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Artificial Intelligence, Digital Technologies and the Future of Law: Literature Review

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Abstract: Digital technologies and Artificial Intelligence (AI) are increasingly becoming integral to various aspects of our daily lives. While AI offers numerous benefits, such as simplifying everyday routines, education, and work processes, it also brings forth significant challenges and risks. These risks include concerns about data privacy, potential discrimination, misdiagnoses, incorrect treatments, and the dangers associated with autonomous vehicles. The inherent risks of AI are widely acknowledged in both scientific literature and the media. However, mere recognition is insufficient; it is essential that AI-related challenges are addressed through appropriate legal regulations. The theoretical and methodological grounds of the study of the AI, digital technologies, their transformation and possible impacts, as well as the features, future development and transformation of law have become the fundamental basis of current economic theory, as well as scientific and academic works of leading scientists and practitioners in the field concerning technological transformation of the society. To

accomplish the study, we used an integrative literature review of specific kind, namely a survey of currently existent European Union initiatives and its member state initiatives regarding the AI and digitalization. The findings indicate that the legal regulation of AI has only recently begun. The EU has begun by defining AI-related terminology and has developed a broad definition of AI to accommodate future advancements in the field. Recent EU initiatives have identified key risks associated with AI, including data privacy in interactions of humans with AI, the opacity of AI operations, discrimination, and the need for enhanced legislation to regulate human-AI interactions. The research reveals that most significant EU initiatives and national AI strategies have only emerged around the 2020s. Currently, the EU and its member states are more focused on advancing AI development and securing their positions in the global AI race than on establishing comprehensive legal regulations. The process of developing legislative frameworks is complex, particularly given the intricacies of the AI industry and the EU's organizational structure, requiring time and careful deliberation.

Keywords: computer technologies, machine learning algorithms, legal regulation, European Union legislation, member state AI initiatives.

Introduction

Digital technologies and Artificial Intelligence are increasingly permeating each and every aspect of our life: personal, professional, social, as well as political and military aspects. Interestingly enough, there is still no globally approved definition of the AI, as well as term “intelligence” has not received any standard definition. Summarizing a big amount of currently existent information, we can describe the AI as a number of discreet algorithms or their combinations that analyze data and statistical relations to complete a specific task that require reasoning, collecting of information, planning and organizing, learning, communicating, manipulating, identifying and generating (however, the latest is arguable). The AI is embedded in following: machine learning technologies aimed at analyzing big volumes of data, recognizing patterns, and making predictions; robotics aimed at designing, manufacturing, and operating programmable machines; and decision making algorithms and systems aimed at predicting human and machine behavior and making autonomous decisions (Cath, 2018, Hassani et al., 2020).

The driving force of the wide utilization of the AI systems lays in the increasing complexity of the modern world and our seeking to adapt to new personal, professional and global challenges that requires swifter, more efficient approaches, flexibility and out-of-box thinking. It is believed that the process of the decision making performed by humans is way not always rational and often results in far from optimal choices, and delegation this process to the automated systems is worth studying.

Similar to other technologies or tools, AI can be used to achieve positive outcomes, as well as malicious ones. While AI is clearly recognized to generate novel opportunities, it is also recognized to pose risks and challenges, for example in the areas of safety and trustworthiness, security, biased behavior and discrimination (Yigitcanlar, 2020).

There is a now widely recognized issue related to how the AI really works referred to as black box. This concern has been risen by the opaqueness and hiddenness of the very intrinsic mechanisms of the functioning of the AI learning algorithms. Without deep comprehension of how the AI systems reach their conclusion, it is totally unclear to what extent the society can trust these systems in making decisions and to what extent we can delegate performing our inherently human cognitive functions to the AI systems. Therefore, if the society will continue to deploy the AI along its current trajectory without any legal regulations, it may ultimately result in various detrimental impacts on society, economic situation and political well-being, including damaging competition, compromised privacy of the consumers and violated right of choice; excessively automating labor and fails to improve employee productivity, fueling inequality and aggravating discrimination, to name a few (Eschenbach, 2021, Acemoglu, 2021).

Research Problem

The development of AI in the first half of the 21st century laid foundation for the scientific and technological breakthroughs that, providing its paramount importance, can be easily compared to the most brilliant creations of mankind. The AI is the next step in global deployment of Internet and general digital technologies and makes possible automation of the processes previously performed by human beings, using machine algorithms that substantially mimic the cognitive abilities of human beings. Current use of modern achievements in the digitalization field revealed presence of the major issues that are outputs of the ways these technologies operate and their capabilities not fully known to society yet. Therefore it is difficult to outline the nature of the AI use, as well as intensity and prevalence of its applications; of the possibility of the high technological and legal development of the state to automatically exclude other, less developed countries from the application of the AI; of increasement of the risks of violations in various areas of law and social life; and, finally, the possibility of creation of the threats to the entire world and peaceful communication between countries.

Overall, a significant gap has arisen between the pace of the digital and AI technological advancements and enhancement and development of the relative laws and regulations. The more prosperous a country is, the more significant gap can be observed. Although, governments are attempting to adopt the existent laws and regulations to the novel realities, it is still vital to develop new legal approaches to regulate human-machine interaction on all the level to insure the prosperity and security of the society.

Research Focus

The AI is currently one of the most popular and desirable areas of research and exploration among scientists and practitioners, as the AI has become a driving force of the digital transformation of the economy, political climate, and life in general, and is turning into an integral and vital part of many organizations in public and private sectors, as well as everyday personal routine.

AI can be considered as so-called "disruptive" technologies that lay foundation of the Fourth Industrial Revolution, and their development can lead to technological breakthroughs for each and every country in plethora of the national industries. Technologies based on the AI have already become widely adopted in many industries, resulting in a significant increase in productivity, and simultaneously decrease in the number of repetitive, routine tasks, as well as creation of novel, previously not known, products, etc. Now it is widely recognized that digitalization and AI wide application create opportunities to improve the efficiency of functioning of the government institutions, specisically at the level of elaborating solutions dedicated to ensuring the society well-being.

Therefore, the focus of this paper is study the existent and developing legal database regarding human-machine interaction that aim at overcoming biases inherent to digital and AI technologies in the European Union.

Research Aim and Research Questions

The world has already taken another step towards fundamentally new technological, economic, political and social paradigm. At the same time, challenges created for modern industrial society by new technology implementation are difficult to overestimate. They inevitably will change the global socio-technological order, which will result in complete reformation of the systems we now take as granted, as well as formation of new social and economic paradigm. Thus, this research aim is to study European Union legislative database in order to highlight the approaches for legal regulation of human-machine interaction and overcoming of three major AI-inherent biases: issues of privacy (cyberprivacy) and surveillance, issues of biased decision making and discrimination, and the role of human judgment. In this paper, we study both regional initiatives and national, local regulations to draw the full picture of the state-of-the-art. Specifically, the present paper attempts to reveal whether there is a general understanding of the AI phenomenon by the EU authorities, whether a solid nomenclature regarding

the AI was developed by the EU authorities, what is the vision of the EU authorities of the EU future in the era of the AL, and finally, whether the describes AI-related issues and biases are recognized by the EU authorities and whether they offered any initiative to overcome these issues.

Literature Review

Human activity inevitably bears some portion of the unfairness and unethical behavior due to existence of stereotypes and biases in society. Therefore, a now common misconception has occurred that that AI-assisted machines and gadgets are able to perform humanly inherit tasks while bearing more objectiveness and lack of biases compared with human beings. That is why the issue of AI-related biases and risks is garnering increasing attention in the popular and scientific press. AI-related biases and risks are recognized in various applications ranging from face and voice recognition, and search engine, to autonomous vehicles and medical robots (Heinrichs, 2022).

Technical literature in the area of discrimination typically relates the issue of bias and issue of discrimination. However, despite being an important part of the discrimination phenomenon, bias does not necessarily result in discrimination. Generally, bias means a preference, inclination, or prejudice towards a particular object, subject, or area, and in AI-related sector biases can be divided into algorithmic processing biases introduced during the AI modeling step, training biases introduced during AI training steps, and usage biases introduced during the AI application for unintended purposes, for example. One must admit that the AI is inherently designed biased since in order to generate results for initial data beyond the training pattern the AI forms generalizing assumptions that are called “inductive biases” (Ferrer et al., 2021).

The most prominent examples of the AI-based technologies that already demonstrated biased patterns are partially autonomous vehicles, digital personal assistants and recommendation systems widely used in the retail and e-commerce, financial and healthcare services. Partially autonomous vehicles use AI-assisted computer vision and deep learning algorithms to make driving-related decisions in real time, e.g. automatic braking, acceleration and steering, with the ultimate goal to become fully autonomous. Digital personal assistants are represented by the most famous examples, such as Alexa, Google Home, and Siri, in which AI technologies assist in performing multiple routine tasks such as answering various questions, playing music and creating lists of recommendations, managing schedule, controlling house ecosystem, ordering products, and plethora of other tasks. The examples of the recommendation systems are Amazon and Netflix platforms. Concerning the financial and healthcare industries, they widely utilize robotic advisors such as Betterment to construct and manage financial portfolio, and robotic-based medical tools for conducting surgeries, collecting vitals and wellbeing measures, identifying risks in real time, disease managing, and ensuring medication adherence, to name a few.

Autonomous vehicle encompasses novel sensory technologies together with machine learning technologies aimed at mitigating numerous risks associated with human driving decisions. This combination creates a topographical representation of the road that enables making more immediate and accurate autonomous driving decisions eliminating issues associated with the human fatigue, challenged perception, intoxication, and problematic decisions. In 2017, Mercedes-Benz announced that by 2020 it plans to achieve full autonomousness that will allow the passenger to be driven without any human intervention. One may assume that if autonomous cars successfully operate, the rates of the car accidents can be drastically decreased, issues related to the heavy traffic jams can be successfully resolved, and overall logistics costs may be reduced. In majority cases it is correct. However, even partially autonomous vehicles are a great example of a potentially pervasive AI technology. There are known cases of the lethal accidents caused by inability of the AI-equipped cars to recognize representatives of specific population as pedestrians, e.g., disabled people in the wheelchairs. Therefore, there are a number of issues that require autonomous vehicle industry to be legally regulated: privacy, since machine learning algorithms are generally trained on big amount of data that

can be mined without the individual knowledge; and lack of transparency, since now companies are unwilling to disclose the exact algorithms they utilize; possibility to become a subject of the machine-made decision having an adverse effect on the individual (in hypothetical cases when machine have to choose between a pedestrian and a driver) (Cunneen et al., 2019, Wei, 2020).

Another major concern of the AI widespread utilization is discrimination issues that are globally recognized. To date, many revealed biases in AI systems are associated with race and gender, namely AI-generated biases generally harms women, people of color, and gender minorities. AI systems work based on the inputs on which they are trained; if a particular category of data is missing, e.g., images of people with dark skin, these data will not be recognized or included by the AI model. Turn one more time to autonomous vehicles: if the training data used to train a pedestrian recognition does not include images of people using scooters or wheelchairs, it is likely that future AI-driven autonomous vehicle will not recognize such people as pedestrians. Advocating to real life examples, the incidence of discrimination against female employees-to-be by AI recruitment tool forced Amazon to abandon its autonomous recruitment project. Similarly, significant biases against black defendants when making decision on releasing a subject from a jail before a trial were observed during utilization of commercial AI software called COMPAS, "Correctional Offender Management Profiling for Alternative Sanctions" (Ferrer et al., 2021, Whittaker et al., 2019, Nuseir, 2021, Watcher, et al., 2021).

Another challenge posed by the AI and digital technologies era is ensurance of personal privacy and cybersecurity that we already briefly metioned. The incidences of heavy data breaches are well known. Notorious cases involve social media platforms such as Instagram that at least twice allowed huge personal information leakage, software developers such as Adobe that compromised millions of its usernames and passwords, bank systems, e.g. hacking of the U.S. Federal Reserve bank, retail stores that failed to notice stealing of millions of bank cards numbers, to name a few. With increasing of the scale of consumer data collection through digital technologies in general, and using AI products particularly, continuing of social media growth, as well as cloud services, and the mobile environment, the risk for cybersecurity compromise and data breaches is also dramatically increasing, highlighting the need for novel cybersecurity measurements.

Particularly interesting challenge born by AI technologies is increasing use of the social media that can lead to addictions to social media and smart phones that ultimately resulting in a detrimental impact on the human autonomy and wellbeing. AI technologies are widely used in social media, e.g., Instagram and TikTok, to filter and arrange news feeds, messages, overall content, and targeted recommendations, with the main objective of maximizing time spent by consumers on the site or app. Further development of the AI algorithms aimed at only one goal to attract consumer attention, as much and longer as possible, at the same time creating compulsive or addictive behaviors. On top of that, social media, namely Instagram, Facebook, and TikTok fail to control hate speech and defensive comments, despite wide deployment of the AI that leads to bullying and discrimination in social media.

Additionally, one should not forget the potential of the AI to replace human labor, fundamentally change job landscape, and introduce digital technologies and AI systems as the new norm leading to loss of employee's values and convictions. According to different estimations, approximately 60% of job positions will have at least 30% of constituent working activities being replaced by automatics or AI-based automatics by 2030, and, by the mid-2030s, the share of job positions at high risk of automation will rise to approximately 30%. What is truly threatening is that not only purely manual job positions can be impacted, but the positions that historically required higher qualification and cognitive skills such as managing positions (Du & Xie, 2020, Mirbabaie et al., 2022, Leyer & Schneider, 2021).

Concerning intersection of personal and professional utilization of the AI technologies, it is worth describing the biases of the AI usage in medical field. In medicine, one of the directions of the AI utilization is application of machine learning techniques (clinical decision support systems) to solve complex problems and make predictions based on enormous quantities of patient`s data, e.g., providing

guidance on the safe medicine prescription, providing adherence to the treatment regimen, risk screening, prognosis scoring, providing diagnosis based on photographs and prediction of the disease development based on the electron images, etc. A decade of the AI medical utilization revealed AI-associated safety issues, diagnostic uncertainty issues, issues of missed diagnosis, inability to recognize relevant changes in context or data, inability to distinguish, transparency issues, issues regarding healthcare provider skills, etc. On top of that, discrimination issues have also arisen in the medical field: voice recognition failure when used to recognize higher-pitched, women, voices; the AI failure to make diagnosis for dark skin people, and of course issues with recruitment algorithms that downgrade female's resume. Therefore, there are questions about whether already existing laws and regulations are able to address concerns stemming from health-related AI, namely whether existent medical laws and regulations can adequately attend to errors caused by the AI and whether they can appropriately attribute liability in case of AI-related errors; how liability should be attributed between healthcare representatives, developers of the AI products, and actual manufacturers in case of errors related to the AI application; whether existent medical laws and regulations can adequately attend to discrimination of the historically marginalized groups; whether existent privacy regulations are sufficient to protect the patient's data in case of AI-related errors and breaches; and whether existent regulations regarding informed consent are sufficient to protect patients in case of the AI-involved treatments and therapies (Challen et al., 2019, Whittaker et al., 2019, Da Silva, 2022).

Finally, from the military perspective, the AI found its utilization in enhancement of the military operations in several areas, including reconnaissance, surveillance, and assassination missions, as well as cyber area for detection of derived viruses, network suspicious nodes, and system oddities. Many countries currently use partially autonomous, partially AI-assisted, weapons and try to switch to fully autonomous, or fully AI-assisted, weapon technologies (Horowitz et al., 2020). The AI technologies are incorporated into military vessels, generally for communication with other vehicles, navigation of a route, determination of a distance, and, particularly interesting, they are incorporated into lethal autonomous weapon systems that are systems capable of targeting and using potentially lethal force toward any object or subject without direct supervision from the humans and decision making. While lethal autonomous weapon systems possess huge advantages in terms of their ability to replace combatants and decrease the need for deployment of human resources in high-risk areas, they are still prone to occurrence of the integration errors, being hacked or fail unanticipatedly, particularly if the system works on machine learning algorithms. Thus, for now, the complexity of lethal autonomous weapon systems may pose huge obstacles for people to predict what these systems will do in every possible situation (Pedron & Cruz, 2020, David, 2020, Malle, 2019). These AI-born issues may result in unintended escalation in a military crisis or situation destabilization if lethal autonomous weapon systems target objects or subjects other than what the operator intended. Additionally, such systems may easily anonymously select human targets in the absence of supervision from the human being, that, taking into account already discussed AI-related discrimination issues, can lead to discriminative selection of specific human target based on age, sex, ethnicity, as well as facial features, or outfit, etc. What is concerning in terms of legal regulation of the AI for military purposes is extremely rapid development of fundamentally different AI-assisted military tools that currently fail to comply with international laws of war (Pedron & Cruz, 2020, Armitage, 2019).

We briefly described several issues with the AI-associated biases. Summarizing all the aforesaid, the AI poses three major types of ethical and legal concern for humankind: issues of privacy (cyberprivacy) and surveillance, issues of biased decision making and discrimination, and the role of human judgment and whether this role may be fully delegated to the AI. Therefore, we summarized the state-of-the-art of the AI utilization according to the degree of the risks (see Table 1).

What is the most dangerous is that the AI technologies confer on their inherent biases a kind of scientific credibility making AI-based predictions and judgments seem to possess a decent degree of objectivity to general public. In addition to that, legal concerns are risen from lack of transparency of AI

algorithm functioning and unwillingness of the manufacturer to publicly disclose these algorithms (Jia & Zhang, 2021, Steimers & Schneider, 2022, Turchin & Denkenberger).

Table 1

Risk-dependent classification of the AI application

Degree of risks	AI application
Unacceptable degree	AI systems that pose threats to the human life, right, and security, and are used in public transportation and critical infrastructure: lethal autonomous weapon systems, and autonomous vehicles
High degree	AI systems that are used in personal life, education and professional life: various selective algorithms used in recruitment and legal field, algorithms used in social media to influence the right of choice and promote the addictive behavior
Minimal degree	AI systems that do not pose threats to the human life, right, and security, but otherwise make life simpler: chatbots, , computer spam filters, etc.

Given AI power and expected pervasiveness, some experts argue that the AI application should be tightly legally regulated. However, how that should be done and who should make the rules is still a subject of the hottest debates. Moreover, government regulators, who will develop legal regulation of the AI usage, need a deep and comprehensive technical understanding of the artificial intelligence and the principles of its functioning.

Materials and Methods

The theoretical and methodological grounds of the study of the AI, digital technologies, their transformation and possible impacts, as well as the features, future development and transformation of law have become the fundamental basis of current economic theory, as well as scientific and academic works of leading scientists and practitioners in the field concerning technological transformation of the society. To accomplish the study, we used an integrative literature review of specific kind, namely a survey of currently existent European Union initiatives and its member state initiatives regarding the AI and digitalization, in order to understand the today situation in the European Union on understanding the phenomenon of the digitalization and AI, and challenges posed by these advancements on society, economics, and politics, as well as to identify any existing gaps between the already globally acknowledge challenges and their comprehension by the EU authorities.

General Background

We undertook an integrative literature review of the current state of legal regulation of the digital technology and AI application in the European Union guided by general principles of PRISMA 2020 Statemen for Systematic Reviews and Meta-Analyses.

Instrument and Procedures

To select and study currently existent EU initiatives and initiatives of its member states, we explored the official web-site of the EU: https://european-union.europa.eu/index_en?prefLang=uk, that publishes all the EU initiatives and regulation regarding digitalization and AI on the regional level, and specifically dedicated official web-site of the European Commission: <https://ai-watch.ec.europa.eu/>, that publishes the information on the initiatives and regulations regarding digitalization and AI on the national level. To select the EU initiatives and regulations we systematically explored the chronological list and extracted those documents that mentioned the following key words: digital technologies, digitalization, digital Europe, and Artificial Intelligence.

A reviewer undertook the primary selection process, with legal documents screened via titles. To receive the broadest possible understanding of the current situation, the documents were included if they covered any of the following: digital technologies, digitalization, digital Europe, and Artificial Intelligence.

Next, a reviewer undertook the secondary selection process among the already selected documents, with legal documents being full-text screened. The documents were included if they covered any of the following: definition or nomenclature of the digitalization and AI, recognition of the digitalization and AI challenges, regulation of the specific digitalization and AI applications.

Data Analysis

In this literature review, we adopted the manual qualitative data analysis mainly based on interpretation and understanding the qualitative data we extracted from the selected EU initiatives and regulations. To enhance the results of the manual qualitative data analysis, we also used synthesis, deduction and induction, historical-logical analysis, institutional analysis, and structural-functional analysis.

Before conducting the manual qualitative data analysis we review the extracted data three times and organized them according to the region: the European Union, Austria, Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

Next, to secure the possibility of the interpretation, we created a set of the evaluation questions that were following:

- 1) what AI definition the document contains;
- 2) what digitalization or AI-related risks and issues the document contains;
- 3) what solutions to the digitalization or AI-related risks and issues the document contains. The answers to the evaluation questions were appropriately coded and used for the further data interpretation.

Results

Selected EU initiatives are summarized in Table 2, and selected national initiatives are provided in Table 3.

Table 2

European Union initiatives regarding regulation of the artificial intelligence

Year of issue	Title of the document	Issuing authority
2014	Act on Services for Electronic Communications	European Commission
2015	Digital Single Market strategy	European Commission
2016	The EU general data protection regulation	European Commission
2016	New Skills Agenda for Europe	European Commission
2016	Recommendation for Member States on "Upskilling Pathways: New Opportunities for Adults"	European Commission
2017	Report with recommendations to the Commission on Civil Law Rules on Robotics	European Commission

2018	Communication from the commission: Artificial Intelligence for Europe	European Commission
2018	Coordinated plan on AI	European Commission
2019	EU guidelines on ethics in artificial intelligence: Context and implementation	European Commission
2019	Ethics Guidelines for Trustworthy Artificial Intelligence	European Commission
2019	Communication: Building trust in human-centric artificial intelligence	European Commission
2020	Digital Education Action Plan	European Commission
2020	Coordinated Plan	European Commission
2020	European strategy for data	European Commission
2020	Report on security and liability issues in emerging technologies	European Commission
2020	White Paper on Artificial Intelligence - A European approach to excellence and trust	European Commission
2021	Digital Europe Programme for the period 2021-2027	European Commission
2021	Communication on Fostering a European approach to AI	European Commission
Waiting for approval	ePrivacy Regulation and the Cybersecurity Act	European Commission

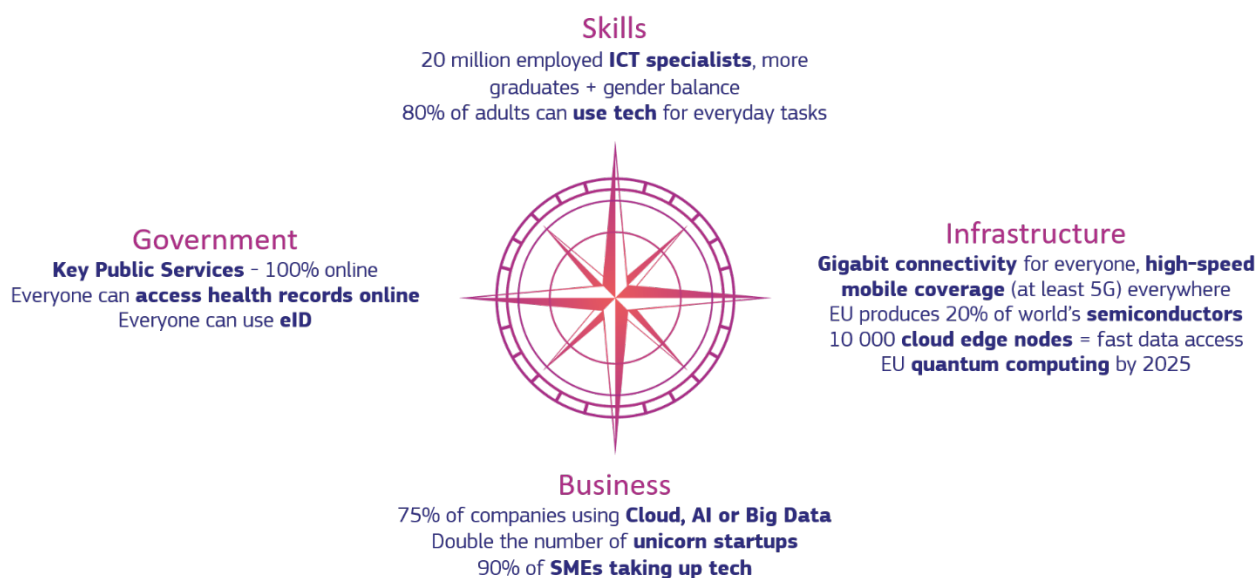
Source: Author's development.

The data from Table 1 show that recognition of the digitalization challenges in the EU started in early 2010s, and as early as in 2014 first initiative was approved. From that time onward, the EU, in their initiatives dated on 2015-2017, started understanding the need to adapt to new digitalization reality and upskill the citizens to adapt to new working and business environment. The first initiative that clearly attempted to deal with AI phenomenon was approved in 2018. As less as one year later, the EU published the initiative on ethics and trustworthy regarding the AI. From that time onward, the EU started understanding the digitalization and AI challenges and the need to adapt to them.

Fig. 1 provides the best summary of the ambitions of the EU regarding full digitalization according to the Digital Decade policy programme that set four objectives to secure a fully digitally skilled European population and train highly skilled digital professionals, develop trustworthy and sustainable digital infrastructures, provide transformation of the business and transformation of the public services from the digital perspective.

Figure 1

A Scheme of the ambitions of the EU regarding full digitalization



Source: European Commission (n.d.).

Table 3

National initiatives regarding regulation of the artificial intelligence

Year of issue	Title of the document	Country
2018	National AI strategy: AI for humanity	France
2018	AI policy report	France
2018	National AI strategy	Germany
2019	Ethical guidelines and specific recommendations	Germany
2020	Report with specific recommendations for action	Germany
2020	Updated AI strategy	Germany
2019	RDI strategy in artificial intelligence	Spain
2020	National AI strategy	Spain
2020	Spanish digital agenda 2025	Spain
2020	Recovery, transformation and resilience plan	Spain
2021	National digital competence plan	Spain
2019	National strategy: AI Portugal 2030	Portugal
2020	2020 Strategy for technological innovation and digitalisation	Italy
2021	National AI strategy	Italy
2018	Shaping the future of Austria with robotics and artificial intelligence	Austria

2019	Artificial intelligence mission Austria 2030	Austria
2016	Digital education strategy	Hungary
2020	National AI strategy	Hungary
2020	Policy for the development of artificial intelligence in Poland from 2020	Poland
2017	National strategy on open access to research information	Czech Republic
2019	Innovation strategy 2019–2030	Czech Republic
2019	National AI strategy	Czech Republic
2021	Digital Czech Republic	Czech Republic
2016	Digital strategy 2016-2020	Denmark
2018	Strategy for Denmark’s digital growth	Denmark
2019	National AI strategy	Denmark
2019	Strategic action plan for artificial intelligence	Netherlands
2021	National AI strategy	Belgium
2017	National AI strategy: Finland’s age of artificial intelligence	Finland
2018	Work in the age of artificial intelligence	Finland
2017	Artificial Intelligence Programme	Finland
2020	Artificial Intelligence 4.0 Programme	Finland
2018	National AI strategy: National approach for artificial intelligence	Sweden
2020	National AI strategy	Norway
2019	Estonia’s national AI strategy	Estonia
2020	National AI strategy: Developing artificial intelligence solutions	Latvia
2019	Lithuanian artificial intelligence strategy: a vision for the future	Lithuania
2019	Action plan for the digital transformation of Slovakia for 2019–2022	Slovakia
2019	Strategy of the digital transformation of Slovakia 2030	Slovakia
2020	National AI strategy: Concept for the development of artificial intelligence in Bulgaria until 2030	Bulgaria

Source: Author’s development.

The data from Table 3 show that the earliest birds in the adoption of the AI initiatives in the European Union were Finland, Sweden, France, and Germany (2017-2018). In 2019, the national strategies were adopted in Czech Republic, Denmark, Estonia, and Lithuania. In 2020, these countries were joined by Spain, Hungary, Norway, and Latvia. In 2021, the national strategies were approved in Italy and Belgium.

Greece, Croatia, Romania, and Ireland are currently working on their national AI strategies. Slovakia included AI policies into its broader digitalization strategy (2019). Slovenia prepared a draft of the AI National strategy as early as in 2020, however, still has not adopted it. Switzerland does not intend to release any AI national strategies.

Fig. 2 provides an illustrative representation of the chronology of the AI strategy adoption.

Figure 2

An illustrative representation of the chronology of the AI strategy adoption across the EU



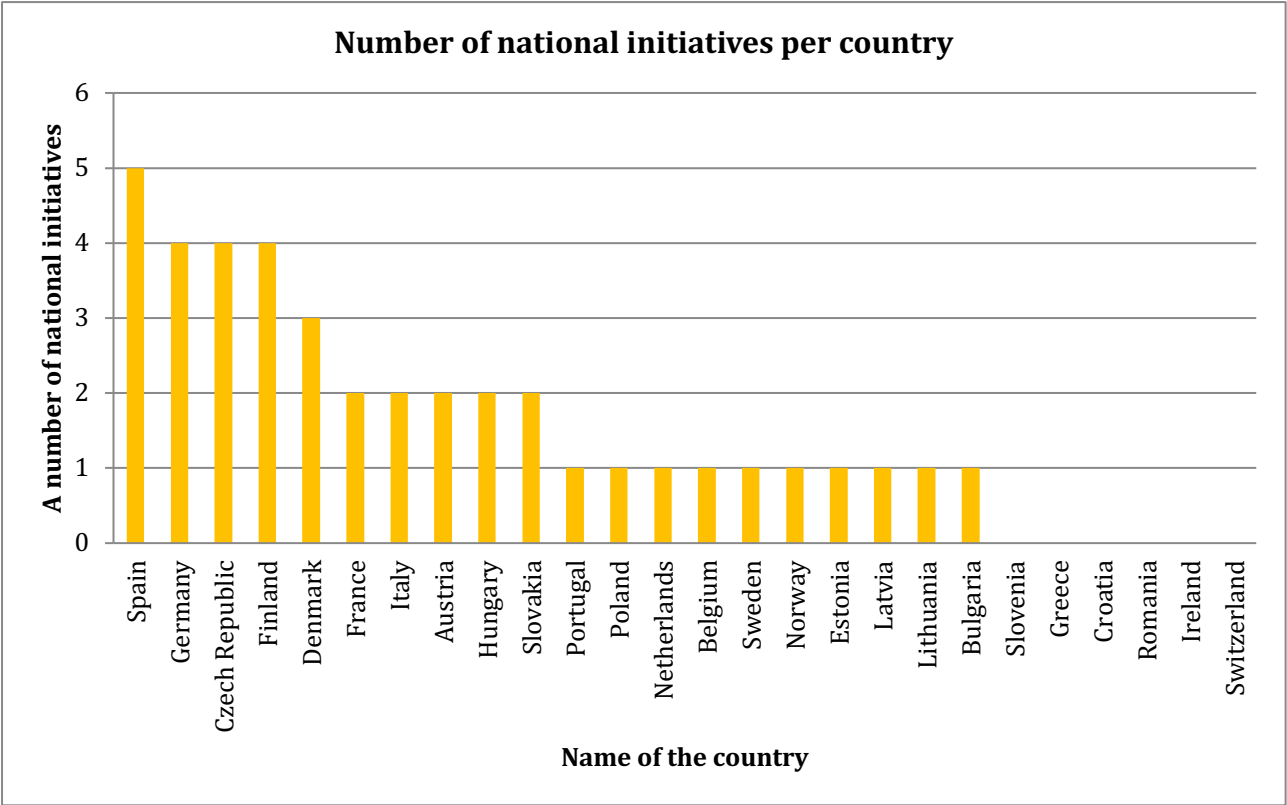
Source: Author’s development

Fig. 2 shows that west continental European countries almost simultaneously adopted the national AI strategies in the period of 2018-2020. Baltic countries show the same pattern, with Finland being an exception. Overall, we can surely admit that the wave in the adoption of the national AI-related strategies rolled across the European Union around the same time.

Fig. 3 and 4 show the number of the digitalization and AI-related documents, that were accessible in English, allocated to each country and year of approve.

Figure 3

Comparative representation of the most and least active countries in terms of the number of the digitalization and AI related national initiatives

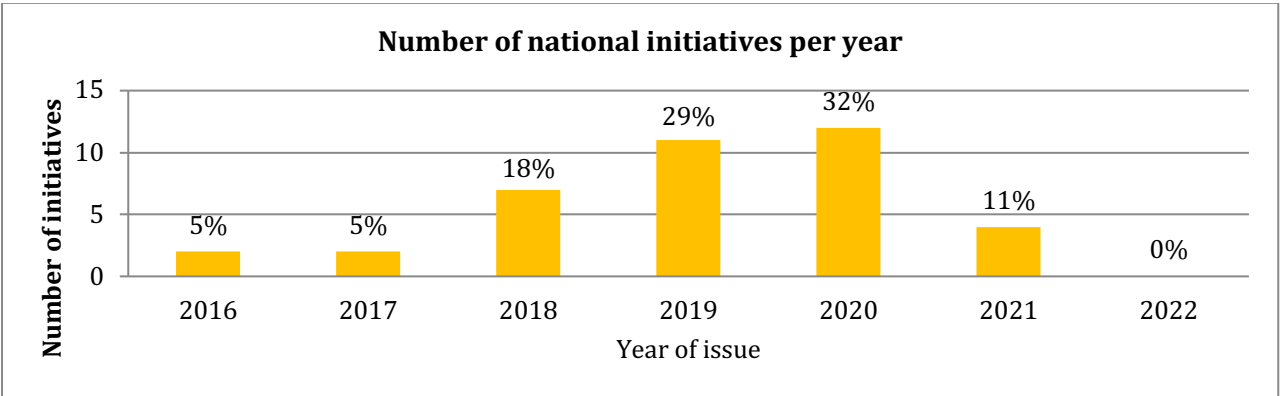


Source: Author’s development

Unsurprisingly, the most active country turns to be Spain, Germany, and Finland. A little unexpectedly, they are accompanied by Czech Republic. France, Italy, and Austria created only two initiatives per country.

Figure 4

Comparative representation of the number of the national initiatives issued by the EU countries per year



Source: Author’s development

The most fruitful period in the digitalization and AI regulation was 2018-2020.

Overall, the results show that attempts toward regulation of the AI application and comprehensive digitalization have already been made both on the regional level and national levels. The largest degree of advancement has been achieved in the period of 2019-2020, wherein the initiatives on the regional level started appearing in the early 2010s, and initiatives on the national levels started

appearing more to the end of 2010s. Although there are still several countries that are developing their AI regulations, the majority have already adapted at least one national strategy per country.

It is worth noting that the gap between adaptation on the regional level and national levels was small: from only a couple of years to no more than ten years. It is also worth noting that a small number of countries simultaneously adapted plans and initiatives regarding social risks related to digitalization and wide implementation of the AI. The example of the EU shows that digitalization and wide application of the AI technology come side-by-side, which is apparent taking into account their strong dependence on each other and advancements in computer technologies in general, and that the EU authorities recognize and acknowledge the demand for the legal regulation of the AI implementation.

Discussion

Study of the issued initiatives clearly shows that the legal regulation of the application of AI is still in its infancy, because, in 2020, a number of critical legal questions are still unresolved. However, one should admit, that the analysis of the initiatives shows the complexity of the issue and awareness of the European Commission of this complexity (Hacker, 2020).

In this context, it is fascinating to explore a little deeper the ambitions of the European Union in the field of the AI. Thus, a couple of initiatives provide information of the amount of investments in public and private research of the AI: in 2017, the investments were estimated to be around EUR 4-5 billion, and were planned to increase to EUR 20 billion by 2021. In 2020s, the EU was planning to attract EUR 20 billion each year of the decade. The major concerns of the EU in its “Communication from the commission: Artificial Intelligence for Europe” are risks of losing the opportunities provided by AI, losing of highly intellectual personnel, and becoming a consumer of AI products created elsewhere outside the European Union.

Another concern of the EU stated in the “White Paper on Artificial Intelligence - A European approach to excellence and trust” published on 2020 is competing with the leading institutes globally by ways of creating stronger synergy and overall network between research centers working on AI in different European countries and aligning their efforts to develop the best AI technology with a main research center that would coordinate the work, become a global example of superiority in AI technologies, and engage investments and top talents in the AI field (Smuha, 2019).

To accomplish its goals, the EU started with precise definition of the AI that was further enhanced by the Expert Group. A critically important task for the future legislation on the AI is to define the scope of the AI application. Thus, the working hypothesis of the European Commission is that the legislation should apply to products and services based on the AI. Moreover, the European Commission aims at refining the very definition of the AI to provided flexibility for the later inclusion of any future development without reconsideration of the legislation.

In April 2019, the European Union published “EU guidelines on ethics in artificial intelligence: Context and implementation” and Ursula von der Leyen, the President-elect of the European Union, announced that the European Commission would put forward further legislative proposals and initiatives for a coordinated pan-European approach in order to face the human and ethical issues stemming from AI application. Thus, the cornerstone principle of the European Union guidelines is developing a “human-centric” regulation of the AI sector meaning guaranteeing that the human values should be considered central during development, use and monitor of the AI (Madiega, 2019).

The “White Paper on Artificial Intelligence - A European approach to excellence and trust”, 2020, as well as almost all EU initiatives, at least acknowledges the paramount importance of the AI and the risks imposed by the AI to human fundamental rights such as right for privacy, protection of the private data, and right for non-discrimination.

Key ethical AI-related issues covered by the EU initiatives include the issues of human agency and supervision, technical trustworthiness and safety, privacy and protection of the data, transparency, non-

discrimination and fairness, as well as wellbeing from the societal and environmental perspective. Regarding human agency and supervision, the EU initiatives contain an interesting statement that a machine should not hold the full control, meaning there should always be supervision from the human side, and humans should always have the possibility to cancel a decision made by an AI-driven system. This poses the obligation to the manufacturer of the AI to always provide technical means to ensure human oversight. However, in the final edition of the EU initiatives statements regarding no future implementation of the AI for building autonomous lethal weapons were deleted.

Regarding AI-related issues, a couple on the initiatives contain interesting statements that public policy should encourage the wider accessibility to the private data, while guaranteeing the proper legislation on the protection of the private data, for AI training purposes. The EU is planning to establish a new support center for data to be shared that would provide legal and technical support to the public authorities and companies that attempting to access data from public sector and companies (Viljanen & Parviainen, 2021, European Commission, 2018, Atkinson, 2020, Hacker, 2020). In addition, the “White Paper on Artificial Intelligence - A European approach to excellence and trust” acknowledges the necessity of creation of experimentation sites to support the development and subsequent application of the novel AI technologies “possibly including a new legal instrument”. However, any interpretations of what this instrument could be are absent (European Commission, 2020). In the same initiative European commission acknowledges that access to data is paramountly important factor of the AI development. Therefore, the EU aims at promotion of the practices guaranteeing responsible data management and compliance of the data management with the fair principles. More close analysis of this and other initiatives reveals that the EU aims at securing its top place in the AI race, planning to establish dedicated center for the AI development and test, and ensuring that this centers have enough data to train future algorithms. However, the source of this data is vaguely described (Ruppert, et al., 2021).

Regarding discrimination issues, the EU adopted a number of legislations such as Directive regarding race equality, Directive regarding equality in employment and occupation, Directives regarding equality of treatment of men and women in terms of employment and access to goods and services, consumer protection rules, General Data Protection Regulation, Data Protection Law, and Enforcement Directive. However, all of them were adopted before the AI-related issues have become widely recognized, and do not cover specific relations between the AI and human beings. The same is acknowledge by the very EU authorities: while the legislation is fully applicable in AI-absent reality, there is a demand of the reconsideration and assessment of the current legislation in terms of its suitability for being enforced adequately to mitigate the risks and biases that AI created, or the need for adjustments or completely new legislation.

Concerning the aforesaid, the European Commission came to the conclusion that there is a significant probability that the existing legislation demands to be enhanced. Particularly, the European Commission recognizes the issues of the lack of transparency on how the algorithms work, therefore, it can be challenging to identify and confirm AI-related breaches of laws, attribute liability to the truly guilty party, and satisfy the claims for compensation. Another legal dispute concerns the issue whether the AI software is a part of final product and must fall under EU product safety legislation, whether the updates of the machine learning software can poses safety risks during the product lifecycle, whether the product safety can be compromised if AI software is downloaded after the product purchase. And, the main, the most complex, question to answer is who must bear legal responsibility and liability for the damages caused by AI.

A couple of the most recent EU initiatives state that economic actors, for now, bear full responsibility for the conformity of AI to current legislation that protects consumers. Another statement poses to the producers an obligation to secure the reliability of the systems and software (cybersecurity) in the process of designing and building, before launching, the corresponding systems and software. Additionally, there are recommendations for producers to provide technical means for human control

and abortion in case the system is compromised. Regarding the other AI-related issues EU initiatives states that AI manufacturers must document the sets of data and processes involved in building AI systems and guarantee their traceability in order to ensure transparency, ensure that the AI is not biased, and provide external independent audits for the AI that can affect fundamental rights (Castillo, 2021).

Regarding national initiatives, almost all EU countries adopted national AI strategies, except Switzerland that does not intend to release a national AI strategy. Ireland, Greece, Croatia, Romania are still working on their AI strategies. All the published national strategies were approved around 2020s with the earliest being published in 2017 in Finland and the latest being published in 2021 in Italy. Basically, the national AI strategies were adopted just yesterday.

The main focus of the national AI strategies is development of the national AI sector by means of enhancing education on primary, secondary and tertiary levels, not only regarding AI, but also regarding reinforcement of mathematical, logical aspects of the education, as well as critical thinking. Another objective is raising the general awareness and understanding of the AI technologies among general public and scientists. To ensure nation place in the competitive global market almost all the EU countries are planning to create special training centers and funding organization to promote the research and study of the AI technologies, as well as research of their application. Basically, the current national strategies are heavily focused on securing the place of the country in the global AI race and create means for securing this place.

Regarding the biases and AI-originated risks, mainly only issues of data privacy is recognized and acknowledged. Among all the EU countries, Germany approved “Ethical guidelines and specific recommendations”, and Finland published a report “Work in the age of artificial intelligence”. Thus, EU countries have just entered the long and complex path to understand and regulation of the AI technologies.

Research limitations

In this paper, we studied first attempts to legally regulate the AI application in the EU and its member states. Thus, the main limitation of the current research is its regional nature. Since the AI and phenomenon of the digitalization is now globally used and swiftly increasing field of technology, it would be insightful to explore the global approach to the legal regulation in the field of the AI, as well as national approaches of the countries with somehow different understanding of the AI and digitalization, for example, of the countries with strong officialdom.

Another limitation of this research bears linguistic nature. Although English is one of the official languages of the European Union, French and German are as well. Thus, the EU documents on French and German fall out of the scope of this research, and we were not able to analyze them. In addition, despite being the EU members, many EU countries have their own official languages, and a set of legal documents published on these languages. Thus, we were not able to analyze these documents, and in order to maintain the preciseness and clearness of the data interpretation in this work, the documents on the national languages other than English were not included.

Conclusions and Implications

The issued EU initiatives immediately got criticized for lack of clarity, short-sighting, vagueness, lack of long-term risk consideration, and lack of regulatory supervision to support implementation of the guidelines. However, the practical implementation, as well as legal regulation, of the AI can still be considered being in its infancy. The EU and member countries did a great job on the way to develop AI nomenclature, detect and acknowledge almost all biases and risks associated with AI applications, highlight the necessity to reconsider and enhance current legislation to include the interaction between human beings and AI, and develop AI strategies.

However, one should keep in mind the AI industry is inherently extremely complex, poses numerous challenges to understanding the AI complexity and regulating industry functioning, as well as challenges posed to cooperation inside the EU in order to create national and regional legislation.

Providing that the national and regional AI strategies started being adopted only in the last 5 years, the industry and authorities need more time to reach a legally working AI ecosystem.

Suggestions for Future Research

As we mentioned earlier, the AI industry bears a high degree of complexity that create a need to elaborate AI-related nomenclature and the ways it can be further developed to ensure comprehensiveness. We have already detected the EU adopted an inclusive approach toward digitalization and AI definition. Therefore, it is worth studying approaches of other key political players such as the USA, the UK, and China.

Another interesting research point is ambitions of the EU and its plans to establish AI development and train centers. In this context, further research is needed in terms of sources of the data that will be used in such AI development and train centers. Worth studying are member state initiatives and legal regulations that can reveal the country strategies and plans regarding the data security of the citizens.

Additionally, it is worth analyzing the practices of other countries in AI legal regulation such as the USA, the UK, China, and Australia, as well as Asian region as a whole, and explore whether they are focused much more on the AI development or legal regulation.

Finally, it is worth researching the global approach to development of lethal autonomous weapon systems and autonomous vehicles, as well as legal regulation of their development and application. Although autonomous vehicles are publicly recognized as generally safe, the biases in the AI training still pose major threats. Taking into account global enthusiasm in development of the fully automated vehicles, the situation regarding legal regulation needs to be extremely carefully explored.

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Conflict of Interest

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