

3D printing: A sui generis right for the convergent technology

Dr James GH Griffin, Senior Lecturer, University of Exeter.

Abstract:

3D printing poses a challenge to traditional IP protection because of the nature of the technological convergence inherent within it. Technological convergence exists where a product takes on new roles, in the same way that a mobile phone is now capable of taking photos and playing video. This can lead to convergence within legal regulation as well; i.e. combining telephonic regulation with privacy and copyright.¹ 3D printing poses a significant challenge due to the amount of legal convergence. A 3D printed product may be regulated by copyright, patent, trade marks, passing off, design rights (both registered and unregistered), contract law, among other areas. Ultimately, 3D printing raises the issue of how law and regulation should deal with the situation where technologies converge, causing laws to overlap and conflict. This paper argues that in this situation, a new type of right should be introduced to harmonise existing law.

Keywords – 3D printing, convergence, copyright, patent, trade marks.

Introduction

Convergence has been a longstanding topic of discussion among those working in the technology sector and in particular 3D printing.² Convergence refers to the way in which technologies originally designed for different purposes have come together within a single device or application. Multimedia applications are one example, where video, music and text are combined together; mobile phones are another where computers, email, cameras, satellite navigation and numerous other functions

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¹ For an example, see the rise of the right to be forgotten which has developed out of privacy rights and technological regulation. For consideration of the impact see inter alia H Grant, R Jay and C Craig, *Encyclopaedia of Data Protection and Privacy* (London: Sweet and Maxwell, 2012), Volume 1, Part 1, Chapter 10 at 1-692 and A Mullis and R Parkes, *Gatley on Libel and Slander* (London: Sweet & Maxwell, 2013), 12th edition, Main Volume, Part III, Chapter 22, Section 4, 22.19.

² For a discussion of the various forms, see K Choi, 'A Research Analysis on the Concept of Converging Technology and Converging Types of Information Technology' *ICIS '09: Proceedings of the 2nd International Conference on Interaction Sciences: Information Technology, Culture and Human* (2009) at 1422, A Nordmann (Rapporteur), *Converging Technologies – Shaping the Future of European Societies*, European Commission research (2004) at 14 available at http://www.ntnu.no/2020/final_report_en.pdf, and for an example see N Rosenberg, 'Technological Change in the Machine Tool Industry, 1840-1910: Discussion', *23 Journal of Economic History* (1963) 444 at 444; F Kodama, *Emerging Patterns of Innovation : Source of Japan's Technological Edge*, 4 *Harvard Business School Press* (1995) 414-443. On 3DP, see P Diamandis, *3D Printing and Technology Convergence*, at <http://www.diamandis.com/blog/3d-printing-technology-convergence>; J Reitz, *3D Printing Today: Democratization of Technology and Disruptive Innovation Converge*, at <https://3dprint.com/207176/democratization-innovation/> .

have been brought together. Whilst these existing examples of technological convergence did not lead to an equivalent legal convergence,³ recent technological developments have led to such a situation. This has happened in the advances concerning 3D printing, where numerous laws may apply over a single 3D printed article, with conflicting results. Other technologies are on the horizon that also are likely to lead to legal convergence, including areas such as 4D printing, artificial intelligence and augmented reality. This paper will outline how legal convergence leads to self-conflicted law, where conflicts in application lead to the overall aim of the law being stifled. The paper will outline how this conflict can be resolved with the creation of a sui generis right.

In making the argument for a sui generis right, the paper will focus on 3D printing, as this is the area where legal convergence today is the most prominent and also the most problematic. The regulation of 3D printing is extremely piecemeal and fragmented. As one 3D designer has noted, “IP laws have typically lagged behind new technologies, leaving the courts to fashion old laws to situations that were not envisioned when they were created.”⁴ The different levels and methods of protection cause confusion and dissuade investment - “The industry is just completely choked by intellectual property law right now.”⁵ 3D printing is an area that is bringing together an increasing variety of laws, as opposed to simply stretching the applicability and scope of an existing area of law. Whereas the printing press, or online file sharing, challenged the rules concerning infringement and secondary liability, 3D printing poses the challenge of overlap between numerous levels of IP protection.

The regulatory challenge of 3D printing matters because such technology is becoming an ever important element in society. 3D printing is used in the manufacture of parts in cars and planes, prosthetics, cells to fight cancer, and even to print food.⁶ Notwithstanding the technical, health and potential nutritional benefits that 3D printing can bring, there is no specific right that protects the products of 3D printing. Such regulation has, instead, been based around a number of different types of rights that indirectly influence the technological development of 3D printing in a random and piecemeal fashion.⁷ Even patent rights, which regulate inventions, concern only certain elements of

³ See discussion *infra* p.**.

⁴ Anon, ‘3D printing: Patents could make it difficult for start-ups to enter the industry’ accessible at <http://blog.drupa.com/3d-printing-patents-could-make-it-difficult-for-start-ups-to-enter-the-industry/>.

⁵ Anon, ‘3D printing has stagnated, says pioneering designer Francis Bitoni’ *De Zeen Magazine* (25 June 2015), available at <http://www.dezeen.com/2015/06/25/3d-printing-industry-stagnant-francis-bitonti-interview-intellectual-property-makerbot/>

⁶ For discussion of application, see inter alia C Anderson, *Makers: The New Industrial Revolution* (Random House Business Books, 2012), B Berg, S van der Hof, E Kosta, *3D printing: Legal, Ethical and Economic Dimensions* (The Hague: Springer, 2016), P Li ‘3D Bioprinting Technologies: Patents, Innovation and Access, (2014) 6 *Law, Innovation and Technology*, 282; J Tran, ‘To Bioprint or not to Bioprint’, 17 *North Carolina Journal of Law and Technology* 123 (2015) P Li, S Mellor, J Griffin, C Waelde, L Hao and R Everson, ‘Intellectual Property and 3D Printing: A Case Study on 3D Chocolate Printing’ (2014) 9(4) *JIP&P* 322.

⁷ For discussion see *ibid.*, S Bradshaw, A Bowyer, P Haufe, ‘The Intellectual Property Implications of Low-Cost 3D Printing’, (2010) 7:1 *SCRIPTed* 5

3D printing – e.g. if what is printed is an invention ‘as such’, and if it has not become part of the ‘state of the art.’⁸ Legal protection has often been piecemeal and operated in a number of different ways, and not just between different subject matters but also between different countries.

A revised set of intellectual property protections could resolve the issue of overlapping and confused rights, whilst maintaining the system of incentives and privileges that operate under the current legal regime. The proposal in this paper will provide a means by which to enable a more efficacious system of legal protection. This will ensure that those companies who are fearful of legal protection will be assayed:

“We need to create our own guidelines and boundaries of what is acceptable before legislation does if for us, we need to work as a community to define what is acceptable, and when it is not, how we deal with that.”⁹

This need can be met with a harmonised right, a sui generis right which will protect 3D printed products as a thing in themselves. The proposed right is not one which is based on patent, copyright, trademark or even design rights. It is a specific, unique, right. It is not to be confused with, for instance, the sui generis database right which is similar to copyright.¹⁰ The proposed right is not a form of copyright that protects a literary technological work, nor is it a form of patent such as a utility right which is similar to standard patent protection with less stringent requirements and reduced duration. Instead this right will hold the characteristic of many types of sui generis right, which means that it will focus on the labour, skill and effort which is put into developing a technology.¹¹ This protection when granted will override any other form of intellectual property right in that 3DP work.¹² This will remove the existing problem of conflicting intellectual property rights. To maintain the current balance, though, existing IPR will not be overridden. This will also ensure that there is not over protection or under protection that is not realised or understood by legislators working within the confines of their own specific specialisms.

⁸ See discussion of patent law, *infra*. p**.

⁹ Duann, ‘IP, 3D Printing & DMCA’ (2011) available at <http://www.shapeways.com/blog/archives/747-ip,-3d-printing-dmca.html>.

¹⁰ For the discussion of application of such a right applied to databases, see E Derclaye, *The legal protection of databases: a comparative analysis* (Cheltenham: Edward Elgar, 2008); G Davies, N Caddick, & G Harbattole, *Copinger and Skone-James on Copyright*, 17th edition (London: Sweet & Maxwell, 2016), Chapter 18; M Islam, ‘Should Singapore follow the EU in creating sui generis protection for databases?’ (2009) 4 *JIP&P* 665.

¹¹ Discussion of the application of a sui generis right to computer software is discussed in L Diver, ‘Would the current ambiguities within the legal protection of software be solved by the creation of a sui generis property right for computer programs?’ (2008) 3 *JIP&P* 125

¹² See discussion *infra* p.**.

To this end this paper will go through a number of different sections in order to make its argument. It will begin by assessing why, and how, it is that technology is so important to society, and then focus on the issue of convergence raised by 3D printing. This is to establish the rationale for the protection that is being proposed. It will then consider the protection that currently exists, namely in areas such as copyright, patents, and passing off, to see whether these different rights, merely through their differences, frustrate the importance of technology to society despite their possible rationales, namely the historical and ex-post justifications. Having done this the paper will proceed to consider how to regulate 3D printing. The paper will then outline how reform could be initiated. It will suggest what a new 3D printing right would look like, and how it would be founded in statute.

The function of technology

Without technology, society would not exist. The statement may sound grandiose but this is in part due to the broad definition which can be given to the word ‘technology.’ From the period of prehistory there has been a need for the existence of technology to allow for human existence. Mankind has always required the use of tools for hunting. This is something that Heidegger¹³ has considered in his works when he has discussed the development and use of tools in the development and being of mankind. In essence such technologies have become so widespread and so commonplace that in many instances tools could be considered to be an essential part of being human, e.g. in the making of art. Today, there is much consideration by academics of the importance of tools in the development of humanity, for instance, in human-android hybrids.¹⁴ This is why regulation of technology is so important because technology has become a central component of our being. Any impediment to the development of that technology could have grave consequences to the future of humankind. It is into this debate that the regulation of 3D printing comes – and it is why a holistic, i.e. technically informed approach to the regulation of such technology is required. Technological regulation is not just about maximising profit or even inventiveness or creativity per se, but about the future direction of society.

It is therefore quite perplexing that there has been no attempt to directly regulate technology as a thing in itself. There have been many intersecting laws which incidentally impact technology – for instance, IP law is incidental. Copyright law clearly is, since this concerns the protection of publishers, authors or more rarely creativity, but even with patent law the emphasis is upon the scope of monopoly protection. There has been no regulation that squarely considers the use of technology within society, or even whether the use of that technology is desirable or not. We have been

¹³ M Heidegger, *Being and Time* (1927, SUNY edition trans. J Stambaugh, New York: SUNY, 2010), 100-101.

¹⁴ S Fuller, *Humanity 2.0* (Basingstoke: Palgrave Macmillan, 2011), R Braidotti, *The Posthuman* (Malden: Polity Press, 2013), W Wallach and C Allen, *Moral Machines, Teaching robots right from wrong* (Oxford: OUP, 2009). Many of these ideas can be found in H Marcuse, *One Dimensional Man* (1964, Oxon: Routledge, 1991)

developing laws blindly without reference to the impacts of those laws in a meaningful way - we have not been considering how our laws will impact the use of technology and in turn the development of society. This is something that the proposed sui generis right over 3D printed products will seek to provide.

The relationship of law and technology is one that is extremely complex and should not be underestimated. To begin with, law itself is a form of technology, a form of technology which has a simultaneous battle and co-existence between the technology of law and the technology of invention. Each technology is growing and developing in a way that is Darwinian¹⁵ - in the same way that plants will grow for light these technologies will develop through the means of replication. It may seem strange to characterize law in this way but law in many respects seeks to influence and affect the structure of that which it regulates. Law is all about replication because it is all about making others conform to its structure and its means of thinking. This is what underlies the whole approach of Habermas in his analysis of the colonisation of the human mind through legal concepts.¹⁶ It is also what underlies even HLA Hart's approach to law when he considers which rules are those that are recognised by the judiciary.¹⁷ It is what underlies the approach of law by Rawls and the notion of rationality.¹⁸ Although it has never been overtly characterized as a technology with Darwinian characteristics, those underlying characteristics have therefore been recognised throughout the works of those leading theorists. To this end it is therefore natural to consider the similarity between law and technology, and technology more generally. It is in this that we can then begin to consider the future of society; and more specifically, the development of a sui generis right for 3D printing. This is because it shows that the rules regulating 3D printing have the potential to 'colonise'¹⁹ the technology and influence the way in which it not only operates, but the way in which it develops and the way in which it influences societal development.

Concerning the issue of societal development, the utilisation of technology such as 3D printing is performed by people - trite but true. By the same token it is also true that law is performed by people. This means that the characteristics of people are as critical for technology as they are for the law. It is the interfacing of the people with the technology that affects the manner and success by which replication of the technology such as 3D printing, and indeed law, occurs. This realisation was

¹⁵ For some discussion along these lines see M Greenberg, *Comic Art, Creativity and the Law* (Cheltenham: Edward Elgar, 2014) Chapter 1.

¹⁶ J Habermas, *Theory of Communicative Action* Vol II, Part VIII(2) (Cambridge: Polity Press, 1987)

¹⁷ H Hart, *The Concept of Law* (Oxford: OUP, 1961) at 92ff.

¹⁸ J Rawls, *A Theory of Justice* (Oxford: OUP, 1972) at 142-150. For discussion of this in the context of IP see J Griffin, Copyright evolution - Creation, Regulation, and the Decline of Substantively Rational Copyright Law, *Intellectual Property Quarterly* [2013] 234

¹⁹ J Habermas, *Theory of Communicative Action*, n.16.

established by the work of Justice Brandeis²⁰ and Eugen Ehrlich²¹ through the concept they termed “living law”. The concept of living law is simply that people such as the judiciary would interpret laws in order to keep them current and relevant for the general population. By the same token, technologies have kept their relevance and their rationality – being utilised by coders and users alike whereby code becomes a form of regulation that is to be followed or to be broken.²² Digital Rights Management loses its rationality by either being too strict with regard to actions performed by users, or by permitting the breach of its protections. It can be observed that the law, and technology, was influenced and developed in a way that impacted their respective replicability within the other. The characteristics of the people were brought into the law and technologies including their likes and dislikes and so forth. When considering the relationship of law and technology, we should therefore be careful to call to mind the purposes of the people who the law regulates and the people who use the technology. A specific right for 3D printing should not become completely divorced from either aspect – the technology should not become an end in itself, but instead it should be central to the right to consider what the purpose of the regulation should be. This purpose is reasonably self-evident – it is the continued development of society. As to what that precisely means – well, this is something that the proposed system should enable discussion of. A system that is correctly structured and attuned to what it regulates, in this instance technology, should operate in a way that permits the aims of the regulation to be easily modified. This is not something which has been seen with current IP laws, where regulation is often based around implicit ex-post justifications.²³ This makes amendment of the law, both in statute and through case law, slow and difficult to achieve. When dealing with technologies which are changing rapidly, it is easy to see why it is that economic reasoning in IP cases, and also by legislators, has become common place. Economics provides a ‘traditional’ regulatory handle by which to achieve change.²⁴ However, this economic approach falls short because such economic based reasoning is merely a means by which to interpret events rather than an end in itself. If regulation is to be effective, then it should work towards a regulatory aim that is capable of explicit discussion, i.e. to ensure that regulation is consistent with the technology that is being regulated; to spur innovation, or creativity.

The challenge of 3D printing

²⁰ L Brandeis, *The Living Law* (1916) 10 *Illinois Law Review* 461

²¹ E Ehrlich, *Fundamental Principles of the Sociology of Law* (1936, New York: Russel and Russel, 1962).

²² Consider the link to the discussion about architecture (in its broadest sense) in L Lessig, *Code* (New York: Basic Books, 1999) throughout and Appendix 1.

²³ See for example *Gyles v Wilcox* Barn C 368 (1741), *Millar v Taylor* (1768) 98 Eng Rep 201. and The Hansard Report of *Donaldson v Beckett*, reported as ‘Proceedings in the Lords on the Question of Literary Property’, 14 Geo III 1st Ser. 17 950 (1774)- (although these ex post justifications do become embedded within the law over time; however, the lack of more than a handful of explicit references back remain there is a distinction between the original ex post justifications and the development of case law)

²⁴ See *infra* p.**.

Whilst 3D printing poses enormous challenges to the traditional modes of production,²⁵ in particular customised production,²⁶ the main challenge, it is argued, that 3D printing poses to regulation is that it could encourage mass scale piracy through the copying of files, and also through the 3D scanning of existing objects (a 'Napsterisation' of the physical).²⁷ It is argued that this is difficult to guard against because of the piecemeal IP system whereby many types of IP can be used to protect the content, but with no particular system being the 'go to' one to bring legal actions of infringement. Should an action for infringement of a plastic doll, for instance, be brought through copyright, patent, trade marks or the various levels of design protection? How would a threat to initiate legal proceeding be handled, bearing in mind different rules exist for copyrights, designs, trade marks and patents?²⁸ These challenges are complex, but it is suggested that trying to create a complex web of rules to govern application of the existing law is not desirable due to the complexity involved. Rather than simply dealing with the regulatory challenges reactively, this paper suggests that an approach should be used which is more proactive, which focuses upon the function of technology within society and seeks to identify where 3D printing fits within this narrative. Any sui generis right for 3D printing should, ideally, be consistent with that function (or at least provide an ontologically correct means by which to challenge it).

As noted above, 3D printing is currently protected by a large number of intellectual property rights. The justification of these intellectual property rights has been most varied, with ex post justifications for IP being particularly predominant. The justifications stem from protecting individual property to

²⁵ n. 6 above. See also C Doctorow, *Makers* (London: Harper, 2009) (a fictional story which raises key issues), I Silverman, *Optimising Protection: IP Rights in 3D printing* (2016) 38 *EIPR* 5, RM Ballardini, M Norrgard and T Minssen, *Enforcing Patents in the era of 3D printing* (2015) 10 *JIP&P* 850; P Twomey, *A new dimension to intellectual property infringement: an evaluation of the intellectual property issues associated with 3D printing* (2014) 17 *Trinity College Law Review* 14, S Bradshaw, *3D printing update*, (2013) 24 *Computers and Law* 31, L. Osborn, *Regulating Three-Dimensional Printing: The Converging Worlds of Bits and Atoms* (2014) 51 *San Diego L. Rev.* 553, J Hornick, *3D Printing and the elephant in the room*, 55 *Santa Clara Law Review* 801 (2015); A Lewis, *The Legality of 3D Printing: How the technology is moving faster than the law* (2014) 17 *Tulane Journal of Technology and Intellectual Property* 303; P Viscounty, A Gass, K Virgien, *3d printing: A new technology challenges the existing intellectual property framework*, (2014) 56 *Orange County Law* 16; R Sedhom, *3D printing and its effect on the fashion industry*, (2015) 55 *Santa Clara Law Review* 865. See also the projects funded by the EPSRC via Cambridge University (S. Ford) concerning 3D printing and redistributed manufacturing - <https://capturingthevalue.wordpress.com/2016/01/15/3dp-rdm-feasibility-studies-call-for-proposals-2016/>

²⁶ E Kennedy and A Giampetro-Meyer, *Gearing up for the next industrial revolution: 3D printing, home based factories, and modes of social control* (2015) 46 *Loyola University Chicago Law Journal* 955, B Depoorter, *Intellectual Property Infringements & 3d printing: Decentralized piracy*, (2014) 63 *Hastings Law Journal* 1483, S Peacock, *Why manufacturing matters: 3d printing, computer aided designs, and the rise of end-user patent infringement* (2014) 55 *William and Mary Law Review* 1933.

²⁷ D Desai and G Magliocca, *Patents, Meet Napster: 3D Printing and the Digitization of Things* (2014) 102 *Georgetown Law Journal* 1691

²⁸ For details see J Griffin and A Nair, *Scientia potentia est: Making threats of copyright infringement*, 27 *International Review of Law Computers and Technology* 280 (2013). See s.21 TMA 1994, s70 PA 1977, s.253 CDPA 1988, s.26 RDA 1949; M Anderson, *Threats provisions: time to abolish them?* *IP Draughts* (2011) available at <http://ipdraughts.wordpress.com/2011/05/26/ip-threats-provisions-time-to-abolish-them/>.

encouraging creativity. There has been much written about what is the most appropriate justification. However, what is common to these different approaches is that they are all based around, in some form, a lack of efficient and ordered regulation. Lockean labour theory, where the labour of the individual on the commons, is, when applied directly or indirectly through law, a way of remedying market defects – IP grants a right to reward the labour of a creator when such reward might otherwise not be forthcoming.²⁹ Personality theories of the type discussed by Hegel³⁰ and Kant,³¹ when applied through law, are also an attempt to justify a system which otherwise would not be protecting the personal interests of the author. The proposed sui generis right seeks to deal with this issue of a lack of efficiency and lack of ordered regulation. However, it goes further in achieving this by considering the importance and function of technology to society more generally. Thus, rather than remedying a defect, or inefficiency per se, the proposed system is seeking to achieve the creation of regulation which is efficient in and of itself, because of the regulatory structure. By focusing on the importance of technology to society itself, and encouraging those key aspects, rather than seeking to remedy defects within the present system, it is believed efficiencies will be gained and that the regulation will be more efficacious.

Regulation of 3D printing

With the above in mind the task becomes one of assessing the nature of how the technologies of law have thus far influenced the development of technology more generally. As suggested above the importance of not just lawmakers, but also those who apply the law, are central as well as the subsequent use of the law and technology by individuals. What is assessed is the regulation of technology and what that has achieved in terms of the development of that technology, to consider how law has or has not enabled certain technological directions, and why that has occurred.

In relation to 3D printing, much of the existing literature has provided overview of the relationship of 3D printing with the current law.³² For instance, central articles in the 3D printing regulatory field are

²⁹ J Locke, *The Second Treatise of Government* (1690, New York: Dover, 2002) Chapter V. See also discussion in S Shiffrin, Lockean Arguments for Private Property in S Munzer (ed), *New Essays in the Legal and Political Theory of Property*, 138 (Cambridge: CUP, 2001) about application to IP law. See also J Hughes, *The Philosophy of Intellectual Property* (1988) 77 *Georgetown Law Journal* 287 and W Fisher, *Theories of Intellectual Property*, in S Munzer, 168.

³⁰ G Hegel, *Philosophy of Right* (1821, New York: Prometheus Books, 1996).

³¹ I Kant, *The Groundwork of the Metaphysic of Morals* (1785, London: Routledge, 1991) and I Kant, *The Metaphysic of Morals* (1797, Cambridge: CUP, 1996).

³² *Infra* n.6

those by Mendis,³³ as well as another by Bradshaw et al,³⁴ who have focused upon establishing a groundwork of what the technology is and the application of the law to that technology, rather than taking a broader approach to the nature of technology and society. This paper argues that it is necessary to consider the relationship between law and all technologies, not just 3D printing, if regulation of 3D printing is to be effective. A holistic approach is key,³⁵ i.e. it is not possible to simply select one technology and treat it as an independent and separate case, because the development of one technology invariably feeds into a future technology. This is the underlying philosophy behind this paper.

With this holistic approach in mind it is suggested that we also need a similarly holistic approach towards an analysis of the law and that it should not therefore be undertaken in relation to single areas such as databases, patents, trademarks, or copyright, but instead be a complete view of all types of regulation. This means drawing similarities from the case law and literature to establish what it is that links together all of these different types of legal protection. Do they all draw upon similar starting points or do they have different and completely conflicting rationales? This paper will see what similarities exist within the current case law in order to draw similarities, and assess how it is that technology has thus far avoided being protected under a single particular right. With 3D printing, it is possible for rights to co-exist and also conflict. For instance, patent law focuses on the invention aspect whereas copyright focuses more on the 'cultural' or 'artistic work' aspect. There are boundaries between the two, so for instance patents will generally not override copyright.³⁶ However, some rights more overtly ride alongside posing what is likely to seem an irrational conflict in the eyes of the consumer, for instance, the complex relationship between copyright, unregistered and registered designs.³⁷ The confusion that results from these boundaries are sometimes overlooked by the legislators themselves: for instance, the UK-IPO report on 3D printing emphasised the function of copyright, to the detriment of the consideration of other types of IP.³⁸ Other types of IP could include designs, patents or trademarks, both of which can be more easily infringed with 3D

³³ D Mendis, "Clone wars" episode II - the next generation: the copyright implications relating to 3D printing and computer-aided design (CAD) files, (2014) 6 *Law, Innovation and Technology* 265; D Mendis, "The clone wars": episode 1 - the rise of 3D printing and its implications for intellectual property law - learning lessons from the past? (2013) 35 *EIPR* 155. For an equivalent approach in a Canadian article, see M Rimock, 'An Introduction to the Intellectual Property Law Implications of 3D Printing', (2013) 13 *Canadian Journal of Law and Technology* 1

³⁴ S Bradshaw, A Bowyer, P Haufe, 'The Intellectual Property Implications of Low-Cost 3D Printing', (2010) 7:1 *SCRIPTed* 5

³⁵ An example of an holistic approach can be found in P Li, 3D Bioprinting Technologies: Patents, Innovation and Access 6 *Law, Innovation, Technology* 282 (2014) at 299.

³⁶ *SAS Institute Inc v World Programming Ltd* [2010] EWHC 1829 (Ch), para.205-207.

³⁷ Note recent amendments to s.51/52, *infra* p.***.

³⁸ UK-IPO, A Legal and Empirical Study into the Intellectual Property Implications of 3D printing available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/421543/A_Legal_and_Empirical_Study_into_the_Intellectual_Property_Implications_of_3D_Printing_-_Exec_Summary_-_Web.pdf . For comments, see http://ipkitten.blogspot.com/2015/05/3d-printing-and-law-three-recent_31.html

printing than with proceeding technologies. For example, a 3D print is a physical object that can be more in the nature of a patentable invention than a copyright work.³⁹ A trade mark, such as a shape mark, could be reproduced with a 3D scanner and 3D printer. The lack of consideration of broader IP types is a direct consequence of the law not considering the overall functions and possibilities of technologies such as 3DP. The underlying possibilities of the technology are being overlooked, to e.g. make 3D printing fit within the existing legal category of copyright. This approach needs to change with increasing technological and legal convergence.

What is it within these laws that could be identified, in order to bring together the very many disparate approaches that govern the underlying regulation of technology? The answer is reasonably straightforward – labour, skill and expense. This is the key favoured characteristic of the current legal system perceived as advantageous by 3D printing companies:

“We invested early in turning our novel ideas into patents. It was a learning experience and it took a long time to understand the patent system. It’s actually a pretty cool thing for an innovator to see his or her name on a patent and at MakerBot. We credit the individuals who come up with inventions within the company.”⁴⁰

As will be discussed below, this has been a core tenet in copyright law subsistence as expressed in that form, but it will be suggested that it is also the underlying rationale for most other forms of IP as well – even those not so explicitly expressed. However, the conflicting outcomes of the different types of IP undermine the protection given to that aim. The financial investment into a creative cultural work, an invention, logo, or design appears to be of particular importance, but the outcome of that protection can vary with 3D printed products despite the product being one and the same. As noted above, for instance, a 3D printed product (say a device for holding an object) could be protected by copyright, patents, trade marks, designs and the other rights identified elsewhere for substantially the same item, i.e. the code, invention, shape and function of the object.⁴¹ The relevance of this to the broader holistic approach for a sui generis 3D printing right is that it is possible to assess to what degree this focus on labour has had an impact upon the development of technologies, and whether the division of IP into a large number of conflicting categories potentially undermines this holistic view.

The current focus of the law upon labour, skill and expense is reflective of the relationship between the individual and the law, as discussed earlier. Labour has long been a concept that in the minds of

³⁹ See, for example, multi print designs available on <https://www.thingiverse.com/>

⁴⁰ Anon, Stratsys Lawsuit, Patents and More at <https://makezine.com/2013/12/03/stratsys-lawsuit-patents-and-more-an-interview-with-makerbots-bre-pettis/>.

⁴¹ See infra p.***.

the populace is something worthy of reward – this was an integral element within the protestant work ethic, a term coined by Weber.⁴² Ultimately, through religious influence and State influence, labour became embedded within the minds of the individual citizens. This was reinforced⁴³ by the growth of capitalism and property ownership which also was taking place. By this route, labour has become of critical importance, and it can be seen how labour has therefore become enshrined as a concept within IP law in almost autopoietic fashion.⁴⁴ The ‘power’ of law to govern IP, taken in the Foucaultian sense,⁴⁵ is therefore dispersed and spread out among the different types of IP, in the form of labour – and this concept comes from both the wider citizenry and the regulators. Likewise, this norm has consequently also fed into the technologies themselves. “File sharing”, where individuals copy files over online peer to peer networks,⁴⁶ has led to accusations of piracy⁴⁷ by right holders who claim their labour is being, essentially, misappropriated; meanwhile, many users cry foul because of the labour and effort put into cracking networks and distributing altered versions. If labour does not feature within the technology in some form, then that technology may very well not succeed.⁴⁸ Labour is engrained within society as a central concept. So, where do these themes of labour, skill and expense reside within our legal system of IP, and how does this reflect the proposed holistic view of IP for the introduction of a sui generis right for 3D printing?

Themes for protection of 3D printed products

The technology that is involved in making 3D printed products covers aspects such as the programming code included within a file, the shown product in 3D on a computer, tablet or phone screen, and the final printed products.⁴⁹ Many 3D files are kept within the STL file format, which is a format that contains the main printing points on X, Y and Z axis.⁵⁰ Under current legal protection, this poses a challenge for copyright law due to the fact that the basic file format is little more than an unarguable algorithm. Such works might not be copyrightable, although if the final product meets the subsistence requirements of originality then it might be protectable, perhaps as a literary work –

⁴² M Weber, *The Protestant Ethic and the Spirit of Capitalism* (1905, London: Harper Collins, 1930).

⁴³ Consider the relationship with the “invisible hand” – e.g. A Smith, *Wealth of Nations* (1776).

⁴⁴ N Luhmann, *Social Systems* (California: Stanford University Press, 1995) and G Teubner, A Gebbraro, *State, Law, and Economy as Autopoietic Systems* (Dott. A. Giuffrè editore, 1992).

⁴⁵ M Foucault, *The History of Sexuality* Vol 1 (1978, trans. Random House, 1978, London: Penguin, 1998) Part 4, Chapter 2, and M Foucault, ‘Governmentality’ in J Faubion, *Essential Works of Foucault 1954-1984* (London: Penguin, 2002), 201-223.

⁴⁶ See e.g. W Fisher, *Promises to Keep* (Stanford: Stanford Law and Politics, 2004).

⁴⁷ On which see discussion in A Johns, *Piracy: The Intellectual Property Wars from Gutenberg to Gates* (Chicago: Chicago University Press, 2009)

⁴⁸ See *infra* p.***.

⁴⁹ The importance in this distinction, as well as ‘levels’ discussed *infra*, p.***, is discussed in T Rayna, L Striukova, & J Darlington, *Open-Innovation, Co-creation and Mass Customisation: What role for 3D printing platforms?* In Proceedings of the 7th World Conference on Mass Customization, Personalization, and Co-Creation (MCPC 2014), Aalborg, Denmark, February 4th - 7th, 2014 available at <http://link.springer.com/book/10.1007/978-3-319-04271-8>

⁵⁰ For details see ‘The STL file format’ available at http://www.fabbers.com/tech/STL_Format

although there is no clear precedence on this point. However, the STL file is not the ‘be all and end all’ of file formats for 3D printing; it happens to be the file format that is commonly used for printing files. Other file formats exist which have the potential to be more descriptive and thus, where STL file format files alone may fail for protection, files with different, more descriptive,⁵¹ file formats might be able to obtain protection. 3D printing has additional complications in this regard, as 3D printers require their own file formats to enable printing.

The product as shown on a digital, i.e. computer, screen presents more complex challenges. There is the potential copyright in the design, the specific design rights, trade marks and patents.⁵² Furthermore, there may be complications over the ownership of what constitutes the IP, if the computer is responsible for the operation of the product within a 3D environment. For example, if a computer program such as Blender⁵³ allows a file to perform something that would otherwise be a patentable invention, then it may not be clear what the work or invention is *per se* for patent purposes. Blender or the other supporting software may cause the inventive operation. An example would be if a 3D printing file contains a 3D object in software form that allows for a specific type of operation such as exclusion carried out by other software processes. Furthermore, any 3D printed file may require skeinforge,⁵⁴ part of which provides a complex set of supports to enable the most common form of 3D printing to take place. This may also add in a further factor to complicate what is a work, or what is an invention, since it is an integral element of most 3D printed files to enable their printing.

Once an object has been printed, then it might be argued that there is little difference between that 3D printed object and any other object. However, there can be code embedded in that object - there is potential for digital watermarking⁵⁵ that would operate as part of the “Internet of Things.”⁵⁶ It could be possible to embed a code, such as a barcode, into a 3D printed file, which will then be detected in photographs of the object.⁵⁷ These codes could be searched for by right holders using

⁵¹ Descriptive in the sense of providing detailed information about the file, and hence copyrightable.

⁵² The “as such” criteria is within the exceptions for patent protection in the UK – see the Patents Act 1977 s.1(2).

⁵³ See <https://www.blender.org/>

⁵⁴ See <http://reprap.org/wiki/Skeinforge> and <http://fabmetheus.crsndoo.com/overview.php>

⁵⁵ See A Macq and P Alface, 3D robust blind watermarking, available at

http://www.slideshare.net/sirris_be/applicability-of-tracability-technologies-for-3-d-printing-robust-blind-watermarking-ucl

and B Yeo and M Yeung, Watermarking 3D objects for verification, (1999) 19 *IEEE Journal* 36 available at

<http://www.dtic.mil/dtic/tr/fulltext/u2/a390872.pdf>

⁵⁶ ITU, ‘Internet of Things Global Standards Initiative’ available at <http://www.itu.int/en/ITU->

[T/gsi/iot/Pages/default.aspx](http://www.itu.int/en/ITU-T/gsi/iot/Pages/default.aspx); J Gubbi, R Buyya, S Marusic, M Palaniswami, ‘A Internet of Things (IoT): A vision, architectural elements, and future directions’ 29 *Future Generation Computer Systems* 1645 (2013); E Fleisch, ‘What is the Internet of things?’ *Auto-ID Labs White Paper WP-BIZAPP-053* (2010) available at

<http://cocoa.ethz.ch/media/documents/2014/06/archive/AUTOIDLABS-WP-BIZAPP-53.pdf>.

⁵⁷ These could be reverse engineered by methods of obfuscation could be employed to make their removal from the file extremely difficult, i.e. by placing algorithmic code within low level STL XYZ file data.

computer programs. Likewise, software code could be embedded into a 3D printed file that, if it is subsequently scanned in, will execute when stored in a computer system to reveal to the right holder that the file has been copied. 3D printing will likely as not encourage these trends, as individuals seek to trace the use of their products, either for interest, to reclaim royalties, or begin infringement proceedings – if individuals wish to gain financial reward, by default, as an individual, they will be likely to be producing fewer products than a traditional factory and are therefore likely to have a greater stake in the enforcement of IP in the products that they create.⁵⁸

Having considered the nuanced issues that 3D printing poses, this paper will consider the relationship between the above 3D printed products, and the rationale given for protecting them under current regulation. As already indicated, labour is of particular importance within the existing IP laws, and the basis for this has come about via two main routes. These are the routes of historical explanation and ex post justification. There is some overlap, which will be explained below, as on occasions ex post justifications have been used to support certain case judgments.

The role of ‘labour’ within the justifications for IP

It has already been outlined above, when discussing the relationship between the regulators and citizenry, that the protestant work ethic is one key reason for the existence of labour within the minds of the citizenry, and one of the reasons why labour has become so central within the case law. However, there are other historical factors that can be used to explain the rise of the notion of labour that are more directly related to IP. Perhaps one of the most important is the function of property, which initially provided a means by which individuals could become involved in a ‘democracy’ – important, since democracy was not so common place in the past.⁵⁹ Property rights were widely regarded as inalienable, and a means by which an individual could express their wealth and relations to others, including the Crown. IP, though not formally a property right until much later,⁶⁰ nonetheless had many of the characteristics of property, in that it could be sold and licensed. In this way, the notion of labour became imbued within IP law because the labour involved in making a work could lead to the creation of such intangible properties. There is also another analogous way in which labour became enshrined in the IP context. Whereas today 3D printing promises to place rights in the

⁵⁸ Results of AHRC, Newton Fund and NSTB funded empirical interviews in China by the author demonstrate beyond that a number of 3DP creators are keen to trace product use. For the results, see Chan, Choo, Osuji, Griffin (eds), *3D Printing in China* (Routledge, 2018).

⁵⁹ Note the relation of this to the general thesis of M Weber, *The Theory of Social and Economic Organisation* (1947, trans Parsons, New York: Free Press, 1964) and M Weber, *Economy and Society* (multiple trans., ed. G Roth & C Wittich, University of California Press, 1978) esp. Vol 1 Pt 1 Ch IV, and generally M Weber, *The Protestant Ethics and the Spirit of Capitalism* n.42 above.

⁶⁰ Copyright –first mention in s1(1), s.90, s.93B CDPA 1988; first mention for patents, s.7(2) s.30-s.38 ‘Property in patents and applications, and registration’ Patents Act 1977; first mention for trade marks, s.2(1), s.22 Trade Marks Act 1994.

hands of (labouring) individual content creators rather than manufacturers, in the past it was also control over technology that led to control over the exploitation of IP. Booksellers, and publishers, were powerful in relation to literary works because of difficulties in getting works printed and distributed. It gave the (labouring) booksellers and publishers greater bargaining power and control over how works were created and distributed. Furthermore, those booksellers and publishers, when the printing press was invented,⁶¹ were acting in a way that removed control from the State to them. 3D printing is similar – involving labour through the technology – in particular, the labour of creating and printing. This labour involves financial investment in the technology, and technological skill and scarcity also plays a role. Consequently, IP also has specific reasons why labour has become important in terms of its history.

The theoretical justifications that have been explicitly invoked within case law have also tended to revolve around labour, whether explicitly or implicitly. It is important to note that they tend to be ex-post theories, namely, ‘after the event.’ They are numerous, examples include Lockean labour theory (naturally enough!) and his knowledge theory, Kantian and Hegelian notions of personality,⁶² Benthamite utilitarianism,⁶³ through to modern day justifications such as optimal economic rationalisation.⁶⁴ All of these, it is submitted, utilise a degree of technological skill and expense which is characterised by labour.⁶⁵ With Lockean labour theory,⁶⁶ the importance of labour is self-evident, and it typically arises in relation to labour that is put upon something that had previously been held within a physical commons. With knowledge theory⁶⁷ it is insofar as knowledge production requires skill and is according to Locke enhanced through memory which again implies a degree of mental labour (particularly so since Locke’s work also implies that technology can assist with this).⁶⁸ Observation of the world around us is also enhanced by technology and labour. So, ultimately, Locke’s justifications are all assisted by labour, and invariably that labour can be achieved more efficiently through technology.

⁶¹ Moveable type – Gutenberg press, 1440-1450; Caxton Press, as used in Chaucer’s *Canterbury Tales* (1843) McMurtrie, *The Book: The Story of Printing and Bookmaking* (Oxford: OUP, 1943) Chapter X and Chapter XIV.

⁶² I Kant, *The Groundwork of the Metaphysic of Morals* (1785) and I Kant, *The Metaphysic of Morals* (1797) n31. G Hegel, *Philosophy of Right* (1821) n.30.

⁶³ J Bentham, *Principles of Morals and Legislation* (1789, 1823 edition, Oxford: OUP, 1907).

⁶⁴ See n.72, n.73.

⁶⁵ For discussion of the application of labour theory to IP see discussion in S. Shiffrin, ‘Lockean Arguments for Private Intellectual Property’ in S Munzer (ed), *New Essays in the Legal and Political Theory of Property* n.29; see also J. Hughes, ‘The Philosophy of Intellectual Property’ (1988) 77 *Georgetown Law Journal* 287.

⁶⁶ J Locke, *Second Treatise on Government*, Chapter V (1690) n. 29 above.

⁶⁷ J Locke, *Essay on Human Understanding* (1690, London: William Tegg, 1880). See also J Gibson, *Locke’s Theory of Knowledge* (Cambridge: CUP, 1931).

⁶⁸ “..the mind perceives the agreement or disagreement of two ideas immediately by themselves, without the intervention of any other: and this, I think, we may call ‘intuitive knowledge’...quickness in the mind to find out these intermediate ideas (that shall discover the agreement or disagreement of any other), and to apply them right, is, I suppose, that which is called ‘sagacity’... a steady application of pursuit is required to this discovery...” J Locke, *Essay on Human Understanding*, *ibid.*, Book IV, Chapter II, Section 1, 2 and 4.

Personality theories concern the manner in which a person develops by expressing their will upon physical objects.⁶⁹ Labour, although not cited as a central component, is once again of central importance since it has to be used by an individual to be able to create physical change. Once more, technology is particularly relevant because technology is what enables individuals to be able to have an impact upon the world that is around them. A person can take a block of marble and labour upon that effectively and efficiently with the appropriate technologies; likewise, an individual may do so through the use of 3D printing. Again, the issue of skills also particularly relevant in the use of technologies to see that they are used as effectively as possible.

Finally, the last traditional, long standing, ex post theory is that of utilitarianism – the greatest happiness of the greatest number.⁷⁰ On the face of it, labour is of less importance here – something does not require labour per se if it is to help achieve an optimal level of happiness. However, a moment's consideration will reveal that there is labour involved – for instance, the most efficient and optimal methods by which to achieve this happiness is likely to involve labour i.e. in the creation or processes of dissemination of cultural works, or even just travelling to view them. The balance the happiness of the greatest number of people could arguably be more likely achieved through fine-scale, finely grained, technologies which can utilise a large quantity of small information about individuals. An example of that would be licensing systems on the Internet for copyright content that can lead to more nuanced balancing in terms of ensuring that as much content is available to the public versus reward for the right holder. A current system operating in this way is, where they operate, the automatic identification and watermarking systems on Youtube.⁷¹ Ultimately, technology is extremely important in facilitating utilitarianism, and thus the labour involved in creating and maintaining that technology. In a very similar vein, economic theories, such as those espoused by Landes and Posner,⁷² or Merges and Nelson,⁷³ often base themselves around a degree of utilitarianism in the sense that they seek to achieve an optimal level of protection for IP. Again, labour features in a manner similar to utilitarianism, in the sense that it is required to achieve the application of the theories, but also in the sense that labour is present as part of the calculations.

All of these justifications which in one way or another feature protection of labour have, over time, featured within IP law. For instance, the labour theory has been critical in the development of the

⁶⁹ "A person must give to his freedom an external sphere, in order that he may reach the completeness implied in the idea. Since a person is as yet the first abstract phase of the completely existent, infinite will, the external sphere of freedom is not only distinguishable from him but directly different and separable" G Hegel, *Philosophy of Right*, n.30 above at 41.

⁷⁰ J Bentham, *Principles of Morals and Legislation* (1789) n.63 above.

⁷¹ Anon, 'Copyright on Youtube' at <https://www.youtube.com/yt/copyright/en-GB/>

⁷² W Landes and R Posner, An economic analysis of copyright law, 18 *Journal of Legal Studies* 325 (1989);

⁷³ R Merges and R Nelson, On the complex economics of Patent Scope, 90 *Columbia Law Review* 839 (1990).

originality tests for copyright and the subsistence tests for patents; the knowledge theory has featured to a lesser degree but was repeated in *Donaldson v Beckett* (1774) by Lord Camden.⁷⁴ Personality can be seen within moral rights and, again, patents in the sense that an invention is an expression of the individual; utilitarianism can be identified within case law generally but in particular US law where it has featured within the US constitution due to the involvement of Bentham in its drafting:

“To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.”⁷⁵

Meanwhile the use of economic reasoning has been particularly predominant within recent case law, where the economic impact of judgments is often considered – economic impact in terms of financial investment, or what could be termed financial labour. The below example provides a very clear quote and is from the US; equally clear examples may be found in the UK though:⁷⁶

“The movie studios were reluctant to release movies in digital form until they were confident they had in place adequate safeguards against piracy of their copyrighted movies... In 1998, the studios secured added protection against DVD piracy when Congress passed the DMCA, which prohibits the development or use of technology designed to circumvent a technological protection measure, such as CSS.”⁷⁷

So, to conclude, labour has been something of critical importance to IP law – namely, labour to obtain property. In this regard, one may surmise that within society, labour has become the cornerstone upon which any proposed sui generis right should sit. To this end, the paper will now proceed to question the case law to assess two things a) what the nature of labour is within those cases, and b) whether there is a conflict in the type of labour that is identified between the different rights, and whether there is a difference of approach that is likely to lead to confusion. It will be argued that there is confusion, and that this is why there is a need for a single overriding sui generis right for 3D printing.

Establishing a new sui generis right

⁷⁴ The Hansard Report of *Donaldson v Beckett*, reported as ‘Proceedings in the Lords on the Question of Literary Property’, 14 Geo III 1st Ser. 17 950 (1774) at 999 above n.23.

⁷⁵ Article 1, Section 8, Clause 8 US Constitution. (See E Walterscheid, *The Nature of the Intellectual Property Clause* (William Hein, 2002)).

⁷⁶ *Designers Guild v Williams* [2000] 1 WLR 2416.

⁷⁷ *Universal City Studios, Inc. v. Corley* 273 F.3d 429, 436 (US, 2d Cir. 2001).

It has already been argued above that the 3D printing right to cover 3D printed products should be sui generis in nature. It would be a singular right which would be based around the investment and technological skill involved. In this sense it could be quite similar to the sui generis right in databases.⁷⁸ That particular right, in effect, looks at the skill, investment and arrangement of information in databases – if there is sufficient of those elements present within the database, it will obtain the sui generis protection over those elements.⁷⁹ It was created through European Union legislation namely the Database Directive of 1996.⁸⁰ The right had a number of shortcomings which led to its eventual limitation through case law, in particular the ECJ (as it then was) case of *William Hill*.⁸¹ The issue with the right was that initially some of the criteria were not yet particularly well known or understood by domestic courts.⁸² As a result of this, there was a fear that the Database right would become too broad. If the right were to be read broadly, then the sui generis right could have covered all the contents of a database, thus potentially rendering other IP rights (e.g. copyright) irrelevant since they would have offered less protection.⁸³ It was this fear that the then ECJ in *William Hill* confronted directly,⁸⁴ but the different terminology and terms used still posed an issue for implementing courts. For example, issues remained over the scope of words such as “investment” in a database, which refers to the investment in the selection and arrangement of the data rather than the underlying data itself.⁸⁵

To ensure familiarity with the proposed sui generis right, it is suggested that the right should be based around existing principles of labour, skill and expense from copyright law.⁸⁶ This is not to imply a copyright bias- as outlined in the previous section, these principles are similar to those present within other areas of IP but are simply more explicitly acknowledged within copyright law. By the utilisation of these existing well-known principles courts and legislators will therefore not be so disinclined to

⁷⁸ For a parallel debate see M Islam, Should Singapore follow the EU in creating sui generis protection for databases?, n.10 above.

⁷⁹ “Member States shall provide for a right for the maker of a database which shows that there has been qualitatively and/or quantitatively a substantial investment in either the obtaining, verification or presentation of the contents to prevent extraction and/or re-utilization of the whole or of a substantial part, evaluated qualitatively and/or quantitatively, of the contents of that database.” Article 7(1) Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the Legal Protection of Databases OJL 77, 27/03/1996.

⁸⁰ Directive 96/9/EC, *ibid*. For details see E Derclaye, *The legal protection of databases: a comparative analysis*, *infra* n.10.

⁸¹ C-203/02 *British Horseracing Board v William Hill* [2005] ECDR 1

⁸² See e.g., C-5/08 *Infopaq International A/S v. Danske Dagblades Forening* [2009] ECDR

⁸³ E.g. Nauta Dutilh, Study Contract for the European Commission, ETD/2001/B5-3001/E/72 http://ec.europa.eu/internal_market/copyright/docs/databases/etd2001b53001e72_en.pdf

⁸⁴ C-203/02 *British Horseracing Board*, *infra* n.81 para 97.

⁸⁵ C Colston, ‘Protecting Databases – A Call for Regulation’ 19 *Denning Law Journal* 86 (2007) at 99. See *William Hill*, n. 81, and Colston citing Netherland case *NVM v De Telegraaf* (President District Court of the Hague 12 September 2000) [2001] *Mediaforum* 87 and German case *Paper Boy* (German Federal Court of Justice, 17 July 2003) I ZR 259/00. For subsequent confusion see C-338/02 *Fixtures Marketing v Svenska* [2004] All ER (D) 150 and the Advocate General Opinion.

⁸⁶ See *infra* p.***.

utilise the right. Furthermore, it is suggested that the sui generis right will be one that overrides all existing rights in that work thereby removing one of the main causes of confusion (different levels of legal protection) that currently exists. As noted above the right can be utilised in the same sort of way as if copyright has been utilised. As for infringement between the granted sui generis 3D printing rights themselves, it is suggested that a test from copyright law be utilised. As argued by Chacksfield in *The Hedgehog and the Fox*,⁸⁷ under copyright law in the UK if a work was capable of obtaining copyright protection then it was arguable that it would not be possible for it to be deemed infringing of an existing right – as per Lord Hoffmann in *Designers Guild*.⁸⁸ This is because the new work would have been sufficiently original. In the context of the proposed sui generis right this could be utilised to mean that if a work has sufficient skill, labour and effort then it should be far enough advanced in terms of existing rights so as not to infringe them.

So with this baseline established for the relationship between the proposed sui generis right and the existing rights of intellectual property, and between the proposed rights themselves, along with greater certainty than that present in the *sui generis* database right, it is now possible to move on and look at how the right will operate in practice. As identified earlier,⁸⁹ the main issue that has occurred with 3D printing is that there is no single area of law that creators or users can turn to in order to easily establish what potential rights and liabilities are. The creation of the sui generis right is seeking to deal with this by creating one single set of rules to which everybody can turn. It also removes the uncertainty inherent in a bundle of rights where key rationale, such as the protection of labour, differs considerably from one set of law to the next. Individuals and businesses cannot easily identify even what types of protection exist and over what elements. So how would the proposed sui generis right work? Two distinct examples can be given, one where the work is original and another where the work is not original.

(a) The proposed system where there is an ‘original 3DP work’

In relation to an original work, for instance a 3D printed work of art that has been made entirely by the same author as the author of the 3D printed file, the existence of the sui generis right is easy to establish. There would be a test of whether there has been a sufficient degree of labour, skill and effort in the 3D printed products,⁹⁰ namely the file itself and the final creation. They would be kept separate since, otherwise, protection could become limited by the actions of the 3D printer contributing to the final product. The notion of labour could be adapted from the copyright notion

⁸⁷ M Chacksfield, ‘The Hedgehog and the Fox, a Substantial Part of the Law of Copyright’, [2001] *EIPR* 259

⁸⁸ *Designers Guild Ltd. v Russell Williams (Textiles) Ltd* [2000] n. 76 at 2418-2426.

⁸⁹ *Infra* p. ***.

⁹⁰ The use of the phrase ‘products’ is deliberate, to distinguish it from a copyright ‘work.’

of labour, such as that found in *Walter v Lane*.⁹¹ In this case, heard in 1900, copyright protection was given to a report of a speech that was printed in *The Times*. A number of reasons for protection were given – “labour, skill, and capital”;⁹² “skill, labour, and expense”⁹³; “intellectual skill and brain labour.”⁹⁴ This paper suggests that given subsequent case law, this could be summarised as “skill, labour and effort.”⁹⁵ The final standard would be aimed at preventing individuals from gaining protection over mere copies or copies with low levels of originality thus raising the spectre of quick profit making by cheap copies. As with copyright law, though, protection would still allow for independent creation to be permitted. A provision could be worded as follows:

“There will be a sui generis right to protect against the unauthorised taking of a substantial part of labour, skill and effort in registered 3D printed works. This right will override any other existing IP rights in that same work.”

Protection would arise with registration, with an organisation such as the UK-IPO. Registration could be linked to a Copyright Hub identifier on the file itself⁹⁶ or on the final 3D printed product. The identifier can be made obvious in the same way as a Creative Commons label or a CLA logo.⁹⁷ Protection would run from the date of first distribution (i.e. by demonstrating the date that the file was first shared online). Duration is an issue not thus far discussed but it would be for a lesser period than copyright owing to the nature of products. There are many issues with 3D printing that could lead to protection being granted that is overbroad. The current duration of IP protection over 3D printed products is extremely varied, depending both on the type of IP and the type of, e.g., copyright work, and varies from durations such as life of the author plus 70 years for copyright in a literary or artistic work, to 20 years from the date of filing for a patent. It is suggested, as a means of obtaining support from potential right holders, that protection last for a period roughly in the middle of current protections, which, if we assume copyright and patents are the main levels of protection relevant for 3D printing, could be 70 years from the date of distribution.⁹⁸ As detailed below, it is argued that duration can be amended according to the potential broadness of the protection over the 3D printed content.⁹⁹ This may appear disproportionately long. However, protection exists only over the aspects of the product where there is sufficient labour, skill and effort. More importantly, in practice, because

⁹¹ *Walter v Lane* [1900] A.C. 539.

⁹² *Walter v Lane*, *ibid.*, Lord Halsbury at 545.

⁹³ *Walter v Lane*, *ibid.*, Lord Davy at 551.

⁹⁴ *Walter v Lane*, *ibid.*, Lord Brampton at 556

⁹⁵ See e.g. *Designers Guild Ltd v Russell Williams (Textiles) Ltd* [2000] n. 76 at para.2.

⁹⁶ This system is now operational see <http://themoca.co.uk/events/moca-copyright-hub-event/> .

⁹⁷ <http://www.cla.co.uk/> ; for details see <http://whatcanidowiththiscontent.com/>

⁹⁸ This is based on the focus of the literature about 3D printing, conferences attended, conversations with right holders and empirical research carried out by the author.

⁹⁹ See *infra* p. **.

of the growth of online licensing systems such as that proposed by the UK Copyright Hub¹⁰⁰ these licensing systems can enable mass licensing without user intervention. Current examples include advertising revenues, as operate automatically on youtube.com,¹⁰¹ or subsidies through other means such as taxation or other subscription models.¹⁰² Another option could be to run a levy system whereby originators of 3D printed products are financially rewarded for their creations for that same period of duration.

The test for infringement would operate in a similar manner to copyright law, but in a manner that is more straightforward for the purposes of legal certainty. In the US, for instance, there are multiple tests within the various state jurisdictions and court circuits,¹⁰³ and whilst the UK has a more narrowed set of tests, there is still uncertainty. In the UK, derivation and taking of a substantial part need to be proven,¹⁰⁴ but the copyright statute, the CDPA 1988, does not provide details and so consequently there have been numerous interpretations. It is suggested that the proposed provision provides greater certainty¹⁰⁵ due to the wording of the provision mirroring existing case law.¹⁰⁶ That case law provides courts and right holders with sufficient certainty in any sui generis dispute. A court would apply the known case law, and thus whether labour, skill and effort has been reproduced from an earlier 3DP work into a subsequent work. For example, if 3DP Star Wars work is reproduced in a subsequent work, then the courts would assess whether a substantial part of the skill, labour and effort that went into the original work has been reproduced. If so, then the traditional remedies for infringement could be sought.¹⁰⁷

(b) The proposed system where there is 'not an original work'

In discussing (b) - the issue of protecting a work that is potentially infringing an existing IP right - 3D printing becomes particularly problematic for the reasons previously covered. The sui generis right would operate so as to override the existing set of IP rights in that work, so that whereas before there

¹⁰⁰ See www.copyright.org and G Grassie, 'A UK Digital Copyright Exchange: Will the pipe dream ever become a reality', (2013) 7 *JIP&P* 23 and J Griffin, 'The Digital Copyright Exchange: Threats and Opportunities' (2013) 27 *IRevLCT* 5 (2013)

¹⁰¹ See above n.71

¹⁰² This is outside of the scope of this paper but details can be found in Anderson, Free (Random House 2010) and J Griffin, Making a new copyright economy: A new system parallel to the notion of proprietary exploitation in Copyright, [2013] *IPQ* 69; on the broader relationship between capitalism and cultural works – J Beuys, *What is Money*, (trans. Boccon-Gibod, Forest Row: Clairview Books, 2010), U Roesch, *We are the Revolution!*, (Forrest Row: Temple Lodge, 2013) and in particular J Beuys, *Appeal by Joseph Beuys* [Poster], 1980 available at <http://www.tate.org.uk/art/artworks/beuys-appeal-by-joseph-beuys-ar00853> - legible copy on file with author.

¹⁰³ For a basic overview, see D Nimmer, *Nimmer on Copyright*, Volume 4, Chapter 13 (Albany: Matthew Bender, 2010).

¹⁰⁴ S.17 CDPA 1988.

¹⁰⁵ It is also worth noting that the current copyright infringement test is largely reliant on case law, rather than being detailed within a statute.

¹⁰⁶ See n.95.

¹⁰⁷ G Davies, N Caddick, & G Harbattole, *Copinger and Skone-James*, n.10, Part VI.

could have been a multitudinous set of claims, under the proposed system there remains but one sui generis right. This would mean protection would exist if there is sufficient labour, such as investment and technological skill, and that infringement would occur if there was an appropriation of that investment and skill from someone else. In this way the proposed right does operate quite similarly to the database sui generis right, and again those concepts within copyright infringement rules. So, if a model of an existing 3D printed work is qualitatively substantively reproduced in terms of the labour involved in making the original work, there will be an infringement. However, what would be the situation where the 3D print involves reproduction of an existing (and otherwise not 3D printed) copyright work? The paper suggests the following provision to be added to the one mentioned above:

“The sui generis right will not override existing IP rights in existing works that are not 3D printed works”

This would provide a means for existing IP right holders to be able to still bring infringement actions against those producing infringing versions of their works. This would help to preserve some of the existing IP balance, which combined with the new sui generis right could encourage existing right holders to either produce 3DP goods or license their existing IPR. If the 3DP sui generis right could override existing rights, then a situation similar to that with the database right could arise – namely, the fear, until *William Hill*,¹⁰⁸ that the sui generis right could be used to enhance IP protection for existing works. By way of example, under the proposed system if someone places online a 3DP version of a Star Wars character, then IPR would need to be licensed, or permission obtained, from the right holder if it would result in an infringement of existing IP such as copyright.

The process of implementation

The passing of a sui generis right in the manner proposed would require amendment of existing statutes, which could prove problematic. For instance, the CDPA 1988 in the UK would require significant amendment and limitation in order to enable the overriding of the proposed technology right. There are also clear issues in relation to international law. There are a number of international treaties, for instance the Berne Convention 1886,¹⁰⁹ the WIPO Copyright Treaty 1996,¹¹⁰ the World

¹⁰⁸ See n.81.

¹⁰⁹ Berne Convention for the Protection of Literary and Artistic Works, Sept. 9, 1886, as revised in Paris on July 24, 1971 and amended in 1979, S. Treaty Doc. No. 99-27 (1986) [The 1979 amended version does not appear in *UNTS* or *ILM*, but the 1971 Paris revision is available at 1161 *UNTS* 30 (1971)].

¹¹⁰ WIPO Copyright Treaty, 36 *ILM* 65 (1997).

Patent Cooperation Treaty,¹¹¹ to name but a few, which clearly set out the necessity of the traditional rights. Not conforming to these could lead to a breach of international law with all that entails.

In terms of substantive implementation, the proposed sui generis right must be registered and thus a registration system needs to be instituted. It is necessary for other right holders and users to understand what has been protected. The lack of registration within copyright law (notwithstanding the US system)¹¹² has merely led to more users being uncertain about knowing what is and is not permitted by the law. The system of registration should therefore be as open as possible. Also the proposed law needs to be structured so as to safeguard against abuses in a manner perhaps similar to patent law - patent law has been subject, particularly in the US, to trolling.¹¹³ This is where individuals and companies register patents for the sole purpose of profiteering from them rather than for the purposes of actually exploiting the inventions therein. This is something that the proposed system should be particularly aware of, especially as the potential scope of the right is extremely broad. The consequences of it being overbroad could be disastrous for societal development due the scope of the right. For this reason and despite potential delays registration should be operated in a manner similar to the old patent and trademark systems, namely ones which enables individuals to be able to challenge the registration of a right prior to that right taking effect.¹¹⁴ Individuals should be able to argue that the provision of the right is overbroad and would have a restrictive effects upon the development of future technologies. Partly to deal with this threat, it is also suggested that the duration of the right be more limited than many of the existing rights. Whilst a period of protection of 70 years from the date of registration has been proposed,¹¹⁵ it is also suggested that further to successful implementation of the right the duration of the right could then be varied within certain instances to reflect differences between the technology or content concerned - and it might be possible to do so in relation to the 'level' of the content or technology that is involved. The notion of 'level' refers to whether the technology or content involved is closer to that of being base content or a primary tool, more secondary content or a secondary tool, or even a third level content or technology. In other words, we are utilising the categorisations mentioned earlier in this paper that were used by Luciano Floridi when he suggested that technological tools can be broken into particular categories according to what they build up and what they could lead to.¹¹⁶ These categorisations

¹¹¹ Patent Cooperation Treaty, Washington 19th June 1970 as amended 28th September 1979, modified on 3rd February 1984 and 3rd October 2001 28 UST 7645 , 9 ILM 978 (1970).

¹¹² 17 USC §411 - For details see <https://www.copyright.gov/registration/> - registration of the containing work is required to begin infringement proceedings of a copyright.

¹¹³ J Bessen and M Meurer, *Patent Failure* (New Jersey: Princetown University Press, 2008).

¹¹⁴ For instance, the old law in the UK that permitted relative grounds of refusal to be raised by the examiner and other parties prior to the 2007 regulation change.

¹¹⁵ *Infra* p**.

¹¹⁶ L Floridi, *The Fourth Revolution* (Oxford: OUP, 2014), at 26-34. There is some analogy to the notion of "essential technology" in A Brown, *Intellectual property, human rights and competition: access to essential innovation and technology* (Cheltenham: Edward Elgar, 2013), at 1, or the notion of protocol layers: T Wu, *Who Controls the Internet* (Oxford: OUP,2006) Part I and Part II.

could be achieved in a number of ways – for instance, an examiner in a Patent Office could assess the relevant level, or it could be assessed according to sales data to predict when certain types of technology build upon others. Licensing agreements could be lodged with the IPO to help make such a determination, alongside tracking information concerning use. For example, if a 3D printer is used for making engine parts, then the licences required could be identified by registration of those agreements, by assessing other goods purchased by a particular class of consumer, or we can use these categorisations in order to provide the duration of protection. This could be achieved using online systems to observe the sales data of works and inventions, in order to assess the average period during which a particular technology brings in reward for right holders; after that period, the protection could be lifted or reduced. Computer systems utilising a mathematical algorithm,¹¹⁷ as defined by an organisation such as the Copyright Tribunal or UK-IPO, could be used.¹¹⁸ This might even bring in more money for the original right holder because it may open their works and goods to a wider market.¹¹⁹

These categorisations can also be used in order to establish the scope of the protection. For instance, it may be possible that more investment is required for a primary level tool whereas a third level audit tool should require less investment. This would mean that there is a similarity to the amount of investment put into certain levels. Flexibility in the system would also allow those who produce tools that were originally third order but become first order will ultimately become rewarded to a greater degree for their success. Thus if someone produces a work such as a computer game which becomes commercially successful later on, and is used as the basis for subsequent works, it can be considered to be a more elementary level work and consequently more deserving of protection. This could lead to greater financial reward. Such a system requires constant scrutiny (e.g. by a body such as the Copyright Hub) and so should also be capable of being altered, so that those levels of protection which turn out to be overbroad can also be modified by a court through a standard court process set out in statute. This would help alleviate some of the issues that have occurred within the biotech context where technological protection through patents have turned out to be overbroad.

Notwithstanding the above flexibilities, layering rewards in this manner could lead to restricted development, if for instance a licensing fee has to be paid every time what could be termed an elementary level technology is utilised. This is not necessarily restrictive of innovation - a well-known example today is the competition that arose between proprietary Microsoft Windows, which required a fee to be paid in order to use it, and the 'free' open Source software whose source code remained open to developers. However if an underlying technology, such as an operating system,

¹¹⁷ Above n.102.

¹¹⁸ M Freegard, '40 years on: An appraisal of the UK Copyright Tribunal, 1957-1996', (1998) 177 *Revue Internationale du Droit d'autuer* 2; <http://www.ipo.gov.uk/ctribunal/ctribunal-about/ctribunal-about-membership.htm>. On the Copyright Hub see *infra* n.100 .

¹¹⁹ *Infra* p.**.

leads to a bottleneck - of which there is equal historical evidence, for instance the technologies used within aeroplanes as discussed by Kitsch,¹²⁰ Mergers and Nelson¹²¹ - then thought should be given to providing a system that can avoid that bottleneck. There is some evidence of such a 'bottle-neck avoiding' system starting to develop in relation to Youtube videos where advertising is mandated where there is a possible claim of copyright infringement and those who own the copyright to take the advertising revenue.¹²² Something similar could be used in relation to the utilisation of lower level technologies. In addition to that there is also the chance that the exposure to that technology will lead to people more likely to purchase other goods and services from that particular right holder. In any event the case can certainly be made that it is possible to provide a layered level of protection of the sort being proposed here without it inhibiting the development of dependent content or technologies.

In summary, therefore, the proposed system would provide a sui generis right over 3DP content which right holders could use to exclusively exploit the work. This right would not override existing IP, and so would remain vulnerable to claims from existing IP right holders. The sui generis would need to be registered, and would then last for 70 years from the date of registration. The right would cover the labour, skill and effort that went into the production of the registered work, which would take the existing definitions of those terms from existing UK case law. The right will help to encourage investment in 3D works, whilst maintaining a balance with existing IP right interests. In order to keep the right appropriately balanced, it is argued that it could be possible to amend the scope or duration of protection according to the degree to which the right is used in relation to works that come to form the basis of subsequent works, in order to encourage subsequent uses. This could be achieved by providing a degree of licensing fees to the original right holder. The proposed right would have the basic elements set out in statute, such as the CDPA 1988, with the details of the proposed system then being administered by a body such as the Copyright Hub. That body will monitor the system and carry out alterations to duration as it sees fit given access to data looking at the use and re-use of existing protected works. Taken as a whole, it is argued that this proposal will then help to further encourage investment in 3DP, providing a greater degree of certainty than is currently the case with 3DP protection. As has been argued above, the current system suffers from inherent uncertainty in the levels of protection provided, which has been exacerbated by the continued convergence of technologies and also of the law. The proposed 3DP right is a means by which to deal with the issues posed by convergence, and to signify to right holders that there is a clear means by which to obtain reward for labour, skill and effort put into the making of 3DP works.

¹²⁰ E Kitch, The nature and function of the Patent System, 20 *Journal of Law and Economics* 265 (1977)

¹²¹ R Merges, and R Nelson, 'On the complex economics of Patent Scope', 90 *Columbia Law Review* 839 (1990).

¹²² Anon, 'Copyright on Youtube' <https://www.youtube.com/yt/copyright/en-GB/>

Conclusion

The shortcomings within the regulation of 3D printing reveals an increasingly important issue within legal regulation – namely, that of increasing convergence. Legal convergence is being driven by convergence within the technologies – 3D printing reveals that convergence is increasingly an issue in the way in which newer technologies can bring together previously disparate areas. For instance, it is now possible to easily embed a literary work within a physical invention, in a way that even ten years ago would not have been expected. However, this is now something potentially commonplace with any 3D printed work, not to mention all the other types of IP right which may also be involved. This leads to law being self-conflicting and self-defeating in terms of meeting their aims.¹²³ For this reason, it is extremely important that any proposed reforms need to keep in mind a holistic approach to 3D printing; the regulation needs to operate in a manner that enables regulation to map onto future technologies. The proposed sui generis 3D printing right has been designed with this in mind. The right has been founded in the historical explanations for IP protection, and furthermore, also the ex-post justifications. It has been proposed that labour is the key ingredient, and thus that labour should remain as the justification for the sui generis right. Convergence poses a number of issues with any such right, namely that as technologies converge existing protection will overlap, and that protection may end up being overbroad. The right adopts two approaches – firstly, that the levels of duration should vary according to the technical level of the work; secondly, that the proposed right should not set aside existing IP rights.

The proposed right may encounter considerable opposition should the right ever be implemented. However, it is critical that such an approach be taken. The operation of so many divergent and disparate sets of regulation over a single object merely leads to confusion and it leads to self-defeating law. Convergence means that differing legal protection, which may have originally served different purposes, will come to focus on the same points, the same issues, but due merely to historical precedent, will come to focus on older, less relevant issues as part of the balancing exercise within their respective fields. Meanwhile, technological convergence moves on and the law is left governing fields of irrelevance. Jamie Boyle wrote about how there needed to be aspects of creativity fostered by regulation to encourage the continued development of inventions, e.g. the public domain.¹²⁴ However, there is also a need to ensure that such protections do not develop in a way that inhibits the development of technologies which result in legal convergence. If such piecemeal legal protection continues to influence the development of technologies, then regulation will either depart from that which it purports to regulate, or the technologies will become stymied within the relevant jurisdiction. The proposed sui generis right for 3DP therefore raises and poses questions that regulators should keep in mind whenever regulating technologies. Regulation is not about merely

¹²³ See *infra* p.***.

¹²⁴ J Boyle, *Shamans, Software and Spleens* (Harvard: Harvard University Press, 1996), *inter alia* Chapter 13.

regulating the technologies of today, but also the technologies of tomorrow. This calls for holistic approaches, to ensure that future technologies, such as 3DP, are not inhibited by conflicting and overlapping laws caused by the convergence of technology.