AMERICAN UNIVERSITY OF ARMENIA

ՀԱՅԱՍՏԱՆԻ ԱՄԵՐԻԿՅԱՆ ՀԱՄԱԼՍԱՐԱՆ

LL.M. PROGRAM

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TITLE

AUTHORSHIP AND OWNERSHIP OF INTELLECTUAL PROPERTY FOR OBJECTS CREATED BY ARTIFICIAL INTELLIGENCE

"CAN ART AND INNOVATIONS CREATED BY ARTIFICIAL INTELLIGENCE BE PROTECTED UNDER THE TRADITIONAL COPYRIGHT AND PATENT FRAMEWORK IN ARMENIA AND ARE THERE REGULATIONS ON THIS REGARD IN DIFFERENT JURISDICTIONS?"

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NUMBER OF WORDS

14156

2020

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LIST OF ACRONYMS AND ABBREVIATIONS

AI – Artificial Intelligence

CDPA – The Copyright, Designs and Patents Act 1988 of the United Kingdom

CONTU – The Commission on New Technological Uses of Copyrighted Works

EC – European Commission

EPO – European Patent Office

EU– European Union

GDPR –General Data Protection Regulation

GP – Genetic Programming

IP – Intellectual Property

PCT– Patent Cooperation Treaty

RA – Republic of Armenia

TRIPS – The Agreement on Trade-Related Aspects of Intellectual Property Rights

UK – United Kingdom of Great Britain and Northern Ireland

UKIPO – Intellectual Property Office of the United Kingdom

WCIT– World Congress on Information Technology

WIPO – World Intellectual Property Organization

WTO – World Trade Organization

USA– United States of America

USPTO – United States Patent and Trademark Office

INTRODUCTION

In every country innovators and creators are driving force for economic development. Thus, every society has potential for economic advancement in case of rewarding the innovators and creators for their works. This is where Intellectual Property plays crucial role. It is a huge tool for development entailing economic, social and cultural benefits. In other words, granting IP rights to individual creators and innovators compensate and provide fair share of economic gains for their mental and physical effort put into specific work. In fact, Intellectual property is a significant factor in fostering economic development both at micro and macroeconomic levels. The system of Intellectual property, both on internal and international levels provide opportunity and platform for developing countries to take part in economic competition led by developed countries.[1]

At the meantime, the development of Artificial Intelligence is driving force for economic growth and productivity. It can increase effectivity of work in vast majority of fields by replacing human force with technology in automation of routine tasks and it can also significantly improve decision-making by analyzing the large amount of data not available for human brain to encompass. A study, which covered 12 developed economies, which, in their turn provide 0,5 % of the world's economic output, predicts that AI will double annual global economic growth rates by the year of 2035. It will in the first place enhance labor productivity, and then provide automation in solving problems in more efficient and optional ways.[2]

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[1] Emmanuel Hassan, Ohid Yaqub & Stephanie Diepeveen, *Intellectual property and developing countries: a review of the literature, available at* https://www.rand.org/content/dam/rand/pubs/technical_reports/2010/RAND_TR804.pdf (last visited Mar 16, 2020)

[2] Id.

The first circulation of the term Artificial Intelligence (hereinafter 'AI') can be attributed to John McCarthy of Massachusetts Institute of Technology, who brought it into use in summer 1956 at the conference at Dartmouth College in New Hampshire.[3] The scientists believed that aspects of learning as well as other characteristics of human intelligence can be simulated by machines. Since then the term has undergone several transformations, many researchers and scientists have made a lot of efforts aimed at reinforcing Artificial Intelligence or otherwise defined as Augmented Intelligence. The logic behind is that the aim of AI is not replacing human intelligence, but rather helping it to transform the world to the benefit of society. In other words, it is not AI v. Human Intelligence, but AI plus Human Intelligence. Before the recent developments some advancements, which have not become widespread, were taking place from creation of first Chatbot to computer beating world chess championship.[4] However, the dramatic transformations launched in 2010 mainly due to the considerable improvement in the computing power and access to massive quantities of data. Technical advancement of AI with its several applications in various fields of human interactions caused difficulty to tackle with it. Particularly, concerning legal framework there are no uniform attitudes or legal regulations dealing with the negative or positive outputs created through AI technologies. Thus, it is much obvious that the legal issue of works, generated by AI technologies have not yet been legally defined, although public discussions are occasionally being held.

The link between innovation and AI is very tight: 2019 report on AI by the World Intellectual Property Organization (hereinafter 'WIPO') shows that there has been a boom in the number of scientific papers in the field since the start of the century, which resulted rapid growth in patent application between 2013 and 2016.[5] United Stated Patent and Trademark Office (hereinafter 'USPTO') has registered several patents, mentioning as inventor different stakeholders, and more often - the programmer of the AI machine or program and as the owner of the patent - the company or respectively the programmer. However, innovation and art created by AI is still in the grey area of Intellectual Property (hereinafter 'IP') law, particularly for copyright and patent law. The legal issue identified here is who is entitled to be the author of the work created and consequently, who should

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[3] Council of Europe, Section on Artificial Intelligence, *History of Artificial Intelligence, available at* https://www.coe.int/en/web/artificial-intelligence/history-of-ai (last visited Feb 11, 2020)
[4] Id.
[5] WIPO, WIPO Technology Trends 2019, *Artificial Intelligence, available at* https://www.wipo.int/publications/en/details.jsp?id=4386 (last visited Feb 11, 2020)

be the owner. The programmer? The user? Or the investor? There is an obvious clash of interests between several stakeholders.

The current Armenian copyright and patent legislation was not adopted with the view of protecting works that are not created the 'traditional' way, that is, solely by humans. The global approach on this regard is not finalized as well. The issue of inventorship has not been addressed in any jurisdiction, and the issue of copyright ownership in very few countries. The significance of the issue is strengthened with the fact that World Intellectual Property Organization has been holding public discussions on the impact of Artificial Intelligence on Intellectual Property. Today regulating ownership of AI creativity and innovativeness will have various far-reaching commercial and legal implications and may be a tool for defining the direction in which further development of AI can go on.

In this Master's paper the possibility of granting the authorship and ownership rights will be discussed in traditional copyright and patent framework of Republic of Armenia with comparison to different jurisdictions, where the issue has been solved and also recent trends, specifically WIPO discussions and acceptable approaches. The issue that will be specifically highlighted is how disruptive for IP system is incorporation of AI-generated objects directly into public domain. Hence, based on mentioned gaps, the main research question of this Master's paper is following:

"Can art and innovations created by artificial intelligence be protected under the traditional copyright and patent framework in Armenia and are there regulations on this regard in different jurisdictions?"

The paper is mainly based on in-depth text-based research which is mostly conducted upon the legislation of the Republic of Armenia, analysis of legal books, journal articles, websites and official publications of legislative bodies that have been done in order to provide completeness and illustrating the bigger picture of the issue addressed. Also, cases and administrative acts from different jurisprudences are examined for illuminating the interpretation of rules of copyright and patent law. The method of collecting information on this matter through personal interviews has also been carried out. This was done in structured way, which included predetermined set of questions. The interviews have been carried out with different stakeholders, mainly with legal professionals specialized on research matter.

Master's paper literature is based on a vast array of research articles, legal journals, scholarly papers, as well as recommendations and guides by reputable international organizations, specifically World Intellectual Property Organization. Certain legal instruments in terms of Laws and other normative acts of the Republic of Armenia are also cited in the paper, particularly Civil Code, Law on Copyright and Related Rights, Law on Inventions, Utility Models and Industrial Designs. One of the core documents that has been broadly used in this Master's Paper is Copyright, Designs and Patents Act 1988 of the United Kingdom. WIPO guides and recommendations prove to be another useful reference point in coming up with possible solutions for the regulation of the authorship, inventorship and ownership issues of AI-generated objects.

CHAPTER I

COPYRIGHT IMPLICATIONS OF ARTIFICIAL INTELLIGENCE

Protecting art and artistic expressions and stimulating artistic creations within the society under the copyright law is aimed at promoting innovation and development while giving economic benefits to authors. Intellectual property rights find their roots in the Constitution of the Republic of Armenia adopted in 2015 which establishes under article 60 (7) *"that intellectual property shall be protected by law"*.[6]

The Civil Code of the Republic of Armenia establishes under article 140: *"In cases and in the manner provided for by this Code and other laws, the exclusive right of a citizen or a legal person shall be recognized with respect to the objectively expressed results of intellectual activities and with respect to identification means equated thereto of a legal person, product, works being performed or services being provided (trade name, trademark, service mark, etc.)"*[7] In Civil Code of the RA Section 10 is dedicated to Intellectual Property, in particular Chapter 63 is regulating the field of Copyright. Copyright implications are elaborately addressed in The Law of the Republic of Armenia on Copyright and Related Rights. Both particular section of Civil Code and Law on Copyright and Related Rights provide limited and non-exhaustive list for objects of copyright protection. Article 1111 of Civil Code of RA defines objects eligible for copyright protection, as follows:

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[6] Republic of Armenia, Constitution, Art. 60(7)
[7] Republic of Armenia, Civil Code, Art. 140

"1. Copyright extends to works of scholarship, literature, and art that are the result of creative activity regardless of the use and merits of the work and also to means of its expression.

2. The work must be expressed in audible, written or other objective form allowing the possibility of its perception."

The Law on Copyright and Related Rights defines more elaborately under article 3 the subject matter of copyright determining the main requirements for copyright eligibility.[8] It is worth mentioning that under the same law, same article part 4 types of works eligible for copyright protection are mentioned. The list, however, does not include computer-generated works, maintaining in the center the factor of human creator, which will be discussed further in this Master's Paper. In times when technological development is rapidly expanding and encompassing all fields starting from public policies to everyday encounters, the issue of AI-generated works is of utmost importance. Thus, in this chapter the concept of creative machines and possible scenarios for authorship and ownership of AI-generated objects is discussed with recent examples and in the framework of traditional concept of copyright.

1.1 AI AND CREATIVE PROCESS

In the 1970s computers were capable of creating original material, however it was only done by direct interference by humans. In other words, the issue raised further was related to computer-assisted works, as computers were not enough developed to be more than just tools. The works created by then depended generally upon the action, input and coordination of the programmer. The machine was mainly an instrument.

The major difference between computer as a tool and independent AI machine is demonstrated with an example of Microsoft Office. For software package Microsoft the programmer has already received copyright protection, however if an end user creates a work in the Word document, the owner of the Microsoft does not get economic benefits, but the writer gets copyright protection, if the piece meets the eligibility. In this situation Microsoft Word is just a tool and it is not acting independently. The situation with Artificial Intelligence machines is hardly the same. Thus, considering the specifics, it is not efficient to apply the same rules designed for computer-assisted works for objects created by AI.

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[8] Republic of Armenia, Law on Copyright and Related Rights, Art. 3

The history of AI has its development back and forth. Although the term first has been coined in 1953, rapid developments has been taking place in the last 10 years. Since 2010, however, the discipline has experienced a new boom, mainly due to the considerable improvement in the computing power of computers and access to massive quantities of data.[9]

To understand legal implications for AI, specifically in the field of copyright, it is necessary to define in simpler terms what AI is. High-level expert group on artificial intelligence set up by the European Commission (hereinafter 'EC') defines AI as:

"Systems that display intelligent behavior by analyzing their environment and taking actions – with some degree of autonomy – to achieve specific goals.

AI-based systems can be purely software-based, acting in the virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications)."[10]

With brief description of an AI system three main capabilities can be highlighted: perception, reasoning/decision making and actuation. In fact, various capabilities of AI systems are summoned in different AI techniques and sub-disciplines, used to build AI systems.

All such techniques can be grouped in two main groups that refer to the capability of reasoning and learning. First group of techniques includes knowledge representation and reasoning, planning, scheduling, search, and optimization. Group of learning techniques includes machine learning, neural networks, deep learning, decision trees, and many other learning techniques. These techniques allow an AI system to learn how to solve problems that cannot be precisely specified, or whose solution method cannot be described by symbolic reasoning rules.[11]

As mentioned above an AI program constructed with machine learning technique has built-in algorithm that enables it to learn from data input, and to evolve and make directed or independent decisions. Very much like human brain, these machines generate most part of the work independent from the programmers. Consequently, with such sophisticated mechanisms mainly with machine learning capabilities a huge quantity of AI generated objects have emerged and it is discussed on governmental levels that human is no longer the only source of creativity and innovation. The

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[9] Council of Europe, Section on Artificial Intelligence, *History of Artificial Intelligence, available at* https://www.coe.int/en/web/artificial-intelligence/history-of-ai (last visited Feb 11, 2020)

[10] European Commission, Artificial Intelligence, *A European Perspective EU Science Hub, available at* https://ec.europa.eu/jrc/en/publication/artificial-intelligence-european-perspective (last visited Mar 28, 2020)

[11] Id.

breakthrough in technological development created several fundamental issues based on the fact that the foundations of Intellectual Property have been established at times when 'creative outputs' by machines were not imaginable. The main question that arises is if the creation of the artwork created by the machines could be attributed to machine itself, the creator of the machine (the programmer) or any other respective natural person.

IP has been encountering challenges by the rise of computation and digitalization since 1950s. However, computer generated artworks were first introduced to the public in 1978 with AARON, a computer program written by the artist Harold Cohen, which creates original artistic material.[12] In 2008 Russian publishing house Astrel SPb, released "True Love" a novel created by a computer program.[13] In 2016 the portrait named the Next Rembrandt was unveiled followed by computer making analysis on works of 17th-century Dutch artist Rembrandt Harmenszoon van Rijn and creating a new one.[14]

What concerns Armenian legal reality no case law has been established. However, in 2019, in the first concert as such, the musicians of the WCIT World Orchestra performed two works composed by AI.

In most of jurisdictions such creations enter into public domain immediately. Thus, companies which have invested in creation of such works do not get any economic benefit. As mentioned above, the system of Intellectual Property has been built on incentivization of authors to create. In such situation, the interest in creating sophisticated AI-machines will be very low.

1.2 FOUNDATIONS OF COPYRIGHT PROTECTION

To understand whether AI can be an eligible author it is important to understand the main foundations and scope of copyright protection. Granting copyright is mainly based on the personality theory, which views creations as an extension of the creator's personality, and property over such creations as a mechanism for self-development and personal expression. RA Law on Copyright and Related rights define the content of copyright under Article 11 as follows:

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[12] Chris Garcia, *Harold Cohen and AARON-A 40-Year Collaboration* (2016), CHM Blog, *available at* https://computerhistory.org/blog/harold-cohen-and-aaron-a-40-year-collaboration/ (last visited Mar 28, 2020)

[13] Vitali Vitaliev, *E&T reviews the first ever novel written by a computer* (2009), Engineering and Technology, *available at* https://eandt.theiet.org/content/articles/2009/01/after-all/ (last visited Mar 28, 2020)

[14] The Next Rembrandt, *available at* https://www.nextrembrandt.com/ (last visited Mar 28, 2020)

"Copyright is the exclusive moral non-economic and exclusive economic rights of the author to his work."[15]

In its turn, the elaboration of moral non-economic rights and exclusive economic rights is done respectively under Article 12 and 13 of the same law:

"(1) Moral non-economic rights of the author shall provide his intellectual and personal ties to the work (which includes right of authorship, the right of the author's name, the right of honor and reputation of the author, the right of making public, right to withdrawal).[16]

(1) Economic rights provide the economic interests of the author giving the author an exclusive right to authorize or to prohibit the use of his work or copies thereof."[17]

This means, that the copyright eligibility of AI-generated works should be discussed from the perspective of both components of Copyright. But before allocating the moral and exclusive economic rights of the author, first the issue of copyright eligibility should be addressed. Article 3 of the Law on Copyright and Related rights establishes the Subject Matters of Copyright as follows:

"(1) Subject matters of copyright shall be the unique outcome of a creative activity in the domain of science, literature and art (hereinafter referred to as "works") created individually or jointly, which are expressed in spoken, written or any other objectively perceivable manner, including permanently or temporarily storage in electronic form, regardless of the scope, significance, merits and purpose of creation."[18]

By the force of Article 3(4), which lays down non-exhaustive list of works eligible to copyright protection and also defines that other works in compliance with paragraph (1) of the article are also entitled for copyright protection. Hence, the eligibility of AI-generated objects should be discussed by analyzing first part of Article 3 of the Law on Copyright and Related Rights.

- **Originality**

The originality threshold is set to different extent and levels in different jurisdictions. The United Kingdom and systems of law derived from it generally require a lower standard of originality than European countries and the United States, which often require some creativity, Canadian system mentions a standard of non-mechanical and non-trivial exercise of skill and judgement. United Kingdom has also skill and labor standard.[19]

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[15] Republic of Armenia, Law on Copyright and Related Rights, Art. 11
[16] Id., Art. 12
[17] Id., Art. 13
[18] Id., Art. 3(1)
[19] D. Vaver et al., *Principles of copyright: cases and materials Notions fondamentales du droit dauteur: recueil de jurisprudence*, World Intellectual Property Organization (2002)

Generally, to be original means that a work is "independently created by the author" and that it possesses at least some minimal degree of creativity. In Armenian legislation, Law on Copyright and Related Rights, Article 3 the concept of "independently created by the author" equals to *created individually or jointly"* and "minimal degree of creativity" to *"unique outcome of a creative activity".[20]*

However, originality does not require novelty. Some created works of art can include the threshold of creativity and uniqueness, but not be novel, it is just creative enough to differ from the same category of works created before. However, discovery is not a creation. Thus, originality standard requires that one be the "maker" or "originator", not merely one that discovers and records a fact. At the same time, regardless of novelty requirement, the work should not be "so mechanical or routine as to require no creativity whatsoever". A work will be regarded copyrightable even if it incorporates nonoriginal elements. Author can take nonoriginal material and by adding her own expression of originality qualify for copyright.

Berne Convention for the Protection of Literary and Artistic Works defines under Article 2 the subject matter of the copyright.[21] In that, originality is not included in Berne Convention as a requirement since it was considered to be evident. The Convention uses the expression "original works" later in this sense and to distinguish from those copied.[22] However, the WIPO Guide to Berne Convention explains further that originality should never become confused with novelty. The given example is about two artists, who are painting the same scene.[23] The second one who finishes does not create something novel, as that has already been done by the first one, however, it is original because the personality specifics of the maker is reflected. Another argument on originality submits that it does not require "novelty, usefulness, inventiveness, aesthetic merit, quality or value".[24]

Case law in Armenian legislation does not specify whether RA judicial approach to originality standard is more inclined to European model or American. Also, by the force of Article 2(2) of the Law on Copyright and Related rights, RA it is also bound by the regulations of Berne Convention:

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[20] Republic of Armenia, Law on Copyright and Related Rights, Art, 3
[21] Berne Convention for the Protection of Literary and Artistic Works, Art.2, Sep. 09, 1886, www.wipolex.wipo.int/en/text/283693
[22] Id., Art. 2(3)
[23] WIPO, *Guide to the Berne Convention for the Protection of literary and artistic works* (1971)
[24] Id.

"If the ratified international agreements of the Republic of Armenia state norms other than those stated by this Law the norms of international agreements shall apply."[25]

If we again refer to wording of Article 3 of Law on Copyright and Related rights, particularly the *"unique outcome of a creative activity"* requirement*,* we can assume that built-in algorithm in AI systems can provide the creative activity with for example machine learning technique, as by learning from its experience some processes can be carried out without programmer explicitly specifying how it is done and considering that an AI-machine can include much more data than human brain does, the unique outcome can be expected. Sometimes, such systems can demonstrate learned skills, that programmers do not even possess and does not know exactly how the creation is done. By this, it can be concluded that first requirement for copyright eligibility can be met for AI-generated objects. Computers are becoming faster and more capable, creativity machines and other forms of AI will likely take center stage in the creative process.[26]

- **Authorship & Rightsholders**

In order to explain the requirement for authorship, the difference between authors and rightsholders must be demonstrated. Rightsholders are defined as any physical or legal persons, including companies and entities which are capable of practicing the rights included under copyright either by being the employer of the physical creator of the work or the entity that publishes the work. However, authorship has been deeply linked to human factor since only human beings were the only ones capable of creating artwork. RA Law on Copyright and Related Rights establishes under Article 6, that:

"An author is a natural person who creates the work."[27]

Under Article 10(2) of the same law *the alienation, by the author, of a material object in which the work is embodied, shall not presume alienation of copyright*, meaning that the author in any case maintains the moral rights on the objects, regardless of transfer of ownership.[28] This is once again reiterated by the Article 12(3) of the same law:

"The moral rights of the author are inalienable and nontransferable and are not subject to exhaustion with the exception of the right to withdrawal, which runs for the life of the author."[29]

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[25] Republic of Armenia, Law on Copyright and Related Rights, Art. 2(2)
[26] Kalin Hristov, *Artificial Intelligence and the Copyright Survey*, SSRN Electronic Journal (2019), *available at* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3490458
[27] Republic of Armenia, Law on Copyright and Related Rights, Art. 6
[28] Id., Art. 10(2)
[29] Id., Art. 12(3)

If we assume that AI-generated objects are eligible for copyright protection, the issue of economic rights can be easily solved by the opportunity of transfer of ownership, considering the number of stakeholders for these objects and the possible necessity to transfer the ownership. However, the main question that is still in the gray area, how can a "robot" be an author? From my point of view, the question of granting legal personality is out of question at this point. As discussed above, the main line that goes into copyright laws in different states comes centuries ago: it is **incentivization**. Machines does not need an incentive to come up with creative output, but the people behind, regardless of the extent of their impact, and they need to be motivated. Thus, I believe that granting legal personality to robots not only will disrupt the copyright system, but also eventually people will lose control over it. That requires more of philosophical outlook, rather than legal. But the legal issue that is still there, is whether AI, prima facie, can disrupt copyright system.

Although the moral rights are inalienable, the law has some limitations of ownership for specific kinds of works, in which likewise AI-generated works, the author is not the ultimate exclusive rightsholder. Article 31of the Law of Copyright and Related Rights establishes the copyright protection in collective works, stating that:

"(1) Collective work shall mean a work, created by two or more natural persons on the initiative and responsibility of any person (hereinafter "the organizer").

(2) The persons, organizing the creation of a collective work, who publish encyclopedias, encyclopedic dictionaries, periodic and continuous collections of scientific works, newspapers, magazines and other periodicals, shall have an exclusive right to use the collective work as a whole. Those persons are entitled to mention their names (denomination of the periodical) or require such a mention whenever the collective work is used.

(4) The organizer is not an author of the work."[30]

Article 33(1) defines the peculiarities for Copyright in an Employment Work, in particular:

"Economic rights in a work created on employment assignments or employment duties shall belong to the employer unless otherwise stipulated by the contract between the author and the employer."[31]

These two articles are demonstration of situations where exclusive economic rights are granted to people other than authors of the work by the force of specific regulations. Employment works in fact do not provide the physical maker with copyright. This exception for works made for hire is an indication that not the mere expression but the initiatory mental and spiritual essence of the

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[30] Id., Art. 31
[31] Id., Art. 33(1)

expression is in fact the subject of protection, meaning that moral rights of the work still stick to the maker. This means that the authorship and ownership of AI-generated objects may be discussed from the perspective of granting ownership rights to those that in fact are not the creators of objects in question.

1.3 LEGAL ISSUES

Considering all possible stakeholders for AI-generated object, three possible parties can be identified: 1. AI programmers 2. AI system owners or otherwise Investors 3. Users. To determine the best possible author, social benefit should be kept in mind. In other words, would society benefit most if copyright is assigned to the AI programmer, the investor or owner of the AI, or the potentially millions of end users of AI programs. What concerns initial rightsholders of copyright may either be: the maker, designer who instructs and supervises the physical maker, employer of the physical maker or the legal entity who publishes the work.

Granting copyright to each of mentioned possible authors entails its legal consequences.

- **Programmers** - As mentioned, RA Law on Copyright and Related Rights, Article 3 defines the subject matter mentioned creative activity is related to the creation of work by natural person established in Article 6. Thus, to grant the programmer copyright for AI-generated object, legislative amendment is required, expanding the scope of Article 6. The scope of the author should be not only human who creates the work, but also human who contributed mostly to the creation of the work. If so, and moral and economic rights are granted to the programmer some other issues arise. The part of incentivization is in place, however, if the product is developed enough to go into mass production, possible customers will not have impetus to purchase the product, as the copyright of ultimate output of the machine will be granted to the programmer.

- **Investors or Owners** - The same incentivization principles are required for investors as for programmers, as without the pricy R&Ds creations of the machines may not be possible. The legal relationship regarding the investors and programmers can be solved on contractual basis or within employment work doctrine. Considering also, that investors contribution to the creation of the work is only monetary, and not on mental work, it is in no circumstances recommended to grant copyright to the investors of AI.

- **End Users** -The foundations of copyright are based on principle of awarding creativity and innovation and foster more mental work outcomes. Thus, in most jurisdictions, the author is the person who in the first place creates and contributes mentally most to the creation of the work. In such circumstances, it is debatable whether end user create a work or at least contribute to the creation of the work. However, considering that end user might also provide input as the programmer may, this can create environment for end user to be considered copyright-holder in some circumstances.

Based on provided information few scenarios are possible for overcoming legislative gap:

1. Sui generis rights

The *sui generis* database right is an exclusive right that protects databases against unauthorized extraction and re-utilization of their content. It is different from copyright, which protects original works. The *sui generis* database right protects a database, defined as *a collection of works, data or other independent materials arranged in a systematic or methodical way the individual elements of which shall be separately accessible by electronic or other means and the acquisition, verification or presentation thereof shall require substantial qualitative and (or) quantitative contribution* in Article 58 of RA Law on Copyright and Related Rights.

"The maker of a database shall be deemed any person by whose initiative and on whose own responsibility substantial qualitative and (or) quantitative contribution is made for the acquisition, verification or presentation of the content of the database."[32]

By the force of Article 58 database maker is not considered to be author of copyright but is eligible for sui generis protection. As a result of the conducted interviews with Professor Lior Zemer of Osgoode Hall Law School, Canada and Professor Ryan Abbot, of University of Surrey, UK, sui generis protection for AI-generated works is suggested.

Contrary to copyright protection, sui generis protection grants rights to the person making most of the contribution to the work and not the creator in its traditional sense, who mental work has led to creation of the artistic expression. In fact, it is also possible to transfer sui generis economic rights to another person under RA Law on Copyright and Related Rights, Article 59, as follows:

"(5) The economic rights provided for by this Article in respect of the database may be inherently transferred to another person by the order of comprehensive succession or as a result of reorganization of a legal entity, which is the right holder."[33]

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[32] Id., Art. 58
[33] Id., Art. 59(3)

2. Work for Hire Doctrine

Another scenario in which the exclusive rightsholder is not the creator, but other related person, is expressed in work for hire doctrine. RA Law on Copyright and Related Rights addresses work for hire doctrine under Article 33:

"(1) Economic rights in a work created on employment assignments or employment duties shall belong to the employer unless otherwise stipulated by the contract between the author and the employer."[34]

In this scenario, AI system should be considered as an employee and person owning the machine - as an employer. When a work is deemed to have been made within employment, that alienation is formally and legally complete. The doctrine is a legal fiction that prescribe a policy option to bypass the natural person-author to vest copyright elsewhere. Concerning AI authorship, treating the programmer like an employer—as the author-in-law of a work made by another—would avoid the problem of granting rights to a machine and the ability to respond to copyright's incentives. However, this does not change the ownership issue, it just overcomes the copyright system disruption part on short-term basis.

Works made for hire, do not provide the physical maker with copyright. This exception for works made for hire is an indication that not the mere expression but the initiatory mental and spiritual essence of the expression is in fact the subject of protection. AIs do not possess human quality and machines are not considered as laborers. Which disables the owner from claiming the copyright under works made for hire exception under current legal reality. Also, whenever economic rights are transferred to other physical person, moral rights in any case vest in the author. And it is highly arguable whether the moral rights can be assigned to machines, even artificial intelligent ones, such as not having the work distorted, mutilated or modified to the detriment of the author's honor or reputation.

3. Programmer as an Author

Another option of filling the legal gap is granting both moral and economic rights to programmer, which will mean that AI incorporation into IP field will disrupt whole system built mainly on incentive theory. By the fact of creating the software algorithm for the machine, the programmer already might have received both recognition in the face of moral right and financial benefits in the face of economic rights. From the perspective of social benefit, granting double advantage to the programmer is not justifiable, also contrary to theories at the basis of copyright legal framework has

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[34] Id., Art. 33(1)

been developed. The issue with customers in this case in fact may be coordinated with end user license agreements, which is also stipulated by RA Law on Copyright and Related Rights. Article 39 defines the conditions under which the economic rights can be transferred with license:

"(1) Third persons may use the work only with the consent of the holder of economic rights (the author of a work or a third person who has obtained these rights in the order established by Law, hereinafter right holder) on the basis of author's contract, unless otherwise provided by Law."[35]

4. Based on Input and Made Arrangements

As mentioned in previous parts of the Master's Paper, the AI machine is something in-between just a tool and completely autonomous machine, which can identify the problem before solution. The completely autonomous machines creation is already planned for not far future, however now it is not a reality yet. At the moment when generating works by AI machines is still joint work by someone who gives input, initial directions to the machine. Hence, as another short-term feasible solution granting authorship and ownership to person making the most arrangements can be also considered.

CHAPTER II

PATENT SYSTEM AND ARTIFICIAL INTELLIGENCE

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[35] Id., Art. 39(1)

2.1 AI AND INVENTIVE PROCESS

For already decades Artificial Intelligence was generating patentable works, as drug discovery, robotics and mechanical design, which, however, was disguised under the "human inventor" concept. Since 20th century autonomously generated inventions have been on display. In 1994, computer scientist Stephen Thaler disclosed an invention he called the "Creativity Machine," a computational paradigm that "came the closest yet to emulating the fundamental mechanisms responsible for idea formation."[36] The Creativity Machine is able to generate novel ideas through the use of a software concept referred to as artificial neural networks—essentially, collections of on/off switches that automatically connect themselves to form software without human intervention.

There is long line of examples of such inventions. Hitachi engineers programmed a computer that independently designed a new nose cone for the Japanese bullet train, which improved the train's aerodynamic performance and reduced the noise level for passengers.[37] Similarly, a computer was programmed to independently design a novel piston geometry that reduced fuel consumption in diesel engines. Computers are also being used to develop new pharmaceutical compounds.[38]

On 25 of January, 2005 USPTO has granted patent to Software modeled after the process of biological evolution, known as Genetic Programming ("GP"), which succeeded in generating patentable results independently. That invention was created by the "Invention Machine"— the moniker for a GP-based AI developed by John Koza. These are known earliest examples of such inventions.[39]

Today, computers are generating inventions, eligible for patent, in which the AI machine, rather than a human, meets the requirements to qualify as an inventor. It is only about time, that computers reach the level of development to become the main source of innovation. It is stipulated with decreased costs, increased speed, also the works is mainly divided between different machines, that is why lines are blurring between traditional concepts of invention, inventor and instruments of invention.[40]

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[36] Ryan Abbott, *Think Therefore I Invent: Creative Computers and the Future of Patent Law*, 54 B. C. L. Rev (2016)

[37] Ben Hattenbach & Joshua Glucoft, *Patents in An Era of Infinite Monkeys And Artificial Intelligence*, 19 Stan. Tech. L. Rev. 32 (2015)

[38] Id.

[39] Id.

[40] Liza Vertinsky, Thinking *Machines and Patent Law*, SSRN Electronic Journal (2017), *available at* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3360344

The singularity in inventive process, where AI inventions overtake human inventions is expectable. For now, while using principles of evolution, molecular biology, neurology, and human cognitive science, technologies are evolving computers into "thinking machines" with the potential to perform creative and inventive tasks.[41] Even though, AI machine can produce patentable subject matter, and computer, rather than a person can meet the requirements for inventorship. Yet, it is still restricted by human inventor clause to be registered.

Article 40 of RA Law on Inventions, Utility Models and Industrial Designs, defines author as follows:

"(1) The author (inventor, designer) is the natural person mentioned as such in the application for the grant of a patent on invention or utility model, in application on granting certificate on industrial design unless proven otherwise by the verdict of the court."[42]

Regardless of the further result of who will be the ultimate rightsholder, the object will be patented if there is human inventor, otherwise a patent can be held invalid or unenforceable. Initially, the requirement of inventors to be humans, was designed to prevent corporate ownership. In fact, nothing could have been predicted by that time about thinking machines. Also, the main actor and assignee of the inventions was supposed to be human being in order to incentivize the innovation, as was the case with copyright. The main justification for the patent system is the incentivization theory, in which patents are impetus to innovate, for the sake of society. From the beginning of foundation of patent system cornerstones, the main idea was administering monopolies to reward creative effort in response both to sovereign abuses of the right to grant monopolies and the desire to encourage industrialization. Later on, utilitarian system of rewarding any inventor of a new and useful invention as a means of ensuring efficient investment in and disclosure of this invention. Some form of external protection was required to disclose his or her idea to benefit the society.

Another theory that justifies the grant of patents is the natural rights theory, according to which an individual should have property rights over products of his/her mind. Another theory behind patent law can be called "social benefit" theory, based on the fact the invention should be disclosed to public after designated time period, so as to foster further technological advancement.

The use of computing in different aspects of product research and development, development and sales, the commercial success of machine discoveries, and the shift in Research and Development (hereinafter 'R&D') towards computational capabilities, is indicator of the growing role that thinking

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[41] Id.

[42] Republic of Armenia, Law on Inventions, Utility Models and Industrial Designs, Art. 40(1)

machines are playing in the invention process. Where an AI is involved, there is possibility that inventions becomes more widespread, with little or no human intervention and possibly cheaper. The human ingenuity in such inventions is less visible, while the process becomes much easier, as most of the mental effort is conducted by the AI machine.[43] Patent system is not currently ready to deal with it at either a conceptual or practical level.

The whole process of invention, however, supposes identification of a problem to be solved, creation of solution and application of the technical findings to the solution of the problem. It is obvious that in AI-generated inventions human still have his say, as AI machines are not capable of identifying a problem in today's conditions. At the same times, AI is not a tool any more. However, the legislation to be drafted should be so advanced as to encompass future developments in the field of AI's inventions, when they will be able to autonomously implement whole process. In fact, now the machine is not the sole inventor, it is still collaborative process between human and machines.

2.2 FOUNDATIONS OF PATENT LAW

To understand the main components of patent system, the cornerstones of patent law will be discussed in the following part of this paper. According to RA Civil Code, Article 1144, the conditions of Legal Protection of an Inventions, Utility Models, or Industrial Designs are:

"1.The rights to an invention, utility model, or industrial design shall be protected on the condition of issuance of a patent.

2.Legal protection shall be given

1) to an invention, which is a solution that is new, has an inventive level, and is industrially applicable;

2) to a utility model, which is the design realization of means of production and consumer items;

3) to an industrial design, which is an artistic-design solution for a manufacture defining its external appearance and being new, original, and industrially applicable."[44]

The subject matter discussed in this paper are inventions and utility models. To be patentable, however, an invention and utility model must not only contain patentable subject matter; it must also be **novel, nonobvious, and useful**.

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[43] Ana Ramalho, *Patentability of AI-Generated Inventions: Is a Reform of the Patent System Needed?* SSRN Electronic Journal (2018), *available at* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3168703 (last visited Mar 28, 2020)
[44] Republic of Armenia, Civil Code, Art. 1144

Article 9(1) of the RA Law on Patents, Inventions, Utility Models and Industrial Designs defines the conditions for patentability of Invention:

"Within the meaning of this Law a technical solution in any field, relating to the use a product (in particular, a device, substance, biotechnological product) or process (process of affecting a material subject matter using material means), shall be protected as an invention. An invention shall be granted legal protection if it is new, has an inventive step and is industrially applicable (conditions for patentability of invention) even if it refers to a product containing biological material or consisting of it or a process through which biological material is produced, derived or used."[45]

Article 15(1) of the same law regulates the conditions of patentability of utility models:

"*Any new, non-obvious and industrially applicable technical solution that concerns a production (particularly accessories, equipment, tools or their parts, material) or a method (condition for patentability of utility model) shall be protected as a utility model in the order established by this Law."[46]*

This means that 3 components are required: novelty, inventiveness and industrial applicability.

● **Novelty**

For inventions the RA Law on Inventions, Utility Models and Industrial Designs has separate article dedicated to novelty requirement.

Article 11. Novelty

"(1) An invention shall be considered to be new if it is not a separate part of the state of the art.

(2) The state of the art includes any kind of information on the given field of technical solutions (separate parts) made available all over the world by means of oral or written disclosure, or in any other way, before the priority date of the invention. The data provided in the sources of information, contents of which is available for any person directly, or it is notified in a legitimate way shall be deemed publicly available, moreover the solutions made available through open use shall be included in the state of the art, if such a use has been implemented in the Republic of Armenia.

(3) The state of the art also includes the content of earlier inventions and utility models, disclosed in applications for inventions and utility models submitted to the State Authorized Body, provided that the State Authorized Body subsequently publishes those applications or the patents granted on the basis thereof."[47]

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[45] Republic of Armenia, Law on Inventions, Utility Models and Industrial Designs, Art. 9(1)
[46] Id., Art. 15(1)
[47] Id., Art 11

The issue of novelty can be solved easily for AI-generated works, since they are capable of being fed with unlimited quantity of data, which excludes the possibility of repeating same invention that has been on display before.

● **Inventive Step**

The next requirement for invention to be patentable is inventive step, which is defined under article 13 of RA Law on Inventions as follows:

"(*l*) *An invention shall be considered as having an inventive step if, having regard to the state of the art within the meaning of Article 11(2), it is not obvious to a person having ordinary skill in the given art.*"[48]

The inventive step prevents exclusive rights being granted over obvious advancements, as a way to hinder the number of patents from rising and nor allowing those skilled in the art receive due award. In the case of AI-generated works, the issue that arises is how state of art is going to be checked by skilled person, in which skilled person is defined to be someone who has specification in the field. Neither legislator, nor case law of granting patents to applicants interprets properly how the skilled person is defined. In fact, it is known fact that in Armenian judicial reality it is a physical person, who conducts the analysis. Hence, if patents for AI-generated works is applied, even disguised with human inventor, the skilled person is not capable of knowing whole data that AI-machine can encompass. Thus, to maintain the balance, it would be logical to use AI-machine to check the inventive step of AI-generated inventions. In today's conditions, however, AI-generated inventions can meet the inventive step requirement as well to be patentable.

● **Industrially applicable**

Article 14 of the same law interprets the industrial applicability, as:

"*An invention shall be considered industrially applicable if it can be made or used in industry, agriculture, public health and other fields.*"[49]

The invention and utility models, invented by AI, as mentioned in the previous part of this paper, have already been applied industrially.

The further issue that can arise with utility models as well is non-obviousness test, as in the case of inventive step.

Article 15 further defines:

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[48] Id., Art. 13
[49] Id., Art 14

"(2) A utility model shall be considered to be new if it does not form separate part of the state of the art.

(2.1) A utility model is considered to be non-obvious if it does not stem very obviously from the state of the art for a specialist of that special field.

(3) The state of the art is determined by the world-wide available information on identical means with the utility model presented until the date of priority of the utility model, as well as the application of such measures in the Republic of Armenia. The state of the art shall also include the content of inventions and utility models previously disclosed by applications filed with the State Authorized Body, provided that the State Authorized Body subsequently should publish those applications or the patents granted on the basis thereof."[50]

Again, here the problem that can arise related to the non-obviousness test, which should be implemented by a specialist of that special field, a physical person, who cannot physically encompass whole data required. Considering all these requirements, it is possible for AI-inventions and utility models to be patentable. However, for application to be completed the indication of inventor is required.

According to the RA Law on Patents Article 40:

"(1) The author (inventor, designer) is the natural person mentioned as such in the application for the grant of a patent on invention or utility model, in application on granting certificate on industrial design unless proven otherwise by the verdict of the court."[51]

Meanwhile, the rightsholder can be a not the inventor, and the rights are entitled to the applicant of the patent, however without mentioning a physical person inventor, the patent application will not be valid. Article 41 of RA Law on Patents defines:

"(1) A patent shall be granted or an industrial design shall be registered in the name of the person (hereinafter "rightsholder") who is designated as the applicant at the time of the grant of the patent or registration of the industrial design."[52]

Inventors own their patents as a form of personal property that they may transfer by "assignment" of their rights to another entity. In fact, the optional obligatory of inventor's name in patent application to some extent replaces moral right of inventor, in other words inventor can receive appropriate recognition, however financial investments are mainly done by big corporations. Thus,

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[50] Id., Art. 15
[51] Id., Art 40(1)
[52] Id., Art. 41(1)

the logic of patent law, that is to foster innovation, is concentrated in the hands of investors. So, as follows, the RA Law on Patents and Utility Models defines the right to obtain a patent under article 15:

"(1) The right to obtain a patent shall belong to the inventor (the author) or his heirs and shall be transferable in the order established by Law."

If a patent has multiple owners, each owner may independently exploit the patent without receiving consent of the others. Considering that the process of invention is not one-off step and very often more than one stakeholder are included, the law defines the co-authorship as well:

"(2) In case of the invention is created by a number of persons jointly (by co-authorship) then the right to obtain a patent shall belong to them jointly.

(3) In case of the same invention is created by different persons independently, then the right to obtain a patent belongs to the person whose application pursuant to Article 49 of this Law has a date of priority, provided that the application is published in the established order."[53]

2.3 LEGAL ISSUES

As mentioned, in the previous part of the chapter the legal gap concerning AI-generated inventions and utility models is based on the fact that indication of human inventor is a must to be granted a patent. To overcome this, for instance in the USA, such inventions are registered with name of random human inventors, who mainly are the programmers. However, if a programmer creates an AI in order to receive useful information and the AI in its turn invents a patentable result, there would be no reason for the scientist to qualify as an inventor on the AI's result, as the programmer himself has made no effort in making the invention possible.

The recent example lays with the artificial inventor named "DABUS". University of Surrey has applied for its creation – DABUS's inventions in the UK, the USA and at the European Patent Offices. The invention is a new food container. As a response, the UK Intellectual Property Office (IPO) has, in its most recent update to its Formalities Manual, added a statement that "An AI Inventor is not acceptable as this does not identify 'a person' which is required by law. The application has to be withdrawn as it does not meet the mentioned requirement. Using a first system of networks to generate new ideas, and second system of networks to determine consequences, DABUS invented a beverage container and a flashing device used for search and rescue that are the

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[53] Id., Art.15

subjects of patent applications filed in the United States and Europe."[54] The European Patent Office has refused two European patent applications that designated an artificial intelligence called DABUS as the inventor, following a non-public hearing on November 25, 2019.[55] The UKIPO has also refused to accept the DABUS applications, saying they shall be taken to be withdrawn at the expiry of the 16-month period. The Office has published a decision setting out its reasons.[56] The EPO simply stated at the time that the applications did "not meet the requirement of the European Patent Convention (EPC) that an inventor designated in the application has to be a human being, not a machine".[57]

In fact, this was the first case of when application was made with AI inventor, and basically beforehand the same would have been done by just mentioning the inventor as a random human being. So, the outcome is the same. Without the ability to obtain patent protection, owners of inventive computers may prefer to protect patentable inventions as trade secrets without any public disclosure. In the same manner, business entities would not be able to create patentable inventions and make those into commercial products without patent protection.

In case when inventive AI does not receive patent, still the computational creativity will be developed. However, it will be at lower speed because of logistical issues, efficiency and fairness problems. Regardless of the fact that not always the inventor gets economic benefits for his work, but still he receives fame, thus it is not fair for the computer scientist. He already receives copyright protection for software development.[58] Thus this will decrease due award that other scientists can receive.

It is true that computational inventions may be developed without patent incentives. But considering that patent logic differs from copyright logic, and R&D is costly, it is intuitive that incentive is required. Another argument is AI inventions might hinder human intentional mind, and further consolidate the whole IP in the hands of big corporations. AI's problem can arise in theoretical background. Labor Theory supports granting patent to natural person who has worked for

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[54] Benjamin Ford, *Artificial Intelligence Inventor Asks If 'WHO' Can Be an Inventor Is the Wrong Question?* IPWatchdog, https://www.ipwatchdog.com/2019/08/05/artificial-intelligence-inventor-asks-whether-can-inventor-wrong-question/id=1 11896/ (last visited Mar 28, 2020)

[55] James Nurton, *EPO and UKIPO Refuse AI-Invented Patent Applications,* IPWatchdog, https://www.ipwatchdog.com/2020/01/07/epo-ukipo-refuse-ai-invented-patent-applications/ (last visited Mar 28, 2020)

[56] Id.

[57] E*PO Provides Reasoning for Rejecting Patent Applications Citing AI as Inventor*, IPWatchdog https://www.ipwatchdog.com/2020/01/28/epo-provides-reasoning-rejecting-patent-applications-citing-ai-inventor/id=118 280/ (last visited Mar 28, 2020)

[58] Republic of Armenia, Law on Copyright and Related Rights

years to invent a new device so that they can make profits from their invention, but it is not applicable for computers considering that they are neither legal persons nor can own property. In scientific circlers granting legal personality to computers is considered neither efficient nor appropriate from moral aspect. Based on mentioned information few scenarios are possible for regulation of inventorship and ownership in regard to patents. Patent ownership may be assigned to computer's owner (the person who owns the AI as a chattel), developer (the person who programmed the AI's software), or user (the person giving the AI tasks). The developer, user, and owner may be the same person, or different entities.

1. First possibility is expanding the definition of inventor and not limiting with the term physical person so as computers can be registered as inventors. This way ownership issue is not definitely solved, and granting legal personality to computers is not widely discussed among scientific circles, both as it is counterintuitive because of moral point of view, also as it is non-justifiable for Incentive theory, while computers do not need incentivization to come up with new ideas and innovation. Thus, the ownership can be granted in first scenario to the owners of computers, in reality to corporations. First of all, it will be mostly justified, as the main investors in innovation and R&D are big corporations. Computer's owner, developer, and user are different entities, such parties could negotiate alternative arrangements by contract.[59] Granting ownership of inventions to computer's owners could be a starting point. The parties then can negotiate and agree on licensing conditions.

2. Assigning ownership rights to programmers would create a lot of personal property issues in the form of computers. Logistically, it would be challenging for programmers to monitor computational inventions made by machines they no longer own. Also, they will in fact receive double protection, as they already may have copyright (except for the cases when it is work for hire), so it will not be fair if they receive patent as well.

3. As in the case of copyright, in case of inventions and utility models theoretically it is possible that user gives input and some form or coordination to the AI machine to create any output. However, in case of inventions it is not that feasible, because, as mentioned before the inventions require more investment than in case of copyright eligible works. In practice, same logistical issues applied to programmers will apply in case of mentioning users as inventors.

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[59] Ryan Abbott, *I Think Therefore I Invent: Creative Computers and the Future of Patent Law*, 54 B. C. L. Rev, p. 1079 – 1126 (2016)

Since end users have the smallest contribution to the initial development of AI, their claims for inventorship are least applicable.

CHAPTER III
INTERNATIONAL LEGAL PRACTICE

The legal gap of AI-generated works of art and inventions have been addressed in very few countries. Some countries have demonstrated strong objection to granting copyright protection for AI-generated objects. On December 13, 2019 WIPO started public consultation process on Artificial Intelligence and Intellectual Property Policy in order to get feedback from several countries on essential questions of AI impact on IP policy. Responses have been collected from governmental and non-governmental institutions in WIPO member states. The attitude, however, is quite diverse. Based on the mentioned consultations and previous legislative initiatives and amendments, four models are discussed in this research: US model, UK model, EU model.

UNITED STATES OF AMERICA

Intellectual property laws exist to reward for intelligence, problem solving, creativity. Artificial intelligence is a way to mimic human intelligence with all its characteristics. Although in technical development is rapid, the laws in the United States are not in conformity yet. In the United States, intellectual property rights are provided only for artworks created by human beings, arguing that a computer is incapable of infringing others' intellectual property rights. In a statement in 1978, United States Commission on New Technological Uses of Copyrighted Works (CONTU) claimed that computers are not able of demonstrate enough originality or creativity to be eligible for copyright. In

simpler terms, AI generated works in US are directly attributed to a human author, thus those are not copyrightable and are entering public domain by the time of their creation.

In US case law the issue of works, where some form of electronic device has helped the creation of the work is assigned to human author by virtue of human contribution to the creation.[60] With regards to computer authorship, CONTU wrote in 1979 that there was no need for special treatment of computer-generated works because computers were not autonomously generating creative results without human intervention; computers were simply functioning as instruments to assist human authors.[61]

In its 2014 the Copyright Office published an updated "Human Authorship Requirement" which states that to be a work of "authorship" the work must be created by a natural person. The works created by nature, animals, or plants will not be registered. Correspondingly, the Office will not register machine creations which was set forth without any input or interference from a human author.

The 2014 announcement of the Human Authorship Requirement was mainly resulted of a prominent public discussion about nonhuman authorship originating from the "Monkey Selfies". The case was centered around animal, who is not a legal personality as well, who has taken selfies on a device belonging to a photographer. The latter respectively claimed copyright protection. The logic is same with AI-generated works, as not created directly by human. Mentioned Human Authorship Requirement, specifically lists the example of a photograph taken by a monkey as something not protectable. The wording of the judgement was aimed also at "works produced by a machine or mere mechanical process that operates randomly or automatically without any creative input or intervention from a human author", which also were considered as non-copyrightable.[62]

The USPTO Manual of Patent Examining Procedure gives detailed interpretation of inventorship as: "The threshold question in determining inventorship is who conceived the invention. Unless a person contributes to the conception of the invention, he is not an inventor. One must contribute to the conception to be an inventor."[63]

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[60] Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 61 (1884)

[61] Abbott, supra at 54 B. C. L. Rev

[62] Paulo Moura Oliveira, Paulo Novais & Luís Paulo, *Progress in Artificial Intelligence*, 19th EPIA Conference on Artificial Intelligence, EPIA 2019, Vila Real, Portugal, September 3-6, 2019, Proceedings, Part I (2019)

[63] USPTO, *Manual of patent examining procedure (MPEP)*, 9th Editio, *available at:* https://www.uspto.gov (last visited Mar 30, 2020)

An AI computer cannot create an invention in a way the law is currently interpreted. Proving only initial data to an AI computer is not suffice to make the human an inventor. Anyway, US law requires a human being to be the inventor. If there is no human inventor, then the invention cannot be eligible for patent because it lacks the statutory human inventor.

In a patent application, the inventor "must execute a declaration for the application.", when he is not the real inventor. An AI computer cannot execute an oath or declaration to meet this requirement. If there is no declaration, the U.S. Patent Office rejects as not meeting the required rules.

However, the more public discussions are in place on the topic of AI, the more interest it entails. Thus, it seems likely that the USPTO will offer additional guidance on the topic. In 2019 USPTO has announced 3 public requests on comments for AI impact on the innovation topic. This means, that although, so far US has demonstrated objection to AI incorporation into IP system as author or inventor, the technological rapid development cannot bypass the IP legal system.

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

The notion of assigning authorship of computer-generated works to humans can be traced back to U.K. Copyright Code.[64] The legal ownership of computer-generated works is perhaps only at first sight straightforward in the UK. Section 9(3) of the Copyright, Designs and Patents Act (CDPA) states:

"In the case of a literary, dramatic, musical or artistic work which is computer-generated, the author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken."[65]

Furthermore, computer-generated work is defined as one that "is generated by computer in circumstances such that there is no human author of the work." House of Lords discussed computer-generated in the context of exempting s 9(3) from the application of moral rights. In that context, Lord Beaverbrook usefully commented that "[m]oral rights are closely concerned with the personal nature of creative effort, and the person by whom the arrangements necessary for the

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[64] Kalin Hristov, *Artificial Intelligence and the Copyright Survey*, SSRN Electronic Journal (2019), *available at:* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3490458

[65] United Kingdom, Copyright, Designs and Patents Act 1988

creation of a computer-generated work are undertaken will not himself have made any personal, creative effort."[66] This suggests that the law recognizes that there is no creative work in computer-generated works, and thus s 9(3) has been established as an exception to the creativity and originality requirements of copyright. This is what makes the UK's computer-generated clause exceptionally different to other jurisdictions.

The options of who owns a work produced by an artificial intelligent agent are fluctuating among the programmer, the user, to the agent itself, or to no one at all. However, this obvious ambiguity could be solved by applying the law on a case by case basis. If a machine is directly coordinated by the programmer, and it creates a work of art, then the programmer is clearly the author in accordance to s 9(3) CDPA. However, if a user purchases a program which is able to generate works eligible for copyright and uses it to that purpose, then ownership goes to the user. This is already happening with Deep Dream images. After announcing the existence of the Deep Dream project, Google released its code to the public as an open source program, not claiming ownership over any of the resulting art.

Any user can use the program and create art and it will be efficient that Google own the images, still the user is the one who is making the necessary arrangements for the creation of the work. European copyright law has been tackling the issue from different perspective with regards to originality, and this could prove to be a clash in regard to the long-term viability of the UK's direction. This difference is discussed next. In fact, UK system has always been based on skill and labor originality standard, more fortified by case law.[67]

What concerns patent law of United Kingdom, no legislative solution has been created for inventions. In fact, a decision issued in early December, 2019 by the UKIPO refused the two UK DABUS patent applications. The patent application was rejected by virtue of sections 7 and 13 of the Act and Rule 10 of the Rules, mainly by Section 7(2) states, according to which:

(a) A patent for an invention may be granted - primarily to the inventor or joint inventors;

And Section 7(3) defines what constitutes an inventor:

7(3) In this Act "inventor" in relation to an invention means the actual deviser of the invention and "joint inventor" shall be construed accordingly.

Accordingly, from the section 13 follows:

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[66] Guadamuz, Andres, *Do Androids Dream of Electric Copyright? Comparative Analysis of Originality in Artificial Intelligence Generated Works*, Intellectual Property Quarterly (2017)

[67] Nova Productions Ltd v Mazooma Games Ltd [2007] EWCA Civ 219

Temple Island Collections Ltd v New English Teas Ltd and Another (No. 2) [2012] EWPCC 1

(a) where the applicant is not the sole inventor or the applicants are not the joint inventors, indicating the derivation of his or their right to be granted the patent; and, if he fails to do so, the application shall be taken to be withdrawn

As a result, UKPTO rejected the application based on the lack of identification of any case law of direct relevance to the questions to be decided. However, in comparison with other mentioned Patent Offices it states that: "inventions created by AI machines are likely to become more prevalent in future and there is a legitimate question as to how or whether the patent system should handle such inventions. I have found that the present system does not cater for such inventions and it was never anticipated that it would, but times have changed and technology has moved on. It is right that this is debated more widely and that any changes to the law be considered in the context of such a debate, and not shoehorned arbitrarily into existing legislation"[68] This statement is an obvious demonstration of more progressive attitudes in state regulation of AI in IP. In fact, UK is one of few European countries which tackled to some extent the copyright issue of AI-generating objects. The statement regarding patents is also promising to be much ahead of most countries' implications.

EUROPEAN UNION

As it has been covered above, while the law is relatively clear in the UK covering AI-generated works, the situation other European countries is not inclined in this direction. There is no equivalent to s 9(3) in the major continental copyright jurisdictions, and the subject is not covered by the international treaties and the copyright directives that harmonize the subject.[69]Art 5 of Spanish copyright law [70]clearly states that the author of a work is the natural person who creates it; while Art 7 of German copyright law[71] establishes that the "author is the creator of the work", and while it does not specify that this is to be a person, Art 11 declares that copyright "protects the author in his intellectual and personal relationships to the work", which explicitly requires personhood for the copyright.[72] Also, the level of originality is different in each jurisdiction establishing different creativity thresholds. This is particularly demonstrated in the *Infopaq* decision, where the Court of

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[68] Rachel Rothwell, *AI inventors: the fight to protect a computer's creations*, Raconteur (2020), https://www.raconteur.net/risk-management/ai-inventors-protect-ip (last visited Mar 30, 2020)
[69] Guadamuz, supra at Intellectual Property Quarterly (2017)
[70] Copyright Act, Madrid (1879), Primary Sources on Copyright (1450-1900)
[71] Copyright Act of 9 September 1965 (Federal Law Gazette I, p. 1273)
[72] Guadamuz, supra at Intellectual Property Quarterly (2017)

Justice of European Union commented that elements by themselves may not have originality, but a selection process could warrant originality. The Court ruled:

"Regarding the elements of such works covered by the protection, it should be observed that they consist of words which, considered in isolation, are not as such an intellectual creation of the author who employs them. It is only through the choice, sequence and combination of those words that the author may express his creativity in an original manner and achieve a result which is an intellectual creation."[73]

Human actor involvement has been seen as a requirement within the Infopaq decision specifically on the interpretation of the Article 5(1) of Copyright Directive[74].

European Union legislation on the matter has also been seen as parallel regulations, as the Berne Convention mentions the successor and nationality of the author, indicating that these articles are initially considered solely for human authors, no such verdict that requires the author to be a human being has been explicitly mentioned. As mentioned in parts above, EPO also rejected both applications a machine called "DABUS" In its decisions, the EPO considered that the interpretation of the legal framework of the European patent system it can be concluded that the inventor defined in a European patent must be a human being. The Office further clarified that the interpretation of the natural person inventor happens to be an internationally applicable standard, and that various national courts have judgements based on this standard.

European legal framework's feature is relatively higher standards for personal data protection-GDPR. The GDPR is a good practice for regulation in personal data protection and protects data of citizens of EU member states even beyond the boundaries of European Union. The European policymakers can impact for setting standards for human-centered AI, as it has already been done in relation to privacy.

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[73] Infopaq International A/S v Danske Dagblades Forening [2009] ECR I-06569

[74] Directive 2001/29/EC of the European Parliament and of the Council of 22 May 2001, Art.5(1)

CONCLUSION

As discussed in this Master's Paper Artificial Intelligence, which is now eventually becoming the biggest source of innovation and creativity, is already able to create and invent almost autonomously, with little human intervention. Creations with zero human intervention are predicted along with the development of Strong AI, which will be able not only to find a solution to a problem, but also

identify the problem itself. In a global context, legislative models should be explored in order to ensure that regulatory efforts are jointly made and to avoid forum shopping or to a regulatory race to those countries where such objects are protected. That is why, several actors have called for a global dialogue on the establishment of norms and ethical rules or principles. There is a considerable disadvantage to the incorporation of autonomously generated AI creative works into the public domain. Without a specified period of protection, there is no real incentive for developers of AI machines to keep on creating, using, and improving their capabilities.[75] Denying copyright to developers and owners of AI machines lowers their incentives to produce new AI programs and machines, and can gradually lead to a smaller number of AI generated works and innovation with considerable decrease in works which otherwise would enter into the public domain and be eligible for copyright protection. As a result, it becomes apparent that immediately releasing AI works into the public domain is counterproductive for the development of AI. A decreased number of AI generated works would possibly have far reaching negative effects in numerous sectors where the impact of AI research is proving very beneficial.[76] Hence, regulations internally and internationally must be compliant with the framework of well-structured economic rights, where fair use that does not hinder scientific progress and human creators (authors and inventors) making a living is possible.

The Republic of Armenia is not an exception. Considering the promising development in the field of ICT, in particular AI, the regulations of authorship and ownership of Intellectual Property, specifically in the field of copyright and patent, is an objective necessity. In this Master's Paper both copyright and patent eligibility for AI-generated works and inventions have been addressed both from international perspective and in line with regulations of the Republic of Armenia. As a result, the problems haven been identified which requires amendments to the Civil Code, Law on Copyright and Related Rights and Law on Inventions, Utility Models and Industrial Designs of the Republic of Armenia.

Based on conducted research, following recommendations are provided:

1) Acknowledge that as a result of recent enhanced computer capabilities, humans are no longer the only source of innovative and creative works.

2) Recognize the need for incentives (under the form of copyright protection) needed by programmers and AI owners in order to stimulate future development and investment in the AI field.

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[75] Hristov, supra at SSRN Electronic Journal (2019)
[76] Id.

3) Recognize the need for the balance (under the form amendment human inventorship requirement in patent law) and proper allocation of ownership rights.

Thus, I would suggest two solutions for AI-generated objects:

1) Granting copyright protection to developer of the AI system as the ultimate creator of the work. In this Master's Paper both pros and cons of allocation copyright to the developer have been discussed. Nevertheless, such legislative solution is not absolute and entails few disruptions in the copyright system which is built on multiple theories altogether supporting one main idea - **incentivization**. In that, public good should also be considered, however the solution that is developed, should maintain the balance in-between. During years of rapid technological development not once conceptual approaches to the copyright have been changed. Nowadays, we have a new phenomenon in the face of Artificial Intelligence, the impact of which is already visible. Thus, although in this solution the programmer receives double protection - both for the software source code and AI-generated work, still the main incentive to create is in his/her hands. Without professional contribution from the developer's side, making AI system a reality will not be possible. In fact, this solution is, as mentioned in the first Chapter of this Master's Paper, to some extent against copyright foundations, concerning the fact that in this the economic rightsholder is the person, who is not the 'real' author of the work. But there are examples in different jurisdictions, where not the 'real' author but for instance employer receives economic advantages. However, not to diminish the importance of public appreciation and recognition, the definition of the author should also be revised, amending the general requirement of the human author, so as for AI-generated works it is indicated that the machine is creator, but the developer the rightsholder. As such, the programmer will not receive moral rights for the work generated by AI, only economic advantages. With this, other authors will have their moral predominance toward developers. Further relations with possible end users, could be solved by contractual basis between programmer and end user, or in case of work for hire, between company/employee and end user. Thus, if the AI machine goes into mass production, the end user will purchase not only the system/software, but also the license for further copyright eligible works created by AI.

2) Assignment the inventorship and ownership rights of invention or utility model to the owner of the computer, which would be the most consistent option with the rules governing ownership of property and it would most incentivize innovation. Computer owners would still have the option negotiate alternate arrangements with developers and users by contract.

Artificial Intelligence is gradually expanding its scope of impact, from being main subject in public policies to incorporation into everyday encounters. To take control of its expansion in many fields of application and make the best possible use of it, regulations should be established. This Master's Paper adds on to the existing literature, considering that few researches have been done in regard to Intellectual Property rights for objects created by Artificial Intelligence in the framework of legislation of the Republic of Armenia.

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