PATENTABILITY OF COMPUTER PROGRAM ALGORITHMS IN THE G20 STATES

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Ubiquitous computerization and digitalization are contributing to the unprecedented growth of the software market. Computer programs are protected as subject of copyright law in international law and domestic legal systems. However, copyright law does not protect the interests of the copyright holder from borrowing ideas and algorithms which often have a great commercial value. This circumstance has prompted the legal science and law enforcement practice of the most developed states to justify the possibility of protecting computer programs and their algorithms. The leading states chosen for in this paper are the G20 states. The relevance of this choice is due to the following: 1) The G20 states account for 86% of global GDP; 2) All world leaders in computer software development are G20 members; 3) All BRICS states are G20 members; 4) The law-and-orders of the G20 states are relevant to all existing traditions of the legal protection of intellectual property in the world. The legal systems of the G20 states follow one of three approaches according to the criterion of patentability of computer programs and their algorithms. We call the first approach "neutral." It includes States which legislation does not explicitly prohibit the patenting of computer programs, but computer programs themselves are not mentioned among the subject matters of inventions. The second ("positive") approach includes those states which legislation explicitly classifies computer programs as patentable inventions. On the contrary, the third ("negating") approach includes states where it is legally established that computer programs as such are unpatentable. The results of the research demonstrate that there is no direct correlation between the way of solving the issue of patentability of computer program algorithms in different legal systems and the state's place in the global IT market. For example, the United States and China take a neutral approach, Japan takes a positive approach, the EU Member States and India take a negating approach. We believe

that the most flexible approach is a neutral approach from the point of view of patent law policy. The most liberal and consistent approach is the positive approach presented by the Japanese legal system. Finally, the negating approach is the most controversial and at the same time widespread among the G20 and BRICS states.

Keywords: algorithm; computer program; patentability; software patent; intellectual property; G20; BRICS.

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Introduction

All new achievements of the fourth industrial revolution are effectively based on digital and information technologies and are improved on the basis of computational capability. Such achievements include, for example, uncrewed vehicle, 3D printing, robotics, the Internet of things, artificial intelligence technologies, facial recognition, blockchain. Ubiquitous computerization and digitalization are contributing to the unprecedented growth of the software market: its volume amounted to 3.65 trillion U.S. dollars in 2020, and it is expected to reach about 3.92 trillion U.S. dollars in 2021.[1]

The commercialization and high-cost characteristics of software predetermine the significance of effective mechanisms for its legal protection. Computer programs are protected as by copyright law on international level and in domestic legal systems. The fundamental principle of copyright law is that it protects the creative expression of ideas rather than the ideas themselves. Accordingly, copyright law protects the source text, object code, and audiovisual representation of a computer program, but not the underlying ideas and algorithms.

[1] Information technology (IT) worldwide spending from 2005 to 2022, Statista (Feb. 26, 2021), available at https://www.statista.com/statistics/203935/overall-it-spending-worldwide/.

It is as difficult both to accurately define the term "algorithm" and to define the concept of artificial intelligence expressed in legal science.[2] In general, an algorithm is any method consisting of a relatively small number of sequential steps that should be taken to solve a particular problem. The term is derived from the famous ninth-century astronomer and mathematician al-Khwarizmi who introduced the Indian numerals, which we know as Arabic. Al-Khwarizmi discovered the rule for adding multi-digit numbers. This rule became known by the name of its creator in Europe after the conquest of Spain by the Arabs. The rules of calculation became known as the "algorithm" alongside with the development of mathematics. When computers appeared, this term also began to designate the rules of calculation that underlie the operation of these machines. It should be clarified that algorithms can be written in various ways: in the form of text or a conditional visual flow-chart or a computer program in a specific programming language.

Algorithms of a computer program often have very high commercial value. Algorithms are often compared to the building blocks of modern advances in the sphere of information technology. However, the interests of software developers cannot be protected by copyright law from borrowing their algorithms, because the expression of the algorithms may be different depending on which programming language the developer uses. Undoubtedly, algorithms can be protected as confidential information. However, such protection is ineffective because it does not protect the interests of the copyright holder from the parallel creation of the same algorithms by others.

The lack of copyright protection of computer program algorithms and the ineffectiveness of their protection through the confidential information regime have prompted the jurisprudence of many states to substantiate the possibility of protecting these subject matters by means of patent law. According to the forecast of the analytical company Gartner, by 2020 the number of patent applications mentioning "algorithm" in the claims or in the title should have reached half a million.[3] The approaches to solving the problem of algorithms patentability offered today by legal science and judicial practice are insufficiently defined and often inconsistent. This undoubtedly has a negative impact on the harmonization process and complicates enforcement.

Our research is based on G20 states' cases. The relevance of this choice is due to the following:

1) The G20 states account for 86% of global GDP;

2) All world leaders in computer software development are G20 members;

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[2] *The Cambridge Handbook of the Law of Algorithms* (Woodrow Barfield ed., 2020).

[3] Gartner Says Within Five Years, Organizations Will Be Valued on Their Information Portfolios, Gartner, 8 February 2017 (Dec. 21, 2020), available at https://www.gartner.com/en/newsroom/press-releases/2017-02-08-gartner-says-within-five-years-organizations-will-be-valued-on-their-information-portfolios.

3) All BRICS states are G20 members;

4) The legal systems of the G20 states belong to different legal families;

5) The law-and-orders of the G20 states are relevant to all existing traditions of the legal protection of intellectual property in the world.

The purpose of this paper is to determine the vectors of lawmaking development, legal thought and judicial practice in the sphere of patenting computer program algorithms by comparing various approaches adopted in the G20 states.

The international legal framework for the protection of computer programs and their algorithms will be considered in the first part of this paper. Acts of international law give G20 states relative freedom in the patentability of computer programs. Unsurprisingly, these states have established different rules regarding the patentability.

We believe that the legal systems of the G20 states should be divided into three groups according to the criterion of patentability of computer programs and their algorithms.

In the second part of this paper, we will consider legal systems which do not explicitly prohibit the patenting of computer programs in their legislation, but computer programs themselves are not mentioned among the subject matters of inventions. We call this approach "neutral."

In the third part, we will consider legal systems that explicitly classify computer programs as patentable inventions in their legislation. This approach is inherently "positive" or "permissive."

Finally, in the fourth part, we will analyze the legal systems that prohibit patenting of computer programs as such in their legislation. This approach is addressed as "negating" or prohibiting in the paper.

1. International Legal Framework for the Protection of Computer Programs

The modern history of computers originates from the developments of the American John Atamasoff and the German Konrad Zuse, who independently built computers operating in the binary number system at the turn of the 1930s–1940s. Information about Atamasoff's computer was unknown due to World War II. For many years people believed that the first electronic computer was the Electronic Numerical Integrator and Computer (ENIAC) created by John Mauchly and John Presper Eckert in 1944–1945. However, U.S. District Court for the District of Minnesota ruled its judgment in 1973 that the Atanasoff-Berry Computer was the first electronic computer in the world.[4]

[4] John Vincent Atanasoff – The father of the computer (October 4, 1903 – June 15, 1995), Columbia University (Dec. 21, 2020), available at http://www.columbia.edu/~td2177/JVAtanasoff/JVAtanasoff.html.

The software was rigidly linked to a particular computer model in the early days of computers. The problem of independent legal protection of computer programs did not exist. In 1964, the IBM System/360 computer was released, the architecture of which was so successful that it became the industry standard for computing technology. Many companies began to produce computers compatible with the IBM 360. In fact, the compatibility of computers from different manufacturers and different models have become a prerequisite for the foundation of an independent software market.

With the formation of the software market at the turn of the 1960s–1970s, the need for effective protection of the interests of computer program developers arose. Copyright law and patent law were considered as the main legal regimes for such protection. However, not all experts were convinced of the need for such protection then. In 1970 Stephen Breyer (now a U.S. Supreme Court Justice) wrote in his classic article that the lack of copyright protection for computer programs is unlikely to significantly affect the development of such programs. He believed that it would be unwise to extend copyright protection to virtually all computer programs, because such expansion could cause significant harm. If computer manufacturers were to protect almost all of their programs through copyright law, there would be a serious problem of transaction costs.[5] According to S. Breyer the widespread protection of computer programs may lead to the fact that many users will borrow only the algorithm of the program and recreate the program itself or, more likely, make various modifications to it to avoid the appearance of copying.[6]

The issue of the protection of computer programs began to be discussed at the international level in 1971, when World Intellectual Property Organization (WIPO) organized a meeting of experts to prepare appropriate research. Also, in 1971 the last revision of the Berne Convention for the Protection of Literary and Artistic Works of 9 September 1886 – the most important act of international copyright law, took place.[7] It is clear that the protection of computer programs is not reflected in the Berne Convention in any way.

In 1978 WIPO published the Model Provisions on the Protection of Computer Software – the result of six years of work by the International Bureau of WIPO and invited experts.[8] The introduction to the Model Provisions justifies the need for software protection and suggests two main models of such protection: patent law and copyright law. According to WIPO copyright law is the preferred form of

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5 Stephen Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84(2) Harv. L. Rev. 281, 346–347 (1970).

6 *Id.*

7 Berne Convention for the Protection of Literary and Artistic Works (1886) (Dec. 21, 2020), available at https://www.wipo.int/edocs/lexdocs/treaties/en/berne/trt_berne_001en.pdf.

8 Copyright: Monthly Review of the World Intellectual Property Organization (WIPO) (January 1978) (Dec. 21, 2020), available at http://www.wipo.int/edocs/pubdocs/en/copyright/120/wipo_pub_120_1978_01.pdf.

protection. Firstly, many states, as well as the European Patent Convention, exclude computer programs from the list of patentable inventions. Secondly, even if patent protection were generally available, it would cover an insignificant part of computer programs, because most of them do not meet such a condition of protection as inventive step (non-obviousness).[9]

The research carried out on behalf of WIPO by the outstanding German scientist Eugen Ulmer had a major influence on the concept of the Model Provisions. Professor Ulmer compared the introduction of a program into a computer with the reproduction of a literary work and concluded that computer programs can be protected as subject matters of copyright law.[10]

In 1985, WIPO organized an expert meeting on the protection of computer programs. One of the items on the agenda of that meeting was the conclusion that many states were gradually starting to grant copyright protection to computer programs based on legislation or precedents, without waiting for an international agreement.[11] In fact, this meeting led to a decisive breakthrough and consensus that computer programs should be protected by copyright law. For example, France, Germany, Japan, and the United Kingdom legally recognized programs as subject matters of copyright law in the summer of 1985.[12] Thus, the issue of adopting a treaty for the protection of computer programs has become irrelevant and has been removed from the WIPO agenda.

The first global international agreement establishing the protection of computer programs was the TRIPS Agreement of 15 April 1994.[13] According to clause 1 of Article 10 of the Agreement – computer programs both source text and object code are protected as literary works in accordance with the Berne Convention as amended in 1971. The legal equalization of computer programs with literary works is based on the position of WIPO. For example, it is noted in the commentary to the Model Provisions on Copyright Law that some States grant protection to computer programs as literary works, while others grant protection as independent works. The first approach is preferable according to the WIPO experts.[14]

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9 Copyright, *supra* note 8.

10 Delia Lipszyc, *Copyright and Neighbouring Rights* 112 (1999).

11 Copyright: Monthly Review of the World Intellectual Property Organization (WIPO) (April 1985) (Dec. 21, 2020), available at http://www.wipo.int/edocs/pubdocs/en/copyright/120/wipo_pub_120_1985_04.pdf.

12 WIPO, Guide to the Copyright and Related Rights Treaties Administered by WIPO and Glossary of Copyright and Related Rights Terms (2005) (Dec. 21, 2020), available at https://www.wipo.int/edocs/pubdocs/en/copyright/891/wipo_pub_891.pdf.

13 Agreement on Trade-related Aspects of Intellectual Property Rights (1994) (Dec. 21, 2020), available at https://www.wto.org/english/docs_e/legal_e/27-trips_01_e.htm.

14 Committee of Experts on Model Provisions for Legislation in the Field of Copyright, Third Session (Geneva, 1990) in Copyright: Monthly Review of the World Intellectual Property Organization (WIPO) (September 1990), at 241 (Dec. 21, 2020), available at https://www.wipo.int/edocs/pubdocs/en/copyright/120/wipo_pub_120_1990_09.pdf.

The original draft of Article 10, clause 1, of the TRIPS Agreement, proposed by Japan, also stated that the copyright protection of computer programs under this agreement does not apply to any programming language, rule, algorithm used to create such a program.[15] However, this offer was modified in order to comply with section 102 of the United States Copyright Act of 1976. According to section 102

> In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.[16]

As a result, the special provision on unprotected elements of a computer program was transformed into the general rule of clause 2 of Article 9 of the TRIPS Agreement: copyright protection shall extend to expressions and not to ideas, procedures, methods of operation or mathematical concepts as such.

Computer programs were recognized as subject matters of copyright law, but the TRIPS Agreement did not prohibit their protection by patent law. Clause 1 of Article 27 of the Agreement states that patents shall be available for any inventions, whether products or processes, in all fields of technology. This general rule does not mean that World Trade Organization (WTO) Member States have to recognize computer programs or software as patentable. This neutral approach is beneficial to developing states because it leaves the question of the patentability of computer program algorithms to their discretion.[17]

The WIPO Copyright Treaty was adopted in 1996 and also provided copyright protection for computer programs.[18] According to Article 4 of the Treaty computer programs are protected as literary works within the meaning of Article 2 of the Berne Convention. Such protection applies to computer programs, whatever may be the mode or form of their expression. Agreed statement concerning Article 4 states that the scope of protection for computer programs under Article 4 of this Treaty, read with Article 2, is consistent with Article 2 of the Berne Convention and on a par with the relevant provisions of the TRIPS Agreement. The purpose of such Agreed statements is to provide guidance on how the provisions of the Treaty should be interpreted. In particular, clause 2 of Article 31 of the Vienna Convention on the Law of Treaties of 23 May 1969[19] provides

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15 *Resource Book on TRIPS and Development* 154 (2005).

16 Copyright Law of the United States (Title 17) (1976) (Dec. 23, 2020), available at https://www.copyright.gov/title17/.

17 *Resource Book on TRIPS and Development*, *supra* note 15, at 366.

18 Copyright Treaty (WIPO) (1996) (Dec. 23, 2020), available at https://wipolex.wipo.int/en/treaties/textdetails/12740.

19 Vienna Convention on the Law of Treaties (1969) (Dec. 23, 2020), available at https://legal.un.org/ilc/texts/instruments/english/conventions/1_1_1969.pdf.

that the context for the purpose of the interpretation of a treaty shall comprise, in addition to the text, including its preamble and annexes any agreement relating to the treaty which was made between all the parties in connection with the conclusion of the treaty. Thus, the WIPO Copyright Treaty did not contain anything new regarding the scope of protection of computer programs.

In summary, the TRIPS Agreement and the WIPO Copyright Treaty recognized computer programs as subject matters of copyright law at the end of the 20th century. Copyright protection extends primarily to the source code and object code of a computer program. On the contrary, copyright law does not protect the algorithms of a computer program. The TRIPS Agreement does not establish any obligations regarding the patentability of computer programs and their algorithms. Accordingly, G20 States have relative freedom on this issue.

2. Neutral Approach to Patentability of Computer Programs and Algorithms

The most flexible approach is a neutral approach from the point of view of patent law policy. This approach implies that the patent laws of some G20 States do not contain provisions that prohibit the patenting of computer programs and their algorithms, as well as there are no provisions that allow it. This approach is a conservative solution for those legislators who prefer not to respond to technological changes and leave the task to the courts and patent offices. The neutral approach is enshrined in the legislation of the United States, Australia, Canada, the Republic of Korea, China, and Saudi Arabia.

The United States is one of the world leaders in both the number of registered patents in general and the number of software patents. The philosophy of American patent law is reflected in the U.S. Constitution, which states that the Congress shall have power to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries (Art. I, sec. 8).[20] Thus, the purpose of granting exclusive copyright and patent rights is the development of society, not the idea of the author's natural rights.

The main requirements for patentable subject matters are set out in Section 101 of the U.S. Patent Act: whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.[21] This act does not contain a list of subject matters that cannot be protected

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[20] U.S. Const., Art. I (Dec. 23, 2020), available at https://www.senate.gov/civics/constitution_item/constitution.htm.

[21] U.S. Patent Act (1952) (Dec. 23, 2020), available at https://wipolex.wipo.int/en/legislation/details/15705.

as inventions, unlike the patent laws of many states. Also, the U.S. Patent Law does not prescribe anything about the patentability of computer programs and their algorithms. This task is traditionally handled by American courts.

The evolution of patent protection of computer program algorithms in the United States can be divided into three stages. At the first stage, the Patent and Trademark Office and the courts refused to grant patent protection to computer programs. These subject matters were regarded as a way of thinking rather than as a patentable product or process. It is important to note the case *Gottschalk v. Benson*, considered by the Supreme Court in 1972.[22] The company filed an application for an invention concerning a method for converting numerical information from binary-coded decimal numbers into pure binary numbers. The Supreme Court explained the refusal of patentability of such a solution by the fact that this process is a mathematical method – an idea. It did not fall under the concept of an invention.

The second stage is characterized by a gradual liberalization of the approach to the conditions of patentability of computer programs. We believe that it began with the Supreme Court's decision in the case *Diamond v. Diehr* (1981).[23] The Supreme Court recognized an invention relating to a computer program as patentable for the first time. This invention concerned a rubber vulcanization process, which was carried out under the control of a computer device that constantly monitored the temperature of the process and calculated on its basis certain parameters of the mold operation.

The most important precedent of the second stage is the decision of the United States Court of Appeals for the Federal Circuit in the case *State Street Bank & Trust Co. v. Signature Financial Group* (1998).[24] This precedent had the effect of a dam failure, because after it the number of granted patents for computer programs increased significantly. The essence of the patent granted to the company "Signature Financial Group," is that the invention is a data processing system for managing a financial services configuration of a portfolio established as a partnership. The court noted that a mathematical algorithm as such is not patentable, since it represents an abstract idea. However, such an algorithm is patentable if it is used to achieve a certain useful and practical effect. This rule has come to be known as the "practical application' test."

The decision in the case *State Street Bank* case was the highest point on the way to reducing the requirements for patentability of computer program algorithms in the United States. Its consequences have raised concerns that the wave of patents on algorithms would lead to excessive monopolization of the market of ideas and business methods and would negatively affect competition and economic development. As a result, at the third stage, the Supreme Court issued

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22 *Gottschalk v. Benson*, 409 U.S. 63 (1972).

23 *Diamond v. Diehr*, 450 U.S. 175 (1981).

24 *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368 (1998).

a series of decisions that tightened the requirements for patentability of computer programs.

The first of these precedents was the decision in the case *Bilski v. Kappos* (2010).[25] In this case, the inventor Bernard Bilski tried to patent a method (algorithm) of hedging risk. The Supreme Court was reviewing the decision of the United States Court of Appeals for the Federal Circuit,[26] which ruled that the abstract investment strategy set out in the application was not patentable. The Court of Appeals rejected the previously formulated practical application test (the *State Street Bank* case) and based its decision on the "machine-or-transformation test." The essence of this test is that the condition for patentability of a process or method is: 1) the process ties to a particular machine or apparatus; or 2) the process transforms an article from one state to another. The Supreme Court generally agreed with the Court of Appeal, but it did not go so far as to say that "machine-or-transformation test" – is the only test for patentability. This rule is one of the useful tools for determining the patentability of computer programs and algorithms. In the *Bilski* case the Supreme Court refrained from formulating any general rules on the patentability of computer programs.

The most recent Supreme Court precedent to date is the decision in the case *Alice Corp. v. CLS Bank International* (2014),[27] in which the Court also refrained from general considerations about whether algorithms and computer programs are patentable or not. "Alice Corporation" owned four patents for electronic methods and computer programs, the purpose of which was to hedge risks in conducting trading operations and settlements. "Alice" accused "CLS Bank International" of using a similar technology and violating its patents. "CLS Bank" responded by filing a counterclaim to challenge the patents.

The Supreme Court unanimously admitted "Alice's" patents invalid and ruled that an abstract idea cannot be patented just because it is implemented on a computer. In this case, the Supreme Court applied the so-called two-part test to verify the patentability of algorithms and business methods. The first step is to determine whether the subject matter contains an abstract idea (for example, an algorithm, a calculation method, or another general principle). If the answer is yes, then the next step should be taken. It is necessary to determine whether the additional elements transform the subject matter into a patentable invention, whether they add something additional to the abstract idea or algorithm that embodies the inventive concept. The court decided that the normal use of a general-purpose computer was not sufficient to convert an abstract idea into a patentable invention.

The "Alice" decision fundamentally changed the patentability requirements of algorithms and methods. Although the decision does not contain general

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25 *Bilski v. Kappos*, 561 U.S. 593 (2010).

26 *In re Bernard L. Bilski and Rand A. Warsaw*, 545 F.3d 943, 88 U.S.P.Q.2d 1385 (Fed. Cir. 2008).

27 *Alice Corp. v. CLS Bank International*, 573 U.S. (2014).

considerations and rules on the conditions of patentability of computer programs, as well as the prohibition of their patenting. Many patents for computer programs have been invalidated in the United States following this precedent. In 2019, the U.S. Patent and Trademark Office published a guide on the patentability of computer programs, which essentially summarizes the judicial practice of the last decade.[28] The guide is not a binding act.

In Australia, the requirements for patentability of inventions are essentially the same as in the United States patent law.[29] The Australian Patent Act of 1990, following the American tradition, is silent on the patentability of computer programs and business methods.[30] Unlike the United States, the Australian Patent Office did not provide explanations and examples that would help determine the limits of patentability of ideas and algorithms.

Judicial practice in Australia today is characterized by approximately similar requirements for patentability of algorithms and computer programs, compared to the U.S. practice following the *Alice* case. For example, in the case *Research Affiliates LLC v. Commissioner of Patents* the court was deciding whether a method of creating a securities index by means of a computer is an invention.[31] The court ruled that simple loading a scheme into an ordinary computer is not patentable unless there is a technical solution to how exactly the computer implements the scheme or method. This decision is notable because here the court considered different approaches to software patenting in the U.S. and Europe. However, the court made it clear that while it may be useful to study foreign approaches, they should not be used if they contradict Australian law and judicial precedent. A similar position to prohibit the patenting of algorithms related to information retrieval and data management was formulated in a recent court decision in 2019 in the case *Encompass Corporation Pty Ltd. v. InfoTrack Pty Ltd*.[32] The Court established that the claimed method was essentially an instruction for the application of an abstract idea using common computer technology without any additional technical features.

Canadian legislation also follows the patent tradition of the United States and is silent on the patentability of software. The two rules by which courts decide on

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[28] U.S. Patent and Trademark Office announces revised guidance for determining subject matter eligibility, United States Patent and Trademark Office, 4 January 2019 (Dec. 27, 2020), available at https://www.uspto.gov/about-us/news-updates/us-patent-and-trademark-office-announces-revised-guidance-determining-subject.

[29] B. Delano Jordan et al., *A Global Perspective on Patent Subject Matter Eligibility and Software-Related Inventions: Court Cases, Legislation and Regulations Are Described Along with Practice Hints for Navigating Patent Eligibility in Australia, Canada, China, Europe, Japan, Korea and the United States*, Intellectual Property Owners Association (2019) (Jan. 5, 2021), available at https://ipo.org/wp-content/uploads/2019/12/IPO_elegibility_whitepaper11-20-19.pdf.

[30] Australian Patent Act (1990) (Jan. 5, 2021), available at https://wipolex.wipo.int/ru/text/579247.

[31] *Research Affiliates LLC v. Commissioner of Patents* [2014] F.C.A.F.C. 150; 227 F.C.R. 378; 109 I.P.R. 364.

[32] *Encompass Corporation Pty Ltd. v. InfoTrack Pty Ltd*. [2019] F.C.A.F.C. 161; 372 A.L.R. 646; 145 I.P.R. 1.

the patentability of computer program algorithms are: 1) the provision of Article 2 of the Patent Act of 1985 on the concept of invention; 2) Article 27(8) of this act, which provides that no patent shall be granted for any mere scientific principle or abstract theorem.[33] It should be noted that until 2005 the Canadian Intellectual Property Office (CIPO) rejected applications for patenting computer programs on the basis of these rules.[34]

The main precedent on the patentability of computer programs in Canada is the decision of the Federal Court of Appeal (2011) *Attorney General v. Amazon.com, Inc*.[35] "Amazon" has filed a patent application for its one-click method of internet shopping. The application was rejected by the Patent Office. In general, the court supported the applicant and returned the application to the Patent Office for expedited reconsideration. As a result, the patent was granted to "Amazon" in December 2011. The following aspects are interesting in this case. Firstly, the court did not consider the arguments that similar patents had been granted in the U.S., Australia and New Zealand. Secondly, the court, resorting to general reasoning about the patentability of methods and algorithms, observed: if the only new aspect of the claimed invention was a mathematical formula, then such subject matter was unpatentable, because scientific principles and abstract theorems could not be patentable. The court also emphasized that patentable subject matter must be something that physically exists or something that exhibits a noticeable technical effect.

Following this court ruling, CIPO issued guidance in 2013 stating that software can be patentable if the computer is an essential physical element of the claims.[36] Implementing algorithms as such by means of a computer is not an invention. However, an algorithm or method is patentable if the invention involves controlling the operation of a computer to achieve a technical result. This result is expressed in the fact that the invention should lead to a change in the state of the physical object. These explanations have attracted critical reviews, because they significantly hinder the patenting of algorithms.[37] For example, the CIPO guidance states: if the claimed software algorithms can be implemented without a computer (for example, with a pen and paper), regardless of the inconvenience or impracticality, then the specified computer hardware is not an essential element of the invention.

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33 Patent Act of Canada (1985) (Jan. 5, 2021), available at https://wipolex.wipo.int/ru/text/566713.

34 Ravindra Chingale & Srikrishna Deva Rao, *Software Patent in India: A Comparative Judicial and Empirical Overview*, 20(4) J. Intellect. Prop. Rts. 210 (2015).

35 *Canada (Attorney General) v. Amazon.com, Inc*., 2011 F.C.A. 328 (CanLII).

36 Practice Guidance Following the Amazon FCA Decision, Canadian Intellectual Property Office, 8 March 2013 (Jan. 5, 2021), available at http://www.ic.gc.ca/eic/site/cipointernet-internetopic.nsf/eng/wr03628.html.

37 Isi E. Caulder & Nicholas Aitken, *Canada: Pulling Out All the Stops – Patenting Computer Implemented Inventions in Canada Despite Unprecedented Obstacles*, Bereskin & Parr LLP (2016) (Jan. 6, 2021), available at https://www.mondaq.com/canada/patent/458794/pulling-out-all-the-stops--patenting-computer-implemented-inventions-in-canada-despite-unprecedented-obstacles.

Thus, the test of additional technical features or notable technical effect applied by the Australian and Canadian courts is essentially similar to the two-part test applied by the U.S. Supreme Court in the *Alice* case. This view is shared by Brad Sherman[38] in his main paper. He calls the test applied by the courts in Australia and Canada the rule of a concrete, tangible, physical, or observable effect.

A neutral legislative approach to the patentability of computer programs is also present in dynamic economies such as the Republic of Korea and China.

The Korean Patent Act of 1961[39] provides exactly the same definition of invention as the Japanese Patent Act of 1959.[40] Article 2 of the Korean Patent Act states that the term "invention" means the highly advanced creation of a technical idea utilizing the laws of nature. In this sense, the patent law of these States develops within the same tradition. However, unlike Japan, the Korean Law does not contain any specific provisions regarding inventions related to computer programs.

The examination guidelines,[41] developed by the Patent Office of the Republic of Korea have a separate section on a computer-related invention (Ch. 10, Pt. IX). A patent for such an invention may be granted if the claimed subject matter falls within the definition of an invention and meets the criteria for patentability. A computer program cannot be a suitable subject matter, because it is considered as instructions for a computer and therefore does not correspond to the concept of an invention as a technical idea using the laws of nature. Furthermore, the guidelines state that the algorithm to be patented cannot be of an abstract nature. In other words, the examination is required to establish whether there is an inseparable link between the software and the hardware which is necessary for the subject matter to be patentable.

An example of unpatentable solutions in Korea is the method of creating a password by combining letters, numbers and symbols. Such a method is considered as not based on the use of the laws of nature, as it is related to the rules of language and alphabet (*Patent Court decision 2001Heo3453*).[42] On the other hand, data processing may be patentable if it is claimed as unique information processing by means of software implemented on certain hardware (*Supreme Court decision 2007Hu265*).[43]

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38 Brad Sherman, *Computer Programs as Excluded Patentable Subject Matter*, SCP/15/3, Annex II (Jan. 6, 2021), available at https://www.wipo.int/edocs/mdocs/scp/en/scp_15/scp_15_3-annex2.pdf.

39 Patent Act of the Republic of Korea (1961) (Jan. 6, 2021), available at https://wipolex.wipo.int/en/legislation/details/17484.

40 Patent Act of Japan (Act No. 121 of 1959) (as amended up to 1 April 2020) (Jan. 6, 2021), available at https://wipolex.wipo.int/en/legislation/details/19899.

41 Korean Intellectual Property Office, Patent Examination Guidelines (January 2020) (Jan. 6, 2021) available at https://kipo.go.kr/upload/en/download/Patent_Examination_Guidelines_2020.pdf.

42 Delano Jordan et al., *supra* note 29.

43 *Id*.

The Patent Law of 1984 forms the basis of China's patent law (as amended on 17 October 2020)[44]. The second most important act dealing with the issue under consideration is the Patent Examination Guidelines[45] approved by the Decision of State Intellectual Property Office of the People's Republic of China (SIPO) as amended on 24 May 2006. The Patent Law is silent on the patentability of computer programs. Article 25 of the Patent Law deals with the unpatentable subject matters, specifies, for example, scientific discoveries, rules and methods for intellectual activities.

Meanwhile, the dynamic development of information technology and artificial intelligence in China has actualized the issues of legal protection of algorithms and methods. However, Chinese scholars have also taken the position that China should not accept the practice of granting patents on these subject matters due to the fact that this would upset the balance of public and private interests and could adversely affect the development of science, technology and commerce.[46]

This criticism was not supported in the process of determining the directions of the national state policy in the field of intellectual property and the choice was made in favor of granting protection to algorithms as inventions, subject to a number of conditions. The implementation of the indicated strategy took place in several stages. The revisions to the provisions of the Guidelines on examination came into force on 1 April 2017. These revisions significantly expanded the ability to grant patents on algorithms and business methods.[47] Thus, it was stated that a computer program was different from software-related inventions: the first subject matter was unpatentable (Pt. II, Ch. 1, cl. 4.2).

On 1 February 2020, a new section of the Patent Examination Guidelines was introduced: "6. Relevant regulations on the examination of patent applications for inventions that include algorithmic features or business rules and method features."[48] The technical nature of the solution is identified as a key aspect to distinguish

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[44] Patent Law of China (1984) (Jan. 5, 2021), available at https://www.chinajusticeobserver.com/law/x/patent-law-of-china-20201017/chn; http://www.jxnf.gov.cn/art/2020/12/1/art_1009_3591086.html.

[45] 中华人民共和国知识产权局, 专利审查指南 2019 [China National Intellectual Property Administration, Guide to the Patent Examination of China (2019)] (Jan. 5, 2021), available at http://www.tsailee.com/upload/2020版大陸專利審查指南.pdf.

[46] 谢黎伟, 利益平衡视角下的商业方法可专利性, 海峡法学 [Xie Liwei, *Patentability of Business Methods from the Perspective of Balance of Interests*, 3 Cross-Strait Legal Science 74 (2010)] (Jan. 10, 2021), available at https://core.ac.uk/download/pdf/41434858.pdf.

[47] 新修改的《专利审查指南》将于4月1日起施行 [The newly revised patent examination guidelines will come into effect on 1 April 2017] (Jan. 10, 2021), available at http://www.gov.cn/xinwen/2017-03/07/content_5174235.htm#1.

[48] 国家知识产权局关于修改《专利审查指南》的决定 [The Decision of the State Intellectual Property Office to amend the guidelines for Patent Examination was reviewed and adopted at the bureau meeting and published by the announcement of the State Intellectual Property Office (No. 343, 2019)] (Jan. 10, 2021), available at http://www.gov.cn/zhengce/zhengceku/2019-12/31/content_5465485.htm.

protectable algorithms from unprotectable rules and methods of intellectual activity (cl. 6.1). The authorized body is instructed not only to analyze the place and role of the algorithm in the claims, but also to determine whether it allows solving a specific technical problem, whether its application produces a technical effect. It is stated that during the examination it is necessary to consider the invention as a complete subject matter, and not only to isolate its algorithmic features. When drawing up a patent application, it is recommended to pay special attention to the "functionally correlated" of the algorithmic and technical features of the invention. Only if they are inextricably linked and it is impossible to achieve a technical result without using the algorithm, the authorized body will have the right to register the invention, the content of which is the algorithm.

The Guidelines provides an application for Multi-Sensor Based Fall Prediction Method for Humanoid Robots as an example of a patentable algorithm (Example No. 7). The claims of such an invention denote that the algorithm discloses robot gait planning and feedback control based on sensory information, and a method for determining the stability of the robot, including an assessment of its stability. In contrast, the algorithm for converting the binary-decimal system to binary will be classified as unprotected subject matters.[49] Algorithms for obtaining a purchaser discount are also not patentable, because such algorithms do not contain any technical features and have no technical effect, which allows them to be classified as rules and methods of intellectual activity.

This section concludes with an analysis of the approach of Saudi Arabia, one of the most closed G20 states. According to Article 2 of the Law of Saudi Arabia "On Patents, Layout-Designs of Integrated Circuits, Plant Varieties, and Industrial Designs" (2004)[50] an invention is an idea developed by the inventor that results in a solution of a certain problem in the field of technology. By virtue of Article 45 of the Act, mathematical methods, business models, rules, methods or types of mental or game activities are not protected as inventions. The Act is silent on the patentability of computer programs. We therefore include the Saudi Arabian law in the group of states taking a neutral approach. A similar point of view is shared by the authors of the WIPO report on the patenting of computer programs.[51]

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[49] Qiang Liu, *Research on Patentability of Artificial Intelligence Algorithms Invention*, 17(4) Presentday L. Sci. 17 (2019).

[50] Law on Patents, Layout-Designs of Integrated Circuits, Plant Varieties, and Industrial Designs, promulgated by Royal Decree No. M/27 of 29/5/1425H (17 July 2004), and amended by Decision of the Council of Ministers No. 536 of 10/19/1439 (3 July 2018) (Jan. 17, 2021) available at https://wipolex.wipo.int/en/legislation/details/19744.

[51] Committee on Development and Intellectual Property, WIPO, Patent-Related Flexibilities in the Multilateral Legal Framework and Their Legislative Implementation at the National and Regional Levels – Part III, CDIP/13/10, 27 March 2014 (Jan. 17, 2021), available at https://www.wipo.int/edocs/mdocs/mdocs/en/cdip_13/cdip_13_10.docx.

However, in accordance with Article 3 of the Patent Regulation of the Cooperation Council for the Arab States of the Gulf of 1992[52] computer programs are not considered inventions. Thus, there is a contradiction between this Act and the Saudi Arabian Patent Law. Apparently, in practice, it is allowed in favor of limited patenting of computer programs. The website of the European Patent Office (EPO) notes that in Saudi Arabia a patent may be granted for a software-related invention, while the program itself may only be protected by copyright law.[53] The scientific literature notes that programs as such are not patentable, but if the invention is a piece of hardware, the operation of which is provided by the program, it is subject to registration as patentable subject matter.[54]

3. "Positive" Approach to Patentability of Computer Programs

One of the most liberal approaches to the patentability of computer program algorithms is presented in the Japanese legal system. Article 1 of the Patent Act (1959) captures the utilitarian idea of protecting patent rights:

> The purpose of this Act is, through promoting the protection and the utilization of inventions, to encourage inventions, and thereby to contribute to the development of industry.[55]

However, in practice, Japan's intellectual property rights protection system is more protective of the interests of the rights holders, rather than of other participants in the turnover or of society as a whole.[56]

An invention is defined in Article 2(1) of the Japan Patent Act as "the highly advanced creation of technical ideas utilizing the laws of nature." One of the subject matters of the inventions is a product that includes computer programs (Art. 2(3) of the Patent Act). This provision was included in the Patent Act in 2002.[57] As for the

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52 Patent Regulation of the Cooperation Council for the Arab States of the Gulf and its Implementation (2006) (Jan. 17, 2021), available at https://www.saip.gov.sa/wp-content/uploads/2020/07/Patent_Regulation_of_the_Cooperation_Council_for_the_Arab_States_of_the_Gulf_and_its_Implementation_Bylaw.pdf.

53 FAQ – Saudi Arabia (SA), EPO (Jan. 17, 2021), available at https://www.epo.org/searching-for-patents/helpful-resources/asian/faq.html.

54 Mohammed El Said, *Intellectual Property Law in Saudi Arabia* 17 (2018).

55 Patent Act (Act No. 121, 1959, as amended up to 1 April 2020) (Jan. 17, 2021), available at https://wipolex.wipo.int/en/legislation/details/19899.

56 James Korenchan et al., *A Comparison of U.S. and Japanese Patent Subject Matter Eligibility*, Patent Docs, 28 May 2019 (Jan. 17, 2021), available at https://www.patentdocs.org/2019/05/a-comparison-of-us-and-japanese-patent-subject-matter-eligibility.html.

57 Hideo Furutani, *Patentability of Business Method Inventions in Japan Compared with the US and Europe*, presented at USPTO, Arlington, Virginia, 3 November 2003 (Jan. 20, 2021), available at http://www.furutani.jp/e/Business_method_patents_in_Japan.pdf.

other G20 States, computer programs are not legally classified as a product in a sense of a patentable invention. Japanese law is also unique in that the Copyright Act of 1970 explicitly states that copyright protection shall not extend to any algorithms of computer programs (Art. 10, cl. 3).[58] At the same time, the Act provides an official definition of the term "algorithm": "algorithm" means a procedure in a computer program, which consists of a set of instructions for the computer.

Japan has adopted Examination Guidelines for Patent, which explains in great detail (unlike other G20 states) the rules of patentability of computer programs.[59] The first thing to consider when assessing the patentability of a computer program is whether it falls within the concept of an invention and whether it is the creation of a technical idea using the laws of nature. It is clarified that economic laws are not considered to be laws of nature. When examining a patent application, it is important to establish that the processing of information by software is carried out precisely with the use of computer equipment (hardware resources). For example, the following algorithm does not meet the specified condition: a phonebook data structure in which data items containing the name, address, and phone number of a subscriber are stored and managed as a set of records, which is used by a computer to search for a phone number using the name as a key.[60]

Next, it should be found out whether the claimed invention falls within any of the unpatentable subject matter, for example, simple representation of information, game rules, mathematical formulas. Examples of unpatentable inventions are: 1) programming languages; 2) the method of collecting money to pay electricity or gas bills by rounding off the amount to be paid; 3) a method of playing Japanese chess between distant players, including the transfer of moves over a computer network via a chat system.[61]

In our opinion, the liberality of the provisions on the patentability of computer programs in the Japanese legal system is expressed in the fact that there are no requirements that the running a program on a computer should give an additional technical effect that goes beyond the usual or normal physical interaction between the program and the computer hardware, in contrast to the European legal systems.

Indonesia is one of the most problematic states of the G20 States in terms of the effectiveness of intellectual property protection. For example, about 87% of the software installed on computers in this country in 2011 was unlicensed.[62] O.K. Saidin

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58 Copyright Act (Act No. 48 of 6 May 1970, as amended 2020) (Jan. 20, 2021), available at https://wipolex.wipo.int/en/legislation/details/20024.

59 Examination Guidelines for Patent and Utility Model in Japan, Japan Patent Office (2015) (Jan. 20, 2021), available at https://www.jpo.go.jp/e/system/laws/rule/guideline/patent/tukujitu_kijun/.

60 *Id.*

61 *Id.*

62 Indonesia and IPR developments, a new dimension, Intellectual Property Expert Group (Jan. 20, 2021), available at https://www.ipeg.com/indonesia-and-ipr-developments-a-new-dimension/.

explains the problem of implementing western and international standards for the protection of intellectual property in Indonesian legislation by the fact that culturally the structure of their life is communal, not individualistic. The TRIPS Agreement is based on an individualistic culture and ideology that does not correspond to Indonesian culture.[63] Indonesia is the only G20 State that participated in the Berne Convention (from 1913 to 1945 as part of the Netherlands and then as an independent State), denounced the Convention in 1960 and then re-acceded to it in 1997. Considering the patent legislation of Indonesia at the beginning of the 21st century as a whole, it can be said that it is not perfect in terms of establishing clear criteria for patentability of innovative inventions, as well as the grounds and procedures for issuing compulsory licenses. However, with the adoption of the new Patent Act in 2016, there has been some improvement in the effectiveness of intellectual property protection.

The Indonesian Patent Act of 2001 did not contain any provisions regarding patent protection for computer programs.[64] In Article 4 of the Patent Act of 2016[65] relating to unprotected subject matter established that rules and methods that contain only computer programs are not inventions. On the face of it, Indonesia prohibits patenting of computer programs and their algorithms. However, this conclusion would be erroneous, because the official explanations to this law[66] state: If a computer program has symbols (instructions) that have a technical effect and functionality to solve a problem, then such subject matter would be patentable. It is also stated in the Explanation that an algorithm means an efficient method expressed as a finite set of well-defined instructions for calculating a function. Furthermore (this is important to underline) the algorithm is named as an example of a patentable invention.

It is clear that the patent protection regime for computer programs in Indonesia is controversial and uncertain. About this mode, scientific papers describe the following: "there are two important elements of software related to computer programs: 1) the basic process and algorithms of the operating system and 2) a set of instructions that explain the process in detail,"[67] the first element would be protected by means of patent law, and the second by means of copyright law. The development of legislation towards strengthening patent protection and expanding

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63 O.K. Saidin, *Transplantation of Foreign Law into Indonesian Copyright Law: The Victory of Capitalism Ideology on Pancasila Ideology*, 20(4) J. Intellect. Prop. Rts. 238 (2015).

64 Law No. 14 of 1 August 2001, Regarding Patents (Jan. 20, 2021), available at https://wipolex.wipo.int/en/legislation/details/2261.

65 Law of the Republic of Indonesia No. 13 of 2016, on Patents (Jan. 23, 2021), available at https://wipolex.wipo.int/en/legislation/details/16392.

66 *Id.*

67 Abdul Atsar, *Perlindungan hukum terhadap invensi di bidang teknologi informasi dan komunikasi sebagai salah satu upaya meningkatkan kesejahteraan masyarakat di Indonesia* (2017) [Abdul Atsar, *Legal Protection of Inventions in the Field of Information and Communication Technology as One of the Efforts to Improve the Welfare of the Community in Indonesia* (2017)] (Jan. 24, 2021), available at https://osf.io/preprints/inarxiv/uwv29/.

the list of patentable subject matter is understood by Indonesian legal scholars as an international trend. It ensures the development of technology and business. However, scholars still note a number of problematic aspects of Indonesian patent law, including the lack of legal certainty expressed in the fact that the provisions on the patentability of algorithms are not contained in the law itself, but only in the explanations to the law.[68]

4. "Negating" Approach to Patenting

The idea of a legal ban on patenting computer programs as such goes back to the European Patent Convention of 1973 (EPC).[69] The EPC introduced the European patents equal to the national patents of the EPC member states. Although all European Union (EU) member states have joined the EPC, it is not included to the EU law system. Moreover, the EPC members include non-EU states, such as Turkey, Switzerland, and Norway. Speaking of the EU law, it is worth to be mentioned that at the beginning of the 21st century European scientists have conducted extensive research on the patentability of computer programs[70] and, in 2002, the European Parliament and Council have tried to propose a Directive on the patentability of computer-implemented inventions.[71] However, on 6 July 2005, the European Parliament rejected the Directive, and the European Commission abandoned its further development.

Article 52(1) of the EPC enshrines that European patents shall be granted for any inventions which are susceptible of industrial application. Article 52(2) of the EPC provides a list of unpatentable subject matters, which includes schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers. Article 52(2) inclines that such objects shall not be considered inventions in the sense of aforementioned Article 52(1). While Article 52(3) of the EPC further specifies that provisions of Article 52(2) shall exclude patentability of the subject-matter or activities referred to in that provision only to the extent to which a European patent application or European patent relates to such subject-matter or activities as such.

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68 Atsar, *supra* note 67.

69 European Patent Convention (1973) (Jan. 24, 2021), available at https://www.epo.org/law-practice/legal-texts/epc.html.

70 Puay Tang et al., *Patent Protection of Computer Programmes*, Final Report, submitted to European Commission, Directorate-General Enterprise (2001) (Jan. 24, 2021), available at http://www.juergen-ernst.de/download_swpat/studie_tang.pdf; Directorate-General for Research, European Parliament, The Patentability of Computer Programme: Discussion of European-Level Legislation in the Field of Patents for Software, Working Paper (April 2002) (Jan. 24, 2021), available at http://www.europarl.europa.eu/meetdocs/committees/juri/20020619/SoftwarePatent.pub.pdf.

71 Proposal for a Directive of the European Parliament and of the Council on the patentability of computer-implemented inventions, COM/2002/0092 final – COD 2002/0047, EUR-Lex (Jan. 24, 2021), available at https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52002PC0092.

Nevertheless, despite such seemingly strict rules, there is practice of the EPO and the national patent offices to grant patents for the aforementioned subject-matters. Lionel Bently and Brad Sherman note that, although it was thought that copyright law, rather than patent law, would protect subject-matters based on information technology, since the enforcement of the EPC (1977), there has been a trend of increasing patent protection of computer-related inventions.[72] This trend is based on a whole contents approach, which is that an invention that includes a computer program can be patentable if the invention as a whole is a technical solution.[73] At the same time, it is considered that a computer program is of a technical character where it is a source of technical influence when run on a computer. Moreover, the impact itself should be more than the basic physical interaction between the program and the computer.

The way to patent computer programs was unlocked by a landmark decision of Board of Appeal of the EPO dated by 15 July 1986. In the case of *VICOM Systems Inc.*[74] the Board of Appeal recognized the claimed method of improving the digital image as patentable. In another case, the EPO stated that a computer program written on a tangible medium was no longer a computer program as such and was therefore patentable.[75] This decision led some authors to conclude that almost any computer program can be patented in Europe.[76] The last one is arguable as the European requirements for patentability of computer programs are slightly stricter comparing to the leading Common law legal systems and Japan. For example, as it is mentioned earlier in this paper, in the United States, Canada, and Australia, "Amazon" was granted a patent for its one-click method of internet shopping. While a similar application was rejected by the EPO on the grounds that the method of reducing the number of steps required to purchase from an online store does not have the inventive step required to grant a patent.[77]

The rules for the examination of inventions based on computer programs are provided in the Guidelines for Examination in the European Patent Office (Pts. G, H).[78]

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72 Lionel Bently & Brad Sherman, *Intellectual Property Law* 410 (2004).

73 *Id*. at 411.

74 T 0208/84 (Computer-related invention), ECLI:EP:BA:1986:T020884.19860715, 15 July 1986 (Jan. 26, 2021), available at https://www.epo.org/law-practice/case-law-appeals/recent/t840208ep1.html.

75 T 0424/03 (Clipboard formats I/MICROSOFT), ECLI:EP:BA:2006:T042403.20060223, 23 February 2006 (Jan. 26, 2021), available at https://www.epo.org/law-practice/case-law-appeals/recent/t030424eu1.html.

76 Susan J. Marsnik & Robert E. Tomas, *Drawing a Line in the Patent Subject Matter Sands: Does Europe Provide a Solution to the Business Method and Software Patent Problem?*, 34(2) B.C. Int'l & Comp. L. Rev. 294 (2011).

77 T 1244/07 (1-Click/AMAZON), ECLI:EP:BA:2011:T124407.20110127, 27 January 2011 (Jan. 26, 2021), available at https://www.epo.org/law-practice/case-law-appeals/recent/t071244eu1.html.

78 Guidelines for Examination in the European Patent Office, EPO (March 2022) (Jan. 26, 2021), available at https://www.epo.org/law-practice/legal-texts/guidelines.html.

The rules provide that a computer program can be considered as an invention where it has a technical effect going beyond the "normal" physical interactions between the program (software) and the computer (hardware). In other words, a computer program or its algorithm do not have enough technical character based the simple fact that they were designed in such a way that they can be automatically executed by a computer.

The impact of the EPC on the patent law of the EU member states is reflected in the fact that the European Patent System is based on the active cooperation between the EPO and the national offices of member states, which implies the harmonization of national patent law with the EPC.

Despite the unlike history and traditions of copyright and patent law, the leading EU legal systems (Germany, France, Italy) and the UK (exited the EU in 2020) generally adhere to the same approach with regard to the computer programs patentability. In 1977, the UK specifically incorporated the EPC provisions into its Patent Act. Happened substantial amendments of both the material and procedural UK patent regulations were called by Susan J. Marsnik and Robert E. Tomas: "the greatest culture shock in the history of British patent law."[79] The basis of the approach is the legal provisions that computer programs as such are not inventions: Article 1(2) of the UK Patent Act of 1977;[80] Section 1(3) of the German Patent Act of 1980;[81] Article L611-10(2) of the French Intellectual Property Code of 1992;[82] Article 45(2) of the Italian Industrial Property Code of 2005.[83]

However, aforementioned does not negate the fact that there is still a certain practice discrepancy between the EPO and patent offices and courts of Germany, France and the UK. The EPO policy is generally more favorable to the patenting of computer programs comparing to the national patent offices' policy of aforementioned States. As a result, a patent registered by the EPO can be challenged and is sometimes challenged in the courts of Germany, France or the UK.

Germany's approach to patenting computer programs has long been considered one of the most conservative comparing to other EU States' legal systems. However, on 22 April 2010, the German Supreme Court has issued a groundbreaking decision considering the case of patent application for the method of dynamic generation

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79 Marsnik & Tomas 2011, at 302.

80 UK Patent Act (1977) (Jan. 26, 2021), available at https://www.gov.uk/government/publications/the-patents-act-1977.

81 German Patent Act (1980) (Jan. 26, 2021), available at https://wipolex.wipo.int/ru/legislation/details/17611.

82 French Intellectual Property Code (1992) (Jan. 26, 2021), available at https://wipolex.wipo.int/ru/legislation/details/19865.

83 Italian Industrial Property Code (2005) (Jan. 26, 2021), available at https://wipolex.wipo.int/ru/legislation/details/19852.

of structured documents.[84] Affirming the patentability of the claimed method, the Supreme Court considerably expanded the existed concept of the technical means provided to solve a technical problem and significantly unified the German practice to that of the EPO. According to the Supreme Court, such means are available not only when the components of the device are modified or fundamentally changed. It is sufficient, for example, if the sequence of data processing that is used to solve the problem is determined by technical factors that lie outside the data processing system, i.e. the computer.

Among the G20 states, Turkey is also a member of the EPC. Article 82(2) of the Turkish Industrial Property Law of 2016[85] establishes that computer programs are not considered inventions. The wording of the EPC that these subject matters are not patentable "as such" is implemented in Turkish Law through the phrase "only these subjects are excluded from the patentability." Talat Kaya justifiably points out that these expressions have the same meaning.[86]

The possibility of granting a patent in relation to algorithms of computer programs, if they meet the general criteria for the patentability of an invention, is testified by the law enforcement practice. So, in 2017, a patent for "Method, controller and display device of RGB image content" was granted (application No. 2017/08960).[87] In 2020, a patent application by Huawei Technologies for the invention "method for determining precoding matrix set and transmission apparatus" was granted (Application No. 2020/15584).[88] At the same time, scientific papers note the presence of gaps in regulation in the field of patenting algorithms and propose to resolve the issue of their protection legislatively, by means of intellectual property rights.[89]

The prohibition of patenting computer programs as such is also established outside the EPC member states: among the G20 states, these are four out of five BRICS

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84 German court ruling Xa ZB 20/08, upholding Siemens patent, End Software Patents, 19 May 2010 (Jan. 26, 2021), available at http://endsoftpatents.org/2010/05/german-court-ruling-upholding-siemens-patent-as-text/.

85 Law No. 6769 of 22 December 2016, on Industrial Property (Dec. 21, 2020), available at https://wipolex.wipo.int/en/legislation/details/16609.

86 Talat Kaya, *A Comparative Analysis of the Patentability of Computer Software Under the TRIPS Agreement: The U.S., the E.U., and Turkey*, ResearchGate (2007) (Dec. 21, 2020), available at https://www.researchgate.net/publication/265264361_A_Comparative_Analysis_Of_The_Patentability_Of_Computer_Software_Under_The_Trips_Agreement_The_US_The_EU_And_Turkey.

87 Method, controller and display device of RGB image content (Dec. 21, 2020), available at https://portal.turkpatent.gov.tr/anonim/arastirma/patent/sonuc/dosya?patentAppNo=2017%2F08960&documentsTpye=all.

88 Önkodlama matris kümesi belirleme yöntemi ve iletim cihazı [Precoding matrix set determination method and transmission device] (Dec. 21, 2020), available at https://portal.turkpatent.gov.tr/anonim/arastirma/patent/detayli.

89 Pelin Özkaya & Refik Samet, *Yazılım Ürünlerinin Telif Hukuku Kapsamında Korunması* [*Protection of Software Products Within the Copyright Law*], 6(1) Uluslararası Bilgi Güvenliği Mühendisliği Dergisi 17 (2020).

members (Brazil, the Russian Federation, South Africa, India), as well as Argentina and Mexico. As seen, the European approach is adopted by both the states of the continental legal family and the Anglo-American. First, let us analyze the continental legal order, and then – the legal systems of the common law.

The prohibition of patenting computer programs in the Russian Federation is established in Article 1350(5) of the Civil Code. Its formulation is very similar to the provision of Article 52(2) and (3) of the EPC.

The Federal Service for Intellectual Property (Rospatent) and its Guidelines for the Examination of Applications for an Invention explain that an application for an invention may relate to an algorithm of a computer program, which is set forth in the form that ensures the achievement of a technical result of a sequence of actions on signals (material subject matter), and is carried out with the help of computer technology (material means). In such a case, the grounds for recognizing the declared subject matter as a technical solution exist (cl. 2.4.36)[90]. As an example of inventions related to algorithms, that were granted in Russia can be considered following: patent No. 2535504 "System for treating site content," No. 2586249 "Method for processing a search request from a user associated with an electronic device", No. 2251737 "Method for automatic recognition of text containing fragments, written in several languages."[91] At the same time, in the mentioned Guidelines it is stated that "a subject matter cannot be considered as an invention, if the application is filed for a computer software product," which only technical result is the reduction of time needed to search for information, as stated by the applicant.

The decision of the Intellectual Property Rights Court dated 8 June 2018[92] is Significant for the Russian patent law. The court upheld patent No. 2553452 "Method for managing connections within a mobile radiotelephone network." In this case, the court did not provide any new and significant criteria for the patentability of computer programs and their algorithms. In fact, the position of Rospatent that the algorithm of a computer program can be patentable, if the sequence of actions on a material object with the help of the computing technology ensures the achievement of a technical result was reproduced.

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[90] Приказ Роспатента от 27 декабря 2018 г. № 236 «Об утверждении Руководства по осуществлению административных процедур и действий в рамках предоставления государственной услуги по государственной регистрации изобретения и выдаче патента на изобретение, его дубликата» // СПС «КонсультантПлюс» [Act of Rospatent No. 236 of 27 December 2018. On Approval of the Guidelines for the Implementation of Administrative Procedures and Actions within the Framework of the Provision of State Services for the State Registration of an Invention and the Issuance of a Patent for an Invention, its Duplicate, SPS "ConsultantPlus"] (Dec. 21, 2020), available at http://www.consultant.ru/document/cons_doc_LAW_316428/.

[91] Patent No. RU 2251737; No. RU 2586249; No. RU 2535504 (Dec. 21, 2020), available at https://new.fips.ru/registers-web/action?acName=clickRegister&regName=RUPAT.

[92] Решение Суда по интеллектуальным правам от 8 июня 2018 г. по делу № СИП-789/2016 // СПС «Гарант» [Decision of the Intellectual Property Rights Court of 8 June 2018 on Case No. SIP-789/2016, SPS "Garant"] (Dec. 28, 2020), available at https://www.garant.ru/products/ipo/prime/doc/71864692/.

In Brazil, Argentina and Mexico, the three states that represent Latin America, the legal models for patenting computer programs and algorithms are very similar. Computer programs are not considered inventions by virtue of the direct indication of Article 6 of the Argentine Law on Patents and Utility Models 1995,[93] Article 10 of the Brazilian Law "On Industrial Property" 1996,[94] Article 47 of the Mexican Federal Law on the Protection of Industrial Property 2018.[95] However, only the Law of Argentina lacks the clause that computer programs are not considered inventions as such.

The issue of the possibility of patenting inventions based on computer programs or containing computer programs is positively resolved in the acts of the patent offices of these states.[96] The technical effect or solution of a technical problem is considered as an additional criterion for the protection of such inventions: Article 33 of the Mexican Regulations, Section 2.1.3 of Chapter IV of the Argentine Guiding Principles, clause 4.1 of the Brazilian Examination Rules. For example, Argentina patented algorithm for detecting faults in environment zonal wells,[97] Brazil – Ultrasonic sealing algorithm with temperature control,[98] Mexico – computer program product for automatic inspection of a train.[99] It should be noted that Section 4 of the Brazilian Examination Rules provides an obvious and simple definition of an algorithm, which is "a logical sequence of actions that must be followed in order to correct a problem." What is curious, is that a similar definition was included in

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93 Law No. 24.481 of 30 March 1995, on Patents and Utility Models (as amended up to Decree No. 27/2018 of 10 January 2018) (Dec. 28, 2020), available at https://wipolex.wipo.int/en/legislation/details/17824.

94 Lei de propriedade industrial (Lei Nº 9.279, de 14 de maio de 1996) (Dec. 29, 2020), available at http://www.planalto.gov.br/ccivil_03/leis/L9279.htm.

95 Federal Law on the Protection of Industrial Property, published in the Official Journal of the Federation on 1 July 2020 (Jan. 15, 2021), available at https://wipolex.wipo.int/en/legislation/details/20034.

96 Rreglamento de la ley de la propiedad industrial. Nuevo Reglamento publicado en el Diario Oficial de la Federación (1994) [Regulation of the Industrial Property Law. New regulation published in the Official Journal of the Federation (1994)] (Jan. 15, 2021), available at http://www.diputados.gob.mx/LeyesBiblio/regley/Reg_LPI_161216.pdf; Directrices de examen en la administración nacional de patentes INPI (P 243/2003) [Examination Guidelines in the National Patent Administration INPI (P 243/2003)] (Jan. 15, 2021), available at http://www.cyta.com.ar/biblioteca/bddoc/bdlibros/patentamiento_directrices.pdf; Institui as Diretrizes de Exame de Pedidos de Patentes Envolvendo Invenções Implementadas por Programas de computador (Resolução INPI/PR No. 158, 2018) [Establishes the guidelines for examination of patent applications involving inventions implemented by computer programs (resolution INPI/PR No. 158, 2018)] (Jan. 15, 2021), available at https://wipolex.wipo.int/en/text/453419.

97 Algorithm for the Detection of Zone Faults in a Well Environment, No. AR098975A1 (Dec. 28, 2020), available at https://patents.google.com/patent/AR098975A1/en?q=algorithm&country=AR.

98 Ultrasonic sealing algorithm with temperature control, No. BR112020017876A2 (Dec. 28, 2020), available at https://patents.google.com/patent/BR112020017876A2/en?q=%22algorithm%22&country=BR&type=PATENT&oq=%22algorithm%22+country:BR+type:PATENT.

99 System, method, and computer program product for automatic inspection of a train, No. MX2018014655A (Dec. 28, 2020), available at https://patents.google.com/?q=(%22computer+program%22)&country=MX&type=PATENT&oq=(%22computer+program%22)+country:MX+type:PATENT&sort=new&page=2.

Article 19.1 of the Trade Agreement between the United States, Mexico and Canada concluded in 2020 (USMCA).[100]

India and South Africa are Representatives of the Anglo-American traditions of law in the BRICS. India is one of the leaders in the IT industry. In the 21st century, Indian Patent Law was influenced by TRIPS Agreement and EPC. Similar to the European Patent Convention, Indian law excludes computer programs from patentable subject matter, but only as such. Article 3 of the 1970 Patent Act presents an extensive list of unpatentable subject matter, among which are named: a mathematical or business method or a computer program per se or algorithms.[101]

The expression "computer program per se" is not clarified in the law and is considered a source of some uncertainty in both legal science and patent practice in India. In order to address this uncertainty, the Indian Patent Office in 2015 developed Guidelines for Examination of Computer Related Inventions.[102] This act prohibited the granting of patents for business methods, but computer programs could be patentable under certain conditions. Indian Open Source Activists criticized the 2015 Guidelines. They stated that this act would negatively influence the development of innovations in India. This criticism led to the withdrawal of the 2015 Guidelines, the new Guidelines were approved in February 2016,[103] and revised in 2017.[104] In the 2016 and 2017 Guidelines, the patentability requirements for computer programs were significantly tightened.

The 2017 revised Guidelines emphasize on the content of the application, it is stated:

> The Patent Law explicitly excludes computer programs as such from patentable subject matter, and this exclusion should not be avoided simply by masking the essence of the application with its wording. Even if a computer program is associated with computer hardware, but the essence of the

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100 Agreement between the United States of America, the United Mexican States, and Canada 7/1/20, Office of the United States Trade Representative (Jan. 23, 2020), available at https://ustr.gov/trade-agreements/free-trade-agreements/united-states-mexico-canada-agreement/agreement-between.

101 Indian Patents Act (Act No. 39, 1970) (Dec. 28, 2020), available at https://wipolex.wipo.int/en/legislation/details/20694.

102 Office of the Controller General of Patents, Designs & Trade Marks, Guidelines for Examination of Computer Related Inventions (CRIs) (2015) (Dec. 28, 2020), available at http://www.rc-iplaw.com/wordpress/wp-content/uploads/2015/10/CRI_Guidelines_21August2015.pdf.

103 Office of the Controller General of Patents, Designs & Trade Marks, Guidelines for Examination of Computer Related Inventions (CRIs) (2016) (Dec. 28, 2020), available at http://www.ipindia.nic.in/writereaddata/Portal/IPOGuidelinesManuals/1_83_1_Guidelines-for-Examination-of-CRIs-19-2-2016.pdf.

104 Office of the Controller General of Patents, Designs & Trade Marks, Guidelines for Examination of Computer Related Inventions (CRIs) (2017) (Dec. 28, 2020), available at http://ipindia.gov.in/writereaddata/Portal/IPOGuidelinesManuals/1_86_1_Revised__Guidelines_for_Examination_of_Computer-related_Inventions_CRI__.pdf.

invention lies in the program or algorithm itself, then such subject matter is not patentable.

Despite the tightening of rules for patenting computer programs, patents for these subject matters are still granted in India. For example, in 2009, "Facebook" filed an application for an invention that is a method of creating dynamic personalized content for a user of a social network. The applicant stated that the invention had a technical effect and further explained the complexity of his method. These arguments satisfied the Patent Office. Thus, in 2017 "Facebook" patent was granted.[105] In 2005, "Google" filed an application for the invention of "Identifying Phrases in an Information Retrieval System". In one of the claims, it was stated that this is a basic mathematical algorithm with logical steps. However, the applicant considered that his invention was not an algorithm or a computer program as such, but provided a solution to a technical problem (how to automatically identify phrases in a collection of documents). As a result, the patent office came to the conclusion that the declared subject matter is a technical solution and granted a patent in 2017.[106]

One of the most unusual computer software patenting regimes has developed in South Africa. On the one hand, clauses 2 and 3 of Article 25 of the Patent Act 1978 borrow the strict approach of Article 52 EPC: computer programs as such, cannot be considered as inventions. The scientific literature concludes that the prohibition of patenting computer programs is not absolute.[107] If a subject matter that meets the criteria of novelty, inventive step and industrial applicability will include an unpatentable element from the list of clause 2 of Article 25 of the 1978 Law, then such a subject matter will generally be considered patentable.[108]

On the other hand, the South Africa patent office does not examine an application for an invention on the merits, but only examines formal requirements. This circumstance is the reason that South Africa has one of the highest grant rates in the world.[109] In the database of patents granted by the South African Office, there is information about patenting and algorithms implemented by computers and computer programs: Algorithm for passive power factor compensation method with differential capacitor change and reduced line transient noise (ZA201508040B),

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105 Ajay Sharma, *Software Patentability: In Indian Context*, Legal Service India (Dec. 28, 2020), available at http://www.legalserviceindia.com/legal/article-9-software-patentability-in-indian-context-.html.

106 *Id.*

107 Thethiwe N. Mashinini, *The Computer Software Patent Debate: A Double-Edged Sword?*, University of Pretoria (November 2016), at 12 (Jan. 28, 2021), available at https://repository.up.ac.za/bitstream/handle/2263/60064/Mashinini_Computer_2016.pdf?sequence=1&isAllowed=y.

108 Philip Stoop, *Commercial and Economic Law in South Africa* 41 (2019).

109 Companies and Intellectual Property Commission, Submission by South Africa: Exceptions and Limitations (October 2017) (Jan. 28, 2021), available at https://www.wipo.int/export/sites/www/scp/en/meetings/session_27/3rdparty_comments/south_africa.pdf.

Method and computer program product for optimization of maintenance plans (ZA201305759B), Apparatus, method and computer program for providing medical advice based on self-reported symptoms of a user (ZA201906845B).

There is no doubt that the absence of examination of the claimed computer programs regarding the criteria for their patentability in South Africa is a favorable factor for those interested in easy obtaining patents. However, such simplicity leads to a collision of patents granted for the same subject matters, and it leads to unnecessary monopolization, which harms competition and technological development. Thus, the example of South Africa confirms our conclusion that even a strict legislative ban on patenting computer programs can be devalued by ill-considered practice of examining applications for inventions.

Conclusion

The constant growth of the software market associated with widespread digitalization determines the importance of the issue of effective legal protection of computer programs. Computer programs are primarily protected as subject matters of copyright law in international law and national legal systems. However, copyright law protection is not sufficient to effectively protect the interests of computer program developers because copyright law does not protect the algorithms underlying a computer program. Meanwhile, computer program algorithms often have a very high commercial value.

In fact, the dilemma of protecting computer programs as subject matters of copyright law or patent law was resolved at the international level in favor of copyright law in 1978, when WIPO published the Model Provisions on the Protection of Computer Software. In our opinion, the TRIPS Agreement (1994) formalized the existing consensus. At the same time, the TRIPS Agreement did not prohibit the protection of computer programs by patent law. It gave relative freedom to national legislations to decide on the patentability of their algorithms.

The research revealed that the G20 states and BRICS states have different legislative models concerning the patentability of computer programs and their algorithms. These states should be divided into three groups according to this criterion.

States that follow a neutral approach were included in the first group: the United States, Australia, Canada, the Republic of Korea, China, and Saudi Arabia. The legislation of these states does not explicitly prohibit the patenting of computer programs, but computer programs themselves are not mentioned among the subject matters of inventions.

The second group included states which legislation explicitly classified computer programs as patentable inventions: Japan and Indonesia. We call this approach "Positive."

The third approach, which we call "Negating," is followed by the majority of G20 and BRICS members: European Union, Germany, France, Italy, Great Britain, Turkey,

Russian Federation, Brazil, Argentina, Mexico, India, South Africa. The legislation of these states prohibits the patenting of computer programs as such.

Our most important conclusion is that patents on computer programs and algorithms are granted in all G20 states at present, regardless of the rules set out in the legislation. The results of the research demonstrate that there is no direct correlation between the way of solving the issue of patentability of computer program algorithms in different legal systems and the state's place in the global IT market. The leaders of the global IT market are the United States, Japan, the EU, India and China.[110] All three approaches are represented among these states.

It should be noted that the G20 states solve the issue of patentability of computer program algorithms with little reference to the deep Anglo-American and Continental traditions of copyright law and patent law that are still in place.

Nevertheless, there is some specificity in each of the three approaches to the patentability of computer program algorithms.

The neutral approach is the most flexible from the point of view of patent law policy because legislators prefer not to react to technological developments and leave the issue of patentability of computer programs to the courts and patent offices. In the United States, for example, the Supreme Court has traditionally dealt with this issue. Notably, the Supreme Court has distanced itself from formulating general rules that would distinguish between unpatentable ideas and patentable algorithms resolving specific disputes.

China is the only BRICS member that follows a neutral approach. China's national intellectual property policy has been fundamentally changed to permit the patenting of computer program algorithms over the past four years. In China, the instrument of this policy is the administrative rules on the examination of inventions rather than Supreme Court decisions, unlike in the United States.

The most liberal and consistent approach is the positive approach presented by the Japanese legal system. It corresponds to the fact that, in practice, Japan's intellectual property rights protection system is more protective of the interests of the rights holders, rather than of other participants in the turnover or of society as a whole. Japan has adopted Examination Guidelines for Patent, which explains in great detail (unlike other G20 states) the rules of patentability of computer programs.

The negating approach is the most controversial and at the same time the most common. Its popularity can be explained by the strong influence of the European Patent Convention on the legislation of Europe and other states. The contradiction of this approach is reflected in the fact that, on the one hand, Article 52 of the EPC and similar national laws prohibit the patentability of computer programs as such,

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[110] Global market share of the information and communication technology (ICT) market from 2013 to 2022, by selected country, Statista (Feb. 25, 2021), available at https://www.statista.com/statistics/263801/global-market-share-held-by-selected-countries-in-the-ict-market/.

and, on the other hand, guidelines for the examination of inventions and judicial practice allow the patenting of algorithms under certain conditions.

The practice of patenting computer program algorithms in states following the negating approach is more restrictive than that in Japan or the U.S. Firstly, in Japan, unlike the European states, India, Russia, Brazil, there are no requirements that running a program on a computer should produce an additional technical effect that goes beyond the usual or normal physical interaction between the program and the computer hardware. Secondly, for example in the United States "Amazon" was granted a patent for its one-click method of internet shopping. However, a similar application was rejected by the EPO.

In our opinion, the most unusual mode of patenting computer programs has developed in the legislation of the BRICS member – South Africa. On the one hand, the SA Patent Act borrows the negating approach of Article 52 EPC. On the other hand, the South Africa patent office does not examine an application for an invention on the merits. This circumstance is the reason that South Africa has one of the highest grant rates in the world. We believe that this practice of patenting computer programs is erroneous and it leads to a collision of patents granted for the same subject matters. It leads also to excessive monopolization, which harms competition and the development of technologies.

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