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THE FOURTH INDUSTRIAL REVOLUTION AND THE NEW PATH OF LAW

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The contemporary accelerating changes in technology lead to drastic transformations in economy, social and political structures, as well as legal practice and the very essence of law. The present research is a try to bring to the light the evolution of industrial revolutions and realize the transformations and developments of law and legal practice throughout the First, Second, Third and Fourth Industrial Revolutions.

Taking into account the consequences of the previous industrial revolutions and the ongoing nature of the Fourth Industrial Revolution, the research defines some general developments / paths in the law, especially the transformations in legal practice (Practical Perspective); transformations in teaching law (Educational Perspective) and transformation in the essence and perception of law itself (Theoretical Perspective).

Based on the research two possible social structures, with economic, political and legal order, have been proposed: negative and positive.

Key words: *industrial revolutions; accelerating changes; artificial intelligence; LegalTech; transformation in legal practice; transformation in teaching law; transformation in perception of law*

The world we are living in has new features that make unprecedented differences with the past social, political and legal environments. The main features include the temp, periodicity, amplitude and phases of changes a person faces during his/her lifetime. This makes a real life of persons, societies, states and, in general, humankind full of new challenges and deep gaps of solutions for them.

The fast-social transformations are an inherent part of these types of realities. Sometimes, they create the sense of chaos, and the socio-political, state-legal, financial-economic challenges are met on the edge of chaos, where organization of social life becomes a complex issue requiring new methods and new paradigms. The paradigm changes are required also for legal perspective on social realities.

These kind of phases in change sometimes are called “revolutions”, which start in the deep levels of a social environment with interconnected complex structures, evolve during some transitional time and with accumulating fluctuations[1] explode in a very short period of time, creating a wide range of bifurcations[2] of future developments.

If we look around, it will not be hard to see that the socio-political, technological, state-legal and other environments around us are behaving in the man-

[1] One of several changes in size, amount, quality, etc. that happen frequently, especially from one extreme to another. - https://www.oxfordlearnersdictionaries.com/definition/english/fluctuation

[2] There are certain locations in parameter space, however, where changes are explosive. The system crosses over an invisible boundary and the landscape of attractors alters dramatically. Such changes are called bifurcations. - **Russ Marion**, *The Edge of Organization, Chaos and Complexity Theories of Formal Social Systems,* Sage Publications, 1999, p. 20.

ner of accelerating changes, which create the feeling of chaos or at least the edge of chaos with different bifurcations.

This is very similar to the notion of "revolutions", a new step or wave of developments that, for example, Alvin Toffler was speaking about a few decades ago. He separated three stages of developments of civilizations and societies: (1) agricultural, (2) industrial and (3) informational[3]. Another author – Klaus Schwab, the director of the World Economic Forum, has introduced his views in his famous book – The Fourth Industrial Revolution[4]. Unlike Alvin Toffler's approach, Klaus Schwab defined this phase of accelerating changes as the continuation of the industrial revolution, naming it as the Fourth Industrial Revolution or otherwise – Revolution 4.0 or 4IR . According to his definition, the main goal of the research was to emphasize the way in which technology and society co-exist, meanwhile sub-goals create a framework for thinking about the technological revolution that outlines the core issues and highlights possible responses[5].

Before digging deep into the possible resonances of the new – the 4th industrial revolution on society, we need to realize the dynamics of the industrial changes till now.

The Fourth Industrial Revolution is not a specific time period or epoch in the history of mankind, but rather refers to a wave of technological development over a period of time that has (had) a significant and widespread impact on all aspects of people's lives[6].

What we, as lawyers, are interested in, is the challenge to the legal practice and legal theory, because we (as practitioners and theorists) have a feeling of being runners left behind social transformations, we want to regulate human relations, but find themselves in the past with no idea of the real horizon of changes in present and future. This brings us to the idea of Heisenberg's "*the principle of uncertainty*", which states that "*one cannot assign exact simultaneous values to the position and momentum of a physical system*", and that "*the more precisely the position (momentum) of a particle is given, the less precisely can one say what its momentum (position) is*"[7]. This principle has been developed in quantum mechanics, but social scientists believe that we are at the borders of the quantum societies and world, so sometimes these principles are the tools for unlocking the fog of incomprehensive realities[8]. For lawyers, dealing with the pure legal principle of legal certainty, pursuing justice based on the rule of law, it is hardly bearable to face the principle of uncertainty, which is becoming the common rule of social reality, especially in the phase of the industrial revolutions. In any case, we will have a short look at the history of industrial revolu-

[3] **Alvin Toffler**, *The Third Wave,* Bantam Books, 1989.

[4] **Klaus Schwab**, *The Fourth Industrial Revolution*, World Economic Forum, Geneva, 2016, https://law.unimelb.edu.au/__data/assets/pdf_file/0005/3385454/Schwab-The_Fourth_Industrial_Revolution_Klaus_S.pdf

[5] Ibid. p. 9.

[6] **Andra Le Roux-Kemp**, "*The Fourth Industrial Revolution and a New Policy Agenda for Undergraduate Legal Education and Training in England and Wales*", Journal of Law, Technology, and Trust, 2(1). 2021, pp. 1-35, p. 4.

[7] Stanford Encyclopedia of Philosophy, https://plato.stanford.edu/entries/qt-uncertainty/

[8] **Chris Jay Hoofnagle, Simson L. Garfinkel**, *Law and Policy for Quantum Age*, Cambridge University Press, 2022.

tions from the legal perspective trying to stipulate reasons and tendencies of the development / changes, targeting the essential changes in the legal practice and the perception of law itself.

HISTORICAL PERSPECTIVE

With the help of domesticated animals, the agrarian revolution started its way in the Armenian Highlands and Middle East (around 10,000 years ago), spreading all over the world, when there was a shift from foraging to farming.

It combined the efforts of animals with those of humans for the purpose of production, transportation and communication. The agrarian age lasted till the 18th century and gave to humankind the birth of law - in general, then the slavery law, Roman law, the Middle Ages law, customary law, canonical law, etc.

According to Klaus Schwab, the "agrarian revolution was followed by a series of industrial revolutions that began in the second half of the 18th century. These marked the transition from muscle power to mechanical power, evolving to where today, with the fourth industrial revolution, enhanced cognitive power is augmenting human production"[9].

The first two industrial revolutions started in Europe, the third one was initiated in the USA and the fourth one is underway in the global world.

The First Industrial Revolution started in the mid-18th century. The discovery of steam engines started to drive industrialization. A set of manufactories started to emerge creating the new realities of the industrial world with the wave of colonial policy and the new perception of law, based on the ideas of Enlightenment, Reformation, Natural Law, Social Contract theory, and in general - the birth of the modern (classical) law, or the law as we know it today.

Literally "the law was used to tame the industrial beast. In 1802, the Parliament of the United Kingdom passed the first of a series of Factory Acts, to protect workers in the mechanised cotton factories.[10] In France, Napoleon regulated the coal mines in 1810 and installed a mining inspection in 1813.[11] In 1831, Prussia dealt with its steam engines and in 1838 with the upcoming railroads, introducing a regime of strict liability.[12] Law also facilitated the industrial revolution. The British patent system, for instance, was continually evolving and responding to the needs of the industrialising economy, without any legislative reform.[13] Inventors could easily obtain and enforce patent rights, which encouraged them to develop new technology. In the 1830s, several German states, such as Baden and Saxony, changed their expropriation legislation to facilitate the construction of railroads.[14] In other words, law played a pivotal role in regulating and facilitating the industrial revolution.[15] The other way around, the First Industrial Revolution

[9] **Klaus Schwab**, ibid, p. 11.

[10] **E.P. Hennock**, *The origins of the welfare state in England and Germany*, 1850–1914, Cambridge University Press, 2007, 73–85.

[11] Loi concernant les mines, les minières et les carriers 1810; Décret contenant les dispositions de police relatives à l'exploitation des mines 1813.

[12] **Miquel Martin-Casals** (ed.), *The Development of Liability in relation to Technological Change,* Cambridge University Press, 2010.

[13] **Sean Bottomley**, *The British patent system during the industrial revolution*, 1700–1852, Cambridge University Press 2014.

[14] **Jonatan Bromander**, *Expropriation i Sverige – en rättshistorisk analys,* examensarbete Juridiska institutionen Uppsala 2020.

[15] **Marc Steinberg**, *England's great transformation: law, labor, and the Industrial Revolution,* The University of Chicago Press, 2016.

seems not to have had any direct impact on the legal sector (legal education, legal professions, legal methodology)"[16].

In other words, in parallel with the first industrial revolution, as its result or as its facilitation, new branches of law and even new legal consciousness have emerged, such as Constitutional Law in the USA, French Republic, Poland, German states, etc., Human Rights (Social Rights, Labor Law, Economic Rights) in Europe and USA, Construction Law in the United Kingdom of Great Britain, French Republic, German states, etc., Civil Law (Ownership, Contracts, Delicts (Torts), etc.), Commercial Law in the Netherlands, Belgium, France, Austria, UK, USA, etc.

Moreover, Napoleon's Civil Code (1804) was the pure manifestation of the tectonic changes, which took place at that time of the First Industrial Revolution along with the political and legal revolutions.

Another important feature of this period of time was that the main legal-political teachings, governing Europe and the whole world in the 20th century and fighting or cooperating with each other, emerged during the rule of the First Industrial Revolution. Those teachings were Communism / Socialism, Nationalism, Liberalism, Nihilism, etc.

It is hard to agree with some ideas that those changes did not have any direct impact on legal education. We can emphasize the great changes in the legal education we have had since the 18th century based on the needs and requirements of the economy, social and political transformations. Whether those changes were shaped directly or indirectly by the First industrial revolution, is not so important, as they were real and transformed the legal education dramatically, giving birth to a set of new law schools with new syllabuses in Europe, USA and Russia.

The Second industrial revolution, which started in the late 19th century and into the early 20th century, made mass production possible, fostered by the advent of electricity and the assembly line[17]. Meanwhile, we should not forget that along with the emerging new wave of revolution the fuel of the First Industrial Revolution had not been run out. It continued to grow and to develop with a growing network of railroads and new factories from the USA to Europe, Russia, British India, and Japan.

The Second Industrial revolution changed the energy of steam engines with the energy of electricity. Since then, the successor of animals' and humans' muscles was not the steam (as it was in the First Industrial Revolution), but electricity.

Fortunately, or unfortunately, "[l]aw increasingly had to deal with interesting legal questions raised by the ongoing industrialization. One example was electricity, which was mostly invisible, powerful and had an incredible arrangement of new, fascinating possible applications. Lawyers had to figure out how they could legally frame this elusive matter. All kinds of difficult legal issues emerged. What was electricity? An object? Which legal qualification should it receive? Electricity could be produced, measured, traded, stolen, etc. Other difficulties arose. The In-

[16] **Bruno Debaenst**, "*The Digital Revolution from a Legal Historical Perspective*", Law, AI and Digitalization, (ed) Katja de Vries and Mattias Dahlberg, Juridiska Fakulteten, I Uppsala, 2021, pp. 23-36, p. 24.

[17] **Klaus Schwab**, ibid, p. 11.

dustrial Revolution developed organically; over the years, each country or even each company had developed its own standards. Lawyers and engineers gathered at international conferences to develop universal standards, for instance, regarding electricity.[18] The Second Industrial Revolution increasingly fuelled the legal development. New branches of law popped up and old ones blossomed. "Industrial law" became the hot topic of the day. Industrial law included inter alia patent law that had to deal with the numerous conflicts arising out of scientific discoveries and technical advances. Industrial workplace accidents also received increasing attention from lawyers because of the many liability issues that arose"[19].

Practical issues in the legal regulations forced the academics of law to multiply their efforts to develop legal theories and practical solutions for new challenges in social, economic and political life. These challenges influenced the law itself. They stimulated the development of insurance law and contemporary social law.

Taking into account the Bolshevik Revolution in Russia and emergence of a new communist state in the map of the world, the social and socialist law started to develop in the USSR faster than in the other part of the world.

In any case, it will be justified if we agree with an idea that "[i]n comparison with the First Industrial Revolution, the Second Industrial Revolution seems to have had some influence on law, through the development of new areas of law; otherwise, the influence was rather limited"[20].

Maybe the reason was that during this very specific period of time the world faced two World Wars and an unprecedented destruction. Because of those factors the attention of law was directed to the development of international law with its mechanism of prohibition of use of force (1928 - the Kellogg-Briand Pact, 1945 - UN Charter), settlement of disputes, elimination of consequences of wars (International Humanitarian Law) and creation of international organizations (League of Nations, United Nations, etc.) that would deal with them.

The Third Industrial Revolution is connected with the digital age, which is very native to almost all people living in the modern world, because their view of the world, perception of reality, thinking and even legal consciousness have been developed in this very period of time. "It is usually called the computer or digital revolution because it was catalyzed by the development of semiconductors, mainframe computing (1960s), personal computing (1970s and 80s) and the internet (1990s)"[21]. "The start of the Third Industrial Revolution is generally situated in the 1940s, with the development of the first modern computers (Alan Turing).[22] In the 1970s and 1980s, the personal computer (PC) conquered the world. In the 1990s, the Internet developed with the speed of light, linking together computers from all over the world."[23] Among the inven-

[18] **Miloš Vec**, Recht und Normierung in der Industriellen Revolution. Neue Strukturen der Normsetzung in Völkerrecht, staatlicher Gesetzgebung und gesellschaftlicher Selbstnormierung, Klostermann Vittorio 2006.

[19] **Bruno Debaenst**, ibid, p. 26.

[20] **Bruno Debaenst**, ibid, p. 26.

[21] **Klaus Schwab**, ibid, p. 11.

[22] **Michael Haenlein & Andreas Kaplan**, '*A Brief History of Artificial Intelligence: on the Past, Present and Future of Artificial Intelligence'* [2019] California Management Review 61(4) 5 (6).

[23] **Bruno Debaenst**, ibid, p. 27.

tions one should also mention: newer sources of energy - nuclear power, and massive progress in electronics.

This new wave has been trying to help humans not only with the help of the "surrogates of muscles" (as it was in agriculture, the 1st and the 2nd industrial revolutions), but also with the help of calculations, sharing information, verbal and written communication, etc., something that helps human brain. "The move from analog electronic and mechanical devices to pervasive digital technology dramatically disrupted industries, especially global communications and energy. Electronics and information technology began to automate production and take supply chains global. … Intellectual property became more valuable than the products and properties during this era. Industrialization, globalization, and the free market economy flourished during the 3rd industrial revolution. The world became into a fingertip of citizens"[24].

Maybe, a little bit belated, but the strong regulations on supply-chain have been developed in the USA and in the European Union[25], as well as the EU member states. The regulations require industrial companies to carefully manage Human Rights, social and environmental impacts throughout their supply chain, including their own business operations, and going far beyond the existing legislation at national level. This was possible only because of the fast-growing information technologies, without which there could not be any opportunity for due management of Human Rights, social and environmental impact throughout the supply chains.

This period of time is special also for the promotion of liberal values and liberalism as a whole. Communism, nationalism, as a way of social life, could not compete with liberal economy and yielded the hegemony of social consciousness to liberal values, which promoted democracy, human rights, rule of law, etc. Some scientists announced that this was the demonstration of the victorious potential of liberalism and thus it was the final destination of societies - the end of history[26]. Was the Third Industrial Revolution the result of liberalism, as a way of socio-political and state-legal organization of humans' life, or did the prerequisite of the Third Industrial Revolution (development of semiconductors, mainframe computing, personal computing, internet - digitalization as an approach) create the basis for liberalism to win the competition? That could be a subject for eternal debates. The fact is that the Third Industrial Revolution started in the USA and gradually took over the world, creating a new social reality of interconnected persons, organizations, groups, parties, which interacted with each other, sharing information, feelings, ideas, goods, money, etc. at an incredible speed (especially through online social networks). The sense of

[24] **Engr. A. K. M. Fazlul Hoque**, *The 4th Industrial Revolution: Impact and Challenges,* Conference paper, Conference: National Conference on Electronics and Informatics jointly organized by Bangladesh Electronics Informatics Society and Bangladesh Atomic Energy Commission held at Atomic Energy Centre, Dhaka, 4-5 December 2019: https://www.researchgate.net/publication/337830441_4th_Industrial_Revolution-_Impact_and_Challenges

[25] On February 23, 2022, the European Commission presented its proposal for a law on corporate sustainability obligations – the Corporate Sustainability Due Diligence Directive (CSDD). The Bundestag has passed the Act on Corporate Due Diligence Obligations in Supply Chains (July 16, 2021), which can be considered as an implementation of the EU requirements. Meanwhile, Germany has provided more detailed regulations rather than the EU act. The Law enters into force on January 1, 2023.

[26] **Francis Fukuyama**, *The End of History and the Last Man,* Free Press, 1992, 2006.

new social reality has even changed the perception of statehood and law. The governments have had to enter the digital age and reorganize their administrative and regulatory functions, as well as state services through digital tools (e-gov, e-state services, e-documents, etc.).

Maybe one of the reasons for the victory of liberalism against communism was the opportunities of technological progress that gave a competitive advantage to liberalism. In any case, after the collapse of the USSR, a new wave of legal reforms started from Eastern Europe to Caucasus, Middle Asia and China. The legal reforms, once again, have been initiated to match the norms of social behavior to the social changes arising from digitalization of the information and growing interconnection among people. In the meantime, those legal reforms, as well as promotion of democracy, human rights, rule of law and constitutionalism, have been trying to fill the gap of legal consciousness and legal culture of the specific societies striving for the benefits of digital age but have been lacking the realization of the legal requirements and legal culture that were meant to serve them. There is an opinion that "however, despite the many fundamental changes brought by the computer, we can meanwhile also observe that the general impact of the Third Industrial Revolution on law has not been that drastic. The way in which legal professionals process and share information may have changed because of the computer, e-mail and the Internet, but these technologies have not fundamentally transformed the way lawyers work.[27] Lawyers are rather conservative, and they do not like to change their usual modus operandi.[28] It is this force of tradition that explains why it took (takes) so long for many of the predictions from the nineties to become real. … Another observation is that – just as with the previous two industrial revolutions – lawyers quickly conquered the unchartered territory created by the new Industrial Revolution".[29]

In any case, we must accept that, even now, on the edge of the next industrial revolution, we still lack of matching or approximation of legal regulations with the accelerating changes of socio-economic developments, and, what is more important - the legal education, which is the main hope for the states to educate professionals who will deal with the complexity of legal systems, have not fulfilled their minimum assignments yet, but have to face the new challenges of the Fourth Industrial Revolution.

The Fourth Industrial Revolution marks its start while most of the progressive world is still in the complexity of reality filled by the previous (third) industrial revolution. Moreover, some states and societies are still in the First or Second Industrial Revolution, not speaking about the backward societies that are still in the agricultural age, but all of them feel the breath of the new wave of revolution. The Fourth Industrial Revolution **"**is characterized by a much more ubiquitous and mobile internet, by smaller and more powerful sensors that have become cheaper, and by artificial intelligence and machine learning. Digital technologies that have computer hardware, software and networks at their core are not new, but in a break with

[27] **Willem H. Gravett**, *Is the Dawn of the Robot Lawyer upon Us? The Fourth Industrial Revolution and the Future of Lawyers*, 2020, 23 Potchefstroom Electronic Law Journal 1.

[28] **Charles Sainctelette**, *De la responsabilité et de la garantie (accidents de transport et de travail)*, Bruylant, 1884, 49.

[29] **Bruno Debaenst**, ibid, p. 29-30.

the third industrial revolution, they are becoming more sophisticated and integrated and are, as a result, transforming societies and the global economy".[30]

The new technologies that transform the whole society include but are not limited to: "artificial intelligence and cognitive computing, robotics, Internet of Things (IoT), autonomous vehicles, 3-D printing, digital currencies, block-chain and distributed ledger technology, nanotechnology, biotechnology, materials science, energy storage, and quantum computing[31].

The driving forces behind these evolutions are the advancements in computing, where the speed, power and capacity have been doubling every two years.[32] The new revolution, however, "is not only about smart and connected machines and systems. Its scope is much wider. Occurring simultaneously are waves of further breakthroughs in areas ranging from gene sequencing to nanotechnology, from renewables to quantum computing. It is the fusion of these technologies and their interaction across the physical, digital and biological domains that make the fourth industrial revolution fundamentally different from the previous revolutions".[33] "These features of 4IR animate disruptions in all aspects of society. The disruptions go beyond connecting smart, advanced machines and systems and the growing harmonization and integration of multiple disciplines and inventions: these developments are spurring conceptual breakaways and breakthroughs, forcing functions that are altering our ways of being, doing, perceiving, and thinking".[34]

LEGAL PERSPECTIVE

Trying to understand the impact of the Fourth Industrial Revolution on law, or finding out some interaction paths with the last one, we can see some familiarities with the previous industrial revolutions. And that is normal, as the influences of the previous patterns have still been in force and will be. Maybe, they will be unlimited in time, but are paralleled with the influences of the new patterns.

As a result of these influences and especially having in mind the great push by the Fourth Industrial Revolution, some general developments in the law can be identified:

(a) transformations in legal practice (Practical Perspective);

(b) transformation in teaching the law (Educational Perspective),

(c) transformation in the essence and perception of law itself (Theoretical Perspective).

The technology of legal practice is changing rapidly. Predictive coding is transforming discovery in litigation. Start-ups like Ravel,[35] Lex Machina,[36] and

[30] **Klaus Schwab**, ibid, p. 12.

[31] **Engr. A. K. M. Fazlul Hoque**, *ibid*.

[32] **Benjamin Alarie, Anthony Niblett & Albert H Yoon**, '*Law in the future*', 2016, 66 (4), University of Toronto Law 423 (424); Jerry Kaplan, Artificial Intelligence, What Everyone Needs to Know, Oxford University Press 2016.

[33] **Klaus Schwab**, ibid, p. 12.

[34] **Virginia Bacay Watson**, *The Fourth Industrial Revolution and its Discontents: Governance, Big Tech, and the Digitization of Geopolitics,* Hindsight, Insight, Foresight: Thinking about Security in the Indo-Pacific, September, 2020, pp. 37-48, p. 38.

[35] Ravel Law. 2015a. Ravel: *Data Driven Research* www.ravellaw.com (accessed December 30, 2015).

[36] **Surdeanu, Mihai, Nallapati, Ramesh, Gregory, Walker, Joshua, and Manning, Christopher D.**, Risk analysis for intellectual property litigation, *Proceedings of the 13th International Conference on Artificial Intelligence and Law.* New York, NY: ACM, 2011, pages 116-20.

the Watson-based Ross[37] are garnering attention and enlisting law firm subscribers, These and other developments in text analytics offer new process models and tools for delivering legal services, promising greater efficiency and, possibly, greater public accessibility[38].

All these new tools in the legal services create a new age of LegalTech, leading to a new reality in legal practice, where "*the result of legal commoditization is a software service or product that anyone can purchase, download, and use to solve legal problems without hiring an attorney, or in current parlance, a kind of computerized legal application, a "legal app"*."[39]

Legal applications or other service based applications with AI create more complex problems for lawyers, as "*[t]he AI universe needs regulation, and the many applications of AI raise numerous ethical and legal issues.*[40] *In many cases, law does its trick by applying old rules to new problems.*[41] *Liability questions arising from self-driving cars can be studied in tort law, and smart contracts are part of contract law.*[42] *... Change is on the way. The only question is how fast or fundamental this change will be. Compared to the previous industrial revolutions, this one is going much faster. It is evolving at an exponential, rather than linear pace.*[43] *Therefore, some predict a complete "disruption", where "law as we know it" will disappear and transform into something new. Authors such as Richard Susskind – who already made quite accurate predictions in the 1990s – predict that the legal profession will change more in the coming twenty years than in the previous two hundred.*[44] [45],

It is required from lawyers to get more and more broad view on the new realities brought by the Fourth Industrial Revolution, in order to stay in the wave of legal services or in general, legal practice. A very different and complex set of issues are arising almost in all spheres of practice from Intellectual Property and Copyright[46] to Legal Education[47].

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[37] Ross Intelligence. 2015. Ross: Your Brand New Super Intelligent Attorney www.rossintelligence.com/ (accessed December 0, 2015).

[38] **Kevin D. Ashley**, *Artificial Intelligence and Legal Analytics, New Tools for Law Practice in the Digital Age,* Cambridge University Press, 6th printing, 2019, p. 6.

[39] **Kevin D. Ashley**, ibid, p. 8.

[40] **Michiel Fierens, Stephanie Rossello and Ellen Wauters**, '*Setting the Scene: On AI Ethics and Regulation*', in Jan De Bruyne and Cedric Vanleenhove (eds), *Artificial Intelligence and the Law* (Intersentia 2021), p. 49.

[41] **Jan De Bruyne and Cedric Vanleenhove** (eds), Artificial Intelligence and the Law, Intersentia, 2021; Woodrow Barfield & Ugo Pagallo (ed.), Research Handbook on the Law of Artificial Intelligence, Edward Elgar Publishing 2018.

[42] **Jan De Bruyne, Elias Van Gool and Thomas Gils**, '*Tort Law Damage Caused by AI Systems*', in Jan De Bruyne and Cedric Vanleenhove (eds), Artificial Intelligence and the Law (Intersentia 2021), p. 359.

[43] **Klaus Schwab**, ibid, p. 8.

[44] **Richard Susskind**, Tomorrow's lawyers. An Introduction to Your Future (second edition), Oxford University Press, 2017, p. xvii.

[45] **Bruno Debaenst**, ibid, p. 32-33.

[46] **Ruth L. Okediji**, *Creative Markets and Copyright in the Fourth Industrial Era: Reconfiguring the Public Benefit for a Digital Trade Economy*, International Center for Trade and Sustainable Development (ICTSD), Issue Paper No. 43, 2018.

[47] **Andra Le Roux-Kemp**, "*The Fourth Industrial Revolution and a New Policy Agenda for Undergraduate Legal Education and Training in England and Wales*", Journal of Law, Technology, and Trust, 2(1). 2021, pp. 1-35; Taron Simonyan, "Practical Challenges of a Lawyer in XXI century: Artificial Intelligence", Articles of the annual conference of the Faculty of Law YSU, 2018, Yerevan, pp. 35-45.

Taking into account the above-mentioned and trying to sum up all the features of the industrial revolution in a scheme, we will use Petre Pisecaru's table[48], and will add a new column for Law.

Wave	Period	Transition period	Energy resource	Main technical achievement	Main development industries	Transport means	Law[49]
I	1760-1900	1860-1900	Coal	Steam engine	Textile, Steel	Train	**Creation of the basis for Human Rights, Ownership Rights and in general civil law**
II	1900-1960	1940-1960	Oil, Electricity	Internal combustion engine	Metallurgy, Auto, Machine Building	Train, Car	**Industrial Law, Social Law, Insurance Law, Electric Law, Intellectual Property law,**
III	1960-2000	1980-2000	Nuclear Energy, Natural Gas	Computers, Robots	Auto, Chemistry	Car, Plane	**Air Law, Space Law, IT Law, Information Law, General Data protection Regulations (GDPR)**
IV	2000-….	2000-2010	Green Energies	Internet, 3D Printer, Genetic Engineering	High Tech Industries	Electric Car, Ultra-Fast Train	**Law of Metaverse, Law of artificial intelligence, Genetics and Law, etc.**

The drastic changes bring new challenges and new opportunities not only for technology engineers but also for the engineers of societies, politics and law. These challenges and opportunities are capable of transforming the structure of power (political and other) in societies and in the world, as the capacity of economic and political power is now measured not only or not even by the amount of real estate (Middle ages) or moveable capitals and stocks (Industrial period), but rather by the big data one owns or possesses.

Moreover, if the 1st and 2nd industrial revolutions are about exchanging the human muscles with the steam and internal combustion engines (coal, oil, electricity), the 3rd and 4th are about exchanging the human brain with new non-human thinking systems and intelligence (robotics and artificial intelligence). If during the 1st and 2nd industrial revolutions the political influence upon the creation and interpretation of legislation was in the hands of those group of people, who owned "energy flow" of coal, oil and electricity, the 3rd Industrial Revolution has brought the power to big data owners (Google, Facebook, Tweeter, etc.), who control the flow of information in a society. As it concerns the Fourth Industrial Revolution, the power is generated in and by the artificial intelligence, and those who create, control and direct the analytic and decision making algorithms of different artificial intelligences in economy, finances, politics, etc.

[48] **Petre Prisecaru**, "*Challenges of the Fourth Industrial Revolution*," Knowledge Horizons - Economics 8, no. 1 (2016), pp. 57-62, p. 57.

[49] The Law's column was added by the Author.

Thus, they will be the ones who will influence the legislative processes much more than other agents in the society.

As Klaus Schwab emphasizes, the growth of inequality within local and global societies, it is connected with different factors of consequences from the Fourth Industrial Revolution: "*The discussion on economic and business impacts highlighted a number of different structural shifts which have contributed to rising inequality to date, and which may be further exacerbated as the fourth industrial revolution unfolds. Robots and algorithms increasingly substitute capital for labour, while investing (or more precisely, building a business in the digital economy) becomes less capital intensive. … As all these trends happen, the winners will be those who are able to participate fully in innovation-driven ecosystems by providing new ideas, business models, products and services, rather than those who can offer only low-skilled labour or ordinary capital*"[50]. Moreover, "*ontological inequality will separate those who adapt from those who resist – the material winners and losers in all senses of the word. The winners may even benefit from some form of radical human improvement generated by certain segments of the fourth industrial revolution (such as genetic engineering) from which the losers will be deprived. These risks create class conflicts and other clashes unlike anything we have seen before*."[51]

But, it is not the last transformation we will face when speaking about law. I believe it is apparent what the new structure of power can do with such social phenomena, as law. It can transform not only the legal practice, or legal education, but even the essence and nature of law as we know it since the 18th century, as it hits the very basics of the values, which create the notion and perception of law.

In this part of the world we define the law as "*mandatory regulatory rules of conduct, accepted and implemented by the state authority, and conditioned by the nature of a society / human, as well as expressing the freedom of a human*". The static thing in this definition is that it is still the state authority that accepts and implements mandatory regulatory rules of conduct. The changing phenomenon is that the nature, essence of a society / human and the freedom of a human have been transforming in an accelerating regime for the last decades. This means that the main fundamentals of law are in the process of active change, such as: values of ethics, freedom, equality, perception of justice and law, as well as the appearance of a new subject, which pretends to the same rights that are possessed by humans.

I have already mentioned about different changes we undergo now in the society level, including socio-economic and socio-political developments. The important features of these developments are also the problem of the rising inequality between peoples and members of societies, based on the unequal distribution of technological tools and information, which having a very big opportunity to deepen the gap between those possessing big data, information flow and algorithms of artificial intelligence and the ones, not possessing them.

On the individual level, we are facing the challenge of one of the fundamental issues we could not even imagine before. The issue of who is an indi-

[50] **Klaus Schwab**, ibid, p. 86.
[51] **Klaus Schwab**, ibid, p. 92.

vidual, is becoming a new subject of discussion in parallel with the rise of technologies and artificial intelligence. This issue is becoming a real subject more and more, as the accelerating changes in technology, which lead to socio-political and legal transformations, bring to the fact of changing not only what humans do, but also who they are. The big data analyzing functions, new tools of artificial intelligence and the whole development patterns suggested by the Fourth Industrial Revolution affect the very identity of human beings and other related factors, such as - consumption, sense of privacy, ownership in circular economy, intellectual property and copyright, nature of relationship between persons (interpersonal, family and other relations), social hierarchies, metaverse relations of virtual reality, virtual personality, rights to such personality, rights to be forgotten and to be deleted as a virtual personality, genetic technologies (genetic prediction and personalized medicine) and ethics, classical education - hierarchical system, new financial tools (block-chains, bitcoins, etc.), and last but not least - the legal personhood of artificial intelligence.

The last issue is becoming a subject of discussion not only in the scientific level[52], but also in practical and in judicial litigations. For example, a robot named Sophia received a citizenship,[53] a chatbot programmed to be a seven-year-old boy became the first AI bot to be granted official residence in Japan[54], the European Parliament accepted a report on a special legal status for robots (electronic person) for possible liabilities,[55] a number of domestic judicial cases on artificial intelligence have already their decisions,[56] etc.

All these developments and factors, challenges and opportunities make us believe that it is time for lawyers to try to expand the horizons of legal practice, legal education and perception of law, taking into account the new reality of the quantum age of technologies, artificial intelligence and metaverse, otherwise they will be behind developments, losing the main regulatory function of social relations, the amplitude, fluctuations and speed of which are far ahead from the law itself. These challenges may create different types of inhumane and/or inefficient social structures with economic, political and legal order (negative version):

[52] **Lawrence Solum B.**, *Legal Personhood for Artificial Intelligences*, 70 N.C. L. Rev. 1231, 1992, p 1231, https://scholarship.law.unc.edu/nclr/vol70/iss4/4/ , Hatziavramidis K. S., Esq., Artificial Intelligence & The Law: Pros And Cons, 2018, p. 383, https://lintar.untar.ac.id/repository/penelitian/buktipenelitian_10288001_3A220716.pdf

[53] **Cuthbert O.**, *Saudi Arabia Becomes First Country To Grant Citizenship To A Robot*, *Arab News,* 26 October 2017, https://www.arabnews.com/node/1183166/saudi-arabia

[54] **Cuthbertson A.**, *Artificial Intelligence "Boy" Shibuya Mirai Becomes World's First AI Bot To Be Granted Residency*, *Newsweek*, 6 November 2017, https://www.newsweek.com/tokyo-residency-artificial-intelligence-boy-shibuya-mirai-702382

[55] European Parliament, Committee on Legal Affairs. Report With Recommendations To The Commission On Civil Law Rules On Robotics (2015/2103(INL)), pp. 17–18, https://www.europarl.europa.eu/doceo/document/A-8-2017-0005_EN.html

[56] Gill v. Whitford, US Supreme Court, (138 S. Ct. 1916 (2017)), Rucho v. Common Cause, US Supreme Court, (139 S. Ct. 2484 (2019)), Spokeo, Inc. v. Robins, US Supreme Court, (136 S. Ct. 1540 (2016)); Kraus v. Cegavske, No. 82018, 2020 Nev. Unpub. LEXIS 1043 (Nov. 3, 2020); Williams-Sonoma Inc. v. Amazon.com, Inc. (N.D. Cal. 3:18-cv-07548); Asif Kumandan et al. v. Google LLC (N.D. Cal. 5:19-cv-04286); Vance et al v. Amazon.com, Inc. (W.D. Wa. 2:20-cv-01084); Vance et al v. Facefirst, Inc. (C.D. Cal. 2:20-cv-06244); Vance et al v. Google LLC (N.D. Cal. 5:20-cv-04696); Vance et al v. Microsoft Corporation (W.D. Wa. 2:20-cv-01082); Janecyk v. IBM Corp. (Cook County Cir. Ct. Ill. 2020CH00833); Jordan Stein v. Clarifai, Inc. (Cook County Cir. Ct. Ill. 2020CH01810); K. et al v. Google, LLC (N.D. Cal. 5:20-cv-02257); Williams et al. v. PersonalizationMall.com LLC (N.D. Ill. 1:20-cv-00025).

(1)an unorganized society with a nihilistic atmosphere regarding law and legal culture, because law has nothing to do with the dynamic relations it tries to regulate. As a result, it leaves the real life behind and stands as archaic institution, creating large gaps, which will be filled with other social norms, such as canonical rules, religion, customary norms, traditions, moral norms of particular groups, taking all societies to a atomization age or even extremist solutions for human behavior;

(2)a dictatorial society, where legislators and governments will try to impose outdated law upon the social environment far ahead of it, because the classical law and political order is understandable for them, and they are not able or unwilling to develop new legal mechanisms and tools, which will meet the challenges of the new realm. By doing so, such societies will be forced to cease the developments not only in technologies but also in legal culture;

(3)a society with a new layered system, where the winners (those who possess the big data, algorithms of artificial intelligence, technology of influences, as well as the quantum technologies) take all power and transform it into mandatory will expressed in law. As it was correctly mentioned before: "*[t]he pendulum could swing back to a world where elite - the small number of people who operate and understand quantum technologies - have more command over ideas and the matters of what is correct and incorrect*"[57]. This will lead to societies with classes full of discriminations in the old (racial, financial, etc.) or new versions, where the ones who have the algorithms (the power) will govern the ones who are feared to lose the access to the system of informational network (metaverse).

In the meantime, the same challenges may create anthropocentric and/or very efficient social structures with economic, political and legal order (positive version) - a very organized society with an effective legal and political mechanism for social coexistence and common development. This ought to be positive and effective not only for all human beings (without any discrimination), but also - an example of social coexistence with the technologies created by humans and even non-human, artificial intelligence, which adapts to the fast-changing transformations of the quantum age realities much more effectively than any human being does. By doing so, technologies, their creators or the ones who possess the algorithms of the information flow/analysis and decision makers will not compete for superiority with other parts of society, but rather will become a unique bridge between humans' time perception and the time of accelerating changes.

The positive version of developments requires much more energy and input than the negative ones, as the last ones will come to life automatically, if nothing is done for the positive option. But the positive version of the future requires hard work on morality, ethics and law, as the leading social norms free from any discrimination. It also requires transformation of what we believe is morality, ethics and law, in order to prepare them for the unpredictable changes they are called to predict and regulate. Moreover, morality, ethics and law must work together in harmonized state, in order not to limit the sphere of influencing of each other.

[57] **Chris Jay Hoofnagle, Simson L. Garfinkel**, *ibid,* p. 355.

The classical paradigm of jurisprudence with its education and practice is not capable of meeting the challenges of the Fourth Industrial Revolution with its artificial intelligence and quantum technologies. It needs to be developed itself, like we had it in the 18th century (after the 1st Industrial Revolution), when the old, archaic, feudal and canonical law had to give its way to the new - classical law, we know it today as the organizer and the tool for predicted behavior in our private, social, state and international life.

The Fourth Industrial Revolution is some kind of transitional period for law, because it gives a set of opportunities to jurisprudence to develop and/or define new features and nature of law that will be an effective tool for regulating human and non-human (but intelligence) behavior in the new realm of metaverse, quantum age of acceleration and coexistence with new members of our common "human life".

What will be the next step after the Fourth Industrial Revolution, is hard to predict. But we can assume that if it goes well, and the coexistence of technologies and humans takes place without any apocalyptic results, it will be a shift to a new type of society and humanity, with its socio-economic, political and legal philosophies and paradigms.

ՏԱՐՈՆ ՍԻՄՈՆՅԱՆ – ***Չորրորդ արդյունաբերական հեղափոխությունը և իրավունքի նոր ուղին*** **–** Տեխնոլոգիաներում արագացող արդի փոփոխությունները հանգեցնում են արմատական կերպափոխումների տնտեսությունում, սոցիալական և քաղաքական կառուցվածքներում, ինչպես նաև իրավական պրակտիկայում ու իրավունքի էության մեջ: Սույն հետազոտությունն արդյունաբերական հեղափոխությունների էվոլյուցիան վեր հանելու և Առաջին, Երկրորդ, Երրորդ ու Չորրորդ արդյունաբերական հեղափոխությունների ընթացքում իրավունքի ու իրավական պրակտիկայի կերպափոխումներն ու զարգացումները գիտակցելու փորձ է:

Հաշվի առնելով նախորդ արդյունաբերական հեղափոխությունների հետևանքները և Չորրորդ արդյունաբերական հեղափոխության ընթացիկ բնույթը՝ հետազոտությունը սահմանում է իրավունքում որոշ ընդհանուր զարգացումներ / օրինաչափություններ, մասնավորապես՝ կերպափոխումներ իրավական պրակտիկայում (գործնական տեսանկյուն), կերպափոխումներ իրավունքի դասավանդման մեջ (կրթական տեսանկյուն) և կերպափոխումներն իրավունքի ընկալման մեջ (տեսական տեսանկյուն):

Հիմնվելով հետազոտության վրա՝ առաջարկվել են երկու հնարավոր՝ դրական և բացասական սոցիալական կառուցվածքներ՝ տնտեսական, քաղաքական և իրավական կարգերով:

Բանալի բառեր – *արդյունաբերական հեղափոխություններ, արհեստական բանականություն, արագացող փոփոխություններ, իրավական տեխնոլոգիաներ, կերպափոխումներ իրավական պրակտիկայում, կերպափոխումներ իրավունքի դասավանդման մեջ, կերպափոխումներ իրավունքի ընկալման մեջ*

ТАРОН СИМОНЯН – ***Четвертая промышленная революция и новый путь права.*** **–** Современные ускоряющиеся изменения в технологиях приводят к радикальным преобразованиям в экономике, социальных и политических струк-

турах, а также юридической практике и самой сути права. Настоящее исследование представляет собой попытку пролить свет на эволюцию промышленных революций и осознать трансформации и развитие права и юридической практики на протяжении Первой, Второй, Третьей и Четвертой промышленных революций.

Принимая во внимание последствия предыдущих промышленных революций и продолжающийся характер Четвертой промышленной революции, исследование определяет некоторые общие тенденции/пути в праве, особенно трансформации в юридической практике (Практическая перспектива), трансформации в преподавании права (Образовательная перспектива) и трансформация в сущности и восприятии самого права (Теоретическая перспектива).

На основе исследования были предложены две возможные социальные структуры с экономическим, политическим и правовым порядком: негативная и позитивная.

Ключевые слова: *промышленные революции, ускорение изменений, искусственный интеллект, юридические технологии, трансформация в юридической практике, трансформация в преподавании права, трансформация в восприятии права*