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Opinion

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Artificial Intelligence Designated as Inventor – An Analysis of the Recent EPO Case Law

This paper will focus on the issue of designating artificial intelligence systems as inventors in the current framework of European patent law. Most recently, the European Patent Office rejected two patent applications which indicated a machine called DABUS as the inventor of the claimed subject-matter. The paper will analyse the grounds of the decisions in detail, thereby reflecting on the current approach of the European Patent Office to such designations and on the concept of inventorship within the European patent system in general.

I. Introduction

Artificial intelligence (AI) is one of the most disruptive technologies in history. We encounter its benefits in our day-to-day life with services like facial recognition systems[1] or advanced driving assistance systems.[2] Within research, artificial agents have become particularly important in fields such as pharmaceuticals[3] and materials science.[4] The inherent potential of AI impacts various legal fields – one being the patent system.

Traditionally, people have understood machines as person-driven devices that perform an intended action in order to support a human being.[5] Although some very powerful artificial agents have enhanced autonomic creative capabilities and change the process of inventing, these agents are still widely seen as tools used by humans.[6] However, various patent offices worldwide today are faced with situations where the applicant designates an AI system as the inventor of the subject-matter instead of a human being.[7]

The current framework of the European patent system does not provide a distinct answer to the question of whether an artificial agent can be recognised as an inventor. Neither the European Patent Convention (EPC) nor its Implementing Regulations explicitly require the inventor to be human. Moreover, the Boards of Appeal of the European Patent Organisation have never been called upon to decide this issue.

Most recently, the Receiving Section of the European Patent Office (EPO) had to decide on two patent applications addressing a subject-matter which was claimed to be invented by an AI system named DABUS.[8] The EPO denied inventorship and refused the patent applications accordingly. This paper will analyse the grounds of both decisions in detail, thereby reflecting on current practice at the EPO.

II. The term 'inventor' within the EPC

Before examining the DABUS decisions, it seems appropriate to recall the general discussion associated with the concept of inventorship in the European framework to set the general scene. Several provisions of the EPC, such as Arts. 60, 62 and 81, mention the term 'inventor', but neither the Convention itself nor its Implementing Regulations define it. There is a long-running and ongoing debate within the patent community as to whether the

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1 Biometric artificial intelligence is used in applications to uniquely identify a person by analysing patterns based on the person's facial texture and shape.

2 Level 2 certified systems (partial automation) like the Tesla Autopilot are already common in day-to-day life today. In some of its testing markets, Waymo operates machines with level 4 autonomy. For a comprehensive survey of various artificial intelligence techniques for driving safety and vehicle crash prediction covered in the literature between 2004 and 2014, see Zahid Halim and others, 'Artificial intelligence techniques for driving safety and vehicle crash prediction' (2016) 46 Artif. Intell. Rev. 351 .

3 More and more pharmaceutical companies specialise in AI drug discovery. The UK firm Exscientia recently announced that its new drug designed by AI-powered software has entered into a phase I clinical trial for the treatment of obsessive-compulsive disorder, commonly known as OCD (cf <https://www.bbc.com/news/technology-51315462> or <https://www.labiotech.eu/ai/exscientia-ocd-ai-sumitomo> accessed 27 June 2020). For an overview see Petra Schneider and others, 'Rethinking Drug Design in the Artificial Intelligence Era' (2020) 19 Nat. Rev. Drug Discov. 353 .

4 cf Fang Ren and others, 'Accelerated discovery of metallic glasses through iteration of machine learning and high-throughput experiments' (2018) 4 Sci. Adv. 1566 for the accelerated discovery of metallic glasses involving machine learning.

5 cf Lewis Mumford , *Technics and Human Development* (Harcourt, Brace & World 1967) 191 (defining a machine, 'more or less in accord with the classic definition of Franz Reuleaux, as a combination of resistant parts, each specialized in function, operating under human control, to utilize energy and to perform work [. . .]').

6 cf Marc Botha, 'Artificial Intelligence is just a Tool' (21 January 2019) <https://towardsdatascience.com/artificial-intelligence-is-just-a-tool-aab880f1bbdd> accessed 27 June 2020. See also Peter Blok, 'The inventor's new tool: artificial intelligence – how does it fit in the European patent system?' (2017) 39(2) E.I.P.R. 69, 73.

7 cf US16/524,350, GB1816909.4 and GB1818161.0 indicating the AI 'DABUS' as inventor.

8 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 and EP18275174.3.

term must be applied autonomously within the EPC[9] or whether the Convention leaves it to be interpreted as a matter of national law[10,11] On the one hand, the *travaux préparatoires* support an autonomous interpretation.[12] The preparatory works explicitly mention that the term 'inventor' has to be understood in a European and not in a national sense.[13] On the other hand, the EPO is bound by final decisions of EPC contracting states ruling on the identity of the inventor (cf. Art. 61, Rule 20(2) EPC). This supports the idea of national leeway to interpret the term.

In its case law, the Boards of Appeal described the term 'inventor' as the 'natural person who has performed the creative act of invention'.[14] With this definition, it neither established a precedent on the issue of autonomous versus national interpretation nor stipulated a binding understanding for national courts or the EPO.[15] In the case decided, the Boards of Appeal had to deal with a late filing of the designation of inventor and its consequences, but not with the concept of inventorship itself. In the United Kingdom, an inventor is defined as the actual deviser of the invention.[16] In a recent German decision, the Federal Court of Justice required an inventor to conceive a way of solving a concrete technical problem by certain technical means and to put this knowledge in such a way that it can be used as an instruction for technical action.[17] For the purpose of the analysis of the DABUS cases, it is sufficient to have in mind the general idea provided by these exemplary definitions of inventorship.

III. The facts of the DABUS cases

At the end of 2018, Stephen Thaler filed two patent applications: one concerning a food container (EP3564144) and a second concerning devices and methods for attracting enhanced attention (EP3563896).[18] He left the field for indicating the inventor empty. Responding to the invitation sent by the EPO to remedy the deficiency,[19] the applicant filed a form to designate the machine 'DABUS' as the inventor. Furthermore, he explained that DABUS is a type of connectionist AI for which he had acquired the right to the European patent as an employer. In a later submission, the applicant filed a corrected designation of the inventor in which he indicated that he had obtained the right to the European patent as a successor in title. The applicant explained that the invention had been made by a machine and that it identified the novelty of its own idea before any natural person did. Furthermore, the applicant argued that he, as the owner of the machine, was an assignee of any intellectual property rights created by it.

The Receiving Section of the EPO decided to consolidate the proceedings concerning both applications and summoned the applicant to oral proceedings, which took place at the end of November 2019. After a further exchange of arguments, the Receiving Section refused both applications and delivered its grounds for the decisions on 27 January 2020. Appeals were filed in March 2020. Currently, we are awaiting the decisions of the Board of Appeal.

IV. The reasoning of the EPO and its analysis

Article 90(3) and (5) EPC stipulate that the EPO has to refuse an application if the applicant fails to correct deficiencies. The Receiving Section based its holding primarily on two grounds. Firstly, the application designated a machine as the inventor and would therefore not meet the formal requirements of Art. 81 EPC, Rule 19(1) EPC (sub 1.).[20] Secondly, the statements of the applicant indicating that he acquired the right to the European patent from DABUS as an employer as well as the correction of this statement indicating succession in title would not meet the requirements of Art. 81 and Art. 60(1) EPC (sub 2.).[21] The Receiving Section supported both primary grounds with various arguments which we will analyse in detail. Since the applicant did not remedy either deficiency, both applications were refused.[22]

In addition to those two primary grounds, the EPO chose to support its decision by separately addressing two other arguments of the applicant. It elaborated that neither the substantive patentability requirements[23] nor any right of the public to know who the actual inventor is[24] would suggest that an AI system could be an inventor under the European patent regime (sub 3.). We will have a look at those additional arguments as well.

9 Luigi C Ubertazzi, *Profili soggettivi del brevetto* (Giuffrè 1985) 275 ff; Axel Cronauer, *Das Recht auf das Patent im Europäischen Patentübereinkommen* (Carls Heymanns 1988) 48 ff, 95 ff; Tobias Bremi and Dieter Stauder, 'art 60' in Romuald Singer, Dieter Stauder and Stefan Luginbühl, *EPÜ* (8th edn, Wolters Kluwer 2019) para 5; Klaus-Jürgen Melullis, 'art 60' in Georg Benkard, *EPÜ* (3rd edn, CH Beck 2019) art 60 para 12.

10 Martijn van Empel, *The granting of European patents* (Springer 1974) 152 ff and 195; Kaisa Suominen, 'art 60(1)' in Derk Visser and others, *European Patent Convention* (Wolters Kluwer 2019) no 1; AIPPI, Q 244, 'Inventorship of multinational inventions' no 17; cf Yann Ménière and Heli Pihlajamaa, 'Künstliche Intelligenz in der Praxis des EPA' GRUR 2019, 332, 335 (arguing that the EPC leaves the interpretation of the term primarily to national courts) and Noam Shemtov, 'A study on inventorship in inventions involving AI activity' (EPO, February 2019) 31 <http://documents.epo.org/projects/babylon/eponet.nsf/0/3918F57B010A3540C125841900280653/$File/Concept_of_Inventorship_in_Inventions_involving_AI_Activity_en.pdf> accessed 27 June 2020 (stating that national courts have been applying their national laws on inventorship).

11 Otto Bossung, 'art 81' in Friedrich Karl Beier, Kurt Haertel and Gerhard Schricker, *Münchner Gemeinschaftskommentar, EPÜ* (Carls Heymanns 1986) para 44 mentions this issue but leaves it open.

12 cf Cronauer (n 9) 96.

13 See Cronauer (n 9) 96 citing 9081/IV/63-D, 76 ff.

14 J 7/99 no 2.

15 In general, the binding effect of Board of Appeal decisions is extremely limited. In the legal system established under the EPC, there is no principle of binding case law (T 1099/06, no 1). See also T 0740/98, no 2.3; Bühler in Singer, Stauder and Luginbühl (n 9) art 112 para 29 ff.; de Lange in Visser and others (n 10) art 111(2) no 1 ff and art 112(3) no 1.

16 s 7(3) UK Patent Act of 1977.

17 BGH GRUR 2010, 817 para 28 – *Steuervorrichtung*; cf Klaus-Jürgen Melullis, '§ 6' in Georg Benkard, *Patentgesetz* (11th edn, CH Beck 2015) para 30.

18 The applications were filed with the Intellectual Property Office of the United Kingdom in accordance with art 75(1)(b) EPC.

19 cf art 81 EPC and r 19(1).

20 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 19 ff) and EP18275174.3 (para 20 ff).

21 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 30 ff) and EP18275174.3 (para 31 ff).

22 Since the applicant had clearly stated that he wished the AI system to be designated as the inventor, the Receiving Section decided to issue a decision in the oral proceedings, even though the time limit under Rule 60(1) EPC had not expired (EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 40 ff) and EP18275174.3 (para 41 ff)).

23 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 34 ff) and EP18275174.3 (para 35 ff).

24 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 37 ff) and EP18275174.3 (para 38 ff).

1. Indication of the inventor (Art. 81, Rule 19(1) EPC)

In its decision, the Receiving Section of the EPO held that designating a machine as the inventor does not meet the formal requirements of Art. 81 and Rule 19(1) EPC.[25] This was the first major ground to deny the patent application. The Receiving Section presented five arguments in support of this ground – three of them are generally convincing (sub a)), two of them less convincing (sub b)).

a) Three generally convincing arguments

As mentioned above, the nature and scope of the term 'inventor' are unclear under the EPC. In its decision, the Receiving Section did not clarify in a general manner whether the term must be applied autonomously within the EPC or whether the Convention has left it to be interpreted as a matter of national law. However, it asserted that in the context of inventorship, the European patent regime makes reference to natural persons only.[26]

This is not altogether true for the EPC itself, since Arts. 60, 62 and 81 just mention the word 'inventor' without any further reference. However, Rule 19(1) of the Implementing Regulations requires 'family name, given names and full address of the inventor' to be stated within the designation, thus suggesting that the inventor has to be a natural person. Since the Implementing Regulations are an integral part of the European Patent Convention (Art. 164(1) EPC) and have the same legal effect as the articles of the EPC itself, this (quasi-)textual argument[27] of the Receiving Section is utterly convincing. In particular the terms 'family name' and 'given names' point to the notion of human inventorship. Although it is still unclear whether the term 'inventor' must be applied autonomously within the European system or if its interpretation is a matter of national law in general, the Regulation requires that the inventor at least has to be human.

Secondly, the Receiving Section's decision argued along historical lines. The drafters of the EPC would have agreed that the term 'inventor' refers to a natural person only.[28] Thus, indicating the name of an AI does not meet the requirements of Art. 81, Rule 19(1) EPC. The argumentation mentions various sources of the *Travaux Préparatoires*.[29] However, those statements of the preparatory works do not refer to AI directly but rather address the issue of whether legal persons as well as natural persons can claim inventorship, as was allowed in some jurisdictions of the EPC contracting states.[30] Nevertheless, these references demonstrate indirectly that the founding fathers of the EPC did not even consider AI systems as potential inventors, which is certainly unsurprising at the end of the 1960s.[31]

Given that neither the preparatory works of the EPC nor today's statutory law takes a clear stance on AI inventorship, one could consider that the EPO must fill this gap and acknowledge AI systems as possible inventors by way of analogy.[32] However, treating artificial agents as inventor by analogy would disregard the dissimilarities[33] between natural persons or even legal persons inventing on the one hand and AI inventing on the other. Unlike inventorship for natural persons or legal persons, AI inventorship does not require *any* direct human activity. The lack of human activity might not speak against AI inventorship from a conceptual point of view, but it does within the current law. Inventorship where no direct human act is involved in the core inventive process differs dramatically from the scenario foreseen and regulated by the EPC and its Implementing Regulations.

Thirdly, the Receiving Section of the EPO additionally remarked that the requirement of being a natural person for inventorship appears to be an internationally applicable standard.[34] The grounds for the decision cite the EPO consultation of 2018/19, various national patent legislations of EPC contracting states as well as the report from the IP5 expert round table on AI for China, Japan, Korea and the USA.

This comparative legal argument might not be decisive on its own, but it supports the decision of the Receiving Section of the EPO. It appears that the national patent laws of the contracting states of the EPC require a human inventor.[35] Moreover, in the parallel DABUS cases, the Hearing Officer at the UKIPO[36] denied inventorship to AI, as did the Commissioner for Patents of the USPTO.[37]

b) Two less convincing arguments

The Receiving Section of the EPO raised two further arguments which were intended to underpin the first ground of the decision. The lack of capacity of AI to own

25 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 19 ff) and EP18275174.3 (para 20 ff).
26 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 23) and EP18275174.3 (para 24).
27 It might not be a textual argument in the narrower sense since the wording of Rule 19(1) does not explicitly ask for a human inventor but only suggests human inventorship.
28 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 24) and EP18275174.3 (para 25).
29 See EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 24) and EP18275174.3 (para 25).
30 See for example IV74860/61-F, 18.
31 Early contributions about the issue of a machine as inventor include Karl F Milde, 'Can a Computer Be an "Author" or an "Inventor"?' (1969) 51 J. Pat. Off. Soc'y 378; Bernhard Volmer, 'Die Computererfindung' Mitt. 1971, 256; Erich Zipse, *Erfindungs- und Patentwesen auf den Gebieten moderner Technologien* (Verlag Chemie 1971) 78; Erich Zipse, 'Computer oder nachvollziehender Mensch als Erfinder?' Mitt. 1972, 41. The possibility of attributing inventorship to a computer under the EPC regime is already mentioned by van Empel (n 10) 128 n 3, who states that the term 'inventor' within the EPC has to be defined by the applicable national laws (see op cit no 152). For this theory, see above under II.
32 For the requirement of a gap within the statutory law to allow for an application of a certain provision by analogy, cf Claus-Wilhelm Canaris, *Die Feststellung von Lücken im Gesetz* (Duncker & Humblot 1983) 25; Lloyd L Weinreb, *Legal Reason* (Cambridge University Press 2005) 90 ff; Aleksander Peczenik, *On Law and Reason* (Springer 2009) 321; María José Falcón y Tella, *A Three-dimensional Theory of Law* (Brill Academic 2010) 140. For analogy in international law, see Ulrich Fastenrath, *Lücken im Völkerrecht* (Duncker & Humblot 1991) 134 ff.
33 An analogy requires cases to be somehow similar (cf Fastenrath (n 32) 134 ff; Albert Bleckmann, 'Die Rechtsanalogie im Völkerrecht' AVR 1993, 353; Fernando Lusa Bordin, *The Analogy between States and International Organizations* (Cambridge University Press 2018) 15).
34 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 29 ff) and EP18275174.3 (para 30 ff).
35 cf Peter Heinrich, 'art 62' in Uwe Fitzner, Raimund Lutz and Theo Bodewig, *BeckOK Patentrecht* (16th edn, CH Beck 15 October 2019) para 9 (only natural persons are recognised as inventors in all Member States). See also *Shemtov* (n 10) 11 ff providing an overview. For Germany: Uwe Fitzner, '§ 6' in Fitzner, Lutz and Bodewig (this note) para 17.
36 UKIPO, Decision of 4 December 2019, BL O/741/19, on GB1816909.4 and GB1818161.0.
37 USPTO, Decision of 22 April 2020, In re Application of 16/524,350.

inventors' rights[38] and the functional difference between names given to things (including AI systems) and names given to persons[39] were the two arguments supposed to support the finding that the indication of a machine name does not meet the requirements of Art. 81 and Rule 19(1) EPC.

Regarding the lack of capacity of AI to hold rights associated with inventorship, the Receiving Section referred among others to the right to be mentioned as the inventor (Art. 62 EPC) and the right to be mentioned in the European patent application (Art. 81 EPC).[40] The decision continued by stating that an AI system has at present no right because it has no legal personality.[41] The EPO further asserted that 'AI systems or machines cannot have rights that come from being an inventor, such as the right to be mentioned as the inventor or to be designated as an inventor in the patent application', thereby suggesting that AI lacks inventorship due to their lack of ability to own inventors' rights.[42]

However, inventorship and the capacity to own inventors' rights must not be confused. According to the general opinion, inventorship is a requirement referring to factual conduct and not a legal act.[43] As demonstrated with the exemplary definitions above,[44] depending on the applicable definition, it might mean e.g. performing the creative act of invention[45] or conceiving the inventive idea and its technical teaching.[46] Whether the inventor has the capacity to hold the rights arising from inventorship is a subsequent question which must not be confused with the capacity to become an inventor.

Moreover, the EPO's argument is weak since the office lacks the competency to judge on the issue of legal capacity, which is an issue of national law. The limitation of this reasoning becomes obvious if we imagine one or more contracting states assigning legal capacity to certain AI systems – an idea that was considered by Estonia[47] and is controversially discussed within certain institutions of the European Union.[48] Would the EPO subsequently need to allow the indication of AI as inventor in patent applications from those jurisdictions?

The second unconvincing argument in support of the first ground of the decision concerned the difference between natural persons' names on the one hand and names given to things on the other. According to the EPO, names given to natural persons not only serve the function of identifying them but also form part of their personality and enable them to exercise their rights.[49] The decisions cited various statutory laws of the contracting Member States protecting a natural person's right to a name, such as Sec. 12 of the German Civil Code and Art. 57(2), (4) of the French Civil Code. In comparison, the EPO argued that things have no rights which a name would allow them to exercise;[50] thus, indicating the name of a machine (e.g. DABUS) would not meet the requirements of Rule 19(1) EPC.

This reasoning suggests that the names alone, which are protected by national law, satisfy the requirement of Rule 19(1) EPC. Consequently, if the stated name of the inventor does not fall within the protection of names of this jurisdiction, the applicant would not fulfil the requirements of Art. 81 EPC and Rule 19(1) EPC.

This logic is not convincing. Firstly, the reasoning fails to explain why protection under name rights should determine inventorship in patent law: just because one might infer rights from his or her name does not make him or her a more suitable inventor than a machine under the considerations and objections of a patent system. Secondly, if name rights were decisive for the proper indication of inventorship, the EPO would be required to apply the respective national law while conducting the examination – a task exceeding the boundaries of a pure formality[51] check.

2. Indication of the origin of the right to the European Patent (Arts. 81, 60(1) EPC)

The Receiving Section could have decided to refuse the application on the mere ground that it did not meet the requirements of Art. 81 and Rule 19(1) EPC. Instead, the EPO chose to develop its reasoning by discussing the applicant's argument that he had acquired the right to the European patent from the machine DABUS either as an employer or by succession in title.[52]

Firstly, according to the Receiving Section, AI systems or machines do not have legal personalities and cannot be party to an employment agreement. They are owned, rather than employed.[53] Secondly, the EPO argued against a potential succession in title. The owner of an AI system may, in accordance with national law, own the output of that system, just as the owner of any machine

38 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 26 ff) and EP18275174.3 (para 27 ff).
39 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 22 ff) and EP18275174.3 (para 23 ff).
40 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 26) and EP18275174.3 (para 27).
41 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 27) and EP18275174.3 (para 28).
42 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 27) and EP18275174.3 (para 28).
43 cf Bossung in Beier, Haertel and Schricker (n 11) art 81 para 41 (not requiring capacity to contract); Rudolf Kraßer and Christoph Ann, *Patentrecht* (7th edn, CH Beck 2016) § 19 para 10; Melullis in Benkard (n 9) art 60 para 15. See also from a German patent law perspective Regional Court of Nürnberg-Fürth, GRUR 1968, 252, 254 (Germany); Fitzner (n 35) § 6 para 16 (Germany).
44 See II.
45 J 7/99 no 2.
46 BGH GRUR 2010, 817 para 28 – *Steuervorrichtung*.
47 In 2017, Estonia's national digital adviser, Martin Kaevats, proposed granting legal personality to AI. Today, Estonia seems to be aiming to follow the approach of the European Union.
48 See for example European Parliament, P8_TA(2017)0051, Civil Law Rules on Robotics, European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)), no 59 f) calls on the Commission to explore, analyse and consider the creation of an electronic personality at least for the most sophisticated autonomous robots. This move by the European Parliament prompted several experts to publish an open letter in April 2018 calling upon the Commission to ignore the Parliament's move and reject 'electronic personality'. In the recent white paper on AI by the Commission (COM(2020) 65 final), the issue of electronic personality goes unmentioned.
49 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 22) and EP18275174.3 (para 23).
50 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 22) and EP18275174.3 (para 23).
51 For the nature of this examination as to purely formal requirements, see art 16 EPC. See also J 18/84.
52 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 30 ff) and EP18275174.3 (para 31 ff).
53 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 31) and EP18275174.3 (para 32).

may own the output of that machine.[54] However, in the EPO's view, the question of ownership of an output must be distinguished from the question of inventorship and from the rights connected therewith.[55] In conclusion, the indications by the applicant would not meet the requirements of Art. 81 and Art. 60(1) EPC.

Given the fact that the Receiving Section had stated earlier in its decision that AI systems lack legal personality, it is not surprising that it denied the existence of an employment relationship with the AI system or its succession in title. Without legal capacity, a machine cannot join a contractual relationship or assign rights.[56] However, one might argue *a fortiori* that the owner of a machine must have the same rights as the employer of a person – an argument which would not require the AI to have legal capacity.

Moreover, as mentioned earlier, the reference to the concept of legal personhood is dubious since the EPO needs to apply national laws for such an assessment. Most importantly, in the context of Art. 60(1) EPC, the law provides for a legal fiction[57] in Art. 60(3) EPC when it stipulates that the applicant shall be deemed to be entitled to exercise the right to a European patent in proceedings before the EPO. Its existence calls into question the competency of the Receiving Section to analyse whether and how the applicant could be entitled to the right to the European patent (Art. 60(1) EPC) and whether his indication (Art. 81 and Art. 60(1) EPC) was sufficient. The legal fiction intends to relieve the EPO of the need to investigate the validity of any substantive entitlement by considering the applicant as being procedurally entitled to file for a patent.[58] Given Art. 60(3) EPC, according to the Enlarged Board of Appeal, the EPO has no power to determine a dispute as to whether or not a particular applicant is legally entitled to apply for and be granted a European patent in respect of the subject-matter of a particular application.[59] The substantive entitlement defined in Art. 60(1) and (2) EPC is therefore irrelevant for the patent application and the grant procedure; only the formal status as the submitter of the patent application is decisive.[60] In fact, there are two safeguards in place for cases where the applicant was not the person substantively entitled to the right of the European patent:[61] Art. 61 EPC ('European patent applications filed by non-entitled persons') and Art. 138(1)(e) EPC ('grounds for revocation').[62]

Even if one wanted to distinguish between the procedural right stipulated by Art. 60(3) EPC and the mere statement indicating the origin of the right to the European patent required in Art. 81, Rule 19(1) EPC, the notion of Art. 60(3) EPC must apply to the mere statement *a fortiori*. The 'facilitating function'[63] of Art. 60(3) EPC within the examination procedure would be overcome if the Receiving Section were to analyse whether the content of the statement corresponds to the true legal situation. Such analysis would require an application of national law, something the drafters of the EPC wanted to avoid by creating Art. 60(3) EPC.[64] The preparatory documents mention explicitly that the EPO cannot examine the question of the validity of the assignment or the problem of the applicant's entitlement in general based on the various laws of the individual States.[65] The complexity of such an analysis would be way above a pure formality check and exceed the competency of the Receiving Section.[66] Thus, the Receiving Section must only analyse whether the indication of the origin fulfils the formal requirements of the EPC (see Rule 57 EPC), i.e. whether an inventor has been indicated in the application. It can only verify that an indication was made, not the accuracy of the information given.[67] Therefore, analysing how the applicant could have been entitled with the substantive right to the European patent in the DABUS case was not consistent with the notion of Art. 60(3) EPC.

3. Substantive patentability and the right of the public

The applicant argued that if the EPO does not accept AI systems as inventors, it would exclude inventions made by AI from patentability in violation of Arts. 52 to 57 EPC and Art. 27 TRIPS.[68] Both treaties require patents to be granted for inventions ('shall') without specifying (or discriminating against) a certain type of inventor.

The Receiving Section defended its decision and the finding of both deficiencies by arguing that the assessment of the formal requirement of the designation of the inventor takes place prior to and independently from the substantive examination and makes no statement as to whether the subject-matter of that application meets the respective requirements.[69] The Receiving Section emphasised a valid point: Arts. 52 to 57 EPC as well as Art. 27

54 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 32) and EP18275174.3 (para 33).
55 EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 32) and EP18275174.3 (para 33).
56 cf Shemtov (n 10) 25 (arguing that AI systems cannot be employed without legal personhood).
57 J2/01, sub 2.5.1 ('legal fiction contained in Article 60(3) EPC'); Suominen (n 10) art 60(3) no 1 ('by way of legal fiction'); Melullis in Benkard (n 9) art 60 para 36 ('Fiktion'); Bremi and Stauder in Singer, Stauder and Luginbühl (n 9) art 60 para 19 ('Fiktion').
58 Cronauer (n 9) 43 ff; Suominen in Visser and others (n 10) art 60(3) no 1; Melullis in Benkard (n 9) art 60 para 36.
59 G 3/92, no 3. See also nJ 2/01, no 2.6 (stating that G 3/92 clearly held that the EPO not only does not need to but has no power to investigate questions of entitlement).
60 Melullis in Benkard (n 9) art 60 para 36. See also Bremi and Stauder (n 9) art 60 para 19 (stating that the fiction prevails even in the case of doubt).
61 The EPC acknowledges that such a case may happen (see G 3/92, sub 2.; Cronauer (n 9) 45; Suominen in Visser and others (n 10) art 60(3) no 1).
62 cf Cronauer (n 9) 45 ff.
63 Cronauer (n 9) 43 ('Entlastungsfunktion der Anmeldervermutung nach Art. 60 Abs. 3 EPÜ').
64 M/PR/I, no 234, 236, 247. See also Cronauer (n 9) 43 with further references. The Scandinavian delegations had proposed an amendment requiring the patent applicant to prove his entitlement in case he is not the inventor (M/PR/I, no 227, 246). This proposal was rejected since the EPO would have had to apply various laws of the individual States in order to determine whether the documents submitted were legally valid and established the assignment (M/PR/I, no 247). See also the short summary of the proposal in Bossung in Beier, Haertel and Schricker (n 11) art 81 para 26 ff or van Empel (n 10) no 196.
65 See in particular M/PR/I, nos 234, 236, 247.
66 cf Melullis in Benkard (n 9) art 60 para 36. (explaining that the proceedings were not designed for such an analysis).
67 r 19(2) EPC. Given the title of art 81 EPC, the 'designation of the inventor' in the sense of r 19(2) EPC includes the 'statement indicating the origin of the right to the European patent' (cf M/PR/I, no 284). See also Guidelines for Examination A. III. 5.3 and Thomas Cimniak, 'art 81' in Fitzner, Lutz and Bodewig (n 35) para 16.
68 cf EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 35) and EP18275174.3 (para 36).
69 cf. EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 36) and EP18275174.3 (para 37).

TRIPS are intended to address the substantive patentability requirements but not formal prerequisites.

Furthermore, the applicant had argued that refusing the designation of AI as inventor would be to the detriment of the public. Such a practice would be used to conceal the true identity of the inventor in cases where the subject-matter of the application was generated without human intervention, in violation of the right of the public to know who the actual inventor is.[70] In response, the Receiving Section argued that the legal framework of the EPC satisfies the aim of providing to the public information about the inventors (citing Art. 62 EPC, Rule 20(2) EPC), but the EPO does not verify the origin of the subject-matter claimed in a patent application (cf. Rule 19 (2) EPC).[71] The drafters of the EPC had decided that it is for the public to challenge wrongful designations in front of national courts, which may result in rectification of the initial designation and publication of a corrected version by the EPO (Rule 20(2) EPC, Rule 21 EPC).[72]

Although the Receiving Section was right in rejecting the applicant's argument, the EPO's reasoning is misleading. Emphasising that the Patent Office does not verify the designated inventorship while refusing AI as inventor creates incentives to indicate a human being's name in cases where the invention was developed without human intervention, thus misleading the public. In cases of machine-generated inventions, neither the AI-inventor nor a third-party natural person could challenge the indication of a non-contributing human being as inventor.[73] The EPO should have rather argued that Art. 62 EPC and Rule 20(2) EPC do not serve any right for the public to know who the actual inventor is: Article 62, as its title indicates, merely concerns the right *of the inventor* to be mentioned. The same is true for Art. 4ter of the Paris Convention, which Art. 62 EPC implements. Those provisions do not mention a right of the public. If there is no human inventor, nobody is entitled to this right and it is not necessary to change the published indication of inventorship for the benefit of the public. It is up to the true inventor to exercise his right.

4. Consequences of both deficiencies

Rule 90(5) EPC stipulates that the EPO has to refuse an application if the applicant fails to correct deficiencies. Since the EPO considered that the indication of a machine's name as inventor did not amount to the proper designation of an inventor (see above sub IV. 1.), the application was deficient according to Art. 90(3) and (5), Art. 81 EPC, Rule 19(1) EPC. Moreover, the Receiving Section saw additional deficiencies based on the second ground, i.e. the indication of the origin of the right to the patent in the designation of the inventor (see above sub IV. 2.). Despite the existence of Art. 60(3) EPC, the EPO did not consider the indication of a succession in title or by employment from the AI system as a proper indication in the sense of Art. 81 and Art. 60(1) EPC. Thus, the EPO refused the applications on both grounds.[74]

V. Key takeaways

1. Paradigm of human inventorship

The wording of the European Patent Convention and its Implementing Regulations does not contain an explicit commitment to human inventorship.[75] However, based on textual, historical and comparative considerations, a paradigm of human inventorship underlies the European patent system. This conclusion of the EPO's Receiving Section is consistent with the leading opinions in literature.[76]

The paradigm becomes apparent within the application of Art. 81 EPC. According to the EPO, both formal requirements – i.e. the requirement of designation of the inventor (Art. 81, Rule 19(1) EPC) and the requirement to indicate the origin of the right to the European patent (Art. 81, 60(1) EPC) – give reason to refuse an application designating a machine as inventor. Given the legal fiction of entitlement enshrined in Art. 60(3) EPC, the EPO was wrong in refusing the application based on an allegedly defective indication of origin. However, the first ground of refusal based on the defective designation of inventor (Art. 81, Rule 19(1) EPC), on which the EPO elaborated in detail, provides sufficient basis for the decisions and offers no hope of success to the appellant in the current appeal proceedings. Particularly the terms 'family name, given names' (Rule 19(1) EPC) leave no doubt about the necessity to provide a human name as the inventor within the European patent framework. Thus, the EPO had no reason to support its first ground with further textual arguments, which suggest the requirement of a (natural) person as inventor, e.g. Art. 56 EPC ('person skilled in the art') or Art. 60(2) EPC ('two or more persons have made an invention').

2. Partial predetermination of the term 'inventor' by the European patent regime (requirement of a natural person)

The EPO did not mention the debate within the patent community regarding whether the term 'inventor' must be applied autonomously within the European patent system or whether the EPC and its Implementing Regulations have left it to be interpreted as a matter of

70 cf. EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 38) and EP18275174.3 (para 39).
71 cf. EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 39) and EP18275174.3 (para 40).
72 cf. EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 39) and EP18275174.3 (para 40).
73 The AI system itself will not be able to execute the rights provided in art 61 EPC given its lack of legal personhood according to the present law. Theoretically, third parties could challenge the patent within nullity proceedings according to art 138(1)(e) EPC. However, in the absence of a relevant provision in the EPC, it is left to the national legislator to determine whether the ground for invalidity in art 138(1) (e) EPC can be invoked by any person or only by the true inventor. Various national laws decide for the latter, cf art II § 6 para 3 IntPatÜG for Germany (see Scharen in Benkard (n 9) art 138 para 19 with more examples of respective national laws).
74 Since the applicant had clearly stated that he wishes the AI system to be designated as inventor, the Receiving Section decided to issue a decision in the oral proceedings, even though the time limit under r 60(1) EPC had not expired (EPO, Grounds for decisions of 27 January 2020 on EP18275163.6 (para 40ff) and EP18275174.3 (para 41 ff)).
75 See in comparison art 7(1) of the Russian Patent Act requiring a natural person.
76 cf Shemtov (n 10) 33; Roman Konertz and Raoul Schönhof, 'Erfindungen durch Computer und künstliche Itelligenz – eine aktuelle Herausforderung für das Patentrecht?' ZGE 2018, 379, 401; Joel Nägerl, Benedikt Neuburger and Frank Steinbach, 'Künstliche Intelligenz: Paradigmenwechsel im Patentsystem' GRUR 2019, 336, 340; Stefan Papastefanou, 'KI-gestützte Schöpfungsprozesse im geistigen Eigentum' WRP 2020, 290, 293.

national law.[77] However, the DABUS decisions indicate that the EPO understands certain parts of the term inventorship as autonomous concepts of the European framework. This partial predetermination of the required nature – a human inventor – is convincing, particularly in the light of Rule 19(1) EPC. National courts applying the EPC regime will have no leeway in this regard while deciding on the concept of inventorship (cf. Rule 20(2) EPC).

The (at least partial) predetermination of inventorship by the European patent regime is not new to us. The drafters of the EPC agreed that the term 'inventor' does not refer to legal persons,[78] a notion that can be found in Rule 19(1) EPC as well.

Overall, given that the European framework neither acknowledges machines nor legal persons as inventors, the concept of inventorship is EPC-autonomous insofar as it requires a natural person to establish inventorship. Even though, until DABUS, the European Patent Organisation did not have to deal with the designation of inventorship to a machine, the requirement of a natural person to qualify as inventor had been well established beforehand.[79] The recent decisions of the EPO only confirm this requirement with regard to the case of the claimed inventorship of a machine.

The partial predetermination of the term 'inventor' by the European regime provides grist to the mill of the proponents of a general autonomous interpretation. From a dogmatic perspective, it seems dubious why there should be any residual leeway for a national interpretation, although representatives of the EPO stated recently that the EPC would leave the interpretation primarily to national courts.[80] The reason to leave the primary competency to the national courts might rather be a practical one: given Art. 60(3), Art. 61, Rule 20(2) EPC, the European Patent Organisation appears to lack the opportunity to decide on the term 'inventor' beyond the requirements and suggestions of Rule 19(1) EPC.

3. The need to revise the present law

Within patent literature, there is a lively and important discussion about whether present AI systems can generate patentable inventions.[81] The EPO did not have to examine whether DABUS actually invented or if a human inventor used DABUS as a tool. The designation of AI as inventor already causes the refusal of such patent applications. As mentioned, it seems highly unlikely that the Board of Appeal will change this outcome. In consequence, the claimed subject-matter will lack patent protection. Considering the positive effects of more-and-more autonomous AI systems on various industries and the technological progress within society as a whole,[82] this consequence gives us food for thought and establishes a need for further reflection.

The importance of further analysis *de lege ferenda* is underpinned by the Hearing Officer of the UKIPO, who decided on the parallel DABUS cases in the UK. He found that the present UK system does not cater for AI-generated inventions either, but he continued to emphasise the legitimacy of the debate on AI inventorship and welcomed considerations to change the law on such inventions instead of having them 'shoehorned arbitrarily into existing legislation'[83] – a quite remarkable statement for a major patent office. This finding is backed by the present calls of CIPA, the Chartered Institute of Patent Attorneys in the UK, to provide more clarity after proper investigations, including discussions with stakeholders such as industry, policy-makers and legislators.[84] Indeed, the current approach of the European patent system might squeeze today's innovation processes into the old-fashioned paradigms of yesterday's patent system. Therefore, further studies and discussions on the capacity of AI to invent as well as on the pros and cons of AI inventorship are more than welcome.

77 See above sub B.

78 Discussed for instance at IV74860/61-F, 18 and M/PR/I, no 286 ff; the restraint of company inventorship might also follow art 4[ter] Paris Convention, which was introduced during the Revision Conference of London in 1934. Beforehand, various contracting states acknowledged inventorship of a company, eg the German patent law until 1936. For the general opinion (no company inventorship within the current framework of the EPC), see J 7/99, no 2; Cronauer (n 9) 96 ff; Bossung in Beier, Haertel and Schricker (n 11) art 81 para 42; Melullis in Benkard (n 9) art 60 para 14; Thomas Heinz Meitinger, 'Erfinderlose Erfindungen durch Know-how einer Organisation und Erfinderprinzip: kein Widerspruch' Mitt. 2017, 149, 151 (however, proposing to accept legal persons as coinventors). Arguing that the EPC system would provide leeway for 'factory inventions': van Empel (n 10) no 195.

79 For this understanding see J 7/99 no 2; Cronauer (n 9) 99 ff; Bossung in Beier, Haertel and Schricker (n 11) art 81 para 42; Bremi and Stauder in Singer, Stauder and Luginbühl (n 9) art 60 para 4; Melullis in Benkard (n 9) art 60 para 14.

80 Ménière and Pihlajamaa (n 10) 332, 335.

81 Exemplary for the discussion, see on the one hand: Ryan Abbott, 'I Think, Therefore I Invent: Creative Computers and the Future of Patent Law' (2016) 57 B.C. L. Rev. 1079, 1079 ff (stating that AI has been generating inventive output for decades); Shlomit Yanisky Ravid and Xiaoqiong Liu, 'When Artificial Intelligence Systems Produce Inventions: An Alternative Model for Patent Law at the 3A Era' (2018) 39 Cardozo L. Rev. 2215, 2219 (stating that AI systems create a wide range of innovative, new and non-obvious products and services which might be patentable if created by humans). On the other hand, see Ménière and Pihlajamaa (n 10) 332, 335 (stating that some participants in the discussion on AI-generated inventions might overestimate the creative capacities of AI); Daria Kim, ''AI Generated Inventions': Time to Get the Record Straight?' GRUR Int 2020, 443 (arguing that current patent literature overestimates the autonomy of AI systems).

82 For the potential impact of AI on innovation, see for example Ian M Cockburn, Rebecca Henderson and Scott Stern, 'The Impact of Artificial Intelligence on Innovation: An Exploratory Analysis' in Ajay K Agrawal, Joshua Gans and Avi Goldfarb (eds), *The Economics of Artificial Intelligence* (University of Chicago Press 2019) 115 ff.

83 UKIPO, Decision of 4 December 2019, BL O/741/19, on GB1816909.4 and GB1818161.0, para 29.

84 See CIPA, 'Patenting Inventions created using an AI system, A CIPA Discussion Paper' <https://www.cipa.org.uk/_resources/assets/attachment/full/0/260456.pdf> accessed 27 June 2020.