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Review paper

ALGORITHM TRANSPARENCY AS A SINE QUA NON PREREQUISITE FOR A SUSTAINABLE COMPETITION IN A DIGITAL MARKET?

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ABSTRACT

Algorithms play a fundamental role in the digital economy. Their impact on the situation of market participants is significant. Hence, ensuring transparency of algorithms, through access to them, is crucial for the proper functioning of the market. Several models of algorithmic transparency are analyzed in the paper: from lack of transparency to complete regulation of algorithms. In particular, transparency through explanation, and "on-demand transparency" were proposed.

The goal of the paper is to determine the optimal form and scope of regulation of this area, in order to ensure sustainable competition in the digital market. Hence, the paper focuses on the concept of algorithmic transparency, the nature of the competition in the digital market, the role of algorithms within the digital trade, and problems related to the regulation of algorithms. This allows to answering the question of whether algorithmic transparency is an indispensable condition for sustainable competition in the digital market, and what are the legal challenges, which may arise with respect to various models of algorithm transparency.

The paper is embedded within the EU legal framework, discusses new legislative developments in the EU law, such as the proposal for the Digital Markets Act, and includes analysis of EU antitrust case-law and market practices.

***Keywords**: algorithm, transparency, digital market, automated decision-making, competition law, Digital Markets Act*

1. INTRODUCTION[1]

One of the most commonly accepted definitions of "algorithm" provides that it is a '*well-ordered collection of unambiguous and effectively computable operations that when executed produces a result and halts in a finite amount of time*'.[2] It can be also defined as a solution to a given problem[3], and can be compared to a recipe consisting of input, set of instructions, and output[4], a technical instruction how various systems, applications, and devices operate. Another definition provides that an algorithm is a pre-set decision mechanism[5, 6].

Nowadays algorithms play a fundamental role in computer science and in the economy, constituting the basis for numerous technologies, from simple IT systems to applications of Artificial Intelligence (AI) and many others (algorithms provide the basis for functioning of numerous remote/intelligent/digital products and services).[7, 8, 9] Indeed their role in the digital economy should be spotlighted, as it is founded on three pillars: data (personal and non-personal), algorithms, which process it, and platforms that use them. Algorithms in cyberspace have the

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1 This paper is a part of research project: "Algorithmic contract as a challenge for commercial law" (no. 2019/35/D/HS5/04377), which is financed by National Science Center, Poland.

2 Schneider M.; Gersting J., *An Invitation to Computer Science*, New York 1995, p. 9

3 Britannica, T. Editors of Encyclopaedia, "*Algorithm*", in: *Encyclopedia Britannica*, [https://www.britannica.com/science/algorithm], Accessed 15 April 2021.

4 The notion of an algorithm is similar to the concept of a computer program, i.e. algorithm has a more general meaning, whereas the latter one denotes rather an implementation of an algorithm, which has been specified in a programming language, in a sense resembling the Turing machine: "*The idea behind digital computers may be explained by saying that these machines are intended to carry out any operations which could be done by a human computer*" Turing, A. M., *Computing Machinery And Intelligence*, Mind, Vol. LIX, Issue 236, October 1950, pp. 433–460, available at: https://academic.oup.com/mind/article/LIX/236/433/986238.

5 Gal M., Algorithmic-facilitated Coordination, OECD's Roundtable on Algorithms and Collusion, 22 June 2017, p. 7.

6 The origin of this term for a long time remained enigmatic, see: Knuth D. E., *The Art of Computer Programming: Fundamental algorithms Vol. 1*, Reading 1997, pp. 1-2.

7 Tucker A.; Belford G. "*Computer science*" in: *Encyclopedia Britannica*, [https://www.britannica.com/science/computer-science], Accessed 15 April 2021.

8 In computer science, the notion of "algorithm" proves to be problematic, dynamic, and complex. See: Gurevich Y. *What Is an Algorithm?*, Conference proceedings: SOFSEM 2012: Theory and Practice of Computer Science - 38th Conference on Current Trends in Theory and Practice of Computer Science, 2012, available at: https://www.researchgate.net/publication/221512843_What_Is_an_Algorithm, p.4.

9 "Algorithm" lacks a legal definition, however, with the rapid transformations occurring in the economy, such definition may turn out to be useful. In fact, algorithms differ greatly, in terms of complexity, importance, etc. Similarly, AI lacks a clear and universally accepted definition that would be practical in legal evaluations. See: Buiten M., *Towards Intelligent Regulation of Artificial Intelligence*, European Journal of Risk Regulation, Vol. 10:1, p. 45.

capacity to regulate behaviour of users, i.e. they determine allowed actions, and restrict others. Therefore, future of the market will be influenced by the scope and mode of their implementation.[10] This article will analyse one of the most important aspects of algorithm regulation, i.e. their transparency, to determine whether sustainable competition in the digital market is jeopardized through untransparent systems, and if adequate rules should be introduced.

2. REGULATION[11] OF ALGORITHMS AND THE CONCEPT OF ALGORITHM TRANSPARENCY

Although numerous legal issues arising from algorithm exploitation in the digital economy can be identified, *inter alia* their design, development, transparency, access, their functioning in the market and compliance with different norms, until now algorithms have not been thoroughly regulated. Naturally, many different legal norms impact algorithms, from the application, performance to the effects of execution, yet the topic of algorithmic regulation increasingly is gaining importance.

Algorithms play an important role in the decision-making processes, implicating legal effects on market participants and other members of the society. Recently highlighted examples of actions taken by algorithms, resulting in decisions having legal effects, include automated termination of Uber drivers' employment contracts[12], students grades decided by an algorithm[13], or automated prediction system utilized by the Dutch government in order to calculate chances of commit-

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[10] See: Kenney M.; Zysman J., *The Rise of the Platform Economy*, Issues in Science and Technology, Vol. 32/3, Spring 2016, pp. 61-69, available at: https://issues.org/rise-platform-economy-big-data-work. See also: Lessig L., *Code is law: On Liberty in Cyberspace*, Harvard Magazine, January 2000, available at: https://www.harvardmagazine.com/2000/01/code-is-law-html, who notes that in cyberspace the regulatory nature of the code denotes that the process of coding entails making choices of values, which are implemented in the digital environment. Moreover, C. Blacklaws indicates the crucial role of algorithms in modern society, claiming that: "*big data, machine learning, algorithmic decision-making and similar technologies have the potential to bring considerable benefit to individuals, groups and society as a whole"*, but *"could also create new injustices and embed old ones in ways that allow them to be powerfully replicated across national and international networks*". Blacklaws C., *Algorithms: transparency and accountability*, Philosophical Transactions of the Royal Society A, Vol. 376, Issue 2128, 2018, p. 1.

[11] Algorithms can be regulated, but they can regulate themselves. See: Lessig L., op. cit.

[12] Russon M.A.., Uber sued by drivers over 'automated robo-firing', 2020, [https://www.bbc.com/news/business-54698858], Accessed 15 April 2021.

[13] Satariano A., "*British Grading Debacle Shows Pitfalls of Automating Government*", New York Times, [https://www.nytimes.com/2020/08/20/world/europe/uk-england-grading-algorithm.html], Accessed 15 April 2021.

ting tax/benefit fraud.[14] The impact of the algorithms, and automated decisions, on the life of the society causes that they should be fair, transparent, and designed ethically[15]. Furthermore, some even assert that in the current circumstances knowledge about the algorithm is a fundamental right[16], and that the challenges raised by automated decision-making systems require regulatory actions[17].

The European Commission's (EC) *White Paper on Artificial Intelligence* provides that a lack of transparency results in difficulties in the identification of possible breaches of laws.[18] The Ethics Guidelines for Trustworthy Artificial Intelligence, formulated by the EU's High-Level Expert Group on AI included 7 main conditions, which AI systems should meet in order to be deemed trustworthy, and among them included transparency.[19]

Algorithms, which are used in commerce, are opaque and access to them is limited because they are protected as trade secrets, generally to avoid manipulation and exploitation by competition.[20, 21] Within the EU legal system trade secrets[22] are protected against unlawful acquisition, use and disclosure by Directive (EU)

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14 Toh A., "*Dutch Ruling a Victory for Rights of the Poor*", Human Rights Watch, [https://www.hrw.org/news/2020/02/06/dutch-ruling-victory-rights-poor], Accessed 15 April 2021.

15 Kearns M., Roth A., "*Ethical algorithm design should guide technology regulation*", The Brookings Institution, [https://www.brookings.edu/research/ethical-algorithm-design-should-guide-technology-regulation], Accessed 15 April 2021.

16 "*Privacy expert argues "algorithmic transparency" is crucial for online freedoms at UNESCO knowledge café"*, UNESCO, [https://en.unesco.org/news/privacy-expert-argues-algorithmic-transparency-crucial-online-freedoms-unesco-knowledge-cafe], Accessed 15 April 2021.

17 See: Felzmann H., Fosch-Villaronga E., Lutz C. *et al., Towards Transparency by Design for Artificial Intelligence*, Science Engineering Ethics, Vol. 26/2020, p. 3334.

18 European Commission's *White Paper on Artificial Intelligence - A European approach to excellence and trust*, Brussels, 19.2.2020 COM(2020) 65 final, p.14.

19 In particular, humans should be aware of the interaction with an AI system's, as well as of its capabilities and limitations, see: High-Level Expert Group on Artificial Intelligence*, Ethics guidelines for trustworthy AI*, Brussels 2019, p. 18.

20 Barriers to the transparency of algorithms may include *inter alia* intentional concealment by organizations using them, and technical illiteracy of the society in areas such as programming and machine learning. See: Goodman B., Flaxman S., *European Union Regulations on Algorithmic Decision Making and a "Right to Explanation"*, AI Magazine, Fall 2017, p. 55.

21 Some authors claim that companies can be better off by making their algorithms transparent, as their quality will increase. Although algorithm transparency may not always benefit the consumers. See: Wang Q. *et al.*, *Algorithmic transparency with strategic users*, Available at SSRN 3652656, 2020.

22 Under art. 2 (1) of Directive (EU) 2016/943 'trade secret' is defined as information that is secret in the sense that it is not, as a body or in the precise configuration and assembly of its components, generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question; AND it has commercial value because it is secret; AND it has been subject to reasonable steps under the circumstances, by the person lawfully in control of the information, to keep it secret. Undoubtfully algorithms can fall into the scope of this definition.

2016/943 of the European Parliament and of the Council of 8 June 2016 on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure (Directive (EU) 2016/943).[23]

One of the proposed solutions to the problem of algorithmic transparency deficiency is to grant the regulatory authorities access to them. A similar approach can be noticed in different fields of law (e.g. financial regulation).[24] It has been argued that a comprise between disclosure and secrecy would make the source code being revealed to the regulator in case of a major issue, what would ensure fairness/lawfulness of an algorithm.[25] Such an approach places the regulatory burden on the public authorities, who are not necessarily competent to make this kind of assessments.[26] Additionally, it is not clear if in such instance, authorities would be responsible for finding faults and loopholes in the algorithm?

In some EU jurisdictions, courts require disclosure of algorithms used by public administration regardless of the protections guaranteed by intellectual property rights (IPRs), arguing that public interest in algorithm transparency prevails over IPRs. In other, the burden of proof that algorithms are in compliance with ethics and regulations is placed on entities using them.[27] In Spain, proposed legislation envisages giving gig-economy workers access to algorithms of digital platforms, which determine their working conditions.[28]

There are many proposed solutions for ensuring algorithmic transparency[29], but the problem of algorithms lies in the trade-off between accuracy and interpretabil-

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23 However, under art. 1 (2)(b), Directive (EU) 2016/943 does not affect the application of EU or national rules requiring trade secret holders to disclose, for reasons of public interest, information, including trade secrets, to the public or to administrative or judicial authorities for the performance of the duties of those authorities. Hence, trade secrets may be disclosed in case of public interest.

24 Kearns M., Roth A., *op. cit.*

25 Hosanagar K., Vivian J., *We Need Transparency in Algorithms, But Too Much Can Backfire*, Harvard Business Review, [https://hbr.org/2018/07/we-need-transparency-in-algorithms-but-too-much-can-backfire], Accessed 15 April 2021.

26 Ibid.

27 Huseinzade N., Algorithm Transparency: How to Eat the Cake and Have It Too, European Law Blog, [https://europeanlawblog.eu/2021/01/27/algorithm-transparency-how-to-eat-the-cake-and-have-it-too], Accessed 15 April 2021.

28 Communication from the within the framework of Social Dialogue, 10 March 2021, available at: https://www.ceoe.es/sites/ceoe-corporativo/files/content/file/2021/03/11/107/comunicado-riders-11-3-21.pdf

29 E.g. a notion of an algorithm ombudsperson was proposed. Diakopoulos N., Towards a Standard for Algorithmic Transparency in the Media, Medium, [https://medium.com/tow-center/towards-a-standard-for-algorithmic-transparency-in-the-media-81c7b68c3391], Accessed: 15 April 2021.

ity of results[30], between efficiency and potential manipulations, which can result in inequalities, unfairness, discrimination, or biased decisions.[31] As such, transparency is not sufficient to solve the problem of equitability of automated decision-making systems. Hence, it is not satisfactory to make the source code available in isolation from other important factors, e.g. evaluation of data.[32]

Therefore an idea of explainable AI/algorithm that allows determining the motivation of the decisions made by algorithms based on machine learning, identify interconnections between inputs and outputs, simultaneously showing any potential biases underlying the decision was introduced.[33] An algorithm black-box could be created, and would constitute a basis for explaining the reasoning of the system using machine learning[34]. However, some authors argue that an AI system/algorithm in order to understood should complement transparency of a source code with a model of analysing input and output pairs, enabling to indicate main factors weighted by an algorithm in the decision making process.[35]

Some legal basis for explainable algorithms already exist in the EU law. In particular, the art. 22 (1) of the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (GDPR) stipulates that the data subject shall have the right not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her. Simultaneously, paragraph 3 ensures that even if there are legal grounds for such a decision, the data controller shall implement suitable measures to safeguard the data subject's rights and freedoms and legitimate interests, at least the right to obtain human intervention on the part

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30 Noto La Diega G., *Against the Dehumanisation of Decision-Making – Algorithmic Decisions at the Crossroads of Intellectual Property, Data Protection, and Freedom of Information*, Journal of Intellectual Property, Information Technology and E-Commerce Law, Vol. 9/2018, p. 9.

31 Olhade S., Rodrigues R., *Fairness and transparency in the age of the algorithm*, Significance Magazine, April 2017, pp. 8-9.

32 Blacklaws C., *op.cit.*, pp. 1-2.

33 Hosanagar K., Vivian J., op. cit.

34 E.g. Amsterdam and Helskiki provide public services systems including "AI registers" to ensure that it is in compliance with "responsibility, transparency and security". Such systems provide an explanation of the operation of the AI systems, but also specifics of utilized data, how it is processed, risks, and human oversight. Wray S., *Helsinki and Amsterdam launch AI registers to detail city systems*, ITU, [https://www.itu.int/en/myitu/News/2020/09/30/07/41/Helsinki-Amsterdam-AI-registers-city-systems-Cities-Today], Accessed 15 April 2021.

35 Deeks A., *The Judicial Demand For Explainable Artificial Intelligence*, Columbia Law Review, Vol. 119/2019, p. 1837.

of the controller, to express his or her point of view and to contest the decision. Additionally, recital 63 constitutes that every data subject should have the right to know and obtain communication in particular with regard to the logic involved in any automatic personal data processing and, at least when based on profiling, the consequences of such processing, whereas recital 71 provides that such processing should be subject to suitable safeguards, which should include specific information to the data subject and the right to obtain human intervention, to express his or her point of view, to obtain an explanation of the decision reached after such assessment and to challenge the decision.[36] Similar provisions were included in the Polish Banking Act[37], German media law[38], and French Digital Republic Act[39]. Transparency and explainability are also among OECD's 5 Principles for responsible stewardship of trustworthy AI.[40]

Explainability does not necessarily mean that an entire decision-making process needs to be disclosed, as it is satisfactory to determine main/decisive factors of the decision, and potential inconsistency of the system's outcomes.[41] Algorithm processes should be explained to entities affected with clarity and comprehension.[42] Then, properly applied algorithms can increase the level of transparency and fairness as compared to human decision-making.[43]

3. ALGORITHMS AND COMPETITION

The role of automated decision-making, intelligent systems, and algorithms in the economy is rising. Many governments try to utilize the AI for growth of produc-

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36 The transparency rights provided for in the GDPR ensure that organizations need to provide in-depth information and communicate it in an accessible way to the data subject, but this neither requires all information about the algorithm to be disclosed, nor guarantees access to the algorithm itself, nor. See: Kaminski M., The Right to Explanation, Explained, Berkeley Technology Law Journal, Vol. 34/2019, pp. 213-214.

37 See: Art. 105a The Banking Act of 29 August 1997 (Journal of Laws of 2020, item 1896).

38 § 93 Interstate Media Agreement (Medienstaatsvertrag, MStV) of 14/28 April 2020.

39 See art. L. 311-3-1 and art. L. 312-1-3, French Digital Republic Act 2016-1321 of 7 October 2016 (Official Journal no. 235 of 8 October 2016).

40 Which stipulates that meaningful information should be provided: for general understanding of AI systems, making stakeholders aware of interactions with AI systems, enabling comprehension of the outcome, and enabling challenges of such outcome based on plain/easy-to-understand information on the factors/logic that served as the basis for the prediction/recommendation/decision. See: Recommendation of the Council on Artificial Intelligence, OECD/LEGAL/0449, OECD 2021, p. 8.

41 See: *Artificial Intelligence in Society*, OECD, Paris, 2019, p. 93.

42 Malgieri G., *Automated decision-making in the EU Member States: The right to explanation and other "suitable safeguards" in the national legislations*, Computer Law and Security Review, Vol. 35/2019, p. 4.

43 Goodman B., Flaxman S., *op. cit.*, p. 56.

tivity and innovativeness. This should however advance in parallel with ensuring a proper environment for fair competition.[44] One of the three main objectives of the EC in reference to the digital transformation is "*a fair and competitive economy (…) where companies of all sizes and in any sector can compete on equal terms, and can develop, market and use digital technologies, products and services at a scale that boosts their productivity and global competitiveness, and consumers can be confident that their rights are respected (…) in the digital age, ensuring a level playing field for businesses (…) is more important than ever (…) rules applying offline – from competition and single market rules, consumer protection, to intellectual property, taxation and workers' rights – should also apply online*".[45] Therefore, there is a special role for the EU competition law in ensuring a level playing field and benefit the society in the digital context. However, it needs to adapt to the rapidly changing market and technological conditions[46], but a fair digital economy is difficult to reach, as market inequalities distort competition: "*in the borderless digital world, a handful of companies with the largest market share get the bulk of the profits on the value that is created in a data-based economy*".[47]

There are multiple ways in which competition is harmed by algorithmic actions. Abuse of the dominant position can involve discouraging and excluding competition from the market, preference of own products and services, taking unfair advantage of information asymmetries, manipulations of algorithms, harmful changes of the platform algorithms, or predatory pricing. On the other hand, algorithms may also be responsible for collusions in the platform economy, in particular when they are designed to facilitate coordination of prices, ranking manipulation, price-optimization, and potential automated collusions.[48] In fact, algorithms can be responsible for any of the anti-competitive actions described in art. 101 and art. 102 Treaty on the Functioning of the European Union (TFEU), such as price fixing, market limitation/sharing, discrimination of trading partners, tying contracts, or imposing unfair pricing. Algorithmic collusions and abuse of market power via

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44 Communication from the Commission: *A New Industrial Strategy for Europe*, Brussels, 10.3.2020, COM(2020) 102 final. See also: Policy for development of Artificial Intelligence in Poland from 2020 (Attachment to the Resolution no. 196 of the Council of Ministers of 28 December 2020, Official Gazette of the Republic of Poland of 12 January 2021, item 23).

45 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: *Shaping Europe's digital future*, Brussels, 19.2.2020, COM(2020) 67 final.

46 *Ibid*.

47 *Ibid*.

48 *Algorithms: How they can reduce competition and harm consumers*, Competition and Markets Authority, 19 January 2021, [https://www.gov.uk/government/publications/algorithms-how-they-can-reduce-competition-and-harm-consumers/algorithms-how-they-can-reduce-competition-and-harm-consumers#theories-of-harm], Accessed: 15 April 2021.

algorithms were already discussed in the literature.[49] Also, several cases in Europe involve collusions based on pricing algorithms.[50] CJEU's "Eturas" case[51] highlighted that actions of the algorithm/computer system can lead to anti-competitive effects. Additionally, in the Google Shopping case, the EC determined abuse of a dominant position because of Google's use of an algorithm for self-prioritizing in search results.[52] Another case of exploiting market power through algorithms to promote own products and business partners with the detriment to other market participants is currently investigated by EC.[53]

However, it should be noted that proper application and regulation of algorithms can result in increased transparency, development of new and improvement of existing products, stimulate market efficiencies, enhance entry chances, and benefit consumers by empowering them with tools supporting them in taking market decisions.[54]

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49 See e.g.: Ezrachi A., Stucke M. A., *Virtual Competition: The Promise and Perils of the Algorithm-Driven Economy*, Harvard University Press, Cambridge, 2016; Mehra S., *Algorithmic Competition, Collusion, and Price Discrimination*, in: Barfield W. (ed.), *The Cambridge Handbook of the Law of Algorithms* (Cambridge Law Handbooks), Cambridge University Press, Cambridge, 2020, pp. 199-208; Mehra S., *US v. Topkins: can price fixing be based on algorithms?*, Journal of European Competition Law & Practice, Vol. 7, Issue 7, July 2016, pp. 470–474; Spiridonova A., Juchnevicius E., *Price Algorithms as a Threat to Competition Under the Conditions of Digital Economy: Approaches to Antimonopoly Legislation of BRICS Countries*, BRICS Law Journal, Vol. 7/2020, pp. 94-117.

50 E.g. Decision of the Competition and Markets Authority in case no. 50223: Trod Ltd/GB Eye Ltd, 2016, [https://assets.publishing.service.gov.uk/media/57ee7c2740f0b606dc000018/case-50223-final-non-confidential-infringement-decision.pdf], Accessed: 15 April 2021; see also: EC's decisions in cases AT. 40465(Asus), AT. 40469(Denon & Marantz), AT. 40181(Philips), AT. 40182 (Pioneer), *Antitrust: Commission fines four consumer electronics manufacturers forfixing online resale prices*, Brussels, 24 July 2018, EC Press Release [https://ec.europa.eu/commission/presscorner/detail/en/IP_18_4601], Accessed: 15 April 2021; *Lufthansa tickets 25-30 per cent more expensive after Air Berlin insolvency – "Price increase does not justify initiation of abuse proceeding"*, Bundeskartellamt, Press Release, 29.05.2018, [https://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2018/29_05_2018_Lufthansa.html], Accessed: 15 April 2021.

51 Case C-74/14 "Eturas" UAB and others v Lietuvos Respublikos konkurencijos taryba [2016] *Digital reports*.

52 Summary of Commission decision of 27 June 2017 relating to a proceeding under Article 102 of the Treaty on the Functioning of the European Union and Article 54 of the EEA Agreement (Case AT.39740 — Google Search (Shopping)), OJ C 9, 12.1.2018, pp. 11–14.

53 *Antitrust: Commission sends Statement of Objections to Amazon for the use of non-public independent seller data and opens second investigation into its e-commerce business practices*, Brussels, 10 November 2020, EC Press Release [https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2077], Accessed: 15 April 2021. See also: Espinoza J., "*EU struggles to build antitrust case against Amazon*", Financial Times, [https://www.ft.com/content/d5bb5ebb-87ef-4968-8ff5-76b3a215eefc], Accessed: 15 April 2021.

54 OECD*, Algorithms and Collusion: Competition Policy in the Digital Age*, OECD 2017, p. 14-15.

Additionally, one should note the specific situation of self-learning algorithms, which could fundamentally improve the quality of achieved results, as their functioning is dependent on big data sets. The abundance of data is a determinant of market power, and rivals who do not have access to such data sets, have limited chances to effectively compete with the quality of products/services.[55] Such algorithms are using predictive models, allowing the machine to learn through training based on a "trial and error" process, and to flexibly adapt to changing conditions in order to make decisions, which are best for achieving the objective. But the methods of performing these tasks are opaque, as no *a priori* domain knowledge is given, and strategy of operation is therefore hidden. Adaptation to market conditions and practices, e.g. through automated price adjustment, can breach competition law.[56]

4. ALGORITHM TRANSPARENCY IN EU COMPETITION LAW AND PRACTICE

The EU law (including case-law) in general, and competition regulations in particular, do not formulate a requirement of algorithm transparency. However, in recent years, legislative developments in the EU introduced measures, which are related to the concept of transparent algorithms.[57] One should note in particular the Regulation (EU) 2019/1150 of the European Parliament and of the Council of 20 June 2019 on promoting fairness and transparency for business users of online intermediation services (P2B Regulation). Its objective, as specified in art. 1(1) is to ensure that business users of online intermediation services and corporate website users in relation to online search engines are granted appropriate transparency, fairness, and effective redress possibilities Although this document includes a number of measures, which enhance the transparency of platform-to-

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55 See: Report of the German Commission on Competition Law 4.0: A new competitive framework for the digital economy (*Ein neuer Wettbewerbsrahmen für die Digitalwirtschaft*), Federal Ministry for Economic Affairs and Energy, Berlin 2019, pp. 14-15.

56 Monterossi M. W., Algorithmic Decisions and Transparency: Designing Remedies in View of the Principle of Accountability, The Italian Law Journal, Vol. 5, no. 2, 2019, pp. 717-720.

57 E.g. art. 3(3) of the "geo-blocking" Regulation (Regulation (EU) 2018/302 of the European Parliament and of the Council of 28 February 2018 on addressing unjustified geo-blocking and other forms of discrimination based on customers' nationality, place of residence or place of establishment within the internal market and amending Regulations (EC) No 2006/2004 and (EU) 2017/2394 and Directive 2009/22/EC, OJ L 60I , 2.3.2018, pp. 1–15) constitutes that where the blocking or limitation of access, or the redirection is necessary for compliance with legal requirements a clear and specific explanation should be provided to customers regarding the reasons why the blocking or limitation of access, or the redirection is necessary.

business relations, the digital platforms are not obliged to disclose the detailed functioning of their algorithms.[58]

A qualitative breakthrough in algorithm transparency[59] is offered by the EU's Digital Services Package, comprising a proposal for the Digital Services Act (DSA)[60], and the Digital Markets Act (DMA).[61] The goal of the DSA is to standardize the rules on liability, due diligence, and regulation/monitoring of the functioning of providers of intermediary services in the internal market. In terms of algorithmic transparency, DSA's main focus is on prioritization and targeting of information, content moderation, and recommendation systems.[62] To ensure this, DSA envisages special privileges of EC and independent auditors, who would have access to algorithms of the very large platforms.[63] In terms of protection of competition, a special emphasis should be placed on DMA, which aim is to ensure contestable and fair markets in the EU digital sector. In particular, it introduces the notion of the gatekeeper (art. 3(1) DMA), i.e. a provider of core platform services, who has a significant impact on the internal market, and operates a core platform service which serves as an important gateway for business users to reach end users and enjoys (or is foreseeable to enjoy) an entrenched and durable position in its opera-

58 And ranking mechanisms, see: Regulation (EU) 2019/1150, recital 27 and art. 5(6).

59 Measures concerning access to algorithms were introduced also e.g. in Australia. See e.g. Australian Competition and Consumer Act 2010 (Act No. 51 of 1974 as amended, taking into account amendments up to Treasury Laws Amendment (News Media and Digital Platforms Mandatory Bargaining Code) Act 2021) Section 52S, Federal Register of Legislation https://www.legislation.gov.au/Details/C2021C00151.

60 Proposal for a Regulation of the European Parliament and of the Council on a Single Market For Digital Services (Digital Services Act) and amending Directive 2000/31/EC COM/2020/825 final.

61 Proposal for a Regulation of the European Parliament and of the Council on contestable and fair markets in the digital sector (Digital Markets Act), COM/2020/842 final.

62 See e.g. DSA, recitals 58, 62, and 64.

63 See e.g. DSA art. 57(1), and art. 54 (3). Additionally, recital 99 provides that EC *should have access to any relevant documents, data and information necessary to open and conduct investigations and to monitor the compliance with the relevant obligations (…) should be able to directly require that the very large online platform concerned or relevant third parties, or than individuals, provide any relevant evidence, data and information (…) should be empowered to require access to, and explanations relating to, data-bases and algorithms of relevant persons, and to interview, with their consent, any persons who may be in possession of useful information and to record the statements made. (…)*, whereas recital 60 provides that *given the need to ensure verification by independent experts, very large online platforms should be accountable, through independent auditing, for their compliance with the obligations (…) Auditors should guarantee the confidentiality, security and integrity of the information, such as trade secrets, that they obtain when performing their tasks and have the necessary expertise in the area of risk management and technical competence to audit algorithms.* Moreover, transparency is ensured by art. 12 DSA: *Providers of intermediary services shall include information on any restrictions that they impose in relation to the use of their service in respect of information provided by the recipients of the service, in their terms and conditions. That information shall include information on (…) algorithmic decision-making and human review.* There are further transparency requirements for very large online platforms, e.g. in art. 29, art. 30, art. 31.

tions. Such entities were given a set of new obligations[64] and special procedures were put in place to ensure that gatekeepers do not distort the market through their actions by incompliance with provisions of the DMA. Similarly to DSA, DMA granted EC access to the algorithms[65], as recital 69 envisages EC *should be empowered to request information (…) In particular (…) should have access to any relevant documents, data, database, algorithm and information necessary to open and conduct investigations and to monitor the compliance with the obligations (…), irrespective of who possesses the documents, data or information in question, and regardless of their form or format, their storage medium, or the place where they are stored*. Failure to provide access to algorithms was sanctioned with fines.[66]

5. IS ALGORITHM TRANSPARENCY A *SINE QUA NON* CONDITION FOR SUSTAINABLE COMPETITION IN THE AGE OF DIGITALIZED ECONOMY?

Previous sections presented the importance of algorithms for competition in the digital market. The role of automated processes and use of programming code for regulation of the market will only increase. Therefore, it seems apparent that a fair and the sustainable competition requires enhanced transparency, *inter alia,* of algorithms. Regulation of this area seems unavoidable and imminent. In fact, it may appear to be paradoxical that modern societies regulate nearly most aspects of life and economic sectors, but platforms and algorithms, which constitute the very fundament of the new economy remain to a great extent unregulated. Such a situation may at first glance look favourable for the market, as technologies can freely develop, but the "regulatory wild west" with respect to the subject-matter of algorithms may result in market distortions, unsustainable growth of biggest platforms at the expanse of SMEs, and could hamper fair competition. In this context, a regulatory action seems understandable and reasonable, in particular if the justification of regulation is the response to the demand of the public for the

[64] Actually, many of these requirements were already formulated in the EU case law. Obligations/prohibitions for gatekeepers concern e.g. combination personal data; automatic signing in of end users to other services; free setting of market pricing; concluding contracts with end users outside the platform; access to platform services acquired outside the platform; interoperability of software; preferential treatment of services and products; access to the performance measuring tools for advertisement; portability and access to data, in particular, access to search data; conditions of access for business users to the platform's software application store.

[65] See: DMA art. 19 (1), and art. 21 (3). Moreover, art. 19 (4) DMA provides that where the EC requires undertakings to provide access to its data-bases and algorithms, it shall state the legal basis and the purpose of the request, and fix the time-limit within which it is to be provided.

[66] See: DMA art. 26(2)(e), and art. 21(1)(c).

correction of inefficient or inequitable market practices[67], especially that currently the EU antitrust regulations do not provide effective tools to protect against market manipulations through algorithms, and elimination of businesses from platforms without legitimate justification[68]. Furthermore, algorithmic transparency is a key factor in the determination of anticompetitive behaviour, in particular, coordination and discrimination[69]. Nevertheless, the eventual regulation of algorithms should involve different considerations, perspectives, and ensure a balance between fair access, functioning, and competition in the market, and legitimate interests of organizations developing and utilizing algorithms. The threat of algorithmic overregulation is actual.

Transparency of algorithms has to provide access to them, otherwise would be illusionary. But, access to algorithms, raises additional legal questions of significant meaning, in particular:

- Who would be entitled to access: only public authorities, or also market participants, and other members of the public, e.g. organizations of consumers?
- Who would be required to disclose algorithms: developments in the EU competition/digital law indicate that such requirement would involve only the biggest platforms. The notion of gatekeepers introduced in the DMA is an example of noticing the specific and particularly important role of the very large platforms in the market. In fact, GAFAM[70] organizations do not only dominate the market (in terms of market share and revenues) but they also control/organize the digital market. It is fair to say that as biggest platforms they provide markets themselves;
- Which institutions would be involved in supervising entities and monitoring process, and what would be their role (passive or proactive);
- Under which conditions the access would be granted: would a legal interest be required, would there be a formalized procedure?
- Which algorithms would be covered by the requirement of disclosure?
- What would be the scope of access to algorithms, in particular, would access be granted only to algorithms as such, or to other items as well, e.g. data, machine-learning processes – in such case how would security of personal data

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67 Such is the justification of regulation according to the theory of "public interest", see: Posner R., *Theories Of Economic Regulation*, Bell Journal of Economics, Vol. 5/2, 1974, p. 335.

68 Graef I., *Differentiated Treatment in Platform-to-Business Relations: EU Competition Law and Economic Dependence*, Yearbook of European Law, Vol. 38/1, 2019, p. 452.

69 See: Gal M., op. cit., pp. 2-26.

70 An acronym used for denoting biggest business organizations in the online environment, i.e. Google, Apple, Facebook, Amazon, Microsoft.

be enforced and ensured, taking into account the personalization of services e.g. offered through search engines, where access to historical search data is considered as a primary factor for developing better search algorithms and increase competitive pressures on dominating entities[71]. Additionally the scope of the relevant market and timeframe of access would need to be determined, especially that algorithms may be adjusted to a specific location of the user and may be dynamic;

- How could the algorithm be further used, and what would be enabled by access? On the contrary, how the algorithm as a valuable intangible property be protected against misuse by other market participants?

Algorithm transparency can be achieved through various regulatory solutions. Therefore, one can identify several approaches to regulation of algorithms in order to ensure their transparency. Below they have been classified according to the relevant level of regulation, which would need to be provided.

1. Indirect transparency – an approach, which would not involve any specific requirement for algorithm disclosure. However, algorithm transparency could be achieved through more general provisions. Such approach could be distinguished e.g. in the P2B Regulation, which encourage the online platforms to be more transparent in their relations with the business users, but does not provide for a requirement of algorithm disclosure. Other factors, which could support such a mechanism of indirect transparency, are potential pressure from the society and regulators, soft law measures, and self-regulation.
2. Transparency through oversight – an approach, which also does not involve any general requirement for algorithm transparency, however the access to algorithms would be granted to specific public authorities, and only in limited instances (periodic or *ad hoc*). This would effectively be a form of an *ex post* regulation, and would not safeguard transparency by default. Such approach was taken e.g. in the DSA/DMA.
3. Transparency through explanation - an approach, which would involve creation of a specific right to an explanation. Although, in such case no general obligation of algorithm disclosure needs to be introduced into the legal system, the market participants would be empowered with the right to explanation (perhaps only from the biggest online platforms/gatekeepers) in case of an automated decision, which substantially affects them. Potentially such a right could be linked with a right to obtain a human intervention, with the right to express their point of view, and a right to challenge automated deci-

[71] Haucap J., Stühmeier T., *Competition and antitrust in internet markets*, in: Bauer J. M., Latzer M. (ed.), *Handbook on the Economics of the Internet*, Edward Elgar Publishing, Cheltenham, pp. 193-194.

sion. Similarly provisions, as indicated above, can be found in the GDPR (art. 22) – of course with respect to the data subjects.

4. On-demand transparency - an approach, which again does not involve a general requirement for algorithm disclosure. Instead, algorithms of dominant organizations/gatekeepers could be available "on-demand", for entities who are most affected by their practices. It seems that a formalized procedure for access to algorithms would be redundant, rather interested entities would acquire such access through negotiations, or possibly through a decision of a court. Hence, a legal threshold would need to be introduced (e.g. substantial legal interest), to avoid potential abuses and to protect corporate secrets. Such access "on-demand" could be limited only to exceptional circumstances. What is important, the CJEU's case-law, where access to items protected by IPRs was granted on the basis of antitrust regulations[72], can be referred to the situation of algorithms, and can provide a sound legal basis for such an approach.
5. Transparency through disclosure – this approach would provide a full transparency, through introduction of a formal requirement of algorithm disclosure. Potentially, such a requirement would apply only to those algorithms which are most relevant for the functioning of a specific digital market. However, additionally, in order to provide an effective transparency mechanism for market participants, algorithm disclosure would need to include also other items (e.g. relevant data, machine learning processes), which are substantially interconnected with the functioning of algorithms.
6. Smart regulation[73] - denoting the use of algorithms by public authorities to regulate the market and limit manipulations and inefficiencies. Such algorithmic market policing effectively would lead to market intervention with the help of algorithms. "Good" algorithms would be deployed in order to mitigate the effects of "bad" algorithms that are responsible for market distortions.
7. Regulation of algorithms as such – it is the most far-reaching model of algorithm regulation, involving a complete regulation of algorithms as such, encompassing among others such aspects as their design, implementation, and

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72 See: Case 418/01 IMS Health v NDC Health [2004] European Court Reports 2004 I-05039; Cases C-241/91 P and C-242/91 P. Radio Telefis Eireann (RTE) and Independent Television Publications Ltd (ITP) v Commission [1995], European Court reports 1995 p. I-00743, Case T-201/04 Microsoft v Commission [2007], European Court Reports 2007 II-03601.

73 Smart regulation involving pricing algorithms that would monitor and set market-clearing prices. However, the use of such tools in the context of dynamic pricing implicates numerous problems: e.g. effective privacy protection, and more market intervention. Yet, there are some advantages of such an approach, e.g. as A. Ezrachi, and M. Stucke note, the current economy is not governed by an invisible hand, but rather a digitalized hand, the latter one being controlled by super-platforms. See: Ezrachi A., Stucke M. A., Virtual Competition…, op. cit., pp. 203-217.

functioning. What is important, such approach could also involve a combination of other methods of ensuring strengthened transparency of algorithms, e.g. disclosure, design control (a concept of an "antitrust compliance by design" has been proposed[74]), increased oversight, and right to explanation[75].

Table 1. Pros and cons of various models of regulation of transparency of algorithms.

Level of regulation	Model of regulation	Pros and cons
1	Indirect transparency	+ No risk of over-regulation; preferable conditions for the development of technology - Ineffective measures for enforcing transparency (lack of a legal requirement)
2	Transparency through oversight	+ Access granted only to public authorities and only in certain situations (limited risk of possible abuses); the legal basis for access to algorithms (increased legal certainty); additional legal mechanisms could be introduced to enforce algorithm fairness - Trade secrets disclosed; bureaucratic approach; lack of technical competence (professional auditors needed); difficulties in selecting relevant public authority, as different subject matters would be involved (e.g. privacy, IPRs)[76]; difficulties of enforcement transparency in a transnational setting

74 Hirst N., *When Margrethe Vestager takes antitrust battle to robots*, Politico, [https://www.politico.eu/article/trust-busting-in-the-age-of-ai], Accessed: 15 April 2021.

75 E.g. Statement on Algorithmic Transparency and Accountability of ACM U.S. Public Policy Council and of ACM Europe Policy Committee indicates 7 principles for algorithmic transparency and accountability: awareness, access and redress, accountability, explanation, data provenance, auditability, validation and testing. See: *Statement on Algorithmic Transparency and Accountability*, Association for Computing Machinery, [https://www.acm.org/binaries/content/assets/public-policy/2017_joint_statement_algorithms.pdf], Accessed: 15 April 2021.

76 OECD, op. cit., pp. 48-49.

3	Transparency through explanation	+ No need for algorithm disclosure (trade secrets protected); less bureaucracy; the legal mechanism provided for market participants, which increases transparency of the market - Enforcement difficulties, brief information may not be satisfactory
4	On-demand transparency	+ Access limited only to exceptional circumstances (a trade-off between transparency and protection of trade secrets); fewer formalities - Enforcement may be difficult and could involve burdensome legal proceedings
5	Transparency through disclosure	+ Apparently complete transparency - No incentives for developing new technologies/improving existing products; confidential data disclosed (not protected); risk of manipulations[77]; lack of proficiency to understand algorithms - complex and burdensome process of algorithm interpretation[78]; in fact disclosure may not be very useful (dynamic nature of algorithms; isolated information without other aspects such as relevant data – would be impractical; the complexity of advanced AI systems[79]; risk of tacit collusions[80]

77 Transparent algorithms can facilitate stronger coordination and response prediction, so competitors can better predict market decisions and adapt their practices. See: Gal. M., op. cit., p. 7.

78 OECD, op. cit., p. 45.

79 In particular, in such instances publication of the source code itself will not provide an effective tool to ensure transparency, as AI systems make partially/fully autonomous decisions. Hence, it may be impossible to explain the outcome achieved through automated systems, which are based on machine learning. See: OECD, op. cit., p. 48.

80 A. Ezrachi and M. Stucke note that elevated transparency in concentrated markets with homogeneous goods, increases the risk of tacit collusion. See: Ezrachi A., Stucke M., *Algorithmic Collusion: Problems and Counter-Measures*, OECD's Roundtable on Algorithms and Collusion, 31 May 2017, p. 7. See also pp. 21-22. Moreover, free flow of information may be considered as a value and therefore such actions may be deemed legitimate. See: Ezrachi A., Stucke M., op. cit., p. 19.

6	Smart regulation	+ Utilization of modern tools of regulation, adjusted to dynamic economic conditions; Not really clear how such algorithms would be designed, controlled, operate, and who would be responsible for their actions? - Market interventions through algorithms can lead to inefficiencies; can constitute a parlous precedent (e.g. risk for privacy protection)
7	Regulation of algorithms as such	+ In assumption, market inefficiencies could be addressed comprehensively; in assumption complete control of algorithms; increased certainty of law - Risk of over-regulation; significant regulatory action would need to be involved; barriers for innovation, fewer incentives to create new products/offer new services; regulators lacking algorithmic proficiency; dynamic nature of algorithms making them difficult to regulate[81].

Table 1 provides juxtaposition of advantages and drawbacks of different models of regulating algorithm transparency. The different regulatory scenarios presented in Table 1 indicate various advantages but also challenges related to the regulation of algorithms. Lack of legal mechanisms for stronger transparency of algorithms seems inadequate for modern economic realities, where very large platforms dominate the market. Increased oversight of the algorithms, as can be seen in the DSA/DMA proposals, indicate the direction of future regulation. These steps may still appear inadequate, and may not offer effective tools, in particular in terms of *ex ante* algorithm regulation. Nevertheless, they can constitute a pressure mechanism that will enhance transparency. However, the bureaucratic approach is unsound, in particular as long as technical proficiency is needed to understand the functioning and specifics of the algorithms.

On the other hand, comprehensive regulation of algorithms presently seem burdened with the risk of over-regulation and can stifle innovation, as there will be fewer incentives for technology development. More importantly, the dynamic nature of algorithms makes them difficult, not only to understand, but also to

[81] Haucap J., Stühmeier T., *Competition and antitrust in internet markets*, in: Bauer J. M., Latzer M. (ed.), *Handbook on the Economics of the Internet*, Edward Elgar Publishing, Cheltenham, p. 194.

regulate. A modern approach of smart regulation may offer an attractive measure to deal with market irregularities, but such economic interventionism can generate inefficiencies and new problems. In particular, complete transparency of algorithms does not seem like an accurate solution to the problem, as it can eventually lead to new market manipulations and disclosure of confidential business information. Moreover, the usefulness of such information could be questioned, in particular when an isolated algorithm without valid data is disclosed, and when advanced AI systems are involved.

Therefore, two solutions for algorithmic regulation appear most reasonable. First one is transparency through explanation, which does not envisage a requirement for disclosure of algorithms, but instead, market participants would be enabled with the right to explanation/right to human intervention in situations, which would involve automated decision-making. Such regulation would safeguard trade secrets and other confidential information of legitimate holders, and would ensure a legal mechanism for market participants to receive clarification in a situation, when a contested decision was made by an automated system.

The second solution – "on-demand transparency" – would create a scenario in which algorithms are available only in specific cases, when dominant platform operators' decisions, would substantially impact other market participants. Hence, a threshold (e.g. a requirement of a substantial legal interest), would be needed in order to avoid potential abuses and protect corporate secrets. What is important, the EU competition law already has worked out a set of conditions under which access to protected subject matter is given on the basis of antitrust regulations. While there will always be an unavoidable interference of IPRs with antitrust rules (since IPRs are legal monopolies), the CJEU's unambiguous line of decisions (*Magill*, *IMS Health*, *Microsoft,* and others) provided conditions under which access to relevant information is granted and under which sustainable competition prevails over legal protection granted through exclusive rights. Although refusal to grant access to relevant information by an entity having a dominant position in the market *per se* is not abusive, in exceptional circumstances, abuse of a dominant position can be related to the exploitation of exclusive rights.[82]

[82] The test of exceptional circumstances involves following considerations: limitation of introduction of a new product into the market; a potential demand for such product; a justification for refusal of access; potential preemption of the market. See note 72.

7. CONCLUSION

The prevalence of automated systems in the modern economy causes the topic of algorithmic regulation one of the key issues for the functioning of the digital market. Among numerous issues, which relate to the subject matter at question, a special emphasis should be placed on the transparency of algorithms. However, true transparency in this regard is very difficult to achieve, as disclosing the source code generally will not be sufficient, and several other factors, such as machine learning system involved, personalization of data, and autonomous decisions taken by AI, should be bared in mind. Lack of transparency facilitates maintaining control over the market and effective elimination of competition. On the other hand, as this paper notes, greater transparency can also lead to market manipulation and anticompetitive actions, such as e.g. tacit collusions. Some of the recent developments in the EU legislation and proposals from the EC provide indications on a potential regulatory approach to the topic of algorithmic transparency. However, in the paper, several approaches were studied and their weaknesses, inadequacies, and further legal problems they implicate were revealed. Therefore, transparency through explanation and proposed "on-demand transparency" appear to be the soundest solutions to the problem of algorithm transparency.

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