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THE IMPACT OF THE FOURTH INDUSTRIAL REVOLUTION ON LAW – CIVIL LIABILITY FOR DAMAGE CAUSED BY ARTIFICIAL INTELLIGENCE SYSTEMS[1]

Abstract: The author attempts to present, in a synthetic and general way, the impact of the fourth industrial revolution on the law, with particular emphasis on the impact on the issue of civil law liability, considering it one of the fundamental ones in the face of this revolution. The intensity and multi-facetedness of the changes resulting from the dynamic technological progress affects practically every area of social and economic life and legal systems. The study aims to briefly present views and perspectives of upcoming changes in the law, mainly in the aspect of possible civil law liability for damages caused by artificial intelligence systems in the EU legal system.

Keywords: fourth industrial revolution, industry 4.0, law, artificial intelligence, civil liability, damage.

INTRODUCTION

The development of civilization has always been a direct or indirect result of technical progress, progress in research and science. The Fourth Industrial Revolution (Industry 4.0) is ongoing and is driven by digitization, data and artificial intelligence (AI). Modern technologies using artificial intelligence will be widely used in every segment of socio-economic life. Examples include: communications, health care, transport, agriculture, environment, management, security, maritime and space industries, and public services.

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[1] The Polish version of this chapter has been publicated in D. Wetoszka (ed) Prawo gospodarcze, C. H. Beck, Warszawa 2020.

According to Dave Coplin, Microsoft's main visionary, "artificial intelligence is the most important technology in the world today"[2]. This thesis is confirmed by public and private funds invested in the development of artificial intelligence. In 2016, this investment amounted to 3.2 billion euros in Europe, 12.1 billion euros in North America and 6.5 billion euros in Asia[3]. During the next decade, the European Union plans to make a total investment of more than 20 billion EUR each year[4]. In addition, the availability of financing in the field of Artificial Intelligence for the SME sector will be increased under the EU's InvestEU programme[5]. In turn, the American company SpaceX – whose founder and president is Elon Musk – will spend about 10 billion dollars to create the Starlink system, which aims to provide access to fast and cheap Internet covering the whole globe – without exceptions, and in the future to transmit the network also to Mars[6]. This will transform mobility of people and devices on an extraordinary scale.

The economy based on industry 4.0 is a civilizational opportunity for further development of mankind and improving the quality of life, but also entails a myriad of resulting threats. Every "revolution", by its very nature, consists of a multitude of rapid changes. Thus, the fourth industrial revolution will lead to a reshaping of the social and economic structure, and possibly also of the political structure – the scale and depth of which we are currently unable to assess precisely.

CHALLENGE TO THE LAW

The most complex, but also the most important challenge, is to properly direct the process of the contemporary technological revolution[7] in such a way, that human being and service to society are at its center. This unique "challenge" must be faced by law. Legislation, including continental Europe, will be compelled to create a new legal and institutional framework that responds to the needs of an innovative economy and the development of 4.0 technologies, while safeguarding a widely recognized system of values and human rights.

The new regulations should, in a way, have a servant role towards technology (to provide an impulse for development) and be flexible enough to define the unpredictable (artificial intelligence). At the same time, the law should harmoniously but as effectively as possible protect the system of values and human rights as the primary role of law in every aspect.

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[2]   S. Shead, *Sztuczna inteligencja to najważniejsza z obecnie rozwijanych na świeci technologii*, https://businessinsider.com.pl/technologie/nowe-technologie/sztuczna-inteligencja-to-najwazniejsza-rozwijana-obecnie-technologia/qscny5j [accessed on: 21.03.2020].

[3]   *COM(2020) 65 final.*

[4]   *Ibidem.*

[5]   *Ibidem.*

[6]   M. Pluskota, *Skąd weźmiemy internet na Marsie?*, "Świat Wiedzy. Kosmos", 2020, nr 2, p. 24–

[7]   K. Schwab, *Czwarta rewolucja przemysłowa*, Studio EMKA, Warszawa 2018, p. 17.

The fourth industrial revolution will, therefore, affect the order of legal systems and legal thought. The widely known different concepts – what is not prohibited, is allowed, and what is not explicitly allowed, is prohibited – will have to be combined in order for the new legislation to create "the most secure space for innovation to emerge"[8]. Success in transition to economy 4.0 will be achieved by those legislators and those societies whose legislation will be able to make laws that fully adapt them in the area of rapidly changing innovative technologies[9].

The implementation of appropriate legal policies will become one of the most important determinants of success of this revolution. The main areas to be regulated by lawmakers in the field of artificial intelligence can be defined as: prevention, supervision and responsibility. The continental law system is also facing such a challenge.

THE PERSPECTIVE OF EUROPEAN UNION LAW POLICY ON ARTIFICIAL INTELLIGENCE

The European Union is working intensively to create regulations to regulate the area of artificial intelligence. Aiming to be one of the world leaders in the development and use of AI in the economy, the Union should work out legal solutions that will be uniformly applicable throughout the Community in order to preserve the values of legal security, legal certainty and competitiveness in the global economy. The European Parliament adopted in 2017 a resolution with recommendations to the Commission on civil legislation on robotics (2015/2103(INL))[10]. Artificial intelligence will affect the greatest number of changes in precisely the branch of civil law (e.g. liability, AI development, research and innovation, intellectual property rights, data flow and protection, insurance). In this resolution, Asimov's rights are considered fundamental among the general principles:

- First Law: A robot may not harm a human being or, by failing to act, allow a human being to be harmed.
- Second Law: A robot must obey human orders, unless they conflict with the First Law.
- Law Three: a robot must protect itself unless it contravenes the First or Second Law.
- Zero Law (overriding): A robot must not harm humanity, actively or by negligence.

The starting point for all relevant legislative processes is the definition of artificial intelligence. The EC Communication on Artificial Intelligence for Europe

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[8]   *Ibidem*, p. 94.
[9]   *Ibidem*, p. 98–100.
[10] European Parliament resolution of 16.2.2017 with recommendations to the Commission on civil law provisions concerning robotics (2015/2103(INL)) (EU Official Journal C 252/239).

of 2018 proposed a definition of AI: "The term artificial intelligence refers to systems that exhibit intelligent behavior by analysing their environment and taking action – to some extent autonomous – to achieve specific goals. AI systems can be software-based, operating in a virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems), or they can be embedded in devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications)"[11]. The High Level Group of Experts elaborates on this concept as follows: "Artificial Intelligence Systems (AI) are human-designed software (and possibly computer hardware) that, in order to achieve a complex goal, operates in a physical or digital dimension, perceiving its environment by acquiring data, interpreting the collected data (structured or not), drawing conclusions from that data or processing information from that data and deciding on the best action to take to achieve that goal. Artificial intelligence systems can use symbolic principles or learn from a numerical model and can also adjust their behavior by analyzing the environmental impact of their previous actions[12].

In addition, the European Commission published a White Paper on Artificial Intelligence in February 2020. A European approach to excellence and trust[13]. The White Paper sets out in detail the current state and use of artificial intelligence in the EU, development prospects, opportunities and threats, the current state of the law and the directions that EU legislation should take when setting standards in the field of AI.

The issues of safeguarding the catalogue of EU values and fundamental rights, including protection of personal data, privacy and non-discrimination, as well as consumer rights, security and accountability, have been identified as strategic for regulation. Currently there is no common European legal framework that would create a unified legal order to minimize the various potential risks of artificial intelligence[14]. The White Paper sets out the horizons of work on these regulations, which will be harmoniously supported by the already existing EU legal acts (e.g. Consumer Rights Directive No 2011/83/EC, Directive No 2019/882/EU on requirements for the availability of products and services).

CIVIL LIABILITY IN THE FACE
OF ARTIFICIAL INTELLIGENCE

One of the most fundamental issues to be regulated in civil law is liability for damage caused by AI systems. Artificial Intelligence is not fully predictable – we know the potential risks, but not all of them. We have the ability to only partially

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[11]   *COM(2018) 237 final.*
[12]   *Ibidem.*
[13]   *COM(2020) 65 final.*
[14]   *Ibidem.*

predict the behavior of AI, and not the final actions, so the extreme possible damage (e.g. personal injury, material and non-material damage).

The use of artificial intelligence in products and services is becoming increasingly common. It is predicted that by 2025 the proportion of data processing and analysis by intelligent objects connected to the Internet will increase significantly in the EU[15]. Research by the World Economic Forum (WEF) shows that the majority of world business leaders (79%) predict that by 2025 10% of vehicles on U.S. roads will be autonomous[16]. The state of Nevada (USA) has already passed a law in 2012 to allow the participation of autonomous cars in road traffic[17]. Autonomous vehicles are also the near future in Europe. Meanwhile, European seaports are already using AI in their infrastructure and are testing further application possibilities (e.g. Port of Hamburg)[18]. Partially or fully autonomous seaport quays are a matter of the coming years.

There are a lot of examples of practical and everyday use of artificial intelligence, such as the above. At the same time, there are many risks associated with this. In 2016, for the first time, a fatal accident involving an autonomous vehicle took place – during a Tesla test, the driver of the vehicle tested in autonomous mode was killed on site[19]. Another fatal accident occurred in 2018, where pedestrian was hit-and-run by an autonomous vehicle belonging to the company Uber[20]. From this perspective, the need for legal regulation of civil liability is becoming even more urgent. According to the report on the impact of artificial intelligence, the Internet of Things and Robotics on safety and liability, traditional concepts in most EU Member States national liability laws can be ineffective and complicate claims[21].

The institution of legal civil liability for damages in the system of continental law (e.g. unlawful damage to someone else's property – damnum iniuria datum), including the formation of a subjective premise of liability (guilt of the perpetrator), has its roots in the jurisprudence of ancient Rome and Roman law (delicta privata)[22]. Today, this is accepted and constituted in many European legislations,

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[15] *Ibidem.*
[16] K. Schwab, *Czwarta rewolucja przemysłowa*, Studio EMKA, Warszawa 2018, p. 177.
[17] A. Knapp, *Nevada Passes Law Authorizing Driverless Cars*, https://www.forbes.com/sites/alex-knapp/2011/06/22/nevada-passes-law-authorizing-driverless-cars/#43f1f1951332, [accessed on: 22.03.2020].
[18] F. Wolski, *Port Hamburg pracuje nad wykorzystaniem autonomicznych pojazdów*, https://www.rynekinfrastruktury.pl/wiadomosci/porty/port-hamburg-pracuje-nad-wykorzystaniem-auto-nomicznych-pojazdow-68865.html, [accessed on: 22.03.2020].
[19] J. Dybalski, *USA. Pierwsza piesza ofiara samochodu autonomicznego*, https://www.transport-publiczny.pl/mobile/usa-pierwsza-ofiara-samochodu-autonomicznego-auto-ubera-przejecha-lo-piesza-58039.html, [accessed on: 22.03.2020].
[20] *Ibidem.*
[21] *COM(2020) 65 final.*
[22] W. Rozwadowski, *Prawo rzymskie. Zarys wykładu wraz z wyborem źródeł*, Ars Boni et Aequi, Poznań 1992, p. 194–202.

including Polish civil law, responsibility *ex delicto*. It is regulated by articles 415–449 of the Civil Code. On the basis of these provisions, tort liability may be incurred on the basis of the principle of fault (the general principle)[23], the principle of risk, the principle of equity and the principle of absolute liability. However, with regard to certain characteristics of artificial intelligence in its broadest sense, such as the unpredictability, non-linearity and non-transparency of the possible behavior of the products, it may be highly difficult or impossible to establish and properly analyze the sequence of facts from human behavior (e.g., the owner or operator of the device) to the given damage caused by the AI device, which would allow the subsuming of these provisions and the attribution of liability to the "perpetrator". It should also be borne in mind that the AI systems are not granted legal personality. Moreover, according to the wording of Article 415 of the Civil Code and in conjunction with Article 6 of the Civil Code, the burden of proof (onus probandi) rests with the injured party, where demonstrating, for example, the existence of a causal link, or the fact of a causal relationship, if possible in general, will at least make it more difficult to document the evidence and significantly increase costs for the injured party, thus limiting the possibility of effectuating claims and exercising rights. Nevertheless, in the case of damage caused by an artificial intelligence device, it will often be unrealistic to demonstrate this adequate causal link.

In the United Kingdom, legislation, including liability issues, is being developed as part of the Autonomous Car project. The project assumes the application of strict liability, i.e. granting the owner or insurer responsibility for damages caused by the autonomous car[24]. Legislative activities in this area are also conducted in the USA. Unification of regulations at the federal level requires, for example, a widespread share of autonomous cars in road traffic, and nowadays it is the individual states that create their own regulations (e.g. the mentioned Nevada). Broad discourse on this subject is not clear. The doctrine of American civil law is dominated by the views pertaining to limit manufacturer's liability, even though it seems to be the most legitimate[25] and it is possible that it will eventually adopt this formula – new regulations are being developed by the Congress[26].

The analysis of the possibilities and establishment of specific standards is also desirable in the EU. Legal certainty in the area of AI is expected by Member

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[23]   W. Czachórski, *Zobowiązania. Zarys wykładu*, Wolters Kluwer, Warszawa 2009, s. 212.

[24]   Ł. Łyczko, *Sztuczna inteligencja – kluczowe aspekty prawne*, https://www.pwc.pl/pl/artykuly/2018/sztuczna-inteligencja-kluczowe-aspekty-prawne.html, [accessed on: 23.03.2020].

[25]   M. Czenko, *Odpowiedzialność za szkodę spowodowaną ruchem pojazdu autonomicznego w systemie amerykańskiego prawa cywilnego* [w:] *Zeszyt Studencki Kół Naukowych Wydziału Prawa i Administracji UAM*, red. M. Jędrzejczak, Wydawnictwo Naukowe Uniwersytetu im. Adama Mickiewicza, Poznań 2017, s. 115.

[26]   W. Czekacz, *W USA trwają pionierskie prace nad przepisami dot. korzystania z autonomicznych samochodów*, https://itwiz.pl/usa-trwaja-pionierskie-prace-nad-przepisami-dot-korzystania-autonomicznych-samochodow/, [accessed on: 23.03.2020].

States, businesses, consumers and many others. One of the concepts is to include damages caused by AI systems within the legal regime of strict liability (aggravated liability), similarly to the British concept (blameless liability). This would eliminate the obligation for the injured party to demonstrate an adequate causal link in the occurrence of damage, and would clearly identify the liable party in the form of the owner or operator of the equipment in question or insurer assuming responsibility through a separate contract. However, an extended analysis should be made of the socio-economic impact and the optimality of the possible application of such a solution in the European system (e.g. slowing down technological development and market innovation, discouraging consumers). It seems unlikely that the EU would choose to accept such a liability structure.

By interpreting the official positions and communications and legal acts issued within the EU to date, it can be concluded that they aim at a different way of shaping the issue of responsibility than the one described above on the model of the British assumption. The civil liability for damage caused by an AI device is most likely to be attributed to the product manufacturer. Initially, this will be done by closing the gaps, strengthening, extending and regulating the existing legal framework, such as Directive 85/374/EEC on liability for defective products (OJ EU L 210/29), Directive 2001/95/EC on general product safety (OJ EU L 11/4), or Directive 2006/42/EC on machinery (OJ EU L 157/24). This thesis is confirmed in particular by the conclusions of the mentioned Communication on artificial intelligence for Europe[27] or the White Paper[28]. Under the Directive 85/374/EEC on liability for defective products, the manufacturer or importer is liable for damage regardless of negligence or guilt. However, due to its characteristics, artificial intelligence requires a review of views and adaptation to dynamic and thus changing technological development, especially in the subject of the injured party's proving the defectiveness of the product and demonstrating an adequate causal link, as well as in the matter of exonerational premises exempting the producer from liability.

In Polish civil law, liability for damage caused by a hazardous product is regulated in the provisions of art. 449^1-449^{11} of the Civil Code. These regulations are fully harmonized with the EU law. The prerequisites for producer's liability are defined as follows: the manufacture and placing a hazardous product on the market within the scope of the manufacturer's business activity, occurrence of damage and an adequate causal relationship between manufacture and introduction of the product on the market and the damage. The injured party is obliged to prove the fact of manufacturing a dangerous product, the damage and an adequate causal relationship between the product properties and the damage. The relationship between the manufacture and marketing of a dangerous product and the manufacturer's business activity a subject of legal presumption.

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27   *COM(2018) 237 final.*
28   *COM(2020) 65 final.*

Exonerating premises include: disclosure of dangerous properties of the product after it has been placed on the market; inability to predict dangerous properties of the product, taking into account the state of science and technology („state of the art") at the time of placing the product on the market (the so-called development risk)[29]; creation of dangerous properties of the product as a result of applying legal regulations. The example of the implementation of the existing EU legal framework into national laws, in this case the Polish Civil Code, further highlights the shortage of applicable standards and the need to create clear regulations in the field of artificial intelligence.

CONCLUSION

At the present stage of development, it is reasonable to strive for the most urgent and effective action to establish a single European Union regime of responsibility for the operation of artificial intelligence systems, based on the adaptation and extension of regulations, inter alia, in the area of responsibility for a dangerous product, placing this responsibility on the manufacturer. The applicable provisions must be updated in accordance with the needs resulting from the specificity of AI systems' functioning, i.e. the completely altered – so far not taken into account – model of ensuring safety, protection of fundamental values and individual rights of stakeholders and parties to legal transactions. Due to the complex, multi-entity and complex supply chain, the possible liability of the actors involved, e.g. the importer or the seller, may also be subject to further reflection in the future.

However, it seems rational to assign responsibility to the manufacturer, as it is him who has the greatest impact on the AI product and will potentially benefit most from its marketing. The present study is intended to showcase only some of the views on the multiplicity of changes occurring as a result of the fourth industrial revolution, which are not indifferent to the law. What is more, they pose a specific challenge to the law. Currently, within the framework of the European Commission preparatory, pre-legislative works, a solution consisting in updating and extending the already existing legal framework to include the issue of artificial intelligence is undergoing an in-depth assessment of its legitimacy, proportionality, adequacy and effectiveness. In these considerations, the attribution of liability for damage caused by AI systems to the manufacturer is considered as a necessary and optimal solution. However, technological developments and artificial intelligence in the future may underline the need for a separate liability regime for damages caused by AI, which may have to be postulated already now in a broader de lege ferenda perspective.

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[29]   W. Czachórski, *Zobowiązania. Zarys wykładu*, Wolters Kluwer, Warszawa 2009, p. 300.

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