EU GLOBAL LEADERSHIP IN TRUSTWORTHY AI: HIGH RISK APPLICATIONS – IMPLEMENTATION AND GABS

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Abstract: *The paper is devoted to the European Union regulatory framework on Artificial Intelligence related to SME and the EU global position in this aspect. The objective is to follow up the readiness of the EU to have a global leadership in trustworthy AI. The thesis of the study is that the EU is not ready to have a global leadership in trustworthy AI**.** For the purposes of the analysis firstly the position of the EU globally is observed within the global trends in Artificial intelligence. Secondly, content analysis and cross-check of current the EU regulatory framework and legislation is performed in order to investigate the main raised issues and their stage of completion. It was found that the main unsolved and unregulated issues are related to adaptation of current legislation of national AI strategies and new and adapted liability rules to be established. As of the national AI strategies a total of 19 Member States, including Norway have adopted national AI strategies. Some Member States (e.g. Finland, Cyprus and Germany), have already updated and reviewed their initial strategies. Forthcoming national action have to be taken by Austria, Belgium, Croatia, Greece, Ireland, Italy, Romania, and Slovenia. As of the new and adapted liability rules, it is postponed to the end of 2022 the EU to measure adapting the liability framework to the challenges of new technologies, including AI. As per global trends, the inconsistency of the EU members will prolong the process of implementation the legislation and achieving the main EU goal to have a global leadership in trustworthy AI.*

Keyword*: artificial intelligence, European union, regulations, symbolic approach, statistical approach, machine learning*
JEL: C51, C52, C53, C65, C67, L21, L22, L25

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Introduction

Artificial intelligence (AI) as a topic and term has been raised by John McCarthy, an American computer and cognitive scientist in 1956. Since then it has been wildly discussed and transformed. The understanding of AI and its application are changing and have an increasing role on the global economy but also in daily life. Although its application has been applied by a number of countries globally and as it seems it is going to be the next generation competition worldwide, the term still is a mystery for the society. Artificial intelligence brings concerns manly related to the risk and uncertainty it generates.

Within the paper successively are presented the regulatory goals and recommendations, conceptual view of artificial intelligence, and global trends on its application.

Following the trends European Union is proposing a full set of regulations boosting Artificial intelligence application at higher risk level, applying risk based approach and challenging SME sector to target so called "high-risk" applications. End of 2024 is the earliest time the regulation could become applicable to operators. It is expected the standards to be ready and the first conformity assessments may be carried out.

The thesis of the study is that the *EU is not ready to have a global leadership in trustworthy AI*. For this reason the study main objectives are, first, to follow up main trends related to AI globally and the EU place among them. Second, the readiness of the EU regulatory framework and legislation and its application in order to provide EU global leadership in trustworthy AI.

1. Conceptual overview of the AI and trends

1.1. Definitions on AI

For the first time the label "artificial intelligence" is used in 1956 by John McCarthy (a computer scientist). He defines it as "the science and engineering of making intelligent machines"[2] Next popular description on the term is given by Merriam Webster dictionary, namely: "A branch of computer science dealing with the simulation of intelligent behavior in computers, and the capability of a machine to imitate intelligent human behavior"[3]. European parliamentary research service interprets AI as: "Artificial intelligence is a te*rm used to describe machines performing human-like cognitive processes such as learning, understanding, reasoning and interacting"*[4].

The Proposal for a Regulation of the European parliament on artificial intelligence (artificial intelligence act)[5] and amending certain union legislative acts[6], chooses the term to be describe as follows: *"Artificial Intelligence (AI) is a fast evolving family of technologies that can bring*

[2] https://www.sciencedaily.com/terms/artificial_intelligence.htm

[3] https://www.merriam-webster.com/dictionary/artificial%20intelligence

[4]https://publications.jrc.ec.europa.eu/repository/bitstream/JRC118163/jrc118163_ai_watch._defining_artificial_intelligence_1.pdf

[5] European Commission, Proposal for a Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (data.consilium.europa.eu) brussels, 21.4.2021.

[6] European Commission, Proposal for a Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, brussels, 21.4.2021.

a wide array of economic and societal benefits across the entire spectrum of industries and social activities".[7]

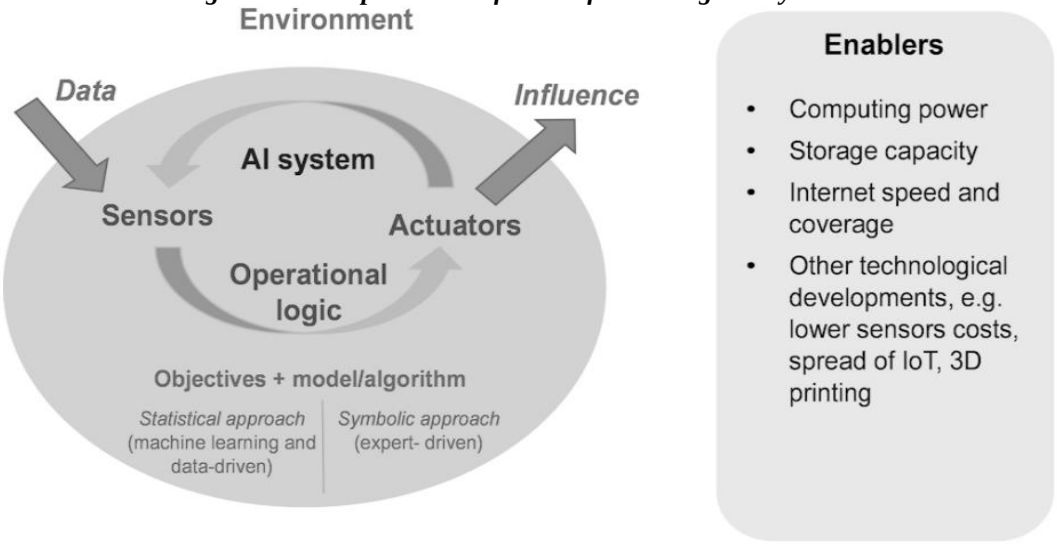
As it seen in brief, the understanding of AI is evolved from *intelligent machines* through *machines performing human-like cognitive processes,* reaching its current interpretation *fast evolving family of technologies.*

1.2. Conceptual view of an AI system

Currently an AI system can be explained by **three main pillars** (see Figure 1):

- First pillar – Data – the stage the date management is performed.
- Second pillar – Environment – the stage the algorithms and the model are developed.

Figure 1: Conceptual view of an Artifical inteligence system



Source: Based on OECD (2019[11]), Artificial Intelligence in Society, OECD Publishing, Paris, https://doi.org/10.1787/eedfee77-en

Within the *Environment stage* two approaches can be used:

- symbolic approach – driven by experts;
- statistical approach – data driven and machine learning approach.

- Third pillar – Influence – the stage the model is applied on the chosen system.

Required enablers are computer power, storage capacity, internet speed and coverage and some other technological development e.g. lower sensors costs[8], 3D printing, ect.

1.3. Global trends on AI application

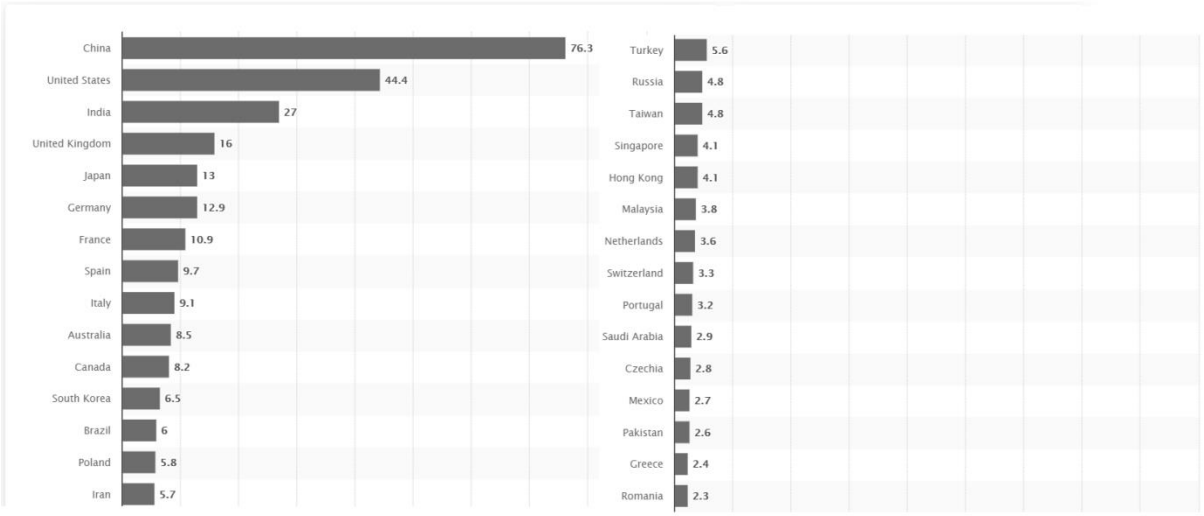
Within the study three main global trends are presented on AI application, representing the most important aspects, namely the AI "frontrunners" trends in publications, businesses performing

[7] European Commission, Proposal for a Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (data.consilium.europa.eu) brussels, 21.4.2021.

[8] https://www.unapcict.org/sites/default/files/2021-10/135.%20OECD%20-%20The%20Digital%20Transformation%20of%20SMEs.pdf

big data analysis, and artificial intelligence hiring index scores worldwide. These global trends are chosen to provide information and to compare EU globally in AI competition.

Figure 2: Number of AI publication worldwide from 2016 to 2020, by country (in 1,000s)



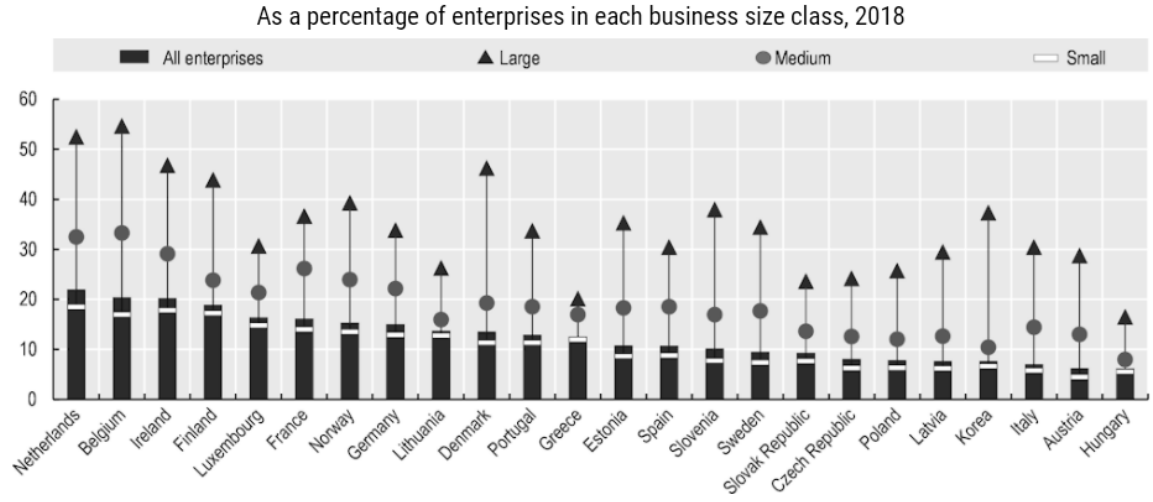
Source: Statista

First trend (see Figure 2) represents the number of AI publications worldwide prom 2016 to 2020, by country in thousand. As it can be seen the main "frontrunner" is China producing 76 300 publications for the observed period. Second approaching country is United States producing almost half of the China publications - 44 4000, follow by India with 27 000 publications. From the EU prospective the main "frontrunner" are Germany, France, Spain and Italy issuing 9 to 10 000 publications for the period. Or it is the EU core which processes publication on AI. Rests of the EU countries are briefly presented on the figure.

The stated trend illustrates the competition the EU is entering by **targeting global leadership in trustworthy AI.** Only the core of the EU have to increase at least 7 time its publications but also the periphery have to do **big effort in terms of investment in all necessary resources like human, capital, information, ect**. to start producing publications close to the "frontrunners".

The second trend (see figure 2) represents the businesses in the EU having performed big data analysis. Big data analyzes are the first pillar of an AI system and its managing is required for AI implementation. As it is seen, business population in most of the countries prove low level of data analytics adoption. Nevertheless countries as Netherlands, Belgium and Ireland have taken the lead. In these countries more than 20% of the companies are executing big data analysis in 2018. A last position in the trend belongs to Italy, Austria and Hungary. They are engaged with 6-7 % only.

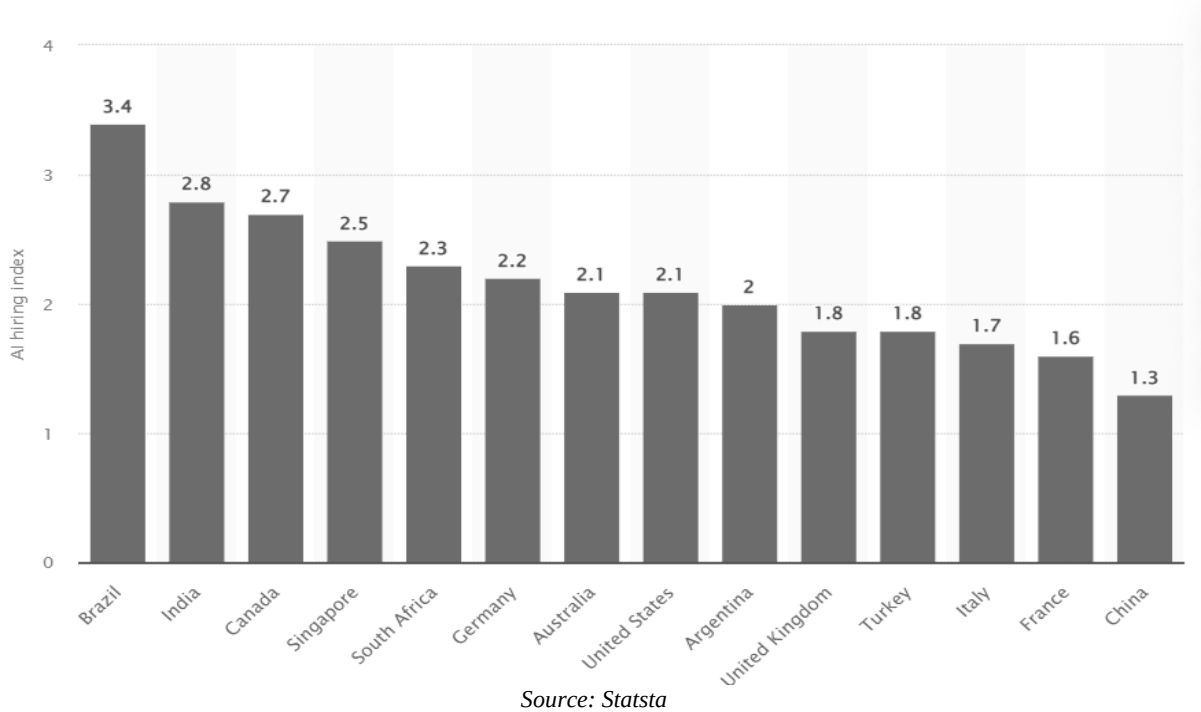
Figure 2. Businesses having performed big data analysis (2018)



Source: OECD (2020[71]), OECD Database on ICT Access and Usage by Businesses, http://stats.oecd.org/Index.aspx?DataSetCode=ICT_BUS (accessed on (www.unapcict.org) 19 September 2020)

The third observed trend is dedicated to the job posting data by country for the period 2013 – 2020.

Figure 3. Artificial intelligence (AI) hiring index[9] scores worldwide from 2016 to 2020, by country



Source: Statsta

[9] The source indicates that the AI hiring index is "calculated as the number of LinkedIn members who include AI skills on their profile or work in AI-related occupations and who added a new employer in the same month their new job began, divided by the total number of LinkedIn members in the country.LinkedIn makes month-to-month comparisons to account for any potential lags in members updating their profiles. The index for a year is the average index over all months within that year."

The hiring index represents Brazil as a "frontrunner" having 3,4 points to the observed period 2013 – 2020 followed by India and Canada. EU presenters for this index are only Italy and France holding last positions on the figure. **The information shows lag of AI skills among EU members and citizens which is mandatory for the goal EU has set: global leadership in trustworthy AI.**

Based on the tends information and the EU place we may conclude the EU briefly presented on the global scene in regard to AI. It is a difficult competition the EU is entering trying to catch up the leader in this industry. The biggest challenge for EU is inconsistency of the EU members.

2. Regulatory framework proposal on artificial intelligence

2.1 Theoretical framework of the EU regulatory proposal on AI and the 2021 Coordination plan

The EU Commission is proposing the first-ever legal framework on AI, which aims at providing AI developers, deployers and users with clear requirements and obligations regarding specific uses of AI. It also seeks to reduce administrative and financial burdens for business, targeting small and medium-sized enterprises (SMEs).

The proposal is part of a wider AI package including the Coordinated Plan on AI reviewed in 2021. AI package tends to have *three main goals*:

- to guarantee the safety and fundamental rights of people and businesses related to AI;
- to strengthen uptake, investment and innovation in AI across the EU;
- **to provide Europe leading role globally in AI[10].**

In order to accelerate opportunities of AI technologies, reviewed 2021 Coordinated Plan puts forward **four key sets of proposals** for the European Union and the Member States[11]:

a) **set conditions for AI development;**
b) **make the EU a high tech place;**
c) **ensure that AI protect human rights and serves them;**
d) **build strong leadership in sectors with high-impact in the society.**

While most AI systems pose limited to no risk and can contribute to solving many societal challenges, certain AI systems create risks. In order to avoid undesirable outcomes the proposed rules target high risk application, set clear requirements for AI systems for high risk applications, and define specific obligations for AI users and providers of high risk applications.

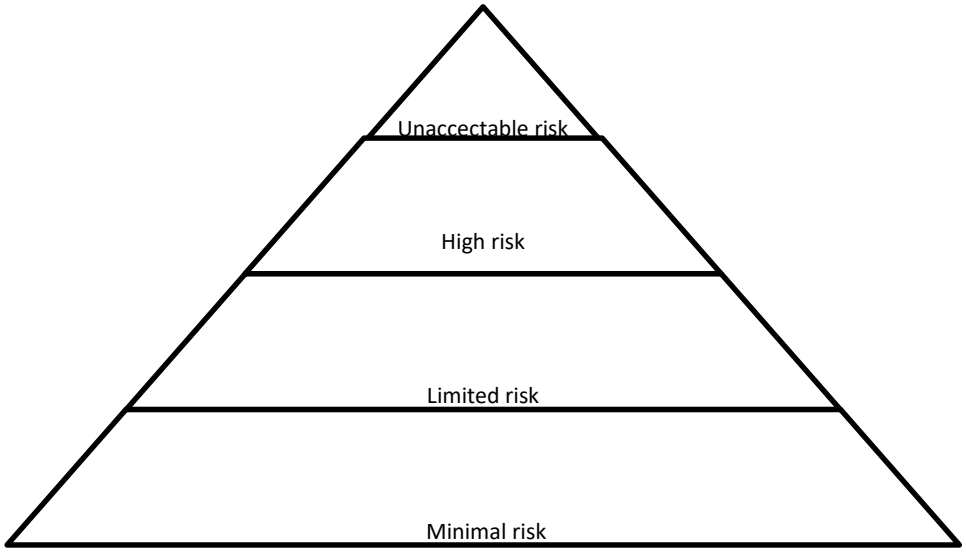
2.2. A risk-based approach

The Regulatory Framework defines 4 levels of risk in AI: (1) unacceptable risk; (2) high risk; (3) limited risk; and (4) minimal or no risk (see Figure 4) but the subject of regulation is only **high risk.** High risk applications are the one expected to boost EU to have **global leadership in trustworthy AI.**

[10] https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai

[11] Cited by European Commission, ANNEXES to the Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions Fostering a European approach to Artificial Intelligence, Brussels, 21.4.2021.

Figure 4. Risk based approach – high risk applications



Sourse: https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai

(1) Unacceptable risk: All AI systems considered a clear threat to the safety, livelihoods and rights of people will be banned.

(2) High-risk: AI systems identified as high-risk include AI technology used in: critical infrastructures, educational or vocational training, safety components of products , employment, workers management and access to self-employment, essential private and public services, law enforcement that may interfere with people's fundamental rights, migration, asylum and border control management, administration of justice and democratic processes.

(3) Limited risk: AI systems with specific transparency obligations: I good example AI systems are chatbots. Users should be aware that they are interacting with a machine so they can take an informed decision to continue or step back.

(4) Minimal risk: The proposal allows the free use of applications such as AI-enabled video games or spam filters. Currently the majority of AI systems used in the EU fall into this category, where they represent minimal or no risk.

Before **high-risk applications** are executed they will be subject to strict obligations, as adequate risk assessment, correct mitigation systems, high quality of the datasets, high level of robustness, ect. [12]

To ensure safety and to protect fundamental rights throughout the whole AI lifecycle the Impact Assessmant document accompanying the Proposal the Regulation on AI sets **five obligatins that provider of high-risk applications** have to ensure (see Figure 5)[13].

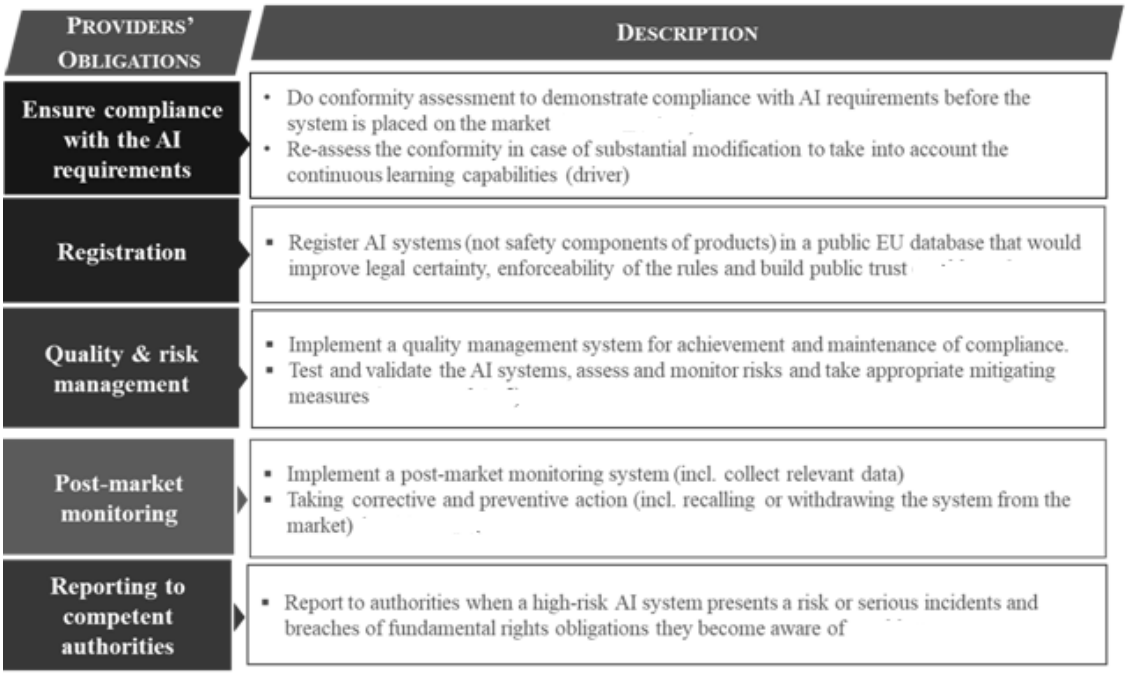
Obligations for providers of high-risk AI systems are stick to:

[12] https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai.

[13] European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, brussels, 21.4.2021, part ½.

- ensure compliance with the AI requirement;
- registration in a public EU data base;
- quality and risk management;
- post-market monitoring;
- reporting to the competent authorities.

Figure 5. Obligations for providers of high-risk AI systems



Source: European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (hal.archives-ouvertes.fr) brussels, 21.4.2021, part ½.

To ensure the minimum degree of algorithmic transparency and accountability a clear requirement for high-risk AI systems need to be set. As far as, it is a common practice for the digital market participants[14]. The fact, gives the author a room to raise the issue with the increasing liberal corporatism as a result of a consequence of the growing monopoly power of interest organizations and increasing economic growth.[15]

[14] European Commission, Proposal for a Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (data.consilium.europa.eu) brussels, 21.4.2021

[15] Благоева. Б. (2017). Корпоративизъм и корпоративна власт: някои теоретични аспекти. - В: Янков, Г. Интердисциплинарни изследвания. ИК-УНСС, с. 362.

3. Gaps and Forthcoming EU AI initiatives

In order to investigate the main concerns and gaps related to the EU initiative to regulated AI application on SME level, an impact assessment on the first issued draft in 2022 was done – White paper On Artificial Intelligence - A European approach to excellence and trust[16].

Part of the assessment process was discution on the White Paper on Artificial Intelligence ran from 19 February to 14 June 2020. Stakeholders from public and private sector (from governmends to citizeds), representatives from Member States but also from US, the UK, Canada, India, China, Japan, Syria, Brazil and Mexico.

According to the assessment **6 main problems** were pointed out (see Table 1) supplemented by the stakeholders concerns. The raised problems and concerns are related with increased risk and legal uncertainty.

Table 1: Main problems and stakeholder concerns[17]

Main problems	*Stakeholders concerned*
1. Use of AI poses increased risks to safety and security of citizens	**Citizens, consumers and other victims** **Affected businesses**
2. Use of AI poses increased risk of violations of citizens' fundamental rights and Union values	**Citizens, consumers and other victims** **Whole groups of the society,** **Users of AI systems liable for fundamental rights violations**
3. Authorities do not have powers, procedural frameworks and resources to ensure and monitor compliance of AI development and use with applicable rules	**National authorities responsible for compliance with safety and fundamental rights rules**
4. Legal uncertainty and complexity on how existing rules apply to AI systems dissuade businesses from developing and using AI systems	**Businesses and other providers developing AI systems** **Businesses and other users using AI systems**

[16] European Commission, White paper on artificial Intelligence - a European approach to excellence and trust, Brussels, 19.2.2020.

[17] European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (eur-lex.europa.eu) brussels, 21.4.2021, part ½.[17]

5. Mistrust in AI would slow down AI development in Europe and reduce the global competitiveness of the EU economy	**Businesses and other users using AI systems** **Citizens using AI systems or being affected by them**
6. Fragmented measures create obstacles for cross-border AI single market and threaten Union's digital sovereignty	**Businesses developing AI, mainly SMEs affected** **Users of AI system, including consumers, businesses and public authorities**

Source: European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (eur-lex.europa.eu) brussels, 21.4.2021, part ½.[18]

As a conclusion of the impact assessment **3 main gabs** are observed:

- specific AI legislation is needed;
- the adaptation of current legislation is required;
- clear definition of "high risk" is needed.

The of 'high-risk' concept has take the main focus among the stakeholders. According to the participants of the assessment the definition given in the White paper needs to be inproved but also to be simplified. There are some suggestions for more levels of risk to be implemented[19].

Table 2: Forthcoming EU AI initiatives[20]

AI initiative	Proposal
Horizontal legislation on AI	Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL LAYING DOWN HARMONISED RULES ON ARTIFICIAL INTELLIGENCE (ARTIFICIAL INTELLIGENCE ACT) AND AMENDING CERTAIN UNION LEGISLATIVE ACTS Issued Brussels, 21.4.2021
New and adapted liability rules [21]	Proposal expected at the end of 2022
Sectoral safety legislation revisions	Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

[18] Cited by European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (eur-lex.europa.eu) brussels, 21.4.2021, part ½.

[19] European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (eur-lex.europa.eu) brussels, 21.4.2021, part ½.19

[20] European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, brussels, 21.4.2021, part ½.

[21] As indicated in Section 1.3.3., one of the elements under reflection is the possible Revision of the Product Liability Directive. The Product Liability Directive is a technology-neutral directive applicable to all products. If and when reviewed, it would also apply to high-risk AI systems covered under the AI horizontal framework.

	On harmonised rules on fair access to and use of data (Data Act) Brussels, 23.2.2022

Source: European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (hal.archives-ouvertes.fr) brussels, 21.4.2021, part ½, including author's data

There are proposed alternative approaches to defining 'high-risk' with more risk levels: some position suggested following a gradual approach with five risk levels.
In order to achieve the main objectives of the framework on AI and to fulfill the gabs, the EU set **three initiatives** related to the framework (see Table 2): (1) horizontal legislation on AI; (2) new and adapted liability rules, and (3) sectoral safety legislation revisions. Each initiative is followed by steps to be achieved.

(1) First initiatives – *Horizontal legislation on AI*, is covered by proposed in 2021 legislative action on a horizontal framework for AI - Proposal for a Regulation of the European parliament and of the Council laying down harmonized rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts[22], issued Brussels, 21.4.2021.

It covers the main 3 gabs investigated through stakeholders' consultation within the impact assessment. The proposal is focused on issues of safety and fundamental rights specific to AI technologies. The proposal provides a definition of AI, sets mandatory requirements for high-risk AI systems.
From the prospective of national AI strategies implementation there still action to be taken (see Table 3).

Table 3. National AI strategies, EU Member States and Norway (by date of initial adoption)[23]

Country	Status	Date	Country	Status	Date
Austria	In progress		Italy	In progress	
Belgium	In progress		Latvia	Published	Feb 2020
Bulgaria	Published	Dec 2020	Lituania	Published	May 2019
Croatia	In progress		Luxemburg	Published	May 2019
Cyprus	Published	Jan 2020	Malta	Published	Oct 2019
Czechia	Published	May 2019	Netherlands	Published	Oct (publications.jrc.ec.europa.eu) 2020
Denmanrk	Published	May 2020	Norway	Published	Jan 2020
Estonia	Published	Jul 2019	Poland	Published	Dec 2020
Finland	Published	Oct 2017	Portugal	Published	Jan 2019
France	Published	Mar 2018	Romania	In progress	

[22] https://www.mdpi.com/2409-9287/7/1/4/html
[23] European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (hal.archives-ouvertes.fr) brussels, 21.4.2021, part ½.

Germay	Published	Nov 2018	Slovakia	Published	Jul 2019
Greece	In progress		Slovenia	In progress	
Hungary	Published	Sept 2020	Spain	Published	Dec 2020
Ireland	In progress		Sweden	Published	May 2018 (publications.jrc.ec.europa.eu)

Source: European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (hal.archives-ouvertes.fr) brussels, 21.4.2021, part ½.

As it can be seen some of tme Members have adopted national AI strategies. but other (e.g. Finland, Cyprus and Germany), have updated or reviewed their local strategies.[24] Each member is deciding on their own about the approach to create or update the national AI strategies. Bulgaria, for example, has included measures as part of the digitalisation strategy - 'Digital Transformation of Bulgaria (2020-2030)' approved in July 2020. Belgian national strategy takes into consideration three regional strategies. Forthcoming national actions have to be taken by Austria, Belgium, Croatia, Greece, Ireland, Italy, Romania, and Slovenia.

(2) Second AI initiative – *New and adapted liability rules,* are to be proposed at the end of 2022. They will be related to EU measures adapting the liability framework to the challenges of new technologies, including AI. It is expected to include a revision of the Product Liability Directive, and a legislative proposal with regard to the liability for certain AI systems[25]. It also have to take into account other existing EU legislation, as well as the proposed horizontal framework for AI.

(3) Third AI initiative – *Sectoral safety legislation revisions*, is covered by the Proposal for a Regulation of the European parliament and of the council on harmonized rules on fair access to and use of data (Data Act), issued in Brussels, 23.2.2022. It sets harmonized rules on fair access to and use of data, as far as data is meant to be a core component of the digital economy, and an essential resource to secure the green and digital transitions.

It is important to take into consideration that the appsence of unified local documents will coused inconvenience of the respective reviewing commities. In addition, it will create a prerequisite for deviations from the main course of regulation. But also will raise the discution about political culture in its four categories - psychological, comprehensive, objective, heuristic[26] as well as political values and political interests – material and moral, private and public.[27] The national strategies will outline another interesting topic to be discussed – the topic

[24] European Commission, Commission Staff Working document, Impact assessment accompaning Regulation of the European parliament and of the Council laying down harmonised rules on artificial intelligence (artificial intelligence act) and amending certain union legislative acts, (hal.archives-ouvertes.fr) brussels, 21.4.2021, part ½.
[25] https://www.mdpi.com/2409-9287/7/1/4/html
[26] Благоева, Б. (2014). Политическа култура и политическа социализация. – В: Основи на политическата социология. УИ "Паисий Хилендарски", с. 131-132.
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about ego in politics, namly relations: individual interests vs. common good, and individual – public interest.[28]

The main unsolved and unregulated issues are related to adaptation of current legislation of national AI strategies and new and adapted liability rules to be established. National action have to be taken still by Austria, Belgium, Croatia, Greece, Ireland, Italy, Romania, and Slovenia. As of the new and adapted liability rules, the single initiative not covered yet, it is postponed to the end of 2022 the EU to measure adapting the liability framework to the challenges of new technologies, including AI.

Conclusions

Despite all concerns, uncertainty and lack of knowledge and skills, AI is already part of our lives even without suspecting it. Its application will increase in future, and understanding and accepting it will help to benefit from it. Following the global trends EU is trying to compete in order to have a **global leadership in trustworthy AI.**

Although EU is boosting the AI application to a higher risk aiming at achieving the main goal, a few concerns could be outlined. **First**, targeting and implementation of the high risk applications will be time- and source intensive process which will transform SMEs in EU. **Second**, investments in service, knowhow and training will be the must during the implementation process but it will reduce the number of SMEs on the market giving change to the so called "frontrunners". **Third**, inconsistency of EU member will prolong the implementation process. While the EU core leads the other members in terms of publications, in the use and implementation of big data analysis Benelux is leading.

Taking into consideration these concerns, the thesis, **EU is not ready to have a global leadership in trustworthy AI** is confirmed. Although from regulation prospective and framework EU is managing to follow the timelines. But from implementation prospective considering the inconsistency of all member and the readiness of SME to manage with AI, it will be a time- and source intensive process.

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