3D PRINTING THE FUTURE

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3D Printing the Future:
The Intellectual Property Implications Of 3D Printing, 3D Scanning And Customisation

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Introduction

In recent times, there has been a flurry of policy documents identifying the significance of 3D printing, 3D scanning and mass customisation and its implications for intellectual property rights (IPRs). In May 2017, the European Commission published a reflection paper on 'harnessing globalisation' stating that 3D printing, amongst other emerging technologies, 'will revolutionise how we produce, work, move and consume'.

[1] In September 2017, a publication titled, *The Next Production Revolution: Implications for Governments and Businesses*[2], emphasised that 'long-term thinking is essential' for technologies such as 3D printing. The report went on to say that 'in addition to addressing short-term challenges, leaders in business, education, unions and government must be ready to frame policies' and reflect on 'how policy priorities may need to evolve, in fields as diverse as the intellectual property system, competition and trade policies, and the distributional implications of future production'. [3] Most recently, on 23 November 2017, the European Parliament, published a Working Document titled *Three-Dimensional Printing, a Challenge in the fields of Intellectual Property Rights and Civil Liability*. [4] The publication highlighted that the European Commission 'has made 3D printing one of the priority areas of

technology'.[5] As such, 3D printing, presents various challenges[6]; amongst these challenges to IPRs stand out as an area that needs immediate attention.

A number of academic commentators and practitioners[7] have examined the implications for IPRs as a result of the recent proliferation of 3D printing; however, the need for robust policy continues, as identified by the European Parliament and Commission. This briefing note aims to capture the essence of some of the issues affecting intellectual property laws in its application to this new technology. Prior to the discussion, the briefing note sets out a brief introduction to additive manufacturing or 3D printing as it is commonly known.

From Additive Manufacturing to 3D Printing and the Maker Movement

3D printing or additive manufacturing refers to the process of creating a product by adding material layer-by-layer. This direct approach to part production was initially termed 'rapid manufacturing'. However, it failed to gain popularity and the *American Society for Testing and Materials* adopted the term 'additive manufacturing'[8] (AM), which in recent years has been referred to as 3D printing – a term which is widely used by the media and general public[9]. The process is particularly powerful as it can produce products of almost any shape or level of intricacy, and is not restrained by the limitations of other more traditional manufacturing techniques.

The patent for the world's first commercial additive manufacturing (AM) or 3D printing machine was granted in 1988 to Charles Hull of 3D Systems.[10] Since then, the field of 3D printing has matured – with further commercial development, and industrial application. In 2005, Neil Gershenfeld considered the emergence of fabspaces, makerspaces, and innovation centres[11] and predicted that 'personal fabrication will bring the programming of the digital

worlds we've invented to the physical world we inhabit.'[12] With the expiry of key foundational patents, Gernshenfeld's prediction has become a reality, especially in light of the emergence of the 'do-it-yourself' maker movement'.[13]

Online Platforms, CAD Design Files and 3D Scanning

The increase in the number of online platforms dedicated to sharing 3D printing design files has implications for IP laws. Intermediaries operating online platforms facilitate the sharing of CAD design files, which are sometimes in breach of IP laws. This also raises the question of enforcement. A 2016 report points out that the two main areas for enforcement against unauthorised 3D printing are in fact "the end-user and the intermediaries involved in facilitating the download and eventual reproduction by the end-user".[14] However, the report goes on to recognise the fact that it can be challenging and costly to enforce rights against end-users, due to the decentralised nature of the activity. As such, the report suggests that "pursuing intermediaries, particularly online hosting sites, may provide a more streamlined enforcement option for rights holders",[15] through the mechanism of injunctions although there are not yet any examples of such injunctions being granted in respect of 3D printing

There is also the question of the copyright status of CAD design files. The functioning of a 3D printer depends on it being 'fed' a well-designed electronic design file, which, for example, could be a Computer-Aided Design (CAD) file, that tells it where to place the raw material. In fact, 'a 3D printer without an attached computer and a good design file is as useless as an iPod without music'[16]. Therefore, the importance of a good object design file or CAD file cannot be underestimated in the 3D printing context. Given a good input (in the form of a CAD design file), a 3D printer can manufacture an unlimited number of copies of the product, which clearly has implications for IPRs. As such, the importance of a CAD design file cannot be underestimated

and raises two important points: (1) Is a CAD file the kind of work (whether artistic or literary) that can attract copyright protection? and (2) if a CAD file can attract copyright protection, what kind of acts of use or reproduction/copying of a file would constitute infringement? These questions have raised more questions than answers,[17] particularly in the realm of mass customisation.

A third issue arises in relation to 3D scanning, which allows for the use and re-use of physical objects. The ability to modify scanned files by using online tools such as *Meshmixer, MakerBotDigitizer* amongst others has the potential to infringe copyright (through scanning) whilst at the same time create a new copyright by applying creative choices, such as the "intellectual creation of the author reflecting his personality and expressing his free and creative choice" [18] in its production. The question of originality in a scanned or potentially reconstructed object was explored in a UK-funded legal and empirical project led by the present author, titled *'Going for Gold: 3D Scanning, 3D Printing and Mass Customisation of Ancient and Modern Jewellery'*.[19] The project outlined the challenges which copyright laws face in light of 3D scanning within museums. In particular, the lack of guidelines for 3D scanning or 3D printing amongst the national, regional or local museums, was revealing.

3D Printing and Mass Customisation

The ability to customise physical objects is one of the many advantages of 3D printing[20]. The widespread use of web-based software tools, as mentioned above, has meant that users have the opportunity to modify/customise products challenging IP issues such as 'authorship' and 'ownership'. This is particularly relevant to the customisation of jewellery, accessories, headwear

and shoes, for example, which in turn has opened up the marketplace for mass-customisation[21]. Whilst the concept of mass customisation appears attractive providing freedom of design to consumers, it raises questions of 'authorship' and 'ownership'[22]. This issue which has also been recognised by the European Parliament, highlights the importance attached to a design document, which raises "the possibility of customising an object" and with it, "raises concerns for intellectual property (and civil liability)".[23]

Conclusion

In looking to the future, the question that needs answering is whether 3D printing poses an immediate threat to IP laws. A Commissioned Study for the UK Intellectual Property Office (UKIPO) in 2015 concluded that the immediate risks are minimal – at least for the next decade – and as such there is no urgency to legislate on 3D printing at present[24]. With that said, the research findings indicate that interest and activity is growing exponentially every year[25] with IP laws continually being challenged. The issue of 3D printing and 3D scanning will become more acute, as the technology improves and the printers are able to reproduce perfect substitutes of the original design. Therefore, whilst time is on the side of the legislator, it will be prudent to consider how policy should be shaped in this area in looking ahead to the future.

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[1] European Commission, *Reflection Paper on Harnessing Globalisation* (10 May 2017), COM (2017) 240 final at http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2017%3A240%3AFIN

[2] OECD, *The Next Production Revolution: Implications for Governments and Businesses* (September 2017) https://www.keepeek.com//Digital-Asset-Management/oecd/science-and-technology/the-next-production-revolution_9789264271036-en#page19

[3] *Ibid.,* at p. 19.

[4] European Parliament, (Committee on Legal Affairs) *Working Document: Three-Dimensional Printing, a Challenge in the fields of Intellectual Property Rights and Civil Liability* (23 November 2017) at http://www.europarl.europa.eu/sides/getDoc.do?type=COMPARL&reference=PE-612.302&format=PDF&language=EN&secondRef=01

[5] *Ibid.*

[6] *Supra*, OECD report, chapter 5; see also, p. 57.

[7] Bradshaw S., Bowyer A., & Haufe P., The Intellectual Property Implications of Low-Cost 3D Printing (April 2010) Vol. 7, Issue 1 *Script-ed* pp. 1-31; Mendis D., Clone Wars: Episode I – The Rise of 3D Printing and its Implications for Intellectual Property Law: Learning Lessons from the Past? [2013] 35(3) *European Intellectual Property Law* pp. 155-169; Mendis D., 3D Printing Enters the Fast Lane [2014] *Intellectual Property Magazine*, pp. 39-40; Mendis D., Clone Wars: Episode II – The Next Generation: The Copyright Implications relating to 3D Printing and Computer-Aided Design (CAD) Files [2014] 6(2) *Law, Innovation and Technology* pp. 265-280; Rimmer M., The Maker Movement: Copyright Law, Remix Culture and 3D Printing [2017] 41(2) *The University of Western Australia Law Review* pp. 51-84; Ebrahim T. Y., 3D Printing, Digital Infringement and Digital Regulation [2016] 14(1) *Northwestern Journal of Technology and Intellectual Property,* pp. 37-74; Mendis D. Nielsen J. Nicol D. and Li P., The Co-Existence of Patent and Copyright Laws to Protect Innovation: A Case Study of 3D Printing in UK and Australian Law' in Brownsword R. Scotford E. and Yeung K., *The Oxford Handbook of Law, Regulation and Technology* (Oxford University Press 2017), chapter 19.

[8] Hague R., and Reeves P., 'Additive Manufacturing and 3D Printing' (2013) 55 *Ingenia* 38, 39–40.

[9] 'Additive manufacturing' refers to the production of end-use layer manufactured parts produced within a business-to-consumer supply chain. '3D printing' is used to refer to the creation of layer-manufactured products within the home or community.

[10] Application no. 06/638,905 filed 8 August 1984. U.S. Patent 4,575,330 'Apparatus for Production of Three-Dimensional Objects by Stereolithography' granted 11 March 1986.

[11] Gersenfeld N., *Fab: The Coming Revolution of Your Desktop – From Personal Computers to Personal Fabrication* (New York: Basic Books; 2005).

[12] *Ibid.,* at p. 17.

[13] Anderson C., *Makers: The New Industrial Revolution* (New York: Random House LLC; 2012); Hatch M., *The Maker Movement Manifesto: Rules for Innovation in the New World of Crafters, Hackers, and Tinkerers* (New York: McGraw-Hill Books; 2013); Hatch M., *The Maker Revolution: Building a Future on Creativity and Innovation in an Exponential World* (Hoboken (NJ): John Wiley & Sons; 2018).

[14] Dumotier J., *et at., Legal Review on Industrial Design Protection in Europe* (MARKT2014/083/D) (European Commission; 2016); See also, *Economic Review of Industrial Design in Europe* (MARKT2013/064/D2/ST/OP) (Europe Economics; 2015), p. 131.

[15] *Ibid.* See also, Mendis D., Fit for Purpose: 3D Printing and the Implications for Design Law – Opportunities and Challenges in Aplin T., *Research Handbook on Intellectual Property and Digital Technologies* (Cheltenham, England: Edward Elgar Publishers) *Forthcoming.*

[16] Lipson H., and Kurman M., *Fabricated: The New World of 3D Printing* (John Wiley, 2013), p. 12.

[17] *Bezpečnostní Softwarová Asociace – Svaz Softwarové Ochrany v. Ministerstvo Kultury* (C-393/09) [2011] ECDR 3; *SAS Institute Inc., v World Programming Ltd.,* (C-406/10) [2012] 3 CMLR 4 and their application in UK court in *SAS Institute Inc., v World Programming Ltd.,* (C-406/10) [2012] 3 CMLR 4, para. 39. *See also,* Mendis D. and Secchi D., *A Legal and Empirical Study of 3D Printing Online Platforms and an Analysis of User Behaviour* (London: UK Intellectual Property Office; 2015), pp. 7-9; Mendis D., In Pursuit of Clarity: The Conundrum of CAD Software and Copyright – Seeking Direction Through Case Law *(Forthcoming, 2018)*.

[18] *Infopaq International A/S v Danske Dagblades Forening* Case C-5/08 [2010] FSR 20; *Eisenmann v Qimron* 54(3) PD 817. *See also,* Michael Birnhack, 'The Dead Sea Scrolls Case: Who is an Author?' [2001] 23(3) European Intellectual Property Review 128. *See also,* Mendis D. and Secchi D., *A Legal and Empirical Study of 3D Printing Online Platforms and an Analysis of User Behaviour* (London: UK Intellectual Property Office; 2015), pp. 12-15.

[19] The project led by Dinusha Mendis of the Centre for Intellectual Property Policy and Management (CIPPM), Bournemouth University in collaboration with Museotechniki Ltd (UK) and Uformia AS (Norway) was funded by the UK Arts and Humanities Research Council (AHRC) and CREATe, University of Glasgow. The 2-year project concluded in August 2017.

[20] For advantages and disadvantages of 3D printing, *see also,* Lipson H., and Kurman M., *Fabricated: The New World of 3D Printing* (Indiana: John Wiley & Sons, Inc.; 2013), pp. 20-24.

[21] Examples of companies providing customised 3D printed jewellery, accessories and shoes include *Nervous System, Jweel, Continuum Fashion, Freedom of Creation, Freakin' Sweet Apps, Mymo* and *Electrobloom* amongst others. *See also,* Reeves P. & Mendis D., *The Current Status and Impact of 3D Printing Within the Industrial Sector: An Analysis of Six Case Studies* (London: UK Intellectual Property Office; 2015), p. 40.

[22] *Ibid.,* at pp. 41-42.

[23] European Parliament, Working Document on Three- Dimensional Printing, a Challenge in the Fields of Intellectual Property Rights and Civil Liability (23 November 2017).

[24] Mendis D., Secchi D., & Reeves P., *A Legal and Empirical Study into the Intellectual Property Implications of 3D Printing* (Executive Summary) (London: UK Intellectual Property Office; 2015).

[25] *Ibid. See also,* Lipson H. and Kurman M., *Fabricated: The New World of 3D Printing* (Indiana: John Wiley & Sons, Inc.; 2013); Hoskins S., *3D Printing for Artists, Designers and Makers* (London: Bloomsbury; 2013); Anderson C., *Makers: The New Industrial Revolution* (New York, London: Random House; 2012).