Institution: University of Surrey

Unit of Assessment: 18 Law

Title of case study: Patenting AI-Generated Inventions

Period when the underpinning research was undertaken: 2016 – 2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Ryan Abbott	Professor of Law and Health Sciences	June 2016 – Present

Period when the claimed impact occurred: June 2016 – December 2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact (indicative maximum 100 words)

The law assumes that only human inventions are patentable. It seems, therefore, that AI-generated inventions can be denied patent protection. Abbott's research has had legal, regulatory, industrial, and societal impacts in exposing this gap in the protection of innovation, and in identifying the optimal ways to fill it. Notably, the first patent applications for AI-generated inventions have become a reality because of his academic work. The ensuing test-cases have resulted in policies formed in the UK, EU, and US, and laws being changed. His academic work influences government/industry/patent offices' approaches to AI invention and, via leading media, routinely affects critical debate among public audiences and industry stakeholders.

2. Underpinning research (indicative maximum 500 words)

Background: Across jurisdictions, patents can be granted only if an 'inventor' is named in the application. If the correct view is that this 'inventor' must be human a significant problem for industry arises: whereas a company can apply for and hold patents for inventions created by humans (e.g., its employees), no such protection is available for its AI-generated inventions. Abbott's research is among the first to scrutinise this problem. The associated outputs, produced from 2016-present, are sole-authored, and appear across a range of outlets, including leading university presses and law reviews (e.g., MIT, CUP, and *UCLA Law Review*) and internationally significant professional and industry publications (e.g., *Landslide*, *Mitteilungen*, *Intellectual Property Watch*). While scholarship in intellectual property law is often characterised by sophisticated doctrinal analysis, Abbott also exposes the complex issues to rigorous theoretical scrutiny, bringing his findings to bear on the very practical regulatory domain of patent law. His work crosses disciplines, adapting methods and incorporating insights from the fields of AI, medicine, law, and philosophy.

Key Research Insights: Rapid technological development has allowed AI-generated invention to proliferate. The question, whether and how to protect innovation where a natural person does not qualify as an inventor, has thus become increasingly pressing. Abbott argues that, even under current patent law, AI should qualify as an inventor when it does the work of an inventor, and that the AI's owner (a company or individual) should be able to apply for and hold the patent. He identifies a number of economic, societal, legal, and individual justifications for this approach, including: (a) incentivising the use and development of inventive machines ultimately to facilitate innovation; (b) promoting the disclosure of inventive AI output that might otherwise be protected

as confidential information; (c) advancing the commercialisation of new technologies such as AI-designed pharmaceutical drugs; (d) preserving the integrity of 'human inventorship' which may be undermined if people claim credit for work they have not performed (e.g., an AI-generated invention).

Outline of Underpinning Research: Abbott's first work on AI-generated invention analyses AI inventorship and Big Data in a book chapter with MIT Press **[R1].** The *Boston College Law Review* article that follows considers the specific implications for patent law of AI inventorship **[R2].** Abbott's book chapter, pre-published in 2017 by Edward Elgar, discusses how to protect computer-generated works in the UK specifically **[R3]**. A second journal article (*UCLA Law Review*) explores how patent law standards must be adapted to the widespread use of inventive machines **[R4].** Abbott has several smaller articles on this subject, including in WIPO Magazine **[R5]** (officially translated into eight languages) and in Popular Science Arabia (in Arabic). His academic work is crystalised in the CUP monograph -- *The Reasonable Robot: Artificial Intelligence and the Law* -- which addresses AI law generally with substantial portions dedicated to AI-generated inventions **[R6]**. Abbott has disseminated his research at a substantial number of conferences, including at Oxford, Cambridge, King's College London, Stanford, and MIT.

3. References to the research (indicative maximum of six references)

[R1] Abbott, Ryan, 'Hal the Inventor: Big Data and its Use by Artificial Intelligence' in *Big Data is Not a Monolith*, MIT Press (Hamid Ekbia, et al., eds.) (2016). ISBN 9780262035057

The chapter was subject to the publisher's usual rigorous processes of peer-review.

[R2] Abbott, Ryan, *I Think, Therefore I Invent: Creative Computers and the Future of Patent Law*, 57 B.C. L. Rev. 1079 (2016).
https://heinonline.org/HOL/Page?handle=hein.journals/bclr57&div=35&g_sent=1&casa_token=&collection=journals

The paper, in a top-tier US law journal, was favourably received beyond its initial base, being adapted for republication in *Landslide* (the intellectual property magazine for the American Bar Association) as well as *Mitteilungen* (the leading journal for German patent attorneys). It has become an important reference point, cited over 130 times to date.

[R3] Abbott, Ryan, 'Artificial Intelligence, Big Data and Intellectual Property: Protecting Computer-Generated Works in the United Kingdom' in (Tanya Aplin, ed.) *Research Handbook on Intellectual Property and Digital Technologies* (Edward Elgar, 2020). ISBN: 978 1 78536 833 2

The chapter was peer-reviewed via the publisher's usual procedures.

[R4] Abbott, Ryan, *Everything is Obvious*, 66 UCLA. L. Rev. 2 (2019).
https://heinonline.org/HOL/Page?handle=hein.journals/uclalr66&div=5&g_sent=1&casa_token=&collection=journals

This article, in one of the most highly regarded US law journals, has already become an important reference point, republished in a CUP handbook, in *Landslide*, in *Mitteilungen*, and by *Intellectual Property Watch*.

[R5] Abbott, Ryan, *The Artificial Inventor Project*, WIPO Magazine (2019).
https://www.wipo.int/wipo_magazine/en/2019/06/article_0002.html

[R6] Abbott, Ryan, *The Reasonable Robot: Artificial Intelligence and the Law*, Cambridge University Press (2020). DOI: 10.1017/9781108631761

The book has been positively reviewed within academia and beyond: Peer Zumbansen, founding director, Transnational Law Institute, King's College London concluded: 'Professor

Abbott's book offers a captivating analysis of the legal challenges that arise from the breathtaking proliferation of artificial intelligence in numerous areas of life, commercial relations and governmental decision-making <…>. In trying to understand the legal conundrum posed by robots' astonishing ascendance, this book is an excellent guide.'

4. Details of the impact (indicative maximum 750 words)

1. The first AI-generated patent applications (industry beneficiaries)

Based on Abbott's publications, an international legal team submitted the first two patent applications for AI-generated inventions. An AI machine, 'DABUS,' was responsible for both, one consisting of a flashing light that uniquely draws the eye in emergency situations, the other a container (to hold beverages for example) with a profile of pits and bulges that enables multiple containers to be coupled, while also improving grip and heat transfer. These applications directly advocate for legal positions advanced by Abbott's published works and his research is identified as a driving force behind the filings **[S1, S2].** The two patent applications are pending consideration or are under appeal in the UK, European Patent Office, US, Canada, Australia, Germany, Israel, Taiwan, China, Korea, India, and Japan.

2. Policy developments and case-law (regulatory, and industrial benefits internationally)

Abbott's research and direct contribution to the applications has (a) caused regulatory bodies to produce clear policies determining that AI-generated inventions are not currently patentable; (b) enabled these bodies to identify the need for new laws and policies to reflect the reality of AI-generated invention; (c) led to judicial appeals across jurisdictions, and (d) prompted international action and co-operation in the area.

(a) The UK Intellectual Property Office (UKIPO) and the European Patent Office (EPO) agreed that DABUS's inventions were sufficiently unique to be patented but both denied the applications, on the basis that only natural persons can be inventors. As a result, the law in the field is now that AI-inventions are not patentable, unless the decisions are overturned **[S3, S4].** These new legal rulings help provide certainty to businesses struggling to determine how to protect the results of AI-based innovation. Siemens, for example, reported in 2019 that they had instances of AI-generated inventions and have not been able to apply for patent protection because they could not identify a human inventor. (See, **[R6]** above, p.10)

(b) In rejecting the applications, a UKIPO official took the unusual step of noting the importance of this topic and the need for change that arises: "As the applicant says, inventions created by AI machines are likely to become more prevalent in future and there is a legitimate question as to how or whether the patent system should handle such inventions. I have found that the present system does not cater for such inventions and it was never anticipated that it would, but times have changed and technology has moved on. It is right that this is debated more widely and that any changes to the law be considered in the context of such a debate, and not shoehorned arbitrarily into existing legislation." **[S3].** There is **specific reference to the DABUS applications in informing questions 2-6 of the UKIPO September 2020 Artificial Intelligence Call for Views: Patents**. **[S9]**

(c) The UKIPO, EPO, as well as US Patent and Trademark Office, rejections are being appealed. Abbott's work is instrumental in guiding preparations for the appeals **[S1]**. An appeal from the UKIPO decision was rejected by the High Court and a right to appeal that decision was granted by the Court of Appeal on 4th December 2020 because, "[t]he principle at stake is an important one." (Rt. Hon. Lord Justice Floyd)

(d) *Consultations*: Abbott's research has helped prompt international recognition of the need to address protection for AI-generated inventions. UKIPO **[S9]**, USPTO **[S7]** and WIPO launched public requests for consultation to develop new policies on AI-generated

inventions following the DABUS applications. These public consultations are another tangible effect of the impact that Abbott's research is having through the DABUS litigation.

(e) *Shaping policy recommendations*: Additionally, Abbott's research has had specific impact in shaping policy recommendations issued by international patent law institutions. This further impact is evidenced in (1) a White Paper **for the World Economic Forum which heavily cites his publications [S5];** (2) his membership of the European Commission Expert Working Group on New Technologies Formation; (3) **the frequent citation of his academic work (13 times) in the September 2020 European Commission Final Report on 'Trends and Developments in Artificial Intelligence' [S6];** (4) citation of his work in the October 2020 USPTO Report on Public Views on Artificial Intelligence and Intellectual Property Policy **[S7]**; (5) reference to his academic work by think tanks including the Information Technology and Innovation Foundation (ITIF) **[S8].**

3. Shaping the debate (societal, industrial, economic and governmental beneficiaries)

Abbott's expertise is sought after, and his insights are directing debate in the field. Lord Justice Kitchin (UK Supreme Court) noted in a UKIPO / WIPO-sponsored keynote address that "Professor Ryan Abbott points out in one of his many interesting papers in this area that [AI-generated invention] has been a reality for some time <…>" **[S10]**. He has been invited to present his work at industry events such as the annual meetings of the American Chemical Society, UK Bioindustry Association, and the International Association for the Protection of Intellectual Property, and to give advice directly to businesses seeking to apply AI to innovation (including to IBM, Novartis, and Warner Music). The patent applications, and Abbott's involvement, received extensive press coverage, bringing the debate to a public audience, with the filings being first published by the *Financial Times* **[S11]**. Subsequent stories on the cases appeared in prominent media including the BBC, and *Wall Street Journal* **[S12]**. *Managing IP Magazine*, lists Abbott as one of the 50 most influential people in IP in 2019. The magazine writes, "Ryan Abbott is a leading academic specialising in law and technology, IP and life sciences. His work on artificial intelligence (AI) and IP has contributed to the international dialogue on how new technologies are challenging existing legal standards." **[S13].**

5. Sources to corroborate the impact (indicative maximum of 10 references)

[S1] Letter from Williams Powell, signed by Robert Jehan (PDF)

[S2] Research on AI & IP underlying The Artificial Inventor project www.artificialinventor.com/resources/

[S3] Patent decision O/741/19. https://www.ipo.gov.uk/p-challenge-decision-results/p-challenge-decision-results-bl.htm?BL_Number=o%2F741%2F19&submit=Go+%BB

[S4] EPO publishes grounds for its decision to refuse two patent applications naming a machine as inventor. https://www.epo.org/news-issues/news/2020/20200128.html

[S5] Artificial Intelligence Collides with Patent Law, World Economic Forum White Paper, April 2018. http://www3.weforum.org/docs/WEF_48540_WP_End_of_Innovation_Protecting_Patent_Law.pdf (PDF)

[S6] European Commission Final Report: 'Trends and Developments in Artificial Intelligence' (September 2020) Trends and Developments in Artificial Intelligence - Challenges to the Intellectual Property Rights Framework | Shaping Europe's digital future (europa.eu)

[S7] USPTO Report on Public Views on Artificial Intelligence and Intellectual Property Policy (October 2020) https://www.uspto.gov/sites/default/files/documents/USPTO_AI-Report_2020-10-07.pdf (PDF)

[S8] Comments to the U.S. Patent and Trademark Office on the Impact of Artificial Intelligence on Intellectual Property Law and Policy. http://www2.itif.org/2020-ustpo-ip-ai.pdf?_ga=2.191185002.1962171925.1580584728-1790900925.1580584728 (PDF)

[S9] Artificial intelligence call for views: patents - GOV.UK (www.gov.uk)

[S10] Lord Kitchin, Justice of the Supreme Court's keynote Speech at UKIPO-WIPO Conference, (June 18, 2019) https://www.supremecourt.uk/docs/speech-190618.pdf. (PDF)

[S11] COULTER, Martin. 'Patent agencies challenged to accept AI inventor' (Financial Times, Aug 01 2019). (PDF)

[S12] COUNCIL, Jared. 'Can an AI System Be Given a Patent?' (The Wall Street Journal, Oct 11 2019). (PDF)

[S13] 50 Most Influential People in IP 2019: Notable Individuals. https://www.managingip.com/Article/3907240/50-most-influential-people-in-IP-2019-notable-individuals.html (PDF)