Infringement/2020_Online_Copyright_Infringement_in_the_EU_Title_Level_Study_FullR_en.pdf)

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[105] EUIPO, *"Online Copyright Infringement in the European Union, Music, Films and TV, trends and drivers"*, 2017-2018, accessed March 25, 2021,
https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/quantification-of-ipr-infringement/online-copyright-infringement-in-eu/online_copyright_infringement_in_eu_en.pdf

Council Directive 2009/24/EC of 23 April 2009 on the legal protection of computer programs provides and defines a basic minimum level of protection computer programs, but lacks to mention or define software definition in the Member States. According to Art. 1 of the Directive:

> *"Member States shall protect computer programs, by copyright, as literary works within the meaning of the Berne Convention for the Protection of Literary and Artistic Works..."*

Copyright protection standard type of legal protection on an international level too. The Berne Convention for the Protection of Literary and Artistic Property is the basis for the international protection of software and reflected in TRIPS Agreement, which Art. 10(1) describes that computer programs shall be protected as literary works under Berne Convention.

After studying the analytical material, the author concluded that the software needs effective legal protection and read the statistics presented in this section. New legal mechanisms need to be put in place to ensure effective protection, as piracy sites and torrent trackers are often located abroad and are virtually inaccessible to national intellectual property authorities, and sanctions are not always an effective solution.

The Republic of the Lithuania[106] and Ukraine are countries with leading IT development in the region and ensuring effective protection are crucial, which will increase the economy and improve the income of companies.

Statistics indicate that individual users of Lithuania and Ukraine use illegal copies of the software, but do not indicate that the software was posted on the websites by Chinese and Russian software hackers, who have hosted on their territory.[107] (illegal trackers such as: "RuTor.org", "BitTracker", "Zengone", "PirateBay", etc.)[108] Developers of illegal copies of software should be combated, not end-users. The data are confirmed by the analytical center of the BSA.

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[106] Andrada Fiscutean, "The rise Lithuania as a force in IT: Why Google and Nasdaq investing here*?"*, (*ZDNet news platform*, June 4 2015), accessed March 26, 2021, https://www.zdnet.com/article/the-rise-of-lithuania-as-a-force-in-it-why-google-and-nasdaq-are-investing-here/.

[107] Lewis, James. "Report. Center for Strategic and International Studies" (CSIS), 2020. Accessed March 27, 2021. doi:10.2307/resrep24249.

[108] Oberholzer-Gee, Felix, and Koleman Strumpf. "File Sharing and Copyright." (*Innovation Policy and the Economy* 10, no. 1 (2010)): 19-55. Accessed March 28, 2021. doi:10.1086/605852.

3. The international experience of Legal protection of Software
3.1. Legal protection of intellectual property rights to software in the Anglo-Saxon (Common Law) legal system, case law

The legal protection of computer software is very important for all developers. This is dictated by market demands, so the issue of the proper legal protection of computer software should be given close attention. It is worth noting that the legal protection of computer components has existed for a long time. Although neither the inventor of the "analytical machine" Charles Babbage nor the first programmer Countess L. Lovelace did not deal with the legal protection of their ideas. However, G. Hollerith already patented his statistical tab, having received US patents № 395781, 395782, and 395783 from January 8, 1889. J. Atanasov was unable to patent his computer "ABC" because of the war that began.

Which eventually led to priority trials. It is noteworthy that in the first post-war decades there was a very strong distrust among patent specialists for new computer technology with its seemingly purely mathematical rather than practical orientation. At the same time, software developers were denied recognition and protection in the first place.

The problem was not the insufficient creative level of software developers, but rather the fact that legislators, patent office workers, and jurists had too little difficulty in making appropriate laws in this area. And if the hardware, i.e., new schemes, and designs of computing devices, were patented without any problems, the presence of software in the application materials immediately caused the rejection of such an object of the invention. In this context, it is interesting to consider the specifics of the legal protection of computer software on both sides of the Atlantic.

The choice of these countries, the United States and the United Kingdom are due to the fact that they created the first electronic computers and the fact that both countries belong to the system of so-called case law when court decisions directly affect the further interpretation of laws. that is, the judicial system performs, in addition to law enforcement, also a law-making function. Today, computer programs are recognized as copyrighted in most foreign countries.

The first legislative precedent took place in the Philippines, where copyright reform was classified as a protected scientific work by Decree № 49 of 14 November 1972.[109] Among industrialized countries, the first special rules on the protection of computer software by copyright were established by the United States in 1980 in the Copyright Act on computer programs.

Their example was soon followed by Australia in 1984, France, United Kingdom, Japan, Germany in 1985, Spain in 1987, Canada in 1988, China in 1990, and so on. Computer software

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[109] "Presidential Decree, № 49", Philippine and Jurisprudence legal database, Malacanang, Manila, accessed March 29, 2021, https://lawphil.net/statutes/presdecs/pd1972/pd_49_1972.html.

rights as copyrights in most countries arise from their creation, regardless of registration or other formalities.

In some countries, it is possible to register computer programs, but such registration is not legal in nature. This position is mainly adhered to by the member states of the Berne Convention for the Protection of Literary and Artistic Works, signed on July 24, 1971.[110] Another position was held before acceding to the US Convention, where copyright law has long required registration which works. In fact, registration was not usually a condition for the legal protection of a work, but gave the right to sue for copyright infringement, i.e., the right to judicial protection.

With the accession of the United States in 1989 to the Berne Convention, this rule was abolished, but mandatory registration remains for works first published before 1989. Among the international agreements and acts that determine the legal protection of computer programs, the main there are some:

• Berne Convention for the Protection of Literary and Artistic Works, 1971;

• World Copyright Convention 1952, as amended in 1971;

• Directive 2009/24/EC on the legal protection of computer programs;

• WIPO Copyright Treaty 1996, etc.

Since in Ukraine, as in most countries of the world, computer programs are protected as literary works, all the rules of the Berne Convention apply to computer programs, authors-programmers, and persons who have the copyright to these programs.

The Berne Convention provides for the legal protection of works (and computer programs as well) regardless of their copyright registration, publication, publication, or other formalities. In addition, works are protected not only in the country of origin or citizenship or residence of the author but also in all other countries.

The term of copyright protection is the life of the author and 70 years after his death. The 50-year term of protection established by previous editions of the Berne Convention was changed to 70 years due to the increase in life expectancy in the world, which required an extension of the legal protection of the rights of authors and their heirs.

The Convention establishes the basic exclusive property rights of the author of a work or a copyright holder, and the intangible (moral) rights of the author, as well as the cases in which the author's consent to the use of the work is not needed. Another important activity in the field of copyright protection is the World Copyright Convention of 1952, as amended in 1971 (Geneva

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[110] "World Intellectual Property Organization. 1982. *Berne Convention for the Protection of Literary and Artistic Works: texts.* [Geneva]": World Intellectual Property Organization. Accessed April 1, 2021, https://www.wipo.int/treaties/en/ip/berne/.

Convention), which provides that all works published outside the contracting state with the mark © and the year of the first issue shall be deemed to be protected by the copyright of a Contracting State, regardless of the formalities required by its copyright law.

The Convention establishes equality between authors who are nationals of a Contracting State and authors who are not its own nationals, prohibiting any formalities from being imposed on nationals of another Contracting State if such requirements are non-existent for their own nationals. The Geneva Convention also sets a minimum term of copyright protection for the life of the author and 20 years after his death and stipulates that this period may not be reduced by the law of a Contracting State.

If the term of copyright is calculated regardless of the term of the author's life, it cannot be less than 25 years from the date of the first publication of the work. The Geneva Convention defines the exclusive right of the author of a translation, to publish translations and to authorize the translation and publication of translations of works protected under it, as well as to limit restrictions on translations of works and the right to publish such translations.

The most important act in the field of the legal protection of computer programs is Directive 2009/24/EC on the legal protection of computer programs. This Directive is based on a number of preconditions set out in the preamble to this Directive. Article 1 stipulates that the Member States must protect computer programs by copyright as works of literature in accordance with the Berne Convention for the Protection of Literary and Artistic Works.[111]

Protection under this Directive shall apply to computer programs in any form. The ideas and principles underlying any element of a computer program, including the elements underlying its interfaces, are not protected by copyright. Therefore, the Directive reiterates that legal protection by copyright is given to the form of expression of work (computer program) and not to its content or the ideas contained therein. A computer program is subject to protection if it is the result of the author's own intellectual activity. No other criteria are used to determine its protection. The tendency to refuse to patent inventions related to computer software was especially evident in the decisions of US courts, where courts have long held the position that the actual computer software is not an object protected by § 101 of the Patent US law.[112]

The turning point in the issue of recognizing the patentability of computer software in the United States occurred in 1969 as a result of a court decision in the "Prater case". The Patent and Trademark Office denied the applicant a patent for a general-purpose computer programmed with

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[111] "Philosophical Justification of Copyright Protection in Regard to The International Treaties and The Eu Law". (*Krytyka Prawa*. Niezależne Studia Nad Prawem, *Krytyka Prawa*. Niezależne studia nad prawem, 10, no. 2 (2018): 573-593.Accessed April 3, 2021, doi:10.7206/kp.2080-1084.221.
[112] "Requirements of 35 U.S.C. 101 [R-10.2019]", US legal online base, accessed April 3, 2021, https://www.uspto.gov/web/offices/pac/mpep/s2104.html.

the new program. The court also found that the introduction of a new program into a known computer will turn this general-purpose computer into a specialized one, which together with the way in which it works (i.e., with a new program running in it), can be patented when compliance with the usual requirements of novelty, usefulness, and non-obviousness.

In the case of Diamond v. Diehr, The U.S. Supreme Court ruled in 1981[113] that simply incorporating a non-patentable object into a method that is otherwise patentable does not make that method generally non-patentable. Because the claims in the patent issued by Mr. Deere contained calculations, the focus of the analysis of the claims on inventions embodied in the computer returned to the presence of a mathematical algorithm in the claimed object.

Two decisions of the District Court of the District of Columbia (USA) played a special role in the transition to the current state of affairs in the field of computer software protection. The decision in AiarraO in 1994 said that the mathematical essence of the case may be nothing but a non-patentable abstract idea, but with the possibility of practical application (i.e., implementation of this abstract idea in the algorithm based on it) the essence of the case may to become in accordance with the law, and therefore to fall under patent protection.

In the same year, the "Lowry" case considered the refusal to grant a patent on an application describing a machine-readable storage medium for storing data selected by an application running in a data processing system containing a data structure that stored in this memory, and the hierarchy of characteristic information objects, i.e., specific interdependent labels, with which the search for information was sharply accelerated. The court found that the data structure stored in computer memory may be patentable as a product, such as a floppy disk.[114]

The court rejected the opinion the Patent Office of the Patent Office on the structure of the data as a simple "imprint". In 1997, this application was granted U.S. Patent No. 5,664,177 for "memory for storing data for sampling by an application program running in a data processing system." Such memory contains a data structure that is stored in it, with information stored in a database used by the application.

The data structure contains: many characteristic information objects, each of which contains different information from the database; the only state and a sign information object for each of the sign information objects, so that between each sign information object and its holding sign information object there is a fixed ratio, and each of the sign information objects has a fixed ratio only with one other characteristic information object, due to which a hierarchy of many

[113] "*Diamond v. Diehr*, 450 U.S. 175 (1981)", US Justia Supreme Court legal online base, accessed April 4, 2021, https://supreme.justia.com/cases/federal/us/450/175/.
[114] "*In re Lowry*, 32 F.3d 1579 (Fed. Cir. 1994)", accessed April 5, 2021, https://casetext.com/case/in-re-lowry-3.

characteristic information objects is established; the reference feature information object for at least one of the feature information objects, while the reference feature information object is in a non-hierarchical relationship with the holder feature information object for the same feature information object, and is also one of the set of sign information objects, while sign information objects, for which there are only state sign information objects, are called elemental information objects, and sign information objects, for which there are also reference feature information objects - relational information objects;

The apex information object that does not have a fixed relationship with any of the characteristic information objects, but at least one of the characteristic information objects has a fixed relationship with an apex information object.

The above translation of the claims according to US patent № 5664177 should demonstrate that the object of the invention was indeed the structure of a computer database. On the basis of these and some other court cases, new rules of the Patent Office for the consideration of computer-related inventions have been developed and entered into force on March 29, 1996. with substantive law, and not only to determine whether the essence of the claims falls under the definition of a patentable invention ("new and useful method, the machine, or product composition or substance new and useful improvement" § 101 of the US Patent Law).

It is important that these rules instruct experts to begin their consideration by examining all the materials, including a detailed description of the invention, any specific embodiments considered, the claims and any benefits intended for the invention, and not simply to revise the claims, to determine whether it contains a mathematical algorithm.

As for the actual mathematical algorithms, there are two main factors: the presence of physical transformations that occur outside the computer, and the presence of signs of its use. Said physical transformation in the claims should generally consist of physical actions performed outside the computer, including the manipulation of physical objects, from which follow the steps performed by the computer.

Preference is given to the claims, which contain, in addition to computer processing steps, computer-aided steps that require the manipulation of data that constitute physical or object objects. When the claims contain a mathematical algorithm as one of its features, it must satisfy the Freeman-Voltaire-Abel test.[115]

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[115] "United States Court of Customs and Patent Appeals—*In re Freeman*, 573 F.2d 1237 (C.C.P.A. 1978), *In re Walter*, 618 F.2d 758 (C.C.P.A. 1980); and *In re Abele*, 684 F.2d 902", (C.C.P.A. 1982), accessed April 6, 2021, https://en.wikipedia.org/wiki/Freeman-Walter-Abele_Test.

According to this test, if a mathematical algorithm is directly or indirectly indicated in the claims, it is determined whether the claims are directed to a mathematical algorithm that does not apply to the physical steps or elements of the method and is not limited to them. It is recognized that the application of a mathematical algorithm to physical elements can be not just an act of data collection before the application of the algorithm and not just a minor action after the decision.

For example, it is recognized that any mathematical algorithm requires input data in some form, and if the input values are not involved and are not converted in any way, then simply collecting inputs to process them with a mathematical algorithm in the general case will not conform to the claims of the law without something else. In addition, it is recognized that the simple display of the results of calculations does not yet provide the law-relevant claims containing a mathematical algorithm.

However, the conversion of the results of calculations into electrical signals having a finite physical manifestation, in the general case, is sufficient to comply with the claims of the law. All this indirectly indicates that when deciding on the patentability of computer software in the United States comes to the fore the technical nature of the patented software in the claims. In fact, it is the technical nature of the mathematical algorithm, as it is easy to see, is tested in the Freeman-Voltaire-Abel test, and it is the technical nature of the software that needs to be mentioned in the new rules of the US Patent Office.

And it is the technical nature of software products that judges saw in all the above-mentioned court decisions. In the Lowry case, according to the court, in previous cases of deviation of printed material, the claims were used, which determine certain new arrangements of printed lines or characters, useful only for the human mind and which are perceived only by them. In the case of Lowry, the invention requires that the information be processed not in the mind, but by the machine, the computer. It follows from the court's decision that the data structure stored in accordance with the present invention greatly facilitates data management in data processing systems and is not simply a print of text.

This is, so to speak, an extremely "left" approach to the issue of patent protection of computer software in the United States. As we can see, court decisions force the US Patent Office to deviate from the statutory principles of the approach to assessing the patentability of inventions related to computer software.

As a result, in the United States, patent protection is established for objects that have traditionally been protected by copyright. In this matter, the New World still confirms its name. The situation is different in the Old World, in the UK. If before 1977, when the current Patent Act was adopted, the British Patent Office was quite liberal in issuing patents for inventions related to software, then the practice became more restrictive.

Examples are just two cases before the UK Patent Court, "Fujitsu, and Raytheon"[116]. In the Fujitsu case, the court's decision reads as follows: "The exception to the patent is the essence, not the form. Therefore, the exception under Part 1 (2) of the Law applies to any type of passive medium or record of an excluded object. Yes, only because a sheet of paper is in principle patented (except when it has no novelty), it is unacceptable, for example, by writing a literary work (or computer program) on a sheet of paper, then ask for a patent monopoly for of this paper containing the recorded work. Similarly, it is unacceptable to ask for protection for a computer program without anything else, if it is stored on magnetic media or simply downloaded to a computer. At first glance, a computer running one program is different from a device running the same computer running another program.

It follows that the claims on a computer-controlled by a program, or on a method of controlling a computer by a program, or on a method of performing a process by using a computer-controlled in this way may be the subject of patent protection. However, because the court considers the essence, not the form, it is not enough for the developer to create a new program and simply place it in one of these objects to ask for protection for his work.

The court or the Patent Office should pay attention not to the fact that the program controls the computer, but to what the computer does in this way. Therefore, a data processing system that works to obtain a new result should not be deprived of protection on the grounds that it is a program "as such".

However, even if the program forces the computer to work in a new way, you still need to look at what exactly the computer does, that is, the essence of the process. If everything that is done is essentially one of the activities defined in Part 1 (2) of the Law as unguarded, then the system will be unguarded. "

In view of this decision, the UK Patent Court rejects innovations such as patenting media with software recorded on them and allows the protection of software if it is part of a method performed by a computer or is part of a computer. In this case, as in the United States, the court requires the technical nature of the claimed software.[117]

Consider, however, how the manifestations of English conservatism were reflected in the second of these cases. The invention of "Raytheon" presented a method of recognizing ships by their silhouettes (outlines). The image of the ship was analyzed by the invention and compared with the silhouettes of famous ships placed in the database. The analysis included the division of

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[116] *"Fujitsu's Application"* [1997] EWCA Civ 1174 I, UK Casemine legal database, accessed April 7, 2021, https://www.casemine.com/judgement/uk/5a938b3d60d03e5f6b82b953.

[117] Cohen, Julie E., and Mark A. Lemley. "*Patent Scope and Innovation in the Software Industry.*" (California Law Review 89, no. 1 (2001)): 1-57. Accessed April 8, 2021. doi:10.2307/3481172.

the silhouette into several vertical stripes, in each of which the height of the ship was given by a number.

These numbers were then compared with the numbers in the database to identify the ship. Raytheon has applied for a device to receive light signals reflected from ships and compare these signals with those available in the database, as described above. The UK Patent Court ruled that the invention for the identification of ships was a mental activity, regardless of whether the human brain would identify the ships in any other way.

The Patent Office, repeating this decision, ruled: "If the invention performs an operation that can be done in the human mind, even if it does so in another way, the patent will not be issued." Here is what the judge says in his decision: "I accordingly recognize that the words 'mental activity' must be interpreted as they are understood in ordinary language. Mr. Jackson was then going to point out that the performance of mental activity involves a conscious process: something intentional, done in the mind.

"However, I am not ready to take these words in any limited sense. I have lived for many years since I learned that seven out of eight would be fifty-six. With the help of an analytical process could show how the result turns out. This is truly a mental activity. But if I meet a friend on the street and recognize him, it's hard to explain in words why.

When recognizing an object, the same comparison is performed as in the mind, but it is done electronically. This demonstrates the mental process better than the recognition of the orange, which I used as an example. The process that actually takes place can be expressed in words and is set out in paragraph 8. It is comparable to the process that results in seven out of eight being fifty-six ....)"

As we can see, the Patent Court of the United Kingdom not only blocked the invention of "Raytheon" but also gave a definition of mental activity, it does not matter that in the machine similar actions can be performed differently than in the human mind.[118]

It is important that they can be performed in the mind at all, and therefore cannot be the object of an invention. With such a question, it is strange how to understand the possibility of patenting inventions related to computer programs, since all the calculations in their basis can be performed in the mind, to put it another way, in terms of this court decision cannot be patentable objects. It seems that in assessing the patentability of inventions related to computer programs, the British court demonstrates traditional English conservatism, preventing the patenting of those unconditionally technical solutions that are entirely within the scope of the current Patent Act.

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[118] "Raytheon decision about decline of patentability", (*Pinsent and Mason law firm*, 2007), accessed 8th of January 2021, https://www.pinsentmasons.com/out-law/news/raytheon-inventions-are-programs-and-not-patentable-says-high-court.

3.2. Legal regulation of protection of intellectual property rights to a Computer Software in the European Union through Directive 2009/24/EC

The essence of computer program is one of the newest and most complex objects of copyright. It is an important component of modern trade relations, a commercial commodity, and the formation and development of its legal protection are marked by a certain uniqueness at the national, regional, and international levels. There are several definitions of computer programs.

Thus, according to John C. Phillips, a computer program should be understood as an ordered set of commands and data to obtain a certain result using a computer. This is a fairly general and technically independent definition of a computer program. It should be noted that the legal protection of a computer program does not depend on the content and scope of the specific definition of "computer program".[119]

According to A. Bertrand[120], a computer program is the result of consistent implementation of the following stages:

1) the idea of solving this problem;
2) algorithm, i.e., a method of solving a problem according to the specified idea, which usually has the form of mathematical formulas;
3) organizational chart or plan of decision or elaboration, which reproduces the algorithm; text in a programming language such as PYTHON, JAVA, SWIFT, etc., which is also called "source program" (source code) and directly reproduces the elements of the organizational chart; text in intermediate language or "assembly language", which is easier to learn by the computer;
4) Directly computer-readable "binary" or "object program" text (object code).

A computer program in the form of source code, expressed in a programming language, is accessible to human perception, in contrast to its expression in the form of object code, which is represented as strings of ones and zeros (binary system) or numbers and letters, depending on the characteristic method of compiling the program. The use of computers, and hence computer programs, has been widespread since 1964. This was due to the advent of the IBM 380 computer.

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[119] John C. Phillips, "SUI GENERIS INTELLECTUAL PROPERTY PROTECTION FOR COMPUTER SOFTWARE", (*George Washington Law Review, Harvard Law School Journal*, 1992), accessed 10th of February 2021, https://cyber.harvard.edu/property/protection/resources/phillips_unedited.html.

[120] Bertrand A., *Protection juridique du logieiel: Progiciels, video je aux, logiciels spifiques, firmware*, (Paris: Parques, 1984), 10, 12-16.

At that time, computers (software + hardware) were offered together with programs and manuals for their use (software or software) designed to meet the needs of consumers. There was no problem with the protection of programs because the program was considered an integral part of the computer, there were no compact means of transfer and convenient ways to copy information. Gradually, the practice of selling programs "tied" to computers was abandoned.

Two independent markets have emerged, necessitating the provision of independent and adequate protection for computer programs. This practice was the impetus for the fact that for a number of years continued scientific and practical discussions, analysis of the legal nature of computer programs, addressed the question of which legal regime of protection will be most favourable and effective for them: industrial property law, copyright, or special legislation needs to be developed.

The activity of the discussion on the provision of some form of legal protection was increased by the fact that computer programs at that time were considered as a new intellectual product, the nature of which has not yet been fully elucidated.

The development of this product required large human and financial costs, which gave it significant value and, consequently, required reliable legal protection. And it should be noted that opinions are divided. Copyright experts have emphasized that a computer program is not literary or artistic.

They feared that its inclusion in the sphere of copyright would weaken the legal constructions that had come at the cost of so much effort. At the same time, research published in the first half of the 1970s had a great influence on the formation of the copyright regime for the protection of computer programs. German Professor Eugen Ulmer on behalf of UNESCO and WIPO.

Professor Ulmer compared the introduction of programs to a computer to the fixation of a work that is part of the concept of "reproduction", which is one of the exclusive prerogatives recognized by national laws by the author.

As a result of research, Eugen Ulmer concluded that a computer program can be protected by copyright. As a result of the properly expressed and reasoned position among scholars in the field of copyright, this point of view began to prevail. It has been recognized that a computer program is a work that is the result of a creative process similar to the process of creating a literary work.[121]

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[121] Miller, Arthur R. "Copyright Protection for Computer Programs, Databases, and Computer-Generated Works: Is Anything New Since CONTU?" (*Harvard Law Review 106*, no. 5 (1993)): 993-998. Accessed February 4, 2021. doi:10.2307/1341682, https://www.jstor.org/stable/1341682?seq=1.

It was noted that if the programmer due to specific internal (rules due to the program) or external (rules due to law, profession, etc.) circumstances are forced to develop the program in such a way that it leaves him no chance to show creativity, such a program is not protected by copyright. All computer programs that were part of technical solutions (industrial product, technology), which as such fall under the rules of patent law, were also removed from the field of copyright protection.

The spread of copyright protection to computer programs has provoked various criticisms, which have been as follows: a computer program is not directly human, it is essentially utilitarian in nature, as it allows an electronic device to perform a specific task or get a specific result:

a) because of this, it belongs not to the state of art, but to the state of application;

b) ideas are not copyrighted;

c) computer programs must be protected under patent law;

d) it is also necessary to protect the content of a computer program, not the form of its expression, while the form is the object of copyright protection;

e) the general term of protection granted under copyright is too long to be applied to a computer program;

Consenting a computer program to be subject to such an open international copyright regime is impractical, particularly for developing countries where it is important to create (as in the case of computer equipment) "Secure market" of locally developed programs and "functionally equivalent" computer programs to be imported; the user of computer programs must have a backup copy, which was not provided by the current legislation on copyright in relation to works; it is not possible to include computer programs in copyrighted works without violating the legal regime, which will lead to its distortion.

Proponents of the application of copyright protection to computer programs responded to these criticisms as follows: a computer program is a work of art; copyrights that provide protection against unauthorized use may be applied without restriction to computer programs.

The fact that a computer program is not directly perceptible to human perception does not prevent it from being considered on an equal footing with other works; the fact that a computer program does not belong to the state of art or aesthetics, that it has a utilitarian function and that it is expressed in the form of special code or in any other form, does not exclude the possibility of its copyright protection.

Essential need to protect the ideas contained in a computer program cannot be satisfied by subjecting it to the patent law regime, because it, like the copyright regime, does not protect the idea; the system of international copyright conventions automatically and effectively protects the

work, and it would take a long time to create a separate, equivalent international system for the protection of computer programs.

At the beginning of 1988, about 50 countries around the world recognized the computer program as the object of copyright by adopting special regulations or by making court decisions. Internationally, computer software has also been classified as copyright.

Thus, the relevant provisions were enshrined, in particular, in the Berne Convention for the Protection of Literary and Artistic Works, the WIPO Treaty, the TRIPS Agreement, and other international legal acts. In particular, under Art. 4 of the WIPO Copyright Treaty, computer programs are protected as literary works within the meaning of Article 2 of the Berne Convention.[122]

Such protection applies to computer programs regardless of the method or form of their expression. In the agreed statement concerning Art. 4 states that the scope of protection of a computer program under Article 4 of this Agreement when read in conjunction with Article 2 corresponds to Art. 2 of the Berne Convention, as well as the relevant provisions of the TRIPS Agreement. According to Art. 2 of the WIPO Copyright Treaty, copyright protection extends to the form of expression and not to ideas, processes, methods of operation, or mathematical concepts as such. Article 4 of the WIPO Treaty also applies to the following agreed statement: "The right of reproduction, as defined in Art. 9 of the Berne Convention and the exceptions permitted by this article apply in full to 0 digital environment and, in particular, regarding the use of works in digital form.

It is understood that the preservation of a protected work in digital form in an electronic environment is a reproduction within the meaning of Art. 9 of the Berne Convention "4. According to Art. 10 (1) of the TRIPS Agreement, computer programs in source and object code are protected in the same way as literary works under the Berne Convention. Similar trends in the implementation of the legal protection of computer programs by copyright have occurred in the European Community.

Thus, in the mid-1980s, the European Commission concluded that there were significant differences in the current national laws of the Member States of the Community in matters of the legal protection of computer programs.

In some countries, computer programs were not protected at all, and in those where such protection was provided, it was not the same. The national laws of some EU member states stipulated that the computer programs are protected by copyright, in others - the legal protection

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[122] "WIPO Copyright Treaty", (World Intellectual Property Organization, 20th of December 2021), accessed 9th of March 2021,
https://www.wipo.int/treaties/en/ip/wct/.

of computer programs is carried out under contract law and/or through the institution of confidential information. National legal regimes have also set different standards for the protection of computer programs.

Thus, in Germany, as a criterion for providing legal protection to this object, a high level of creativity was required when creating the program.[123] As noted above, the creation of computer programs requires a large contribution of human, technical and financial resources, while the cost of copying computer programs is only a small fraction of what is required for their independent creation.

At the same time, computer programs have played an increasing role in various industries, and computer-related technology has come to be seen as fundamental to the Community's framework development.

Significant differences in the legal protection of computer programs that existed in the national laws of the Member States had a direct negative impact on the functioning of the common market for computer programs, and these differences could increase with the introduction of the Member States of new similar legislation.

Thus, in the first place, it was necessary to eliminate significant differences and prevent the emergence of new ones. In view of this, with regard to insignificant differences between the national laws of the EU Member States, the preamble to Council Directive 91/250 / EEC of 14 May 1991 on the legal protection of computer programs states that differences which do not have a significant negative effect should not be eliminated., nor prevent their occurrence.

The White Paper on the Completion of the Internal Market (1985) and the Green Paper on Copyright and the Impact of Technology (1988), for the first time, raised the issue of harmonizing legislation on the protection of computer programs.

As a result of discussions in these publications, the European Commission is convinced that in the future directive the scope of the Community's legal work on the legal protection of computer programs should be limited, first and foremost, to the protection of computer programs. copyright in both literary works and the definition of who and what should be protected, as well as the definition of exclusive rights on which persons who are granted protection could rely on certain actions, as well as the establishment of the term of protection.

The draft future directive on the legal protection of computer programs was submitted by the European Commission to the Council of the EU and the European Parliament on 12 April

[123] Margoni T. "*The Harmonisation of EU Copyright Law: The Originality Standard*". (In: Perry M. (eds) Global Governance of Intellectual Property in the 21st Century, (Springer, Cham, 2016), 32, accessed 12th of February 2021, https://doi.org/10.1007/978-3-319-31177-7_6

1989. On December 30, 1989, the Social and Economic Committee delivered an opinion on the draft Directive. The European Parliament delivered its opinion on 17 September 1990, proposing to include provisions on decomplication in the Directive. On 20 December 1990, the European Commission re-examined the revised draft Directive, which was approved by the European Parliament on 17 April 1991. On 14 May 1991, the EU Council adopted Directive 91/250 /EEC, after consolidated and final version of Directive 2009/24/EC, 25th of May 2009 on the legal protection of computer programs. According to this Directive, computer programs are equated with literary works in terms of copyright protection.

The concept of a computer program also includes preparatory materials for its creation. Computer programs are subject to protection regardless of how they are expressed. However, the ideas and principles underlying the program and the interfaces used in it are not protected under this Directive. A computer program is protected if it is original, i.e., it is the result of the author's own work. The use of other criteria in determining the admissibility of protection of a computer program is not allowed (Article 1.3 of Directive 2009/24 /EC).[124]

The author of a computer program is considered to be an individual or a group of persons, and in some states whose national law allows it, a legal entity that is considered by this law as the right holder. That is, when a computer program is created by an employee in connection with the performance of his duties or at the request of the employer, the latter passes all exclusive property rights to the program unless otherwise provided in the contract (Art. 2.3 of Directive 2009/24 /EC).[125]

Exclusive rights to a computer program include the right to exercise or permit: reproduction on a permanent or temporary basis of a computer program in whole or in part by any means and in any form.

In the event that booting the computer, displaying data on the monitor screen, transferring, transmitting, or storing computer programs in the computer's memory require the reproduction of a protected program, its use must be authorized by the copyright holder; translation, adaptation, arrangement and any other processing of a computer program, as well as a reproduction of a computer program obtained as a result of such actions, without prejudice to the rights of persons performing the processing; all forms of distribution, including the rental of the original or copies of a computer program.

The first sale within the Community of a copy of a computer program by or with the consent of the rightsholder shall exhaust his right to distribute that copy in the Community, with

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[124] "Directive 2009/24/EC, Computer programs directive", accessed March 11, 2021, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32009L0024.
[125] Ibid

the exception of the right to control the subsequent rental or copy of that program (Article 4 of Directive 2009/24 /EC).[126]

These rights may not be opposed to the actions of a person who has purchased a computer program in good faith, the use of this program in accordance with its purpose, backup, study, and testing of the program, as well as actions to familiarize with the ideas and principles laid down in the basis of the elements of the program.

It is permissible to decompile a computer program for the purpose of developing related programs by a person who has acquired a license or the right to operate the program (Article 6 of Directive 2009/24 /EC). Provisions of contracts preventing decompilation are considered to be initially null and void (Article 7 of Directive 2009/24 /EC).

The Member States of the Community are required by national law to take appropriate measures in respect of persons who: put into circulation a copy of a computer program, realizing that it is illegal, or have reason to believe so; own an illegal copy of a computer program for commercial purposes; put into operation or have for commercial purposes any means, the sole purpose of which is to neutralize the technical means of protection of a computer program. In accordance with the general rule of Directive 2006/116 /EC, a computer program is protected for the life of the author and 70 years after his death or the death of the last co-author. This Directive also establishes the specifics of the validity of rights to copyright objects, including computer programs, depending on the relevant circumstances. All deadlines are calculated from January 1 of the year following the event.[127]

For the purpose of conducting a comparative legal analysis, let us consider, on the example of one of the EU Member States, how the provisions of Directive 2006/116 /EC have been implemented into national law. The implementation of the provisions of Directive 2006/116 /EC in Germany has taken place. Following the adoption of Directive 2006/116 /EC on the legal protection of computer programs, Section VIII (§§69a-69g) has been added to Part 1 of the German Copyright and Related Rights Act., which defines the following provisions.[128]

According to this Law, computer programs are programs in any form, including materials for their development. Legal protection was given to computer programs implemented in any form. The ideas and principles underlying any element of a computer program, including those underlying the interface, are not protected.

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[126] Ibid

[127] "Directive 2006/116/EC of the European Parliament and of the Council of 12 December 2006 "on the term of protection of copyright and certain related rights (codified version)". Accessed 9 of March 2021,
https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32006L0116.

[128] Ibid

Computer programs are protected if they are original works, in the sense that they are the result of their intellectual work. No other criteria, in particular quantitative or aesthetic, are used to determine the protection of the program.

Provisions on literary works shall apply to computer programs unless otherwise provided in Section VIII (§69a) of this Law. If the computer program is created by an employee or under the direction of the employer, the latter has the exclusive right to exercise all economic rights to the program, unless otherwise agreed between the employer and the author of the program. This provision applies mutatis mutandis to the official relations set out in Section VIII (§69b) of the German Law on Copyright and Related Rights.[129]

The exclusive rights of the owner of the rights to a computer program are set out in Section VIII (§69c) of the said Law and completely repeat similar provisions of Directive 2006/116 /EC. In particular, the right holder has the exclusive right to exercise or permit: permanent or temporary reproduction of a computer program by any means and in any form, in part or whole. Os - how many downloads, displays, runs, transfers, or saves a computer program requires such reproduction, the mentioned actions must be specified by the right holder; translating, adapting, adapting, or otherwise modifying a computer program and reproducing their results.

The rights of the person changing the program remain unaffected; any form of distribution of the original computer program or its copies, including rental. If a copy of a computer program of the European Community or another Member State of the Convention on the European Economic Area is made with the consent of the copyright holder, the right of distribution in respect of that copy shall be exhausted, except for the right to rent.

In the absence of special contractual terms, the actions referred to in the preceding paragraph do not require the permission of the owner of the rights to the program, if they are necessary for the use of a computer program by any person entitled to use a copy of the program. purpose, including debugging.

The creation of a backup copy by a person entitled to use the program may not be prohibited under the contract, as it is necessary to guarantee the use of the computer program in the future. A person authorized to use a copy of a program may, without the permission of the rights holder, observe, study, or test the operation of the program to determine the ideas and principles underlying any element of the program if he or she does so in any case. which of the actions for downloading, displaying, running, transmitting, or saving the program, which it has the right to perform (Section VIII §69d of the Law)?

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129 "German Copyright Law (Urheberrechtsgesetz, UrhG)", (German Law Archive, published 8 may 1998), accessed April 7, 2021, https://germanlawarchive.iuscomp.org/?p=855 – 69a.

The permission of the owner of the rights to the program is not required if the code is reproduced and its forms are broadcast and are carried out to obtain the information necessary to achieve the ability to interact independently created computer program with other programs, subject to the following conditions: these actions are performed by the licensee or another person who has the right to use a copy of the program, or on behalf of the person authorized to perform them; the information necessary to achieve the ability to interact was not previously available to the above persons; these actions are limited to the parts of the original program needed to achieve the ability to interact.

The information obtained through the above actions cannot: be used for purposes other than achieving the ability to interact with an independently created computer program; be transferred to others, except when necessary, to achieve the ability to interact with an independently created computer program; be used to develop, produce or market a computer program that is substantially similar in expression, or to any other act that infringes copyright.

The above provisions must be interpreted in such a way that their application does not interfere with the normal use of the work and does not unreasonably harm the legitimate interests of the owner of the rights to the program (Section VIII §69c of the Law). The rights holder may request that all illegally produced or distributed copies intended for illegal distribution be destroyed.

This provision shall apply mutatis mutandis to any means the sole purpose of which is to facilitate the improper removal or circumvention of any technical device which may be used to protect a computer program (Section VIII § 1). 69f of the Act).

The provisions of Section VIII of the Law are without prejudice to the application of other legislation on computer programs, in particular the protection of inventions, topographies of semiconductor products, trademarks, and unfair competition, including the protection of business and trade secrets, and agreements under contract law. Any provisions of the contracts that contradict the above provisions have no legal force (Section VIII §69g of the Law).

CONCLUSIONS

The widespread use of computer software in various fields of human activity has revealed a number of problems related to their legal protection and defence. The legal nature of the dualism of the software and similar terminology with computer program as an objects of intellectual property law, and its complexity from a technical point of view, to some extent contributed to the emergence of these problems.

Therefore, computer software has recently become the subject of research by legal scholars and legislative framework. The following conclusions can be drawn from the analysis of the informative material presented in the master thesis.

1. After identifying the essence and value of informational program with concept of software and computer programs, author can conclude that in the scientific papers exist homogeneity of definitions and new graphical-user interfaces intangible from original software, but easily could reverse engineered from original source. On the example of the Member States of the European Union, it can be argued that the protection of a computer program is gradually going beyond copyright in the direction of the possible application of patent protection.

2. Author after identifying historical stages of software protection could conclude that specific features of modern legal protection of a computer program are:

a) the complexity of legal protection, which can be provided by the rules of copyright and industrial property law;

b) the existence of an accelerated procedure for acquiring rights;

c) the presence of mandatory state registration of the computer program;

d) examination of the computer program to determine its feasibility and compliance with the declared functionality;

e) reduction of the term of property rights to a computer program compared to other "traditional" objects of copyright.

3. Reviewing case law author is stated that definition of the term "computer program" and absence of "software" in the Law of Ukraine "On Copyright and Related Rights" may be misleading as to:

a) the possibility of extending copyright protection to the algorithm of the program;

b) attribution of the description of a computer program to one of the forms of its expression, which is protected as an object of copyright;

c) the conditions for obtaining a computer program of copyright protection, depending on the form of its expression, functionality, the ability to perform a computer, as well as the relationship between these features. That is, the definition of a computer program, which is enshrined in national copyright law, is not characterized by simplicity, accuracy, clarity, and

reliability, which creates ambiguity in understanding, in particular, the limits of protection of computer programs.

4. Terms used to denote computer programs in the legislation of Ukraine, the legislation of the EU and other countries of the world belong to professional (technical) or special-technical terms. In the post-Soviet space, the term "computer" is common, which at the beginning of the computer age referred to complexes for calculating certain technical and mathematical problems. Today, the term "computer" refers primarily to personal, portable, and handheld computers. However, in modern information science, this term does not cover electronic devices, the construction of which uses the principles of computers and which run under the control of computer programs: cell phones, smartphones, communicators, industrial computers, digital players, etc. In addition, a modern information object that controls the operation of an electronic computing device may consist of several computer programs, software modules, libraries, and other components.

5. The internal and external forms of a computer program determine its creative nature, i.e., it's originality. At the same time, due to the formalization and standardization of programming languages, the level of originality of a computer program is much lower than the level of originality of a literary work. Therefore, the methods of determining the originality of programs and literary work should be different. Establishing the originality of the program should begin with determining which elements of the internal and external form make the program original. Preference should be given not to comparing the source texts, but to the study of the relationships between individual modules and components of the program or between its structural elements, the internal organization of the program, the architecture of its structure, and the construction of business logic.

6. To eliminate the shortcomings of the statutory definition of a software, operational system, computer program, it is necessary to formulate a new version, which would contain in a generalized form the specific features characteristic of this object of intellectual property:

a) a set of commands for the computer (instructions), etc.;

b) functional purpose with an indication of a wide hardware scope of use;

c) the form of expression without detailed specification. It is inappropriate to list all other characteristics of this object of intellectual property in the definition of a computer program.

7. Requires detailed research and further legislative regulation of the protection of preparatory materials and audio-visual displays of the computer program, as one of the forms of its expression, as well as intermediate results created during the execution of the computer program.

RECOMMENDATIONS

1. Raise to doctrinal and legislative discussion about the issue of effective protection of software not only through copyright, but with possibilities of patenting and identify new mechanisms for effective protection of computer programs. Improve its *sui generis* protection and implement effective legal remedies for efficient protection of software.

2. It is necessary to finally define the concept of computer software/software, operating system and computer program at the legislative level for EU Member States and Ukraine. The current consolidated version of EU Directive 2009/29/EC does not provide a complete picture and provides protection. Provide understanding by demarcating and defining protection boundaries for open source and closed source code.

3. To create a common understanding and unification of systems and principles of software protection between the EU Member States, Ukraine and the Anglo-Saxon (common law) system. Perceive stable harmonization and further framework in the Law of Ukraine "On Copyright and Related Rights" and protect not only the source code, regardless of whether it is open source or closed, but first of all the program and software in general, as a complex object of intellectual property rights, consisting of many interconnected elements that together make up the software.

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ABSTRACT

In this study, a legal, doctrinal analysis of the legal protection of software was conducted, the conceptual-categorical apparatus of software, a computer program was determined, the identity between them in the scientific literature was determined. The comprehensive analysis of judicial and legislative practice of EU, U.S., and Ukraine is carried out and concrete conclusions are defined.

The historical genesis of software and computer program development, legal protection of data objects as a whole complex, primary ways through the protection of Patent, and further change of Copyright were also analysed. The master thesis provided relevant statistics and further ways to improve the laws and areas of intellectual property law.

Key words: Legal protection of software, computer programs, inconsistency of definitions, legal and historical genesis of software, open and closed source code, graphical-user interfaces, software piracy.

SUMMARY

The first part of the master's thesis is devoted to defining the concept of software, computer program, and theoretical principles. This section shows the identity of understanding the concepts of software and computer program and depicts the views of Ukrainian and European scientists in this field. This part is general, which introduces the course of the scientific problem and shows the difference in the conceptual and categorical apparatus. Also, analyses possible ways to solve a scientific problem. The protection of part of the software as graphical interfaces of the program is defined and CJEU case law is given.

The second part of the paper presents the specific genesis of the development of software and computer program protection on the example of common and continental law countries. The second part is divided into micro-stages, which are arranged in chronological and historical order, which makes it clear the path of development first to patents, and only then a radical change to copyright rules for the protection of software code. The last section of the second part conducted a statistical study and analysis of software piracy and provided statistics on violations of right-holders in the United States, the European Union, and Ukraine.

The third part of the master's thesis was a practical and case law analysis of the United Kingdom, the United States, and the European Union in the field of computer program protection. Ways to renounce patents are identified and draft non-adopted directives are analysed. At the end of the work on the points formed conclusions and practical and theoretical ways to solve this problem and improve the legal protection of software and computer programs.
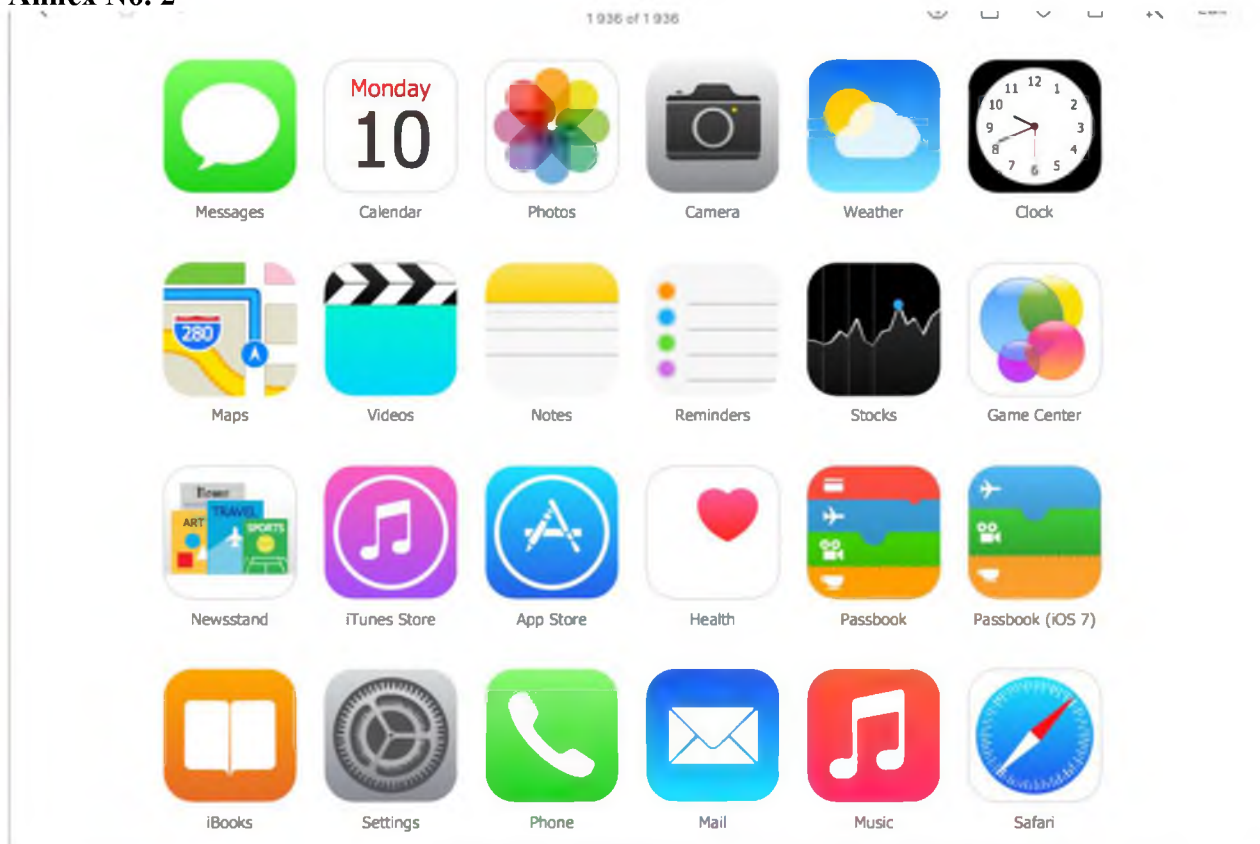
Annex No. 1
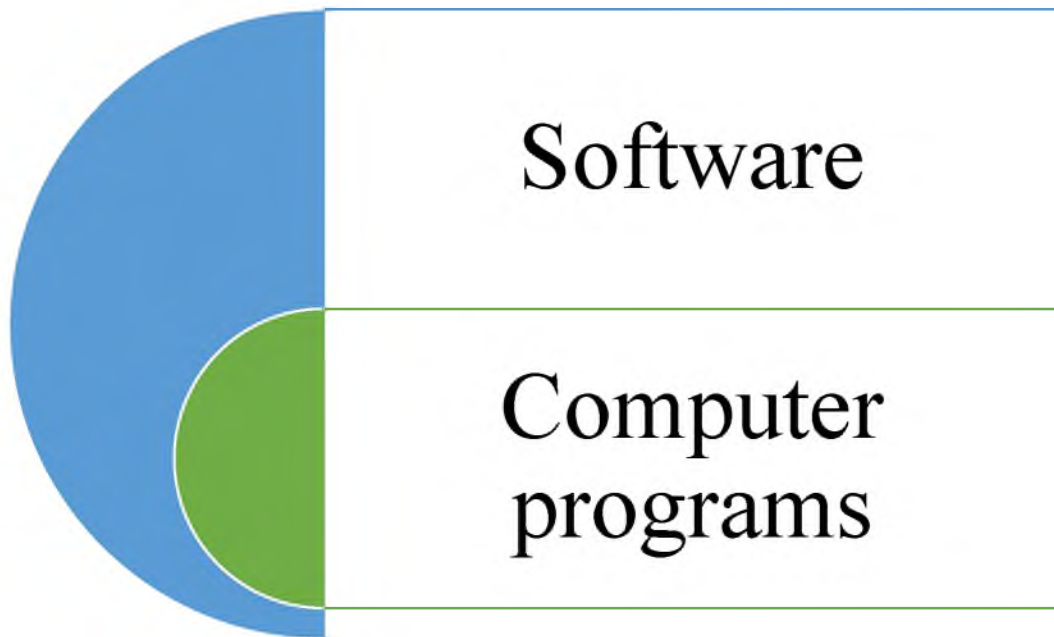
(Figure No.1 Correlations and doctrinal approaches to understanding the concept of software and computer program)

Annex No. 2

(Figure No. 2, Graphical user-interface of Apple Corporation, IOS 14.0, accessed 3 of April 2021,
https://www.apple.com/)
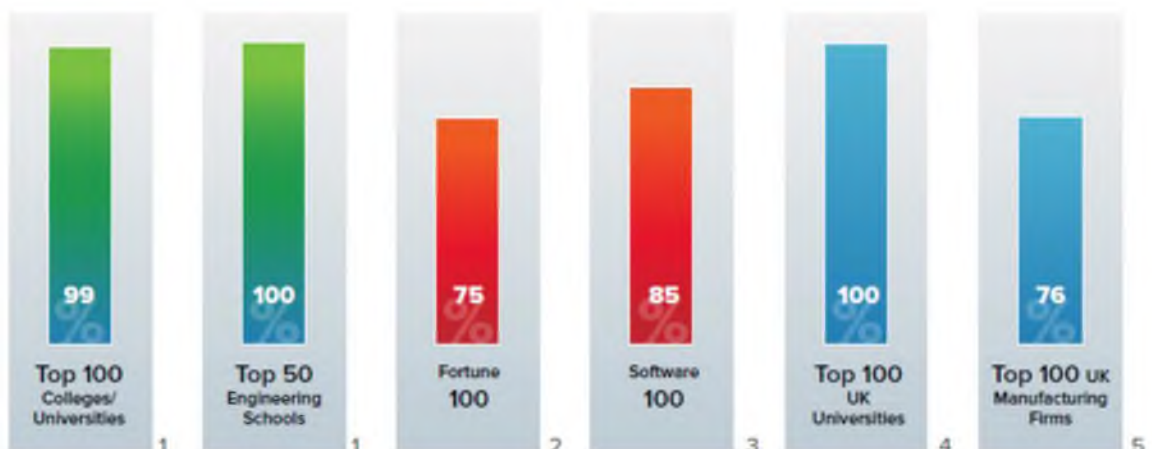
Top 20 Software License Misuse and Piracy Hotspots

Based on aggregate data from Revenera Compliance Intelligence, these are the top 20 countries using pirated software as of Q2 2019:

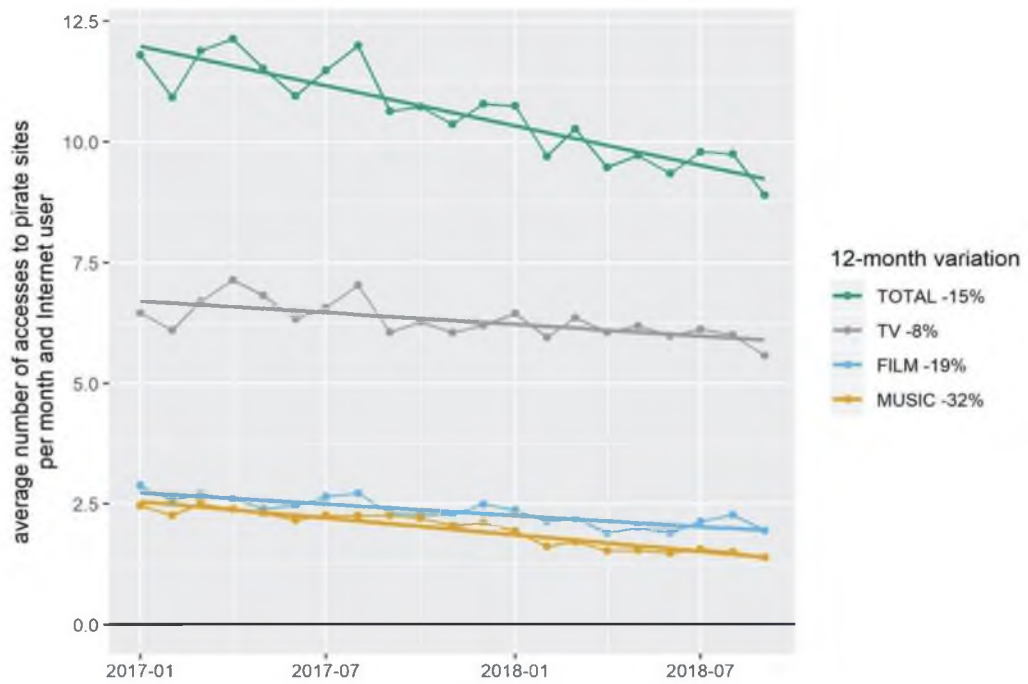(Figure No. 3, from Revenara compliance report 2019, accessed March 24, 2021, https://www.revenera.com/blog/software-monetization/software-piracy-stat-watch/)

Annex No. 4

2018

(Figure No. 4, from Revenara compliance report 2018, accessed March 25, 2021, https://www.revenera.com/blog/software-monetization/software-piracy-stat-watch/)

Annex No. 5

Figure 1. The trend in EU piracy 2017-2018

(Figure No. 5, EUIPO Copyright Infringement data, December 2020, accessed March 26, 2021, https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/reports/2020_Online_Copyright_Infringement/2020_Online_Copyright_Infringement_in_the_EU_Title_Level_Study_FullR_en.pdf)