THE 3D PRINTING REVOLUTION AND ITS IMPLICATIONS FOR IPRs:

NEW OPPORTUNITIES AND NEW CHALLENGES FOR SMEs

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Executive Summary

The adoption and exploitation of 3D printing technologies could offer considerable opportunities for the future. The promise of design flexibility as well as the potential for mass customisation, has the potential to equip consumers with co-creation opportunities resulting in products which will be of significantly higher value than mass-produced products.[1]

Nonetheless, the adoption and exploitation of 3D printing technology throws up a number of challenges for businesses entering this field as outlined in this report.

In highlighting such challenges, the report explores the application of the intellectual property (IP) framework to 3D printing as it relates to Small-to-Medium Sized Enterprises (SMEs). In doing so, the report draws on case studies in highlighting opportunities for SMEs seeking protection in the 3D printing sphere, considering issues where there are infringements, addressing possible liability issues for SMEs acting as intermediaries or bureau services, whilst considering possible exceptions for protection and mechanisms for enforcement. Whereas there has been much literature on the application of the traditional IP framework to 3D printing, there is limited literature on the utilisation of soft IP laws such as trade secrets and database protection – and their viability in this field. Accordingly, this report delves into the areas of trade secrets, database protection and other potential avenues such as licensing, in considering the best way forward in addressing this latest technological challenge for IP law.

Amongst these strands of discussion, one aspect stands out, distinguishing 3D printing from traditional and other types of manufacturing. Whilst it may be argued that 3D printing is no different to other types of manufacturing – which is true – it cannot be denied that the single factor which separates the current 3D printing field from the rest, is not so much the printing, but the digital design file, which can so easily be disseminated via online platforms. In 2015, the activity on these platforms were growing exponentially and cases of counterfeiting and piracy were – slowly but surely – beginning to appear.[2] As Lipson and Kurman eloquently state, "a 3D printer without an attached computer and a good design file is as useless as an iPod without music".[3]

It is clear then, that whilst the hardware, amongst other elements such as materials, simulation, tooling is important in the 3D printing process, the design file (and the computer which facilitates it) is highly important. Recognising these challenges, the European Parliament stipulated, *"Whereas, as a result of the processes that it uses, 3D printing leads to what the industry has described as a kind of 'fragmentation of the act of creating' in that a work may be circulated digitally before it takes physical form, which makes it easier to copy and complicates the fight against counterfeiting".*[4]

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[1] T Rayna and L Striukova, From rapid prototyping to home fabrication: How 3D printing is changing business model innovation [2016] 102 *Technological Forecasting & Social Change*, 214.
[2] D Mendis and D Secchi, *A Legal and Empirical Study of 3D Printing Online Platforms and an Analysis of User Behaviour* (UK Intellectual Property Office, 2015).
[3] H Lipson and M Kurman, *Fabricated: The New World of 3D Printing* (John Wiley & Sons, Inc., 2013), 12.
[4] European Parliament, Three-dimensional printing: intellectual property and civil liability (July 2018) at http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2018-0274+0+DOC+XML+V0//EN&language=EN

In responding to this challenge which has been raised, this report also considers the issues surrounding the protection and infringement of the Computer-Aided Design File utilised for 3D modelling a design – which is not sufficiently developed under the European Union law.

Finally, the enforcement of such laws – even if fully developed - will be a challenge in the future, particularly as a result of the decentralised nature of this technology. This is not an issue unique to 3D printing or scanning, however, one that requires attention in this report as the question of controlling 3D printers and scanners has been raised. Accordingly, the report considers the role of the blockchain technology as a solution; this is an under-developed area in the 3D printing landscape and further research is needed as it could prove to be an important solution in looking ahead to the future. Finally, the report suggests some other potential avenues, drawn from licensing as well as the interaction and interchange between different IP laws, in drawing solutions for enforcement.

Ultimately, it is in the best interest of the policy maker and legislator to take note of these challenges and address them, before the use of this technology becomes pervasive amongst the user, leading to a situation which is challenging to control. Even Steve Jobs could not have envisioned what was to come when he introduced the personal computer. A similar story is waiting to unravel in the 3D printing world. The hope for the future is that IP laws, currently at cross-roads – will travel the path well-trodden for centuries, in meeting the challenges thrown up by this latest technology.

> Human history has seen four major disruptive technologies. First there was fire, then the wheel. Then came the industrial revolution, followed by the digital revolution. When these technologies emerged no one foresaw their full potential … And just as some people wonder today what they would do with a home 3D printer if they had one, even Steve Jobs didn't really know what to do with his computer in the early days. A 1977 Apple computer ad said you could paint dazzling colour displays and invent your own pong games. At the time, these were the best predictions of the potential use of a home computer. How little they knew, and how fast we learned.[5]

[5] J Hornick, *3D Printing Will Rock the World* (CreateSpace, 2015) at ix. *See also*, Apple II Advertisement, The Home Computer that's Ready to Work, Play and Grow with You, *Modern Mechanix*, September 1977 at http://blog.modernmechanix.com/introducing-apple-ii/

Chapter 1

Development of 3D Printing

1. History of 3D Printing

1.1 The Early Days

It is unknown precisely when 3D printing technology was invented but it is presumed that it was originated from numerous 3D printing-related activities in around 1950s and 1960s. The first patent for the technology was granted on 9 August 1977 to Wyn Kelly Swainson, an American.[6] Although it did not lead to a commercially avail- able 3D printer at the time, it paved the way for the manufacturing of 3D parts. Shortly thereafter, Hideo Kodama of Nagoya Municipal Industrial Research Institute published his work in producing a functional rapid-prototyping system using photopolymers, a photosensitive resin that could be polymerized by a UV light.[7] In a process that is now familiar to most, a solid, printed model was built up in layers, each of which corresponded to a cross-sectional slice in the model. Kodama never patented this invention, and the first commercial 3D printer was launched in 1988 by American Charles Hull. Hull's commercial 3D printer was made possible by a patent granted in March 1986 for an 'Apparatus for Production of Three-Dimensional Objects by Stereolithography'[8].

The first emergence of commercial 3D printing technology available in the market was Stereolithography developed and commercialised by 3D systems in 1987. [9] Stereolithography is one of the most exemplary 3D printing technologies within the ASTM category of Vat Photopolymerization. [10]

[6] Application no. 05/165042 filed 23 July 1971. U.S. Patent 4,041,476 'Method, medium and apparatus for producing three-dimensional figure product' granted 9 August 1977.
[7] C Lonjon, The history of 3D printer: from rapid prototyping to additive fabrication at https://www.sculpteo.com/blog/2017/03/01/whos-behind-the-three-main-3d-printing-technologies/
[8] 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.
[9] T Wohlers and T Gornet, 'History of additive manufacturing' in T Wohlers (ed), *Wohlers Report 2014* (Wohlers Associates; 2014).
[10] I Gibson, D Rosen and B Stucker, *Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing,* 2nd ed., (New York: Springer; 2015), p. 37

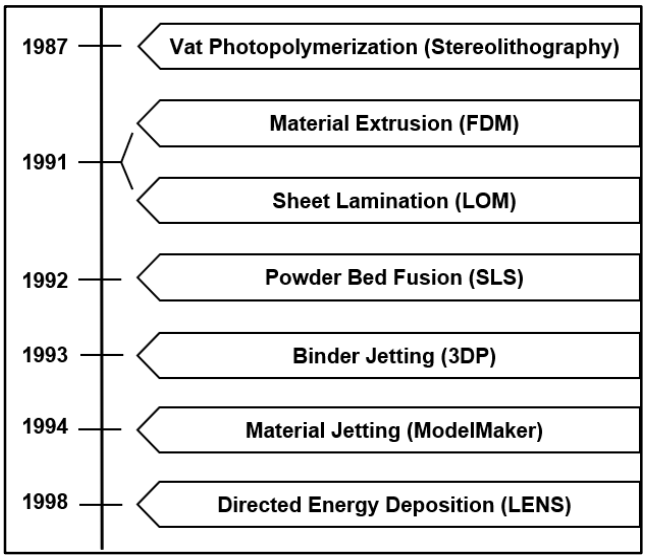

Diagram 1

Since then, diverse 3D printing technologies have begun to emerge. These technologies identified by the ASTM committee F42 on Additive Manufacturing encompass [11] binder jetting, directed energy deposition, material extrusion, material jetting, powder bed fusion, sheet lamination and vat photopolymerization.[12]

1.2 How Does it Work? From Rapid Prototyping to Consumer 3D Printing

3D printing has been referred to in many ways, such as Automated Fabrication, which was coined by Marshall Burns in the early 1990s, Freeform Fabrication, or Additive Fabrication, which was popularised by Terry Wohlers.[13] Most recently, the ASTM F42 committee recommended the term 'Additive Manufacturing', with a view to consolidating all terms that indicate 3D printing technologies.[14] Prior to the adoption of the term 'Additive Manufacturing', 3D printing was also referred to as Rapid Prototyping, Rapid Tooling, or Rapid Manufacturing or Digital Direct Manufacturing.

Rapid Prototyping is the earliest form or use of 3D printing which appeared as soon as 3DP technologies started to come into the market in around the early 1990s. As its name suggests, the term implies that 3D printing technologies were initially used for rapidly producing prototypes rather than manufacturing end-use products or components. Some of the major 3D printing technologies introduced above were adopted for the purpose of rapid prototyping in the industries such as Chrysler Corporation or Ford Motor Co.[15] As 3D printing

[11] Major 3DP technologies by which the report means are those which are identified by the ASTM committee F42 on Additive Manufacturing Technologies. Those encompass binder jetting, directed energy deposition, material extrusion, material jetting, powder bed fusion, sheet lamination and vat photopolymerization. See *ASTM F2792-12a: Standard Terminology for Additive Manufacturing Technologies* (2012).
[12] J Tuomi, S Chekurov and J Partanen, '3D Printing History, Principles and Technologies' in R M Ballardini, M Norrgard and J Partanen (eds), *3D Printing, Intellectual Property and Innovation: Insights from Law and Technology* (Wolters Kluwer, 2017).
[13] Gibson, Rosen and Stucker (n 5), pp. 7-8.
[14] *ASTM F2792-12a: Standard Terminology for Additive Manufacturing Technologies*
[15] X Yan and P Gu, 'A review of rapid prototyping technologies and systems' [1996] 28 *Computer-Aided Design*, 307.

technologies improved significantly in terms of accuracy and material properties, their use started to diversify, including tooling and direct manufacture of consumer goods.[16]

In the late 1990s, 3D printing technologies benefited from new materials as with heat-resistant polymers and metal alloys, which enabled the emergence of Rapid Tooling[17] to create production tools.[18]

Rapid Manufacturing [19] or Digital Direct Manufacturing led to the use of 3D printing technologies for production of end-use products or components.[20] Although the concept of Rapid Manufacturing was introduced in around the early 2000s, it appears that there was no viable system of Rapid Manufacturing during that time, according to Wohlers Report 2003.[21]

An important point to note here is that those three forms of 3D printing (Rapid Prototyping, Rapid Tooling and Rapid Manufacturing or Digital Direct Manufacturing) currently coexist giving rise to varied applications of 3D printing in the industries.[22]

Whilst industrial application through Additive Manufacturing continued to thrive during the 1990s to 2000s driven forward mainly by a company known as 3D systems,[23] interest in the use of 3D printing in professional settings and in personalised home formats also began to gain traction with the setting up of Massachusetts Institute of Technology's (MIT) Center for Bits and Atoms (CBA) in 2001.[24] Much like homebrew computer clubs formed around personal computing, the coming-into-being of fab labs[25] and the social phenomenon of the

[16] I Campbell, D Bourell and I Gibson, 'Additive manufacturing: rapid prototyping comes of age' [2012] 18 *Rapid Prototyping Journal*, 255.
[17] T Rayna and L Striukova, 'From rapid prototyping to home fabrication: How 3D printing is changing business model innovation' [2016] 102 *Technological Forecasting & Social Change*, 214
[18] Gibson, Rosen and Stucker (n 2), p. 437. *Also see*, G Levy, R Schindel and J.P. Kruth, 'Rapid manufacturing and rapid tooling with layer manufacturing (LM) technologies, state of the art and future perspectives' [2003] 52 *CIRP Annals - Manufacturing Technology*, 589; P D Hilton and P F Jacobs (eds), *Rapid Tooling: Technologies and Industrial Applications* (CRC Press, 2000), p. 12.
[19] D Bak, 'Rapid prototyping or rapid production? 3D printing processes move industry towards the latter' [2003] 23 *Assembly Automation*, 340.
[20] Gibson, Rosen and Stucker (n 5), p. 375.
[21] J J Beaman and others, *WTEC Panel Report on Additive/subtractive Manufacturing Research and Development in Europe* (World Technology Evaluation Center; 2004), p. 25
[22] For example, in the automotive industry, use of 3D printing for rapid prototyping still takes a very significant proportion. Use of 3D printing for rapid tooling in the industries is also remarkable. Wohlers Report 2015 categorised this area as 'industrial and business machines' and it is one of the leading industrial 3D printing application areas, whose share takes up around 17.5% in 2014. See for more detail V Duchêne and others, *Identifying current and future application areas, existing industrial value chains and missing competences in the EU, in the area of additive manufacturing (3D-printing)* (European Commission; 2016), pp. 100-106.
[23] H Lipson and M Kurman, *Fabricated: The New World of 3D Printing* (John Wiley & Sons Inc. 2013) chapter 2.
[24] N Gershenfeld, A Gershenfeld and J Cutcher-Gershenfeld, *Designing Reality: How to Survive and Thrive in the Third Digital Revolution* (Basic Books 2017) 18–24. See also, D Mendis, M Lemley and M Rimmer, From the Maker Movement to the 3D Printing Era: Opportunities and Challenges in D Mendis, M Lemley and M Rimmer, *3D Printing and Beyond: Intellectual Property and Regulation* (Edward Elgar, 2019) (Forthcoming), Chapter 1, 2.
[25] ibid, D Mendis et al. Fab labs (laboratories for fabrication) began as an experiment to see what would happen if the most popular of CBA's tools internally became widely available externally. The first full community fab lab opened in Boston in 2005.

Maker Movement rose around 3D printing and other emerging technologies.[26] In 2012 Chris Anderson provided captured the ethos behind this creative community in his book *'Makers'*:

> What defines the Maker Movement? It's a broad description that encompasses a wide variety of activities, from traditional crafting to high-tech electronics, many of which have been around for ages. But Makers … are doing something new. First, they're using digital tools, designing onscreen, and increasingly outputting to desktop fabrication machines. Second, they're the Web generation, so they instinctively share their creations online. By sampling bringing the Web's culture and collaboration to the process of making, they're combining to build something on a scale we've never seen from DIY before.[27]

The Do-it-Yourself attitude of the Maker Movement, empowered creative individuals not just to act as consumers, but also as producers. As Doughtery states, this powerful movement began to have an impact on learning, working and innovating in an open and collaborative manner providing tools for creators to becomes 'prosumers' and step aside from the accepted status quo.[28]

1.3 Main Beneficiaries

3D printing technologies could be employed by almost any industrial sector. For example, it has been used in the fields of health and medicine, aerospace, automotive, consumer goods, construction, energy and industrial and tooling amongst others. The listed industries have already been identified by the European Commission as those which need further investigation as to the impact which 3D printing has on the – and is currently the subject of a commissioned project.

It should also be pointed out that consumer goods encompass a broad range of sub-sectors such as hobby and toy items, jewellery and fashion and many more. One of the areas which has garnered much interest in this field has been the food industry, which has led to food products such as chocolates, pasta and ice creams being 3D printed. The various textures it can present as well as health options for vegetarians and vegans has been hailed as the main benefits of 3D printing food.[29] However, according to Lynette Kucsma, Chief Operating Officer of *Natural Machines* – one of the first 3D food printing companies and maker of the first 3D food printer to make both sweet and savoury foods with fresh ingredients known as

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[26] C Anderson, *Makers: The New Industrial Revolution* (Random House LLC, 2012); M Hatch, *The Maker Movement Manifesto: Rules for Innovation in the New World of Crafters, Hackers, and Tinkerers* (McGraw-Hill Books, 2013); M Hatch, *The Maker Revolution: Building a Future on Creativity and Innovation in an Exponential World* (John Wiley & Sons Inc., 2018); D Doughtery with A Conrad, *Free to Make: How the Maker Movement is Changing our Schools, Our Jobs, and Minds* (North Atlantic Books, 2016); and P Hirschberg, D Doughtery and M Kadanoff, *Maker City: A Practical Guide for Reinventing American Cities* (Maker Media, 2016).

[27] C Anderson, *Makers: The New Industrial Revolution* (Random House LLC, 2012) 20–21.

[28] D Doughtery with Ariane Conrad, *Free to Make: How the Maker Movement is Changing our Schools, Our Jobs, and Minds* (North Atlantic Books, 2016).

[29] *See,* 3D Food Printing at https://3dprinting.com/food/ J Chadwick, Here's How 3D Food Printers Are Changing What We Eat, *Tech Republic* (7 November 2017) at https://www.techrepublic.com/article/heres-how-3d-food-printers-are-changing-the-way-we-cook/

Foodini – it will be around 10-15 years before 3D food printers becomes a norm in our kitchens.[30]

Apart from all the industries, consumers will be one of the main beneficiaries of this technology. Since 2010, low cost 3D printers have paved the way for consumers to engage with 3D modelling, designing and printing and in years to come, and as the technology advances, it is estimated that consumers will certainly embrace the technology for printing smaller items in their homes.[31]

1.4 Countries in which 3D Printing is Most Prevalent

Since 2010, there has been an increased amount of activity in relation to 3D printing and additive manufacturing technologies. At the helm of this activity are the UK, USA and Australia, together with countries such as Germany, Japan, China and South Korea.[32]

UK, USA and Australia share some commonalities in their pursuit of advancing 3D printing technologies whilst positioning themselves as world leaders in 3D printing and additive manufacturing technologies. In doing so, these countries have also demonstrated their desire to be at the forefront of progressive Intellectual Property (IP) policy reform in relation to this technology, whether this be in the form of Government-commissioned projects leading to policy intervention or through academic scholarship emanating from specialists leading the way in IP law. As such, these three jurisdictions, and particularly the UK, has contributed significantly to addressing the IP challenges generated by 3D printing and additive manufacturing technologies.[33]

In terms of supporting the business sector, in the short-term, UK industries are expected to invest £600 million over the next five years, and spend more than £30 million on additive-manufacturing related research.[34] In 2017 it was suggested that UK's manufacturing sector could unlock £445 billion over the next decade and create thousands of jobs 'if it cracks the fourth industrial revolution'; it could also put Britain at the forefront of new technologies such as 3D printing and 3D scanning, amongst others, giving a much needed productivity boost and a net gain of 175,000 highly skilled, better paid jobs.[35]

Apart from the UK, other notable countries in Europe include Germany[36] as well as Scandinavian countries such as Sweden and Finland.[37] For example, 3D printing and

[30] ibid. *See also*, https://www.naturalmachines.com/foodini
[31] D Mendis and D Secchi, *A Legal and Empirical Study of 3D Printing Online Platforms and an Analysis of User Behaviour* (UK Intellectual Property Office; 2015).
[32] Ernst & Young, *How Will 3D Printing Make Your Company the Strongest Link in the Value Chain?* (2016) at http://www.ey.com/Publication/vwLUAssets/ey-global-3d-printing-report-2016-full-report/$FILE/ey-global-3d-printing-report-2016-full-report.pdf
[33] D Mendis, M Lemley and M Rimmer, From the Maker Movement to the 3D Printing Era: Opportunities and Challenges in D Mendis, M Lemley and M Rimmer, *3D Printing and Beyond: Intellectual Property and Regulation* (Edward Elgar, 2019) (Forthcoming), Chapter 1, 3.
[34] UK Government, *Made Smarter Review 2017* (formerly known as Industrial Digitalisation Review 2017), [64].
[35] ibid. [8]
[36] World Intellectual Property Organization, *World IP Report: Breakthrough Innovation and Economic Growth* (World Intellectual Property Organization 2015) http://www.wipo.int/export/sites/www/econ_stat/en/economics/wipr/pdf/wipr_2015_chapter3.pdf

additive manufacturing has a dedicated chapter within the German Bundestag titled 'Report on research, innovation and technological performance Germany 2015'.[38] Furthermore, within the broad context of high-technology manufacturing, the German Government has identified 'Industrie 4.0' (Industry 4.0 (I40)) as a national strategic initiative which is supported through the Ministry of Education and Research (BMBF) and the Ministry for Economic Affairs and Energy (BMWI).[39] The scheme launched in 2011 has a 10-15 year plan for I40 based on the Government's High-Tech 2020 Strategy. In particular, the initiative aims to 'drive digital manufacturing forward by increasing digitisation and the interconnection of products, value chains and business models'.[40]

1.5 The Social, Economic and Environmental Impact of 3D Printing

International organisations such as the World Intellectual Property Organisation (WIPO) and the World Trade Organisation (WTO) has taken note of this technology and has addressed the social, economic and environmental impact which it brings.

For example, WIPO has conducted empirical research into 3D printing as a breakthrough technology[41] whilst WTO has addressed how 3D printing and additive manufacturing may transform world trade[42] paving the way for lead manufacturing and its supply-chains to return to developed countries through 'in-sourcing'. Given how intellectual property has been integrated into multilateral, regional, and bilateral trade agreements, there could be complex issues arising in respect of the digital distribution of 3D printing from an economic perspective.[43]

At the same time from the perspective of society, the United Nations has expressed concerns about the misuse of 3D printing. United Nations Secretary-General, Ban Ki-Moon indicated to the United Nations Security Council that 'Information and communication technologies, artificial intelligence, 3D printing and synthetic biology will bring profound changes to our everyday lives and benefits to millions of people.'[44] He worried, though, that 'their potential for misuse could also bring destruction.'[45]

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[37] B Kianian, S Tavassoli and T Larsson, The Role of Additive Manufacturing Technology in Job Creation: An Exploratory Case Study of Suppliers of Additive Manufacturing in Sweden (2015) 26 *Procedia* CIRP 93-98; and D Mendis, M Lemley and M Rimmer, *3D Printing and Beyond: Intellectual Property and Regulation* (Edward Elgar, 2019) (Forthcoming).
[38] http://dip21.bundestag.de/dip21/btd/18/043/1804310.pdf
[39] European Commission Digital Transformation Monitor, Germany: Industrie 4.0 (January 2017) at https://ec.europa.eu/growth/tools-databases/dem/monitor/sites/default/files/DTM_Industrie%204.0.pdf
[40] ibid [3].
[41] World Intellectual Property Organization, *World IP Report: Breakthrough Innovation and Economic Growth* (World Intellectual Property Organization 2015). http://www.wipo.int/export/sites/www/econ_stat/en/economics/wipr/pdf/wipr_2015_chapter3.pdf
[42] World Trade Organization, *World Trade Report 2013: Factors Shaping the Future of World Trade* (World Trade Organization 2013|) https://www.wto.org/english/res_e/publications_e/wtr13_e.htm
[43] The United States litigation in *ClearCorrect Operating LLC v ITC*, 810 F3d 1283 (Fed Cir 2015) provides an early consideration of the relationship between intellectual property, trade, and 3D printing.
[44] Ban Ki-Moon, Addressing Security Council, Secretary-General Calls for Recommitment to Eradicating Weapons of Mass Destruction "Once and For All, *United Nations* (23 August 2016) https://www.un.org/press/en/2016/sgsm17996.doc.htm
[45] ibid.

On the other hand, there has been a great effort towards experimenting with the use of 3D printing to help fulfil sustainable development goals.[46] In Australia for example, Deakin University researchers have been interested in how 3D printing may address issues in respect of refuse and lack of access to clean water in Pacific island states, such as the Solomon Islands.[47] In the area of healthcare, MSF has been experimenting with 3D printing to develop prosthetic devices in its field hospital in Jordan.[48] In South Africa, Calestous Juma, emphasised that 'the Internet of Things, 3D printing, digital learning, and open source movements provide collaborative opportunities for inclusive innovation'.[49] In this context it is interesting to note the solar-powered 3D printer which makes objects from Sahara sands[50] thereby illustrating the positive impact which 3D printing can have on the environment.

[46] T Birtchnell and W Hoyle, *3D Printing for Development in the Global South: The 3D4D Challenge* (Palgrave Pivot 2014). See also, D Mendis, M Lemley and M Rimmer, *3D Printing and Beyond: Intellectual Property and Regulation* (Edward Elgar, 2019) (Forthcoming), 'Introduction'.
[47] K Powley, Deakin University 3D Printer to Bring Clean Water to the Pacific and Clean Up Plastic Waste, *Herald Sun* (25 April 2017) http://www.heraldsun.com.au/news/victoria/deakin-university-3d-printer-to-bring-clean-water-to-the-pacific-and-clean-up-plastic-waste/news-story/8fbf6d239f8c0ea22a6046da6dedf79b
[48] MSF, Jordan: A Decade of Healing at MSF's Reconstructive Surgery Hospital, (20 December 2017) http://www.msf.org/en/article/jordan-decade-healing-msf%E2%80%99s-reconstructive-surgery-hospital
[49] Calestous Juma, *Innovation and Its Enemies: Why People Resist New Technologies* (Oxford University Press 2016) 301
[50] https://www.dezeen.com/2011/06/28/the-solar-sinter-by-markus-kayser/

Chapter 2

SMEs and 3D Printing Technology: A Case Study from the Jewellery Sector

Key Points Explored:

The Law:
- Opportunities and Challenges in protecting and exploiting 3D printed jewellery under the current law

Main Findings from the Business Sector:
- The take up of designing jewellery in the 3D printing sector
- Use of own or third party software for designing jewellery for 3D printing
- Protection of the file – data or a computer program?

These key points explored in Case Study 1 and the findings presented through an empirical study, sets the scene for the discussion in Chapter 3.

2.1 Introduction

A commissioned report published in 2016 by the European Commission[51] concluded that at the most basic level, 3D printing technology can be understood as being a low cost means of easily reproducing objects that could potentially be protected by intellectual property rights, including design rights.[52] The issue which arises is whether the current legal regime offers a balance between innovation and misappropriation.

On the one hand, it is evidenced that additive manufacturing occurs in the fashion industries (to produce prototypes and models), and in consumer goods markets to manufacture products such as toys, games, home furnishings and sports equipment. Artists, jewellers and fashion designers are also deploying the technology in a range of ways to produce one off bespoke pieces.[53] Moreover, with affordable 3D printers and the emergence of online platforms dedicated to sharing 3D designs, it is possible for individual creators and

[51] J Dumotier *et al., Legal Review on Industrial Design Protection in Europe* (MARKT2014/083/D) (European Commission, 2016)

[52] In relation to the challenges and opportunities presented by 3D printing in the EU region, see *Opinion of the European Economic and Social Committee on Living tomorrow. 3D Printing - A Tool to Empower the European Economy,* CCMI/131 - Additive Manufacturing, Brussels, 28 May 2015

[53] AM Platform, *Additive Manufacturing: Strategic Research Agenda* (2014) at p. 30, available at http://www.rm-platform.com/linkdoc/AM%20SRA%20-%20February%202014.pdf For a discussion on copyright law, see B Rideout, Printing the Impossible Triangle: The Copyright Implications of Three-Dimensional Printing, (2012) 5 *Journal of Business Entrepreneurship & Law*, p. 161, 163–64; H Dasari, Assessing Copyright Protection and Infringement Issues Involved with 3D Printing and Scanning, (2013) 41 AIPLA Q.J. 279; E Lee, Digital Originality, (2012) 14 *Vanderbilt. Journal of Entertainment & Technology Law* 919; M Weinberg, What's the Deal with copyright and 3D printing? public knowledge, (Public Knowledge; 2013); L Osborn, Of PhDs, Pirates, and the Public: Three-Dimensional Printing Technology and the Arts, 1 TEX

consumers to share ideas and designs or have their own creation produced.[54]

The discussion below is based on the findings of a funded collaborative project titled *'Going for Gold: 3D Scanning, 3D Printing and Mass Customisation of Ancient and Modern Jewellery – IP Implications.'* The project was completed in August 2017 and was led by the present author.[55]

In carrying out this project, it was clear that the most relevant Intellectual Property Rights (IPRs) for jewellery are copyright and designs. These rights apply to the appearance of an object that results from its lines, contours, shape, texture, materials, and ornamentation. Other rights that may arise in the fashion and jewellery industry are geographical indications, trademarks, trade secrets and patents.[56] Although fashion designers frequently apply trade marks to protect their brands, patents, for example is hardly used as it is too costly and require a high standard of protection.[57] As such, IPRs such as patents and trade marks do not protect the appearance of an object but are tools used in a firms' business model and brand protection. Copyrights and designs, on the other hand, concern the protection of an object independently from the business model. These rights, indeed, and particularly copyright and unregistered design rights rise automatically.

Before considering the findings from the project on 3D printing and jewellery, the report, sets out some of the opportunities and challenges which emerged from a consideration of 3D printing within the jewellery sector, based on the current law.

2.2 The Law: Opportunities and Challenges

The opportunities and challenges for businesses in the field of 3D printing jewellery mainly arise from copyright and design laws.

With regards to **copyright law**, in accordance with Article 2 of the Berne Convention[58], jewellery may be protected as an artistic work under copyright law. In the United Kingdom, for example, the Copyright, Designs and Patents Act 1988 (as amended) (CDPA 1988) section 4 lists different categories[59] that fall under "artistic work". Items of jewellery could thus be protected under section 4.1 (a) as a graphic work, photograph, sculpture or collage, *irrespective of artistic quality*, or under section 4.1(c) a work of artistic craftsmanship. Section 4.2 further explains that "graphic work" includes

(a) any painting, drawing, diagram, map, chart or plan; and

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[54] D Mendis and D Secchi, *A Legal and Empirical Study of 3D Printing Online Platforms and an Analysis of User Behaviour* (UK Intellectual Property Office; 2015).

[55] The project, led by Professor 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 two-year project concluded in August 2017

[56] For an understanding see the TRIPS Agreement 1994.

[57] See Centre for Fashion Enterprise, *Intellectual Property in the Fashion Design Industry, Trademarks*, p. 6 available at http://www.fashion-enterprise.com/wp-content/uploads/2015/05/CFE-IP-Trademarks-Download1.pdf

[58] Berne Convention for Protection of Literary and Artistic Works 1886.

[59] To be noted that the UK approach is in contrast with the majority of EU countries, where such distinction does not exist and all works could be copyrighted.

(b) any engraving, etching, lithograph, woodcut or similar work; "photograph" means a recording of light or other radiation on any medium on which an image is produced or from which an image may by any means be produced, and which is not part of a film; "sculpture" *includes* a cast or model made for purposes of sculpture *(emphasis added)*.

The explanations offered under s. 4.2 are, however, not exhaustive. This can be inferred from the verb "includes", which does not preclude the possibility to add other types of artistic works. This has led to some uncertainties surrounding the concept of "artistic work" both from a theoretical and practical view.[60] Although courts continue to shed light on the controversial wording of "artistic work", the meaning of the concept is not straightforward. In terms of the issue at hand, this means that a controversy on the qualification of a piece of jewellery as a work of art is left to the courts to decide, on a case-by-case basis.

This could be a challenge for Small to Medium Enterprises (SMEs) wishing to enter the 3D printing field.

The issue is further exacerbated as a result of a lack of agreement as to what amounts to "artistic craftsmanship".[61] Case law, however, offers some guidelines.[62] Contrary to "artistic work", a "work of artistic craftsmanship" must have "artistic quality" and "craftsmanship"[63] It is also necessary to show that the author is both an artist and a craftsman.[64] In some cases, it has been argued that works of artistic craftsmanship ought to be durable handmade objects.[65] If this reasoning is applied to jewellery items, it could exclude certain types of jewellery from being protected. Moreover, even in the case of handcrafted jewellery, the meaning of "durable" needs clarification.

This is not an issue that is applicable merely to 3D printing. This is a challenge which has been faced by businesses over the years. However, as more and more businesses enter the field of 3D printing, it would be helpful to have the law clarified.

Finally, the legal status of mass-produced jewellery also remains unclear. In *George Hensher v Restawile*, it was also argued that "craftsmanship" cannot be limited to handmade objects and machine-produced items could fall under the term "artistic".[66]

Design law protects the "appearance of products" and can easily be extended to protecting 3D printed jewellery. Accordingly, the law as it stands can protect features such as shape, contours, lines and colours applied to or incorporated in material objects – commonly known

[60] J Pila, "Copyright and Its Categories of Original Works" (2010) 30 (2): 229 *Oxford Journal of Legal Studies;* D Booton, "Framing Pictures: defining art in UK copyright law (2003) 38 (2) *Intellectual Property Quarterly* 38-68. For a comprehensive overview see S Stokes, *Art and Copyright*, Hart Publishing (Oregon, 2001).
[61] P Masiyakurima, Copyright in Works of Artistic Craftsmanship: An Analysis (2016) 36(3): 505 *Oxford Journal of Legal Studies*. D Bainbridge, *Intellectual Property*, Pearson Education ltd, pp. 60-62. For more on this issue see also Booton, ibid, p. 11.
[62] See UK IPO, Repeal of the S. 52 of the Copyright, Designs, and Patents Act 1988: Guidance for Affected Individuals, organisations, and business, p. 8. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/551236/160408_guidance_s52_final_web_accessible.pdf
[63] *George Hensher v Restawile Upholstery (Lancs) Ltd* (1976) AC 64 (HL) 77 (Lord Reid); *Merlet v Mothercare plc* (1986) RPC 115.
[64] *Burke and Margot Burke Ltd v Spicers Dress Designs* [1936] Ch. 400
[65] *Hensher v Restawile Upholstery (Lancs) Ltd* (1976) AC 64 (HL) 77 (Lord Reid).
[66] ibid.

as industrial design or applied art. As such, in the context of 3D printing, design rights are very relevant in attempting to protect the shape of 3D models and 3D printed objects.[67] [68]

It should also be noted that the appearance of a product can be established either through registered or unregistered design rights, harmonised through the EU directive 98/71/EC on the legal protection of designs and the Community Design Regulation (6/2002).[69] The rationale for the differentiation between registered and unregistered designs can be explained as follows. Unregistered designs offer advantages by eliminating the burden of registration formalities for those sectors which produce large numbers of designs for products having a short market life. Registered designs, on the other hand, provide legal certainty and a longer term of protection for products with a foreseeable market life.

However, it appears that registered design is underutilised in protecting designs with a rapid cycle. An example from the fashion industry illustrates that the process of registration can be long and expensive.[70] For example, it has been pointed out that registered design rights were not able to provide proper protection for the fashion industry, where a design is produced in a rapid cycle, because registration of a design takes up considerable time and registration fee is expensive.[71]

This overview of the law relating to the jewellery sector, was examined in a qualitative survey that was carried out as part of the *'Going for Gold'* project which focused on 3D printing in the jewellery sector. Points of law, which gives rise to uncertainty in the 3D printing context were explored through questions on 'authorship', ownership' and the current status of the protection of software in the 3D printing field.

2.3. 3D Printing in the Jewellery Sector: Main Findings

Case Study 1: A Case Study in 3D Printing Jewellery

The findings, drawn from the 'Going for Gold' Project explored the following questions, amongst others, in an attempt to determine the status of protecting Computer Aided Design (CAD) files.

In doing so, there was a further attempt to identify the percentage of designers taking up the survey (from Small to Medium Sized Enterprises) to those who were using the designs.

Apart from that we were also interested to understand whether designers used *existing software* or their *own software* in creating their 3D model as well as whether they saw the digital model (encompassed within a CAD file) as a computer program or data.

[67] The Fab Charter of October 20, 2012 available at http://fab.cba.mit.edu/about/charter/.
[68] J Rifkin, *The Third Industrial Revolution: How Lateral Power is Transforming Energy, the Economy, and the World* (first published 2011, Palgrave Macmillan 2013).
[69] Council Regulation (EC) No 6/2002 amended by Council Regulation No 1891/2006 of 18 December 2006
[70] T Farkas, 'Does the United Kingdom need a general law against unfair competition? A fashion industry insight: Part 1' (2011) 33 European Intellectual Property Review 227.
[71] Farkas argued that an individual registration fee might not be too high, but if there is fashion collection consisting of hundreds of fashion items to be registered, the cost is likely to exponentially grow. However, it should be noted that the time and cost required for registration has significantly decreased due to the design modernisation.

These questions are important for understanding the legal and industrial implications surrounding the protection of CAD-based design files and achieving the true potential of 3D printing through mass customisation (chapter 3).

One of the striking findings in the survey, focusing on the 3D printing industry, was the low-take up of designers. A specific reason was not immediately obvious; however, a lack of legal certainty in this area, could be an explanation for the low-take up of designers in the 3D printed jewellery field (along with factors such as materials and costs). Furthermore, most of the participants involved in the survey were from Small-to-Medium Sized Enterprises (SMEs) who noted the high financial outlay needed for investing in 3D printers that can specifically print jewellery (similar to 3D printing food as mentioned above)[72] – which were outside their company's financial potential.[73] In such cases, most turned to 3D printing bureaus or traditional jewellers to have the products made. Against this backdrop of information, some of the results from the project, providing an insight into 3D printing jewellery is set out below.

From the survey sample, designers accounted for just 23.21% whilst consumers accounted for 76.79%.

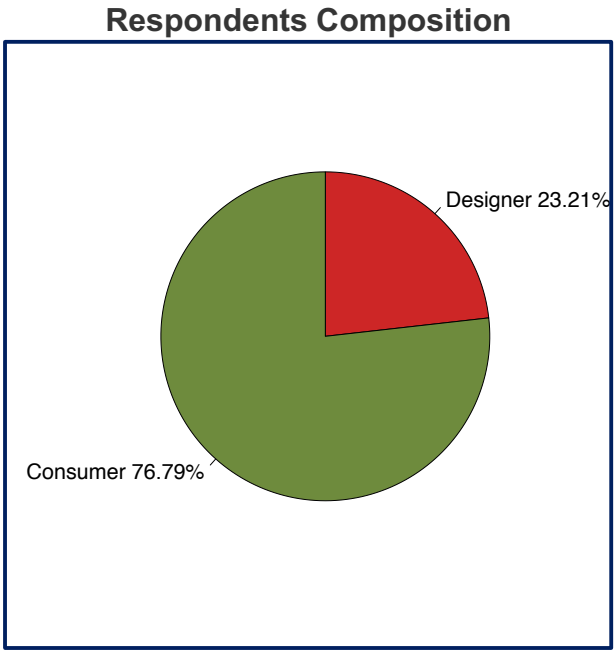

Diagram 2 (Source: Going for Gold Project)

The survey also considered *ownership and authorship* from the perspective of the use of software. The following questions were put to the respondents:

[72] Such as Foodini by Natural Machines https://www.naturalmachines.com/foodini
[73] D Mendis, Going for Gold Project (2017).

For creating your 3D model, do you use existing software or do you use your own software?

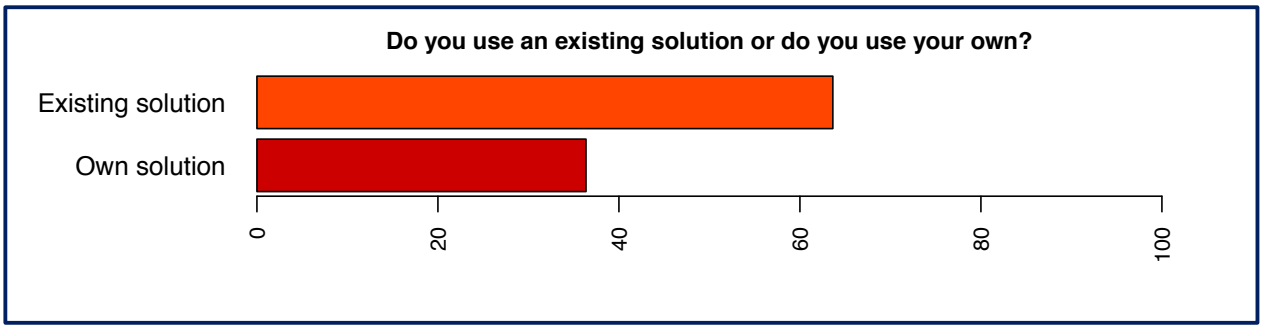

Diagram 3 (Source: Going for Gold Project)

It was revealing to note that everyone used existing software. However, in relation to the question of whether the designers thought their digital model consisted of mere data or was the result of a computer program, the following results were returned:

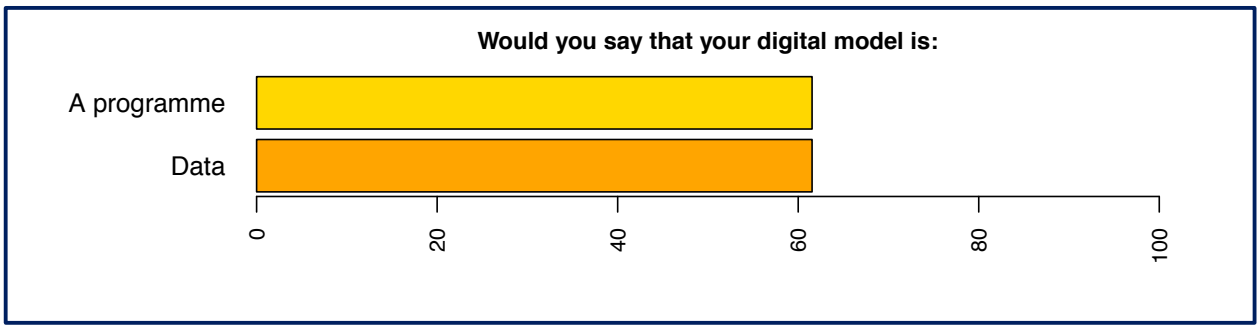

Diagram 4 (Source: Going for Gold Project)

This is an insightful finding and lends itself to answering the question of whether a Computer Aided Design (CAD) file is defined as software – i.e., a computer programme or data – or both. The position is not immediately clear. The results themselves do not shed much light as the respondents are divided in their opinion, which however does demonstrate that there is a clear confusion as to whether it is data or a programme even amongst those in industry and those who use it on a daily basis. The response is important as it further sheds light on ownership and authorship depending on the status of a CAD file, and as discussed in Chapter 3 of this report.[74]

[74] See the discussion on the 'Protection of CAD Files'.

Chapter 3

SMEs as Creators

Key Points Explored:

Protecting the 3D CAD File and 3D Scans:
- Protecting the CAD File: The Legal Status
- 3D scanning leading to 3D printing: does it lead to new subject matter?
- Distinguishing between 3D scans, 3D models and mass customisation

Main Points for the Business Sector –Licensing Schemes:
- What type of license schemes exist for the protection of 3D files and designs on online platforms?
- How are they utilised?
- Are they applicable and appropriate in the 3D printing field?

3.1 Introduction: Protecting the CAD File

The protection of CAD design file supporting the 3D model is an important feature of any 3D printed product.[75] As Lipson and Kurman point out, "a 3D printer without an attached computer and a good design file is as useless as an iPod without music"[76]. Accordingly, computers play a critical role in the 3D printing process. Without instructions from a computer, a 3D printer simply will not work. The functioning of a 3D printer therefore depends on it being 'fed' a well-designed electronic design file, which could be a CAD file, that tells it where to place the raw material. As such the importance of the CAD file cannot be underestimated.

It has been argued that applying the current copyright law to the 3D printing context, could imply that a computer program encompassing a CAD-based design file within its definition is capable of copyright protection as a literary work.[77] This raises the question of whether the software code enabling artistic 3D models to materialise through a software program such as CAD will also attract literary copyright protection? Two English cases – *Autospin (Oil Seals) Ltd v Beehive Spinning*[78] and *Nova v Mazooma Games Ltd*[79] considered this point.

Furthermore, recent discussions have raised the questions of whether there is any literary copyright at all in a CAD design file, or whether it simply contains data in the form of instructions, has also been a point of discussion.

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[75] Adapted from D Mendis, 'Back to the Future'? From Engravings to 3D Printing – Implications for UK Copyright Law in D Mendis, M Lemley and M Rimmer, *3D Printing and Beyond: Intellectual Property and Regulation* (Edward Elgar, 2019) (Forthcoming).
[76] H Lipson and M Kurman, *Fabricated: The New World of 3D Printing* (Indiana: John Wiley & Sons, Inc.; 2013), p. 12.
[77] D Mendis, '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 Review* 155–169; D Mendis, '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* 265.
[78] *Autospin (Oil Seals) Ltd v Beehive Spinning* [1995] RPC 683.
[79] [2007] RPC 25.

As such, these issues prompt us to look deeper into its protection from the point of view of copyright. In particular, they question, whether:

(a) design files containing machine-readable instructions are to be perceived as 'data', based on the fact that they provide instructions.
(b) Or should they attract literary copyright protection (as well as artistic copyright), based on the fact that they encompass preparatory design work leading to the development of a computer program which can result from it at a later stage.

The EU Software Directive[80] offers some guidance, regarding its protection, in this context. According to Recital 7 of the Software Directive, a 'computer program' is considered to 'include programs in any form including those which are incorporated into hardware'. It also 'includes preparatory design work leading to the development of a computer program provided that the nature of the preparatory work is such that a computer program can result from it at a later stage'. An analysis of Recital 7 of the Software Directive ascertains that 'the protection is … bound to the program code and to the functions that enable the computer to perform its task. This in turn implies that there is no protection for elements without such functions (i.e. graphical user interface (GUI), or 'mere data') and which are not reflected in the code (that is, functionality in itself is not protected, since there could be a different code that may be able to produce the same function).[81] In other words, copyright protection will attach to the expression of the computer code and will not extend to the functionality of the software.

Charlotte Waelde *et al* establish, "arguments that object code is incapable of copyright protection are no longer sustainable". [82] Furthermore, the Court of Justice of the European Union (CJEU) in *Bezpečnostní* concluded that that GUI can be protected as a copyright work if the interface represents the author's own intellectual creation.[83] Yet, it is this point which has given rise to much debate as reflected in various articles and commentaries[84] as emerging technologies tend to blur the line between source and object codes. It is akin to co-creation of creative works made possible by technological means, which in turn, has seen the disappearance of the 'traditional author' and raised questions about the end of

[80] Parliament and Council Directive 2009/24/EC of 23 April 2009 on the legal protection of computer programs [2009] OJ L111/16, recital 7.
[81] Case C-406/10 *SAS Institute Inc. v World Programming Ltd* [2012] 3 CMLR 4. *See also* Paolo Guarda, 'Looking for a Feasible Form of Software Protection: Copyright or Patent, Is that the Question?' (2013) 35(8) European Intellectual Property Review 445, 447.
[82] Charlotte Waelde et al, *Contemporary Intellectual Property: Law and Policy* (4th ed), pp. 64-65. This argument succeeded in the Australian case of *Apple Computers Inc. v Computer Edge Pty Ltd* [1986] FSR 537. In New Zealand, the object code achieved copyright as a translation of the source code: *IBM Corp v Computer Imports Ltd* [1989] 2 NZLR 395.
[83] *Infopaq International A/S v Danske Dagblades Forening* (C-5/08) [2010] FSR 20.
[84] D Mendis, '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. 265-281; V Elam, 'CAD Files and European Design Law' (2016) 7 *Journal of Intellectual Property, Information Technology and E-Commerce La*w 146; T Y Ebrahim, 3D Printing, Digital Infringement and Digital Regulation [2016] 14(1) *Northwestern Journal of Technology and Intellectual Property*, 37-74; M Rimmer, The Maker Movement: Copyright Law, Remix Culture and 3D Printing [2017] 41(2) The *University of Western Australia Law Review*, pp. 51-84; M Antikainen and D. Jongsma, The Art of CAD: Copyrightability of Digital Design Files in Rosa Ballardini *et a*l, 3D Printing, Intellectual Property and Innovation: Insights from Law and Technology (The Netherlands: Kluwer Law International BV; 2017), chapter 1; D Mendis, In Pursuit of Clarity: The Conundrum of CAD – Seeking Clarity Through Case Law [2018] 40(11) *European Intellectual Property Review,* 694.

ownership, as it was once known.[85] New technologies such as 3D printing once again drives us to re-visit regulatory boundaries between the creator and publisher; author and owner as well as other new areas such as digital design files where the nuance of protection appears to be subtle.

Whilst such academic debate may continue, from a business perspective, it is important to understand whether these CAD files can be protected and if so, which elements fall within such protection? The answer to these questions can be drawn from the textile sector as well as the electronics sector – based on some decided cases.

Case Study 2: From 3D Files to 3D Models and Scans: Textile Looms, Circuit Drawings and Dead Sea Scrolls

In Case Study 2, the report employs a number of illustrative examples to answer questions relating to the protection of CAD files and 3D scans.

In doing so, an analogy is drawn between other types of files which carry instructions and code in determining whether they have been protected **(*see*, examples 1 and 2).**

Example 3 considers the distinction between the protection of the file as opposed to the 3D model

Furthermore, in relation to 3D scans, does it create new subject matter, distinct from the 3D model? If so, who owns the IP in such a situation? **(*see*, example 4).**

Example 1: Drawing an Analogy with Instructions for Setting up a Textile Loom

Question: Can a ticket stamp consisting of written instructions (as per example below), for an operator to set up the loom be protected as an artistic (graphical) work as well as a literary work?[86]

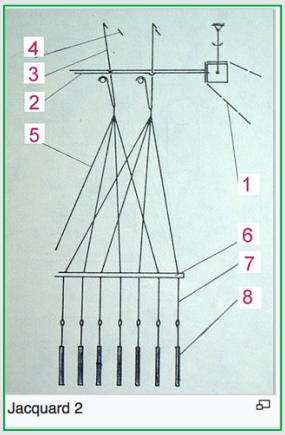

Diagram 5 (Source: Jacquard Loom)

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[85] Aaron Perzanowski and Jason Schultz, *The End of Ownership: Personal Property in the Digital Economy* (Cambridge, MA: MIT; 2016).
[86] This was the question asked in the English case of *Abraham Moon & Sons Ltd v Andrew Thornber and Others* [2012] EWPCC 37.

Answer: Yes; based on the following reasons.

The instructions may be meaningless to most lay people. However, what mattered was that the document had visual significance to *some* people, even though to most it would be meaningless words and numbers to most.

The Judge in this case reasoned that the point is that the ticket is not simply a set of instructions which can be performed on a loom, it is also a record of an image and the image has been reproduced.

Bringing it closer to the present discussion, the Judge in this case drew an analogy to CAD files, stating that the same reasoning could be applied to these files. Referring to the artist David Hockney, who had created works of art on his iPad, Judge Birss suggested that the artworks could be 'ephemeral as they were being created and the images may not even have stayed on the screen all the time as they were being drawn'.[87]

However, the Judge reasoned that 'the only thing which makes sense to be referred to as the artist's work … is the computer file recording the image'.[88] In this sense, the Court concluded that a document or computer file recording an image, where the image is in fact represented through instructions, can indeed attract artistic copyright. As mentioned above, what is important is the visual significance of the image represented through a design document (or CAD file) to those with knowledge of such documents consisting of symbols, numbers and words.

This applies neatly to the scenario in relation to CAD files, where on the one hand set-up instructions for a loom were considered to attract literary copyright whilst the image that they encompassed was said to attract artistic copyright.

Example 2: Drawing an Analogy with Code and Symbols used for Circuit Diagrams

Question: Can circuit diagrams, whether they be written in code or symbols, attract literary copyright?[89]

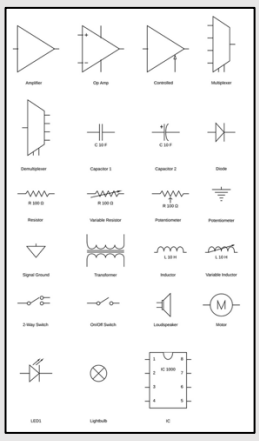

Diagram 6 (Source: LucidChart)

[87] ibid. [105].
[88] ibid.
[89] This was the question asked in *Anacon Corp v Environmental Research Technology* [1994] FSR 659.

Answer: Yes, based on the following reasons.

A UK Court clarified the definition of "writing" as "any form of notation or *code*, *whether by hand or otherwise and regardless of the method by which, or medium in or on which, it is recorded*, and "written" shall be construed accordingly".[90]

Jacob J articulated that whatever is written down, whether it be in code, symbol, hand or otherwise can attract literary copyright.[91]

As such, the cases of *Abraham Moon* and *Anacon* strengthens the argument for literary copyright in design documents, including those containing code, symbols, instructions. Applying the above reasoning to 3D CAD design files, it could be argued that a CAD design file containing the instructions for printing a 3D model, represented through a design document containing written symbols[92] as well as a visual image can be considered as a literary and artistic work. It may remain a conundrum for designers (as seen in Chapter 2) as well as lawmakers whether the instructions are mere data or something more – but until this gap is addressed in the law, there is some guidance in the law from an English court.

3.2 Distinguishing between the 3D Model and 3D File

As mentioned in Chapter 2, a 3D model can be protected as an artistic work – and this is irrespective of whether it will be 3D printed at a later stage or not. This leads us to the question of why, then, it is important to distinguish between the 3D model and 3D file. The answer is significant in relation to mass customisation – which is the true potential of 3D printing.

The impact of mass customisation in the 3D printing sector was tested in the qualitative survey of the aforementioned *Going for Gold* project. 3D printing enables 'mass customisation', where consumers are presented with an 'incomplete product' which they can customise before it is completed.[93] This very much lends itself to the design of smaller items such as jewellery which increases in price and value through personalisation and customisation.[94]

The survey, exploring IP implications relating to mass customisation, returned these results to the following questions.

[90] [1994] FSR 659 at 663. Also, Section 178, Copyright, Designs and Patents Act (CDPA) 1988
[91] [1994] FSR 659 at 663.
[92] ibid.
[93] D Mendis, Going for Gold Project (2017).
[94] D Mendis, Going for Gold Project (2017).

Given a mass customisation site, when do you consider consumers have Intellectual Property (IP) rights while customising and purchasing a design?

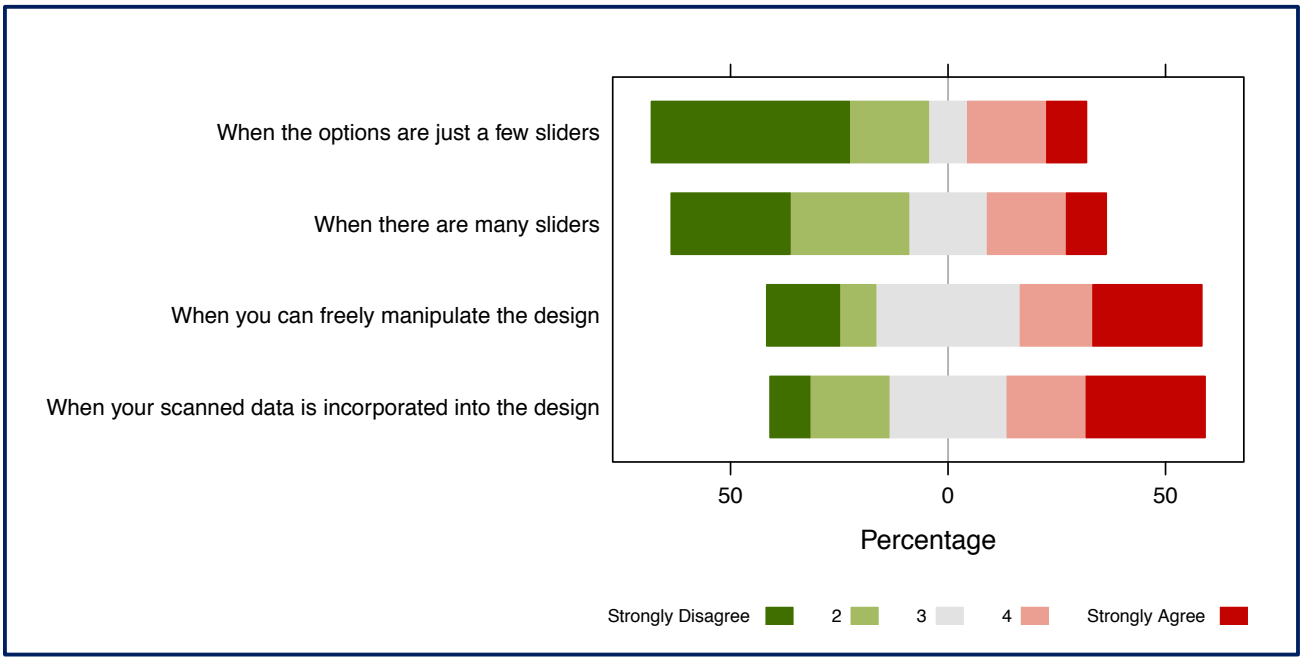

Diagram 7 (Source: Going for Gold Project)

These 'sliders' allow a product or a piece of jewellery to be mass customised. The results confirm that where the customisable options are few, IP issues do not come into play; however, in accordance with the diagram above, where a consumer can 'freely manipulate a design' they believe that they have some rights while customising and purchasing a design.

A construction graph or tree as it is known, represents the 'functions' which are executed to create a 3D model. Taken on its own as the functions which represent the 3D model, could be considered as data, unless the *Nova v Mazooma*, *Abraham Moon* or *Anacon* decisions are followed as discussed above. On the other hand, where the construction graph represents a program, containing instructions to be performed by the consumer customising a 3D model for 3D printing, the execution of this task by a secondary program could lead to the identification of the construction graph as a mini program within the larger program. This diagram below may assist in clarifying this point.

Example 3: The Importance of the 'Construction Graph' in Distinguishing between the 3D File and 3D Model

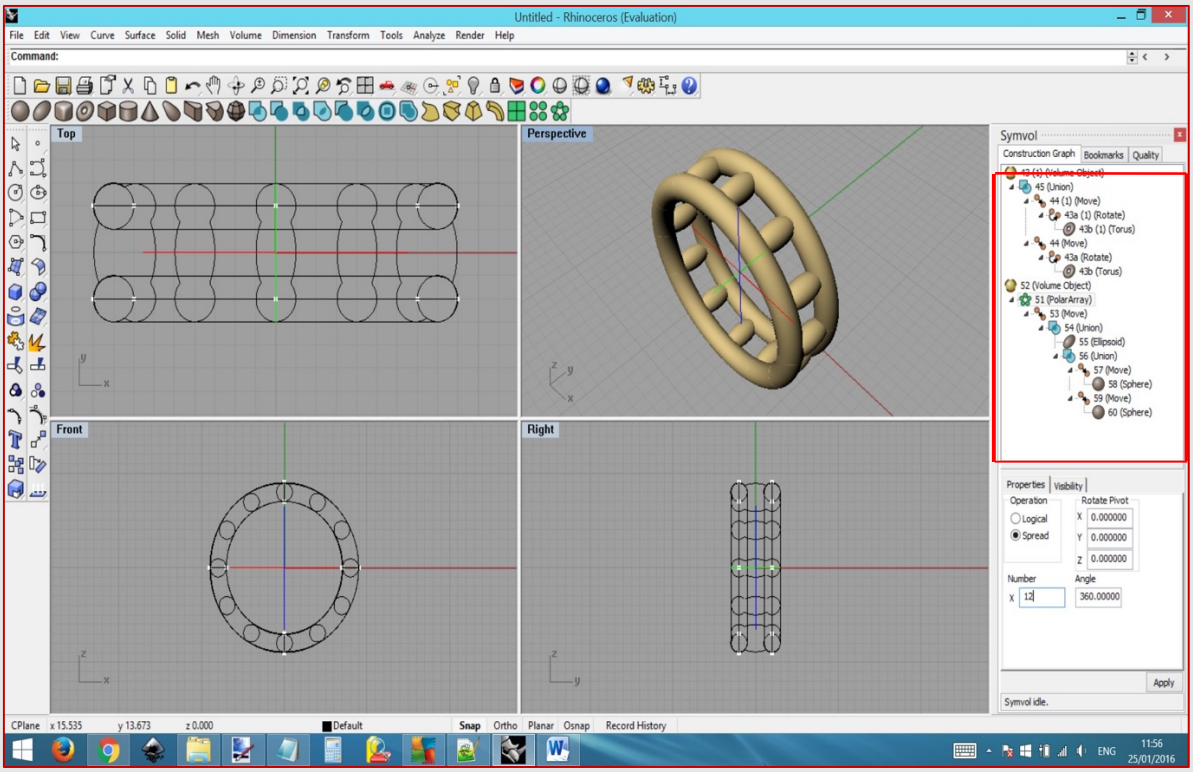

Diagram 8 (Source: D Mendis, In Pursuit of Clarity: The Conundrum of CAD and Copyright – Seeking Direction Through Case Law, [2018] 40(11) *European Intellectual Property Review,* 694-705)

As with most software packages, the CAD software (*Rhinoceros 3D*[95] as illustrated in the above diagram) provides tools as seen on the top and left of the file, which enables a creator to design a 3D model. The graph on the right, is the 'construction graph' which is the written iteration of the 3D model. Where customisation of a 3D model is provided by the designer, the construction graph will also reflect the customisation options, to be executed by a consumer at a later stage. The legal implications of mass customisation, particularly from the context of copyright, is interesting. However, it is important to point out that the more complex the 3D model and its customisation options are, the longer the construction graph will be. For designers, the true value of their 3D model in terms of IP protection, tends to lie in the written iteration of the 3D model (i.e., construction graph).[96] The question is whether the construction graph contains mere instructions to be read by a computer for purposes of

[95] Rhinoceros 3D at https://www.rhino3d.com/

[96] Findings from the AHRC-funded project, *'Going for Gold': 3D Scanning, 3D Printing and Mass Customisation of Ancient and Modern Jewellery'* (2015-2017) at https://microsites.bournemouth.ac.uk/cippm/2017/03/24/going-for-gold-3d-printing-jewellery-and-the-future-of-intellectual-property-law/

printing a 3D model[97], and if so, can such instructions be considered literary works. Where the construction graph presents customisation options, is the situation any different?[98]

In the present context, the author submits that the construction graph could potentially be seen as a 'mini computer program' within the large *Rhinoceros 3D* software program utilised in *Diagram 8*. *A designer may use a third-party software to design a 3D model for customisation as opposed to their own software*. In such a scenario, the question is whether a designer has some protection over their construction graph (which is distinct from the 3D model) or whether it is seen to be a part of the bigger third-party software. An analogy from the 2D world, can put this question into context. Where a writer uses third party software such as *Microsoft Word for Mac* to write an academic paper, should the resulting work be considered a creative work belonging to the writer or to a larger third-party software company. Of course, nobody would dispute that the work belongs to the writer.[99]

If so, in a 3D world, can it not be argued that the array of customisation options provided by the designer and executed by a consumer at the time of customisation, adds a new layer of creativity – and in computer language a new layer of 'source code'?[100] In making this argument it is important to distinguish between instructions for 3D printing a complete product, to that leading to an incomplete product which will be later customised. Whilst a design document, containing instructions for printing a complete 3D model can be considered a literary and artistic work as argued above, it is problematic to make a case for it to be a computer program. However, where mass customisation options are presented by the designer, there is a strong case to be made for those instructions to be deemed as a 'mini computer program' in view of the fact that a construction graph is in fact 'preparatory work' which will lead to a computer program arising from it at a later stage.

In accordance with Recital 7 of the Software Directive[101], it could potentially satisfy the requirements for 'preparatory design work leading to the development of a computer program provided that the *nature of the preparatory work is such that a computer program can result from it at a later stage' (emphasis added)*. As such, it can be argued that providing customisation options within a construction graph is in fact 'preparatory work' leading to a resulting computer program arising at a later stage. This is because the construction graph provides various functions, to be performed as a set of algorithms (source code) which will be executed through a machine-readable computer language (object code), at the time of customisation, by the consumer.

Yet, the current law is such that there is a gap; the preparatory work in the context its described would be seen as 'functional' and not eligible for copyright, thereby acting as a barrier to entry for Small-to-Medium Sized Enterprises (SMEs) wishing to enter the 3D printing sector. This is because the object code is considered incapable of copyright

[97] H Lipson and M Kurman, *Fabricated: The New World of 3D Printing* (John Wiley & Sons, Inc.; 2013), p. 12 - *"a 3D printer without an attached computer and a good design file is as useless as an iPod without music".*

[98] For further detail, see, D Mendis, In Pursuit of Clarity: The Conundrum of CAD and Copyright – Seeking Direction Through Case Law, [2018] 40(11) *European Intellectual Property Review,* 694-705.

[99] ibid.

[100] P Guarda, Looking for a Feasible form of Software Protection: Copyright or Patent, Is that the Question? [2013] 35(8) *European Intellectual Property Law*, pp. 445-454 at p. 445. See also, Waelde et al, *Contemporary Intellectual Property: Law and Policy* (4th ed), pp. 64-65.

[101] Parliament and Council Directive 2009/24/EC of 23 April 2009 on the legal protection of computer programs [2009] OJ L111/16, recital (7).

protection.[102] However, as the technology continues to grow and the future potential of 3D printing expands through the dissemination of 3D design files, policy makers will need to take note of this gap in the law and consider how to protect designers in the future. In other words, policy makers will need to take note of how to balance the future innovation by providing protection for creators and designers on the one hand and user rights on the other.

3.3 From 3D Printing to 3D Scanning: Does it Create New Subject Matter?

In considering whether a scanned 3D digital model of an artistic work is capable of copyright protection, it must first be pointed out that scanning a work which is protected by copyright constitutes copying, [103] requiring permission to avoid infringement. In particular, if a 'substantial part' has been taken from another creator in designing a 3D model, then 'it makes no difference that a different medium is used (once the object has been scanned), or that the infringing work is derived indirectly from the original work, such as where an intermediary has given verbal instructions which are used by a third party to recreate the work'.[104] Therefore, making an exact replica of a work that is protected by copyright, or taking a substantial part of the protected work, appears to infringe copyright.

However, the purpose or intention of scanning objects leads to some interesting questions. Why is the object or product being scanned? In scanning it, does it lead to new subject matter?

Example 4: 3D Scanning for Restoration of Ancient Works, Thereby Creating a New Work

Question: What is the copyright status of 'works' which have been restored and reconstituted through the mechanism of scanning, when in copyright or out of copyright?

Diagram 9 (Source: List of Dead Sea Scrolls – Wikipedia)

[102] Case C-406/10 *SAS Institute Inc, v World Programming Ltd* [2012] 3 CMLR 4. The Court of Justice of the European Union stated that: "keywords, syntax, commands and combinations of commands, options, defaults, and iterations consisting of words, figures or mathematical concepts which, considered in isolation are not, as such, an intellectual creation of the author...It is only through the choice, sequence and combination...that the author may express his creativity in an original manner and achieve a result, namely the user manual for the program, which is an intellectual creation" (paras: 66-67). *See also,* K Toft, The case of SAS Institute Inc., v World Programming Ltd [2014] 20(2) *Computer and Telecommunications Law Review*, pp. 59-62 at p. 60.
[103] Case C-5/08 *Infopaq International A/S v Danske Dagbaldes Forening* [2010] FSR 20 at [24].
[104] Ibid.

Answer: It leads to a 'new' copyright, based on the following reasons.

The Supreme Court of Israel in the *Dead Sea Scrolls* case [105] shed light on this issue. The Court held that Professor Qimron's reconstitution of the 2,000-year-old Dead Sea Scrolls was an original work for purposes of copyright. Qimron therefore owned copyright in the deciphered text as a literary work based on authorial input.

This case is an example of the fact that copyright should not only 'incentivise' works which are 'materially altered' from the pre-existing work. The argument is also made that it could be in the public interest for authors to make identical replicas of antecedent works which are of *major cultural significance or extremely inaccessible or both (emphasis added)*.[106]

This latter point is significant in distinguishing between 3D scans which are direct copies and therefore are an infringement to those which will create new subject matter, based on cultural significance or a business's needs as relevant. Of course, each situation will differ and it will have to be decided on a case-by-case basis.

For, now there is also some support which can be drawn from the case of *Antiquesportfolio* [107] *which is very relevant in the present context.* In *Antiquesportfolio* photographs of antiques were held to be copyright works, taking into account the positioning of the object, the angle at which it was taken, the lighting and the focus, which culminated in exhibiting particular qualities including the colour, features and details of the items. The Court stated that such elements could all be matters of aesthetic or even commercial judgement, albeit in most cases at a very basic level [108] but sufficient to demonstrate a degree of skill for copyright to exist in the photographs.[109]

In *Football Dataco Ltd v Yahoo! UK Ltd*,[110] the Court of Justice of the European Union (CJEU) concluded that a 'copyright work' should demonstrate the 'own intellectual creation of its author',[111] thereby placing the emphasis on the right form of authorial input as opposed to the category of copyright works.

Applying the above-discussed cases to scanned 3D models, it can be deduced that such objects will draw a new copyright on the basis of 'authorial input' requiring the personal touch of the creator before such 3D scanned models can attract new copyright. As such, it could be argued that making creative choices – such as selecting particular angles, lighting and focus of a physical object when a 3D digital model is created through scanning an object – is sufficient to make the 3D digital model an 'intellectual creation of the author reflecting his personality and expressing his free and creative choice'[112] in its production.

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[105] *Eisenmann v Qimron* 54(3) PD 817. *See also* M Birnhack, The Dead Sea Scrolls Case: Who is an Author? [2001] 23(3) *European Intellectual Property Review* 128–133; T Lim, H MacQueen and C Carmichael (eds), *On Scrolls, Artefacts and Intellectual Property* (Sheffield Academic Press; 2001).
[106] B Ong, Originality From Copying: Fitting Recreative Works into the Copyright Universe (2010) 2 *Intellectual Property Quarterly* 165–199 at 174.
[107] *Antiquesportfolio.com Plc v Rodney Fitch & Co. Ltd.* [2001] FSR 23. *See also Painer v Standard Verlags GmbH* (C-145/10) [2012] ECDR 6 (ECJ (3rd Chamber).
[108] *Antiquesportfolio.com Plc v Rodney Fitch & Co. Ltd.* (n 71) para 36.
[109] ibid, at para 37.
[110] (C-604/10) *Football Dataco Ltd v Yahoo! UK Ltd* [2012] Bus. L.R. 1753.
[111] Case C-5/08 *Infopaq International A/S v Danske Dagblades Forening.*
[112] *Painer v Standard Verlags GmbH* (n 72) at para 99.

3.4 The Types of Licensing Schemes for Protecting 3D Designs and How They Are Utilised

Up until now, designs have been secluded from the issues in a digital world,[113] as it has not been possible for the average consumer to manufacture products.[114] At the same time, Mendis and Secchi in their commissioned Report for the UK Intellectual Property Office (UKIPO) revealed that the activity on the sharing of CAD files on major online 3D printing platforms have been exponentially increasing since 2008.[115] In carrying out this Study, the authors considered the *types and percentage* of licenses used on the platforms and their effectiveness of them.

License	Number	Percentage
All Rights Reserved	967	0.02
Attribution-Non-Commercial	4,734	1.20
BSD License	353	0.01
Commons Attribution	64,068	17.00
Creative Commons	57,773	15.00
General License	1,479	0.04
GNU	2,780	0.07
Public Domain	1,511	0.04
NA	251,451	65.30

Table 1 (Source: Mendis and Secchi, 2015)

Accordingly, the research identified that licences such as Creative Commons, Commons Attribution and GNU Public Licence were used on 3D printing online platforms. The data revealed that 35% of users who do license their work are more inclined to use Creative Commons licence, followed closely by Commons Attribution and GNU Public Licence.

However, 65.30% of users engaged in the activities of 3D printing online platforms did not license their work at the time of carrying out this Study (2014), leaving their creations vulnerable and open to infringement whilst losing the ability to claim authorship.[116] Although a lack of licence attribution may be linked to a user's ignorance or misunderstanding of the intricacies associated with each licence, it may sometimes be done intentionally as the file has been uploaded in breach of intellectual property laws.

To overcome such issues, online platforms can assign the most appropriate licence (e.g. GNU, Creative Commons) as a default with 'opt-out' as an option, which has the benefit of protecting rights holders whilst it could act as a deterrent for potential infringers.[117] It will also strengthen the online platforms' position of working within the parameters of the law. Whilst it is a few years since this Study was conducted, the choice of license appears to remain same although with growth of 3D printing, those licensing their works has certainly increased.[118]

[113] Bently L. and Sherman B., *Intellectual Property Law* (4th edn, Oxford University Press 2014)
[114] A Daly, *Socio-Legal Aspects of the 3D Printing Revolution* (Macmillan Publishers 2016)
[115] D Mendis and D Secchi, *A Legal and Empirical Study of 3D Printing Online Platforms and an Analysis of User Behaviour* (UK Intellectual Property Office; 2015).
[116] D Mendis and D Secchi, *A Legal and Empirical Study of 3D Printing Online Platforms and an Analysis of User Behaviour* (UK Intellectual Property Office; 2015) at pp. 43-44.
[117] ibid
[118] D Mendis, In Pursuit of Clarity: The Conundrum of CAD and Copyright – Seeking Direction Through Case Law, [2018] 40(11) *European Intellectual Property Review,* 694-705

Chapter 4

SMEs and Infringement

Key Points Explored:

Controlling 3D Printers and 3D Scanners in a Digital World:
- Is it possible to control illegitimate use of 3D printers and 3D scanners in the industries?
- Can the use of 3D printers and 3D scanners in service bureaus be controlled?
- How pervasive is 3D printing infringement at the moment?

Main Points for the Business Sector –Notice and Takedown:
- How well are notice and take down requests adhered to, by businesses acting as bureau services?

4.1 3D Printers and Infringement

One aspect of 3D printing is the ability for hobbyists to 3D print smaller items, such as toy cars, mini figures and so on. Whilst this may appear to be an issue for consumer 3D printing as opposed to industry, it does raise the question of the implications it poses for industry, especially where a trade mark is used without consent, or is modified.

Similarly, there have been many instances where copyright has been cited as a means of infringement, in the 3D printing toy and hobby industry.

In many ways, smaller items – capable of being printed in plastic or resin – appears to be the most infringed, whereas items needing specialist 3D printers, such as jewellery, have not yet been as widespread.

The question is whether there is a mechanism by which 3D printers and 3D scanners can be controlled?

Case Study 3: Controlling 3D Printers and 3D Scanners

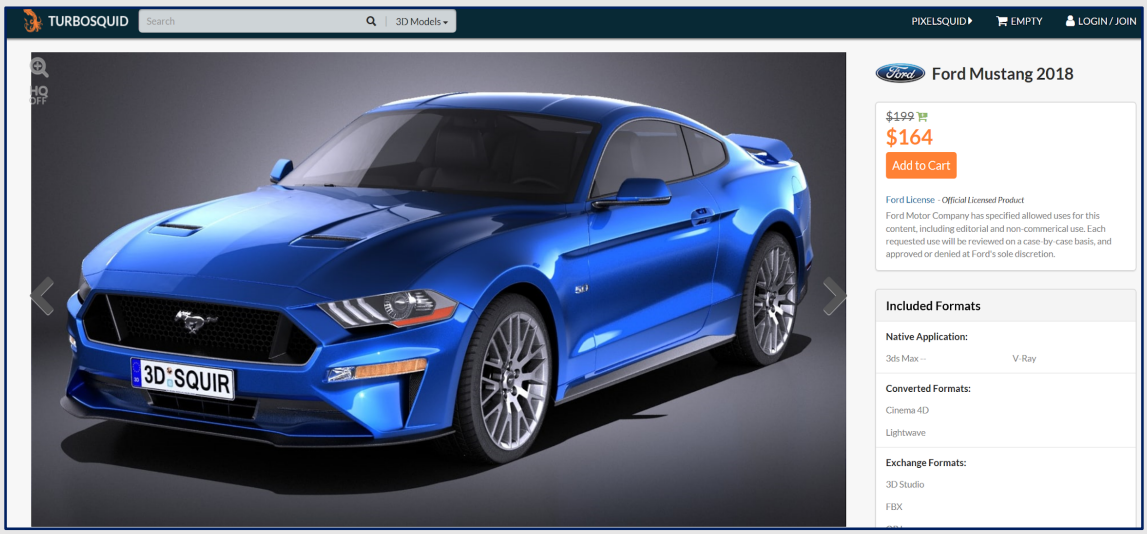
In Case Study 3, the report employs a number of illustrative examples to answer questions relating to infringement, arising from the control of (or lack of control of) 3D printers and 3D scanners.

Is it important to distinguish between general printers utilising plastic and resin for printing toy and hobby items **(*see,* examples 1 and 2)** and specialist printers - for printing items in metal (jewellery), titanium (aeroplane parts) or food (foodini)

Examples 3 and 4 highlights the position of 3D printing services (bureau services) and the implications in relation to infringement (*this is further explored in Chapter 5*)

In the context of toy and hobby items, *Ford* is open to licensing its *Ford* trade mark for use within CAD files on the Turbosquid online platform even though the car manufacturer does not offer the CAD files with the *Ford* car itself.[119]

Example 1



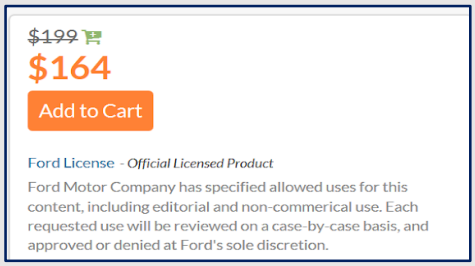


Diagram 10 (Source: turbosquid.com)

On the other hand, not all forms of a use of a sign will fall within the meaning of 'use' in trade mark law. The rationale for this stems from the jurisprudence of the CJEU which has narrowed down the scope of use of a sign by establishing that such use[120] must be consistent with the essential function of a trade mark, which was traditionally held as a guarantee as to the origin of the goods.[121] This begs the question of whether a 3D printed object should function sufficiently well to ensure the sign guarantees the quality of goods. In response the CJEU in the *Adam Opel* case[122] held that making and selling accurate replicas of *Opel* toy cars bearing the *Opel* logo did not amount to trade mark use such as to indicate the origin of goods as they were a mere decorative use of the sign. The same decision would be relevant in the context of 3D printed toy cars.

[119] Available at https://www.turbosquid.com/3d-models/3d-model-mustang-2018/1132944
[120] Article 5(1)(a) of Directive 2008/95/EC of the European Parliament and of the Council of 22 October 2008 to approximate the laws of the Member States relating to trade marks [2008] OJ L299/25. *See also* TMA 1994, s 10(1).
[121] *Arsenal Football Club Plc v Reed*, Case C-206/01 [2002] ECR I-10273; [2003] ETMR 19; [2003] Ch. 454.
[122] *Adam Opel AG v Autec AG*, Case C-48/05 [2007] ETMR 33.

Example 2

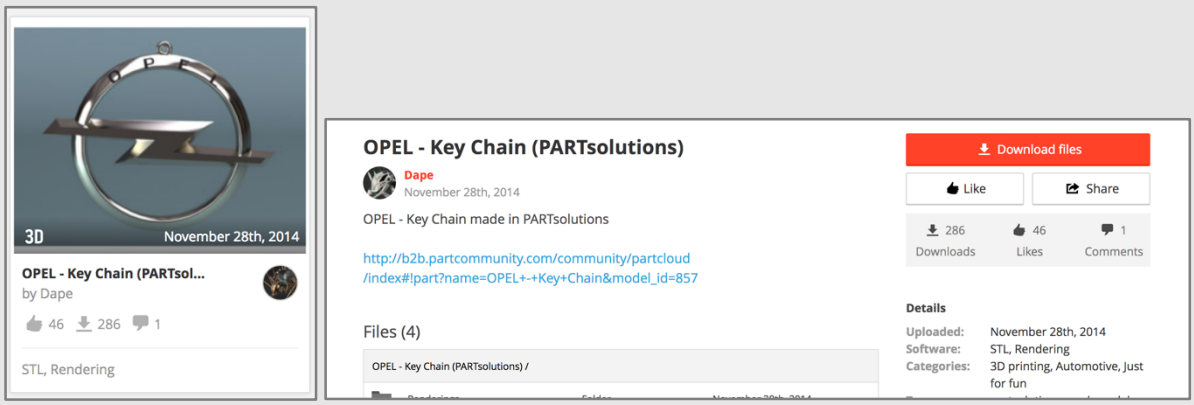


Diagram 11 (Source: Grabcad.com)

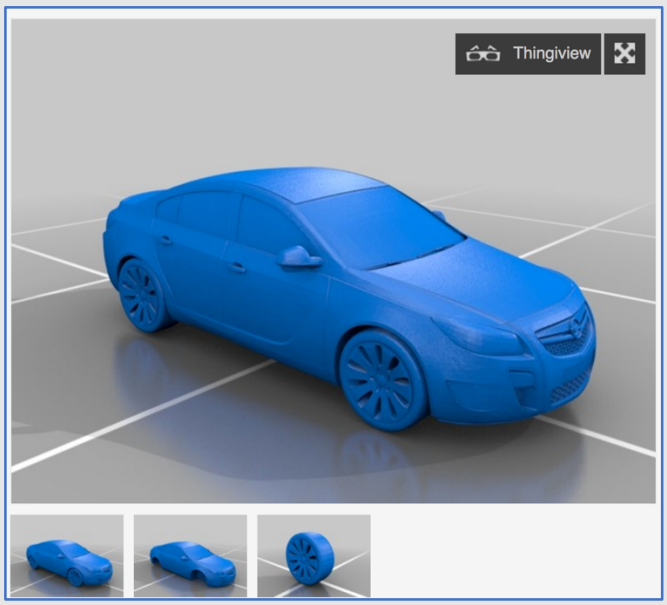


Diagram 12 (Source: Thingiverse.com)

Trade mark law does not differentiate affixation from modification and therefore, in conceptual terms, affixing a sign to a 3D model should not be seen differently from affixing an imitation sign to goods such as to cause confusion, as in *BMW AG v Round & Metal Ltd*.[123]

However, some commentators argue that the inclusion of a trade mark into a 3D printing file does not constitute trade mark use as the file does not include the trade mark in a visible form. The argument is based on the premise that the CAD file would only contain a description of how trade marked products should be used.[124] While this argument is valid, there is growing body of literature which suggests that the inclusion of a trade mark into a

[123] *BMW AG v Round & Metal Ltd* [2012] EWCH 2099 (Pat). See also, D Hong and S Bradshaw, Digital trade mark infringement and 3D printing implications: what does the future hold? in D Mendis, M Lemley and M Rimmer (eds.) *3D Printing and Beyond: Intellectual Property and Regulation* (Edward Elgar, 2019) (Forthcoming).

[124] T Pihlajarinne in R M Ballardini, M Norrgard & J Partanen, *3D printing, Intellectual Property and Innovation* (Wolters Kluwer; 2017), p. 313.

CAD file can be deemed as trade mark use.[125] Even if it was to be accepted that the inclusion of a trade mark within a CAD file does not constitute use, the inclusion should at least be seen as a 'preparatory act' to trade mark infringement in accordance with Article 10 EU Trade Marks Regulations (EUTMR) and Article 11 of the Trade Mark (TM) Directive.

A final point in this context is in relation to the use of trade marks on toy and hobby items – such as the use of the mark on miniature toy cars as discussed above in the case of *Adam Opel* case and in the *turbosqid.com* example. The case law suggests that even if a toy miniature bears the original trade mark, the buyer would not assume a licensing deal for miniature cars in connection with the manufacture of the automotive in question as it will be seen as decorative use. As such, if the CAD file is only used to print miniatures models, a trade mark issue will not arise.[126] However, where the CAD file is primarily used to make or print substitute copies, an issue will certainly arise.[127] Particularly, if the average user assumes licensing ties, leading to a likelihood of confusion[128] or unfair advantage[129] a clear case for infringement can be made.

In the same vein, if a modifier intends to make commercial benefits, such as by fabricating the modified 3D virtual model for sale or stock etc.[130] they could still be liable for trade mark infringement. Whether this applies for removal of outer packaging is less clear as was discussed in *Boehringer Ingelheim KG v Swingward Ltd*.[131] In this case, the court did go on to state that the outer packaging, specifically containing the trade mark, can be deemed 'a part of the condition of the product', which would lead to an infringement of the trade mark.

4.2 Controlling 3D Printers

It should be pointed out that toy and hobby items mainly utilise resin or plastic for 3D printing and such 3D printers are freely available. However, as mentioned above, if one wishes to print jewellery or food, for example or a part for an automotive, these require specialist 3D printers, which are expensive and not easily accessible. Therefore, in terms of controlling 3D printers, the *type* of product will also determine the level of control needed.

A quantitative study carried out for the UK Intellectual Property Office (UKIPO) in 2015 established that the most infringed products were those which were identified as 'miniature' and those which could be printed, using plastic or resin.[132] The table below illustrates this point. It should be pointed out that 'jewellery' items listed below were available in plastic and resin (as opposed to being in gold or silver), whilst 'iPhone' indicated accessories for the iPhone such as cases.

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[125] T Pihlajarinne in R M Ballardini, M Norrgard & J Partanen*, 3D printing, Intellectual Property and Innovation* (Wolters Kluwer; 2017); D Hong and S Bradshaw, *Digital trade mark infringement and 3D printing implications: What does the future hold?* in D Mendis, M Lemley & M Rimmer, (eds.) (Edward Elgar, 2019), Chapter 4 at 3.1 and 4.1.
[126] T Pihlajarinne in R M Ballardini, M Norrgard & J Partanen*, 3D printing, Intellectual Property and Innovation* (Wolters Kluwer; 2017).
[127] ibid.
[128] Trade Marks Act 1994 (UK) (TMA 1994) s 10(2). Also Art. 8 EUTR.
[129] TMA 1994, s 10(3). Also Art. 9 EUTR.
[130] Art. 10 EUTR, TMA 1994 s 10(4)(b).
[131] *Boehringer Ingelheim KG v Swingward Ltd (No 2)*, Case C-348/04 [2007] *Business Law Review* 1100 [43]–[44].
[132] D Mendis and D Secchi, *A Legal and Empirical Study of 3D Printing Online Platforms and an Analysis of User Behaviour* (UK Intellectual Property Office; 2015).

	Category	N	Weight		Category	N	Weight
1	miniature	36596	0.13	21	military	3958	0.01
2	art	27666	0.10	22	aerospace	3904	0.01
3	jewellery	24348	0.09	23	fixture	2831	0.01
4	design	19327	0.07	24	mechanic	2599	0.01
5	household	16083	0.06	25	marine	2037	0.01
6	gadget	16046	0.06	26	medical	1190	0.00
7	games	14643	0.05	27	building	1064	0.00
8	3dp	12629	0.05	28	nature	800	0.00
9	industrial	12585	0.05	29	math	482	0.00
10	tools	11227	0.04	30	tech	432	0.00
11	interior design	8645	0.03	31	robot	343	0.00
12	hobby	7455	0.03	32	accessories	268	0.00
13	home	7247	0.03	33	iphone	151	0.00
14	toys	7027	0.03	34	light	113	0.00
15	electric	6775	0.02	35	creature	54	0.00
16	architecture	6644	0.02	36	music	15	0.00
17	educational	6466	0.02	37	office	6	0.00
18	maker	5583	0.02	38	software	2	0.00
19	model	4853	0.02	39	logo	1	0.00
20	fashion	4196	0.02				

Table 2: User-designated categories ('tags') (Source: Mendis and Secchi, 2015)

Further insight was provided as to the frequency of the descriptive words and in turn the impact on the brands. As per the discussion above, 3D printing toy cars, drawn from various car manufacturers, appears to be very popular as illustrated below.

Label	N	Rel. Weight	Abs. Weight	Label	N	Rel. Weight	Abs. Weight
iPhone	3198	0.2104	0.0128	Ikea	278	0.0183	0.0011
Robo	2479	0.1631	0.0099	Batman	275	0.0181	0.0011
Lego	1309	0.0861	0.0052	lamborghini	270	0.0178	0.0011
USB	760	0.0500	0.0030	Android	262	0.0172	0.0011
Ipod	669	0.0440	0.0027	Nexus	254	0.0167	0.0010
Universal	581	0.0382	0.0023	Snowman	163	0.0107	0.0007
Apple	541	0.0356	0.0022	Star.Wars	162	0.0107	0.0006
iPad.Mini	531	0.0349	0.0021	Canon	143	0.0094	0.0006
Nokia	468	0.0308	0.0019	Porsche	130	0.0086	0.0005
Htc	465	0.0306	0.0019	Galaxy.S4	113	0.0074	0.0005
Samsung.galaxy	414	0.0272	0.0017	Sony.xperia	111	0.0073	0.0004
BMW	389	0.0256	0.0016	Nissan	104	0.0068	0.0004
Sony	330	0.0217	0.0013	X35mm	103	0.0068	0.0004
Ferrari	298	0.0196	0.0012				

Table 3: Frequency of the Descriptive Words (Source: Mendis and Secchi, 2015)

These examples are illustrative of the dissemination and infringement caused by unauthorised use of 3D designs.

Whilst there have been many calls for 'notice and take down' of infringing 3D files by companies such as *Disney, Lucasfilm* etc. the same has not been the case for controlling 3D printers, per se.

This may be because the accessibility to materials, sophisticated printing machines, costs and economics for the average user is yet a barrier for the general public. As such, companies have not felt the impact of infringement acutely at present – and may not feel it for a few years to come.[133] However, this position could rapidly change if there is a significant technological breakthrough in the hardware and software sectors reaching a point where a product can be printed relatively easily and quickly without requiring technical expertise – at which point, it would cause serious concern for all stakeholders in this field.

Having said that, on 9 October 2012, a US patent was granted titled 'Manufacturing Control System'[134]. The patent employs a copy-protection system (similar to digital rights management (DRM)) to prevent people from using 3D printers to 'pirate' goods. In effect, the patent embeds copy controls in 3D design files. Files embedded with the protection system would only proceed to print if the original creator intended for a copy to be produced. The system would look for a licensing agreement or evidence of payment. Where none exists, the printer will not print a 3D object. It is akin to 2D printers which have a mechanism preventing the printing of money. The success or failure of such a system will become apparent in time to come; however, it is interesting to note that since 2012, this trend has not taken off.

Yet, this is a plausible solution for companies and could very well be seen in the future. Furthermore, similar to the levy system that already exists in certain European countries for electronic products which are capable of making copies, a levy system for 3D printers could also be applied in the future. This suggestion was put forward by the European Parliament in their adopted resolution in July 2018.[135] However, organisations such as CECIMO – the European Association of the Machine Tool Industries – believes that a levy system, which will act as a tax on 3D printers – could stifle innovation.[136] The copyright levy has not stifled innovation in the entertainment industry and therefore, it is feasible to reason that the same should be true in the 3D printing sector.

4.3 Controlling 3D Scanners

3D scanning technology can be used for various purposes. For example, it can be used by museums for preservation and conservation of cultural heritage as well as reproduction of their collections for exhibition. A good example here is the reproduction of a marble head of Mecenate which was very accurately digitised by means of 3D laser scanning and

[133] D Mendis, D Secchi and P Reeves, *A Legal and Empirical Study of the Intellectual Property Implications of 3D Printing: Executive Summary* (UK Intellectual Property Office; 2015); D Mendis et al, *'Study into the Intellectual Property Implications of Industrial 3D Printing'* (European Commission; Forthcoming, 2019).

[134] Application no. 12005162 filed December 2007. U.S. Patent 8,286,236' Manufacturing control system' granted 9 October 2012. For further details of the patent, *see*, http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=8,286,236.PN.&OS=PN/8,286,236&RS=PN/8,286,236

[135] European Parliament, Three-dimensional printing: intellectual property and civil liability (July 2018) at http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2018-0274+0+DOC+XML+V0//EN&language=EN

[136] I B Esguevillas, 3D Printing: Is the Copyright Levy Detrimental for the Innovation? Lexology (23 July 2018) https://www.lexology.com/library/detail.aspx?g=bb3f2657-6b40-48d1-b683-f0c9f63957b1

successfully conserved in the National Archaeological Museum in Italy.[137] Another interesting example is the Jericho Skull exhibited in the British Museum, London. 3D printing and scanning was utilised to reconstruct it, as a result of which three different versions of the Jericho Skull were produced, which include a skull with partial construction, a skull cut in half to show a cross section of it, and a realistic figure created through a facial reconstruction based on the skull.[138] These are all displayed alongside the original artwork, offering a realistic experience to museum visitors.

Museums may also reproduce and digitise their collections, with a view to an enhancing their visitor experience[139] by allowing the public to interact with these scanned items which otherwise will not be permissible. In addition, use of 3D printing could provide an opportunity for the visually-impaired to tactilely appreciate museum artefacts like Prado Museum in Spain which recently organised an exhibition of 3D scanned and printed objects for the visually-impaired.[140]

As such, 3D scanning, has many benefits which it presents. At the same time, it has the potential to infringe copyright works – as in the case of many technologies.

Similar to traditional methods such as photographing or filming, scanning is becoming common place. There are apps which are freely available which can be utilised for scanning a physical object.[141] Such scans will infringe IP laws.

For example, as with copyright, one of the more interesting questions is the consideration of whether scanning a patented product and creating a design file would amount to patent infringement. Would the scan of a patented product, such as the digital representation of the product, be considered as *making* the invention? This marks largely uncharted territory for patent infringement, which traditionally focussed on physical copies of the patented invention.[142] Even so, academics have suggested that the creation of a CAD design file, through scanning an object constitutes 'making' the patented invention.[143] This also means that an innocent infringer can be liable if she carries out any such which deals with product inventions if the patent is in force[144]. Such considerations are based on a purposive

[137] R Scopigno and others, 'Digital Fabrication Techniques for Cultural Heritage: A Survey' (2017) 36 *Computer Graphics Forum* 6.
[138] B Jackson, Interview with ThinkSee3D: behind the British Museum's Jericho Skull (*3DPI*, 11 Jan 2017) https://3dprintingindustry.com/news/interview-thinksee3d-behind-british-museums-jericho-skull-102746/
[139] L Johnson and others, *NMC Horizon Report: 2015 Museum Edition* (The New Media Consortium, 2015).
[140] Johnson and others, *NMC Horizon Report: 2015 Museum Edition* (The New Media Consortium, 2015).
[141] See, for example, ReCap by Autodesk at https://www.autodesk.co.uk/products/recap/overview
[142] T Holbrook and L Osborn, Digital Patent Infringement in an Era of 3D Printing (2015) 48 *UC Davies Law Review* 1319 at pp. 1322–1323. Also see, 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] *European Intellectual Property Review* 155; M Mimler, 3D Printing and Patent Law – A UK Perspective: Apt and Ready? D Mendis, M Lemley & M Rimmer, (eds.) *3D Printing and Beyond: Intellectual Property and Regulation* (Edward Elgar, 2019), Chapter 5.
[143] ibid, Holbrook and Osborn.
[144] 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] *European Intellectual Property Review* 155 at 160.

interpretation of patent infringement in order to avoid a gap in protection that may arise by 3D printing technology.[145]

However, as Ballardini, Minssen and Norrgard clearly and quite correctly point out, it would require a 'creative and effort taking solution …' to meet the criteria for 'making'.[146] They argue as follows: 'considering CAD files as same as physical objects and, this way, equating the making of a CAD file on a protected object to direct patent infringement, appears … improper and inaccurate at the least.'[147] They argue that design files generated through the scanning process, would only amount to mere technical representations on how to produce the patented product.[148] As such CAD files are not embedded in the physical device and the file continues to exist once the product has been printed.[149]

This argument is similar to the that which can be made under copyright law. If a scanned product is to avoid infringement, it must show the 'authorial input'[150] as well as a significant and material embellishment to the original.[151] Otherwise it would be seen as a mere copy of the original, especially, if the intent for creating the copy is unclear.

These arguments give cause for concern – and again, raises the question of whether and how they can be controlled?

Similar to the control of 3D printers, at present, the only solution has been proposed appears to be a levy on scanners. Apart from that, online platforms which offer tools for scanning and transformation of 3D models could monitor these spin-offs and by-products offered to the users, thereby adopting a self-regulation mechanism.[152]

4.4 3D Printing and 3D Scanning Services by Bureau Services

'Bureau services' (explained also in chapter 5) such as *Shapeways*, *Makerbot/Thingiverse* for example, have faced some issues for hosting infringing 3D designs and models, without the consent of the rightsholder. These have mostly concerned requests of 'notice and takedown' from UK IP owners or 'cease and desist' letters from USA IP owners. On each of these occasions, the relevant bureau service, such as *Shapeways*, housing the 3D model has abided by the requests and therefore, there has not been any litigation in this regard.

Responding to such 'notice and takedown' or 'cease and desist' letters illustrates a level of control exercised by the bureau services, in terms of 3D printing and 3D scanning. On occasion, there have been examples of moving the infringing item, after an interval of time, to a different platform operated by a different bureau service. In such scenarios, the liability

[145] M Mimler, 3D Printing, the Internet and Patent Law – A History Repeating? (2013) 62(6) *Rivista di Diritto Industriale* 352.
[146] R M Ballardini, M Norrgård and T Minssen, Enforcing Patents in the Era of 3D Printing (2015) 10(11) *Journal of Intellectual Property Law and Practice*, 850 at 856.
[147] ibid.
[148] ibid 863.
[149] R M Ballardini, M Norrgård and T Minssen, Enforcing Patents in the Era of 3D Printing (2015) 10(11) *Journal of Intellectual Property Law and Practice*, 850 at 863.
[150] *Infopaq International A/S v Danske Dagblades Forening* (C-5/08) [2010] FSR 20
[151] *Interlego v Tyco Industries Inc., and Others* [1988] RPC 343
[152] D Mendis, D Secchi and P Reeves, *A Legal and Empirical Study of the Intellectual Property Implications of 3D Printing: Executive Summary* (UK Intellectual Property Office; 2015);

shifts from the bureau service to the uploader – or in fact to the next bureau service, on which the infringing 3D model is hosted.

Apart from hosting 3D designs on their platforms, bureau services, can also 3D print models for consumers without access to 3D printers or materials. Once again, bureaus services have been asked to stop such activities, whilst also ensuring that they stop hosting the infringing file. Example 4, below, concerning Katy Perry's Left Shark is illustrative of such a situation. Similar to hosting, the bureau service complied, thereby avoiding litigation. As such, in terms of control, it appears that this is not as much an issue.

At the same time, as 3D printing and 3D scanning becomes more pervasive, leading to the establishment of more bureaus services, then control and enforcement (as discussed in chapter 6) could become more of an issue.

Example 3

Pokémon targets 3D printed design, citing copyright infringement (21 August 2014)

In this scenario, Shapeways received a 'cease and desist' letter from Pokémon International for hosting a look-alike of the Pokémon Balbasaur Planter model. The model was being shared on the Shapeways platform as well as being sold through their bureau service. Following the cease and desist letter, Shapeways stopped such activities.

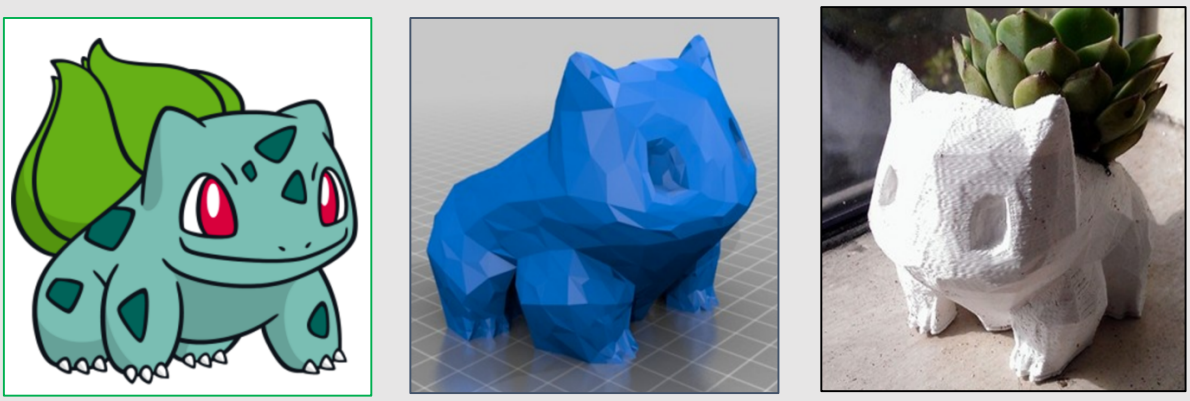

Diagram 13 (Source: 3Dprintingindustry.com). Left- original; Middle and Right – copies

This example, drawn from 2014, illustrates infringement, both from the perspective of 'hosting' the infringing file as well as providing 3D printing services to consumers in return for a payment. Following the 'cease and desist' letter *Shapeways* terminated both services, thereby showing their willingness to comply with the request made by Pokémon International.

Example 4

Katy Perry's Lawyers Demand Removal of 3D Printable Left Shark from Shapeways (06 February 2015)

Similar to the above example, in the present case, lawyers representing Katy Perry sent a 'case and desist' letter to Shapeways requesting that they remove the 'Left Shark' 3D model from their site. The Left Shark was the mascot which appeared during Superbowl Halftime and became an instant meme – and went on to sell many 3D printed versions of it on Shapeways.

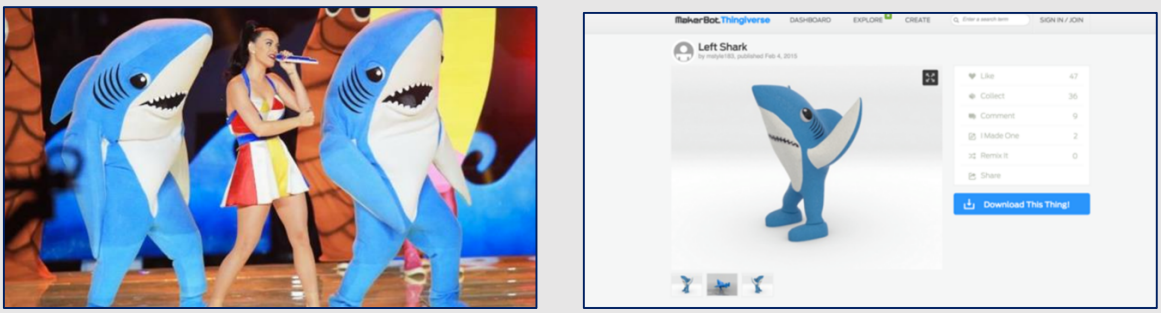

Diagram 14 (Source: 3Dprintingindustry.com). Left- Katy Perry and Left Shark Mascot; Right – 3D Model made available on another platform following the issue with Shapeways

Following the cease and desist letter to *Shapeways*, the designer of the 3D printed Left Shark, Fernando Sosa, moved the 3D model to another online platform – *Thingiverse* – and traded on that platform before he was struck out from there as well.

This example is illustrative of the challenges thrown up by 3D printing and scanning. Whilst bureau services have complied with the requests, it does illustrate the difficulties of controlling the dissemination of CAD files which carry 3D models. Therefore, more so than 3D scanning and printing, the dissemination of the file is one of the main issues. The recent problem surrounding the 3D printed gun in USA is a further example, of the negative implications which new technologies can present along with all the positive opportunities they also provide.

As mentioned above, as 3D printing and 3D scanning becomes more pervasive, leading to the establishment of more bureaus services, then control and enforcement could become more of an issue – leading us to consider their position as intermediary services, as discussed in chapter 5.

Chapter 5

SMEs, Bureau Services and Intermediary Liability

Key Points Explored:

Bureau Services and Intermediary Services – Are they the Same?
- The rise and development of Bureau Services
- Do Bureau Services differ from intermediary services?

Main Points for the Business Sector –Learning Lessons from the Past:
- Can we learn lessons from the past?
- Drawing an analogy between internet cafés of the 1990s and bureau services of late 2000s

Following on from the previous chapter, which identified examples concerning bureau services and potential liability, this chapter will proceed to consider whether bureaus services can indeed fall within the parameters of intermediary services, as prescribed by law. Or do they operate in such a way that they do not come within these limits and boundaries. A consideration of these questions, require a brief overview of the law relating to intermediary services. However, as an introduction, the chapter presents an introduction to the rise and development of bureau services, before progressing to consider labiality issues.

Case Study 4: Bureau Services and Intermediary Liability

In Case Study 4, the report considers a number of illustrative examples relating to bureau services and intermediary services.

Example 1 illustrates the distinction between bureau services and intermediary services and explores the implications for SMEs. The question is whether bureau services in the 3D printing sphere can be held liable for hosting or printing files and objects, infringing IPRs.

In considering solutions, **examples 3 and 4** considers cases from the past and explores the types of considerations which SMEs should bear in mind in looking ahead to the future. In particular, the examples drawn from this case study, considers the analogy with internet cafés.

5.1 The Rise and Development of Bureau Services

'Bureau Services' makes it possible for consumers to order 3D printed products and pay for them online.[153] In this sense, bureau services, offer a service to consumers who do not have

[153] Hoskins S., *3D Printing for Artists, Designers and Makers* (London: Bloomsbury; 2013), pp. 12-13.

access to 3D printers, much like the photocopy shops of the 1970s-1980s and internet cafés of the 1990s. For example, supermarkets such as *ASDA* and electronic retailers such as *PCWorld* in the UK, provided a bureau service in 2014, whereby customers could bring a design to have it 3D printed.[154] Whilst these experiments by large retail chains have been abandoned, in recent times, it has paved the way for a number of independent bureau services focusing only on 3D printing and 3D scanning.

In the early days, bureau services differed from 3D printing online platforms, which were mainly involved in facilitating the dissemination and sharing of CAD files, without providing a printing service.

However, in recent times, independent bureau services, such as *Shapeways, Makerbot* and *Materialise* amongst others, have 'doubled up' as online platform *and* bureau services to assist users who do not have access to, or own 3D printers or print products which are incapable of being printed using a home 3D printer[155]. As such, a registered user of *Shapeways*, for example, can create, upload, edit and share their designs on the *Shapeways* online platform without printing it or opt to have it printed and delivered to one's home.

In this scenario, do bureau services take on the responsibility of checking for IP infringements before carrying out the scanning or printing service? Or what about designers on these platforms, who may agree to customise a product for a consumer; do they check for any IP infringements? This question was explored in the aforementioned 'Going for Gold' project and it returned the following results.

Consider a design where a consumer can add their own scanned data (e.g. an object). Would you, as a designer, feel it is your responsibility to check that the consumer owns the IP for this scan?

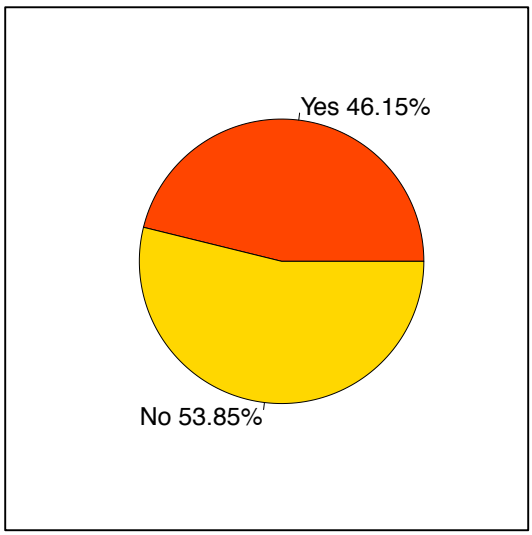

Diagram 15 (Source: Going for Gold Project)

[154] Create a 'mini-me' – 3D printing coming to a store near you (27 January 2014) at http://your.asda.com/news-and-blogs/3d-printing-on-tour

[155] 123D users can create, edit and share their designs, to either be printed at home or through a printing service. The printing and delivery service is provided through Sculpteo, i.materialise or Shapeways. See http://www.123dapp.com/about3D

It is interesting to note that more than half of the respondents felt that it was not their responsibility to check for IP infringements. Yet as bureau services grow and as more consumers approach such companies for the services they provide, they will need to take heed of such issues.

It is also worth noting that there are also other business models which have emerged in the 'bureau services' space, which have transformed over time. Businesses such as 3D Hubs[156], provides a good example of this phenomenon.

Example 1

The Story of 3D Hubs: The Changing Phases of Bureau Services

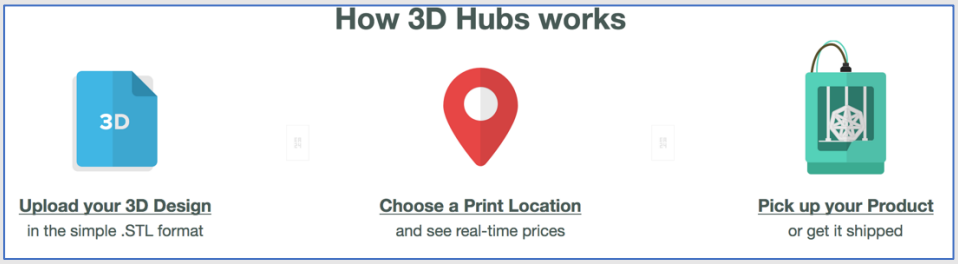

Diagram 16 (Source: 3D Hubs)

"Early adopters of 3D Hubs originated from the DIY and 3D printing community. Makers joined the network either as a supplier (Hub) or a customer. The platform at that time was very much free-form, with the goal of serving as many, mostly one-off, custom maker projects as possible.

As the platform evolved from a peer-to-peer 3D printing network into an all-round manufacturing platform, 3D Hubs' customer base changed. Now, the majority of orders originate from professionals who source parts for larger, high value engineering projects. These users have become a key part of the business and 3D Hubs' success depends on the ability to serve these customers.

It has become clear that in order to reach our goal of revolutionizing the manufacturing industry, 3D Hubs needs to double down on standardization and automation of the manufacturing process. That's why the hard decision [has been taken] to move away from the original peer-to-peer model and become fully B2B focused."

This is a good example of the transformation of a bureau service from a peer-to-peer service to a B2B model. In all these examples, can bureau services or 'hubs' be considered as intermediaries?

[156] https://www.3dhubs.com/

5.2 The Role of Intermediaries

A report by Dumortier *et al* for the European Commission in 2015 suggested that enforcing IP rights against unauthorised 3D printing will focus on two main areas: "the end-user and the intermediaries involved in facilitating the download and eventual reproduction by the end-user".[157]

With regards to end-users, the report by Dumortier *et al* acknowledged that it can be challenging and costly to enforce rights against end-users, due to the decentralised nature of the activity. Attempts to do so through UK's *Digital Economy Act 2010* and France's HADOPI has led to many challenges and limited success.[158]

As such, the report suggests that "pursuing intermediaries, particularly online hosting sites, may provide a more streamlined enforcement option for rights holders",[159] through the mechanism of injunctions although there are not yet any examples of such injunctions being granted in respect of 3D printing. With online platforms such as *Thingiverse, Shapeways* having already experienced the issuance of court orders requesting the takedown of infringing files, it may become more relevant, at least from a legal perspective, to focus on intermediaries which are positioned upstream of the ultimate domestic printing.[160]

However, on the other hand, In this context of intermediaries, according to Articles 12–15 of the E-Commerce Directive,[161] most online platforms and intermediary services will benefit from a safe harbour provision providing immunity from liability as long as such intermediaries act 'expeditiously to remove or to disable the information' upon obtaining knowledge of infringement.[162] This provides a legal base for the widely adopted practice of 'notice and take down'. However, this too has come under scrutiny in recent times, with a growing body of literature advocating 'notice and stay down' (NSD). NSD requires not only a requirement to remove the information, but also to take additional measures to ensure that it is not subsequently reposted, either by the same user or by other users.[163] This requirement can

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[157] J Dumortier *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. 13.1

[158] D Mendis, Digital Economy Act 2010: Fighting a Losing Battle? Why the Three-Strikes Law is Not the Answer to Copyright Law's Latest Challenge' (2013) 27(1–2) *International Review of Law, Computers and Technology,* 60. See also, P Yu, The Graduated Response (2010) *62 Florida Law Revie2,* 1373.

[159] ibid

[160] D Mendis D and D Secchi, *A Legal and Empirical Study of 3D Printing Online Platforms and an Analysis of User Behaviour* (UK Intellectual Property Office, 2015), pp. 43-44. See also, D Mendis, Fit for Purpose? 3D Printing and the Implications for Design Law: Opportunities and Challenges in T Aplin (ed.) *Research Handbook on Intellectual Property and Digital Technologies* (Edward Elgar, 2019) (Forthcoming).

[161] E-Commerce Directive, 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market (E-Commerce Directive).

[162] Article 14, E-Commerce Directive.

[163] A Kuczerawy, From 'Notice and Take Down' to 'Notice and Stay Down': Risks and Safeguards for Freedom of Expression in G Frosio (ed.), *Oxford Handbook of Intermediary Liability Online* (Oxford, 2019) (Forthcoming). See also, C Angelopoulos and S Smet, Notice-and-fair-balance: how to reach a compromise between fundamental rights in European intermediary liability (2016) 8(2) *Journal of Media Law*, 266-301 at pp. 294-300; G Frosio, Reforming Intermediary Liability in he Platform

be satisfied by manual supervision or automated systems. Either way, the intermediaries must filter the entirety of content to detect a re-posting of the removed content. The mechanism, therefore, requires mandatory filtering initiated by the first notification.[164]

NSD is not provided by any legislation at the moment, but, an expanding body of case law (mainly drawn from Germany) has assisted in its analysis and interpretation.[165] In terms of enforcement, these new developments surrounding internet intermediaries could be of benefit in the 3D printing sphere.

On the other hand, recent developments surrounding reforms to the EU Copyright Directive, mean that online intermediaries could be burdened with the requirement to examine for copyright infringement on *all* uploaded content in the future *(emphasis added)*.[166] This reform, proposed under Article 13, known as the 'uploader filter' has been met with much criticism by various stakeholders as it would significantly curtail freedom of expression and lead to censorship.[167]

Furthermore, in light of these recent developments, it is equally relevant to question whether the focus on intermediaries is the way forward? It has also been suggested that "the strategy of targeting intermediaries could become obsolete if users have access to technology which enables them to make a scan of the object in their own home, and then print".[168] With the future of 3D printing pointing in this direction, it would be useful to clarify what constitutes design infringement by including the creation of a design document as an infringing use as discussed above.[169]

Therefore, it is submitted that a consideration of these factors, including (a) relevance of knowledge by intermediaries of an infringement occurring, and (b) control exerted by intermediaries in avoiding such infringement as developed under past case law, is important in looking ahead to the 3D printing and 3D scanning future.[170]

Economy: A European Digital Market Strategy [2017] 112 *Northwestern University Law Review*, 19.

[164] ibid.

[165] A Kuczerawy, From 'notice and take down' to 'notice and stay down': Risks and Safeguards for Freedom of Expression in G Frosio (ed.), *Oxford Handbook of Intermediary Liability Online* (Oxford, 2019) (Forthcoming).

[166] Proposal for a Directive of the European Parliament and of the Council on copyright in the digital market COM/ 2016//0593 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0593 (EU Copyright Directive).

[167] See https://juliareda.eu/eu-copyright-reform/. Also, See CREATe, The Copyright Directive: Misinformation and Independent Enquiry at https://www.create.ac.uk/blog/2018/06/29/the-copyright-directive-misinformation-and-independent-enquiry/ and T Margoni, Why the incoming EU copyright law will undermine the free internet (3 July 2018) *The Conversation* at https://theconversation.com/why-the-incoming-eu-copyright-law-will-undermine-the-free-internet-99247

[168] ibid. Also J Dumotier *et al,* p. 133.

[169] A template for such a provision could be Section 226 (1)(b) CDPA 1988 which extends primary design infringement to "making a design document recording the design for the purpose of enabling such articles to be made". The definition of a design document is provided within Section 263 CDPA 1988 and states that "design document" means any record of a design, whether in the form of a drawing, a written description, a photograph, data stored in a computer or otherwise." This definition encompasses CAD created for the purposes of 3D printing.

[170] *Sony Music Entertainment (UK) Ltd and Ors v EasyInternetCafé Limited* [2003] EWHC 62 (Ch); *Twentieth Century Fox Film Corporation and Others v Newzbin* [2010] EWHC 608 (Ch). See also, D Mendis, 'Back to the Future'? From Engravings to 3D Printing – Implications for UK Copyright Law in

5.3 Learning Lessons from the Past: From Photocopy Shops and Internet Cafes to 3D Printing Bureau Services

Example 2

What lessons can we learn from internet cafes of the 1990s and early 2000s?

Diagram 17 (Source: EasyInternetcafé.com)

The case of *Sony Music Entertainment (UK) Ltd and Ors v EasyInternetCafé Limited*[171] and *Twentieth Century Fox Film Corporation and Others v Newzbin*.[172] provides an insight. Whilst these case are very much from the pre-3D printing era and do not focus on 3D printing per se, they provide insight into the present challenges.

For example, *EasyInternetCafé* examined the lawfulness of a compact disc (CD) burning service made available by an internet café (EasyInternetCafé) in exchange for a payment,[173] whereas *Newzbin* explored the lawfulness of a peer-to-peer (P2P) filesharing platform, through which users could acquire media content that had not been authorised by the copyright holder.[174] Whilst the scenario in *EasyInternetCafé* is akin to that of today's bureau services, *Newzbin* can be likened to online platforms facilitating the dissemination and sharing of files. As such, these cases can shed light on today's challenges and provide an insight into some of the main questions surrounding intermediaries

5.3.1 Relevance of Knowledge by Intermediaries of Copyright Infringement Occurring

In the case of *EasyInternetCafé*, the defendants relied on the defence that they had no knowledge of the copying, arguing that they were merely facilitating the process.[175] This argument was rejected by the Court on the basis that it was not a defence for a person copying an item to assert that he did not know he was infringing copyright. This is because strict liability applies for primary copyright infringement under section 16 CDPA 1988.[176]

Similarly, in *Newzbin*, the defendants asserted that they had no knowledge of infringing material being made available through the Newzbin website. However, Kitchin J concluded

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D Mendis, M Lemley and M Rimmer, *3D Printing and Beyond: Intellectual Property and Regulation* (Edward Elgar, 2019) (Forthcoming).

[171] *Sony Music Entertainment (UK) Ltd and Ors v EasyInternetCafé Limited* [2003] EWHC 62 (Ch).

[172] *Twentieth Century Fox Film Corporation and Others v Newzbin* [2010] EWHC 608 (Ch).

[173] [2003] EWHC 62 (Ch), *per* Peter Smith J, [1].

[174] [2010] EWHC 608 (Ch).

[175] [2003] EWHC 62 (Ch), *per* Peter Smith J, [31].

[176] ibid. [33].

that in considering 'the structure of *Newzbin*, the categorisation of content and the encouragement given to editors to report films', he had no doubt that the defendant was and 'ha[d] been aware for very many years that the vast majority of films in the Movies category of *Newzbin* are commercial and so very likely to be protected by copyright'.[177] As such, Kitchin J established that members of Newzbin who use its facility to download those materials, including the claimants' films, are infringing that copyright.[178]

A few conclusions can be drawn at this stage. Where an intermediary has knowledge of copyright infringement occurring, they will be unable to avoid liability. This will also be the case if the intermediary has been involved in 'aiding and abetting'.[179] However, where the service is used for both lawful and potentially unlawful means, as was the case in *EasyInternetCafé*, then liability may be avoided. Yet, it ultimately depends on the control exerted by intermediaries in avoiding copyright infringement, based on their knowledge, that will decide the case, as discussed below.

5.3.2 Control Exerted by Intermediaries

The control exerted by intermediaries to avoid copyright infringement and therefore, liability, was considered in *EasyInternetCafé* as well as *Newzbin.* In *EasyInternetCafé* Peter Smith J outlined the scenario of an 'involuntary copier' – i.e., the recipient of a fax who has no control over what is being sent.[180] For these reasons, Peter Smith J asserted that *EasyInternetCafé* did not fall within the 'service provider' exception as it was only its internal rules that prevented its staff from seeing the information being copied. In the present case, the defendant chose to keep the files of an individual customer confidential, allegedly by directing that the employees could not see them unless the customer consented. Peter Smith J established that this was not involuntary; it was voluntary,[181] thereby demonstrating that the defendant could have exerted control to avoid copyright infringement but chose not to do so.

In *Newzbin*, Kitchin J clarified that 'authorise does not extend to mere enablement, assistance or even encouragement'.[182] In fact, Kitchin J went on to say that where there is an allegation of authorisation by supply, the circumstances may include the nature of the relationship between the alleged authoriser and the primary infringer. He further clarified the point by expressing that it could also include 'whether the equipment or other material supplied constitutes the means used to infringe, the degree of control which the supplier retains and whether he has taken any steps to prevent infringement'.[183]

These observations are of much relevance to this chapter as well as to the present discussion. Whilst online platforms and bureau services offer their services in terms of facilitating the dissemination of files or 3D scanning and 3D printing services, they will need to actively exert their control to avoid copyright infringement and liability. Also where there is

[177] [2010] EWHC 608 (Ch), *per* Kitchin J, [78].
[178] ibid.
[179] Lord Templeman in *C.B.S. Songs Ltd and Ors v Amstrad Consumer Electronics Plc and Dixons Ltd* [1988] AC 1013, sheds light on relevance of knowledge of copyright infringement as follows: 'a mere sale even with knowledge and intent that there will be infringement, is not an infringement in the absence of aiding and abetting'.
[180] [2003] EWHC 62 (Ch), *per* Peter Smith J, [33].
[181] ibid. *per* Peter Smith J, [34]–[35].
[182] [2010] EWHC 608 (Ch), *per* Kitchin J, [90].
[183] ibid.

knowledge of such infringing activity taking place either on online platforms or within bureau services, intermediaries will have to take note of them. Lessons from *EasyInternetCafé* and *Newzbin* can be learned in looking ahead to the future. However, with the proposed Article 13 – upload filter – of the EU Copyright Directive possibly becoming a reality, 3D printing online platforms and bureau services such as *Thingiverse, 3D Print Bureau* and *GoPrint3D* could face significant challenges in avoiding liability for copyright infringement.

Chapter 6

SMEs as Prosumers

Key Points Explored:

The Law: Exceptions and Limitations
- Exceptions and Limitations in the IP sphere

Main Points for the Business Sector – How Exceptions and Limitations can Benefit SMEs
- The benefit of exceptions and limitations for SMEs
- Relevant exceptions available to SMEs

This chapter will explore the exceptions and limitations in IP law and will consider the applicability of relevant exceptions for SMEs. The rationale for this analysis is to determine whether SMEs can benefit from any of the current IP exceptions in fostering innovation and growth in the field of 3D printing.

Exceptions and limitations, which can vary from country to country and according to each IP right, are important in that they assist in maintaining an appropriate balance between the interests of rights holders and users of protected works. In particular, they permit the use of protected works with or without payment, in certain circumstances[184] as considered below.

The digital world allows consumers to 'produce' and 'consume' at the same time, which has led to the use of the term 'prosumers'. This chapter considers SMEs as 'prosumers'.

Case Study 5: SMEs as Producers and Users ('Prosumers')

In Case Study 5, the report considers a number of illustrative examples relating to the potential application of exceptions and limitations.

Example 1 considers the use of private and non-commercial use by SMEs – particularly, in the context of SMEs as bureau services

Example 2 considers the exception of citation and experimental use and questions the relevance of commercial experimental use. Can commercial experimental use be used by SMEs? If so, how can it be used?

Example 3 explores the opportunities of the spare parts market for SMEs entering the 3D printing field. Spare parts, small in size, have been considered to have a positive impact on the 3D printing market and provide opportunities.

[184] World Intellectual Property Organisation, 'Exceptions and Limitations' at https://www.wipo.int/copyright/en/limitations/

6.1. Private and Non-Commercial Use

One of the most commonly used exceptions relating to most IP rights is the exception of 'private and non-commercial use'. Broadly, 'private use', refers to the type of use which can be carried out solely for the individual's personal use or sometimes for friends and family, but, excludes the use of this exception when the public at large benefits. 'Non-commercial use', on the other hand, refers to use, devoid of economic benefit for the user.

For example, under copyright law, a private copy is usually defined as any copy for non-commercial purposes made by a natural person for his/her own personal use. In some jurisdictions[185], levies (a tax) are attached to the private copying exception in dealing with modern technological developments. The levy takes into account the income potential rightsholders who are impacted by technological devices which makes 'copying' straightforward and easy.[186]

Non-commercial use, differs to private use. As mentioned above, non-commercial use, refers to use, which does not involve an economic benefit for the use. In some circumstances, such as in the case of patent and design laws, the conditions of private and non-commercial use are considered cumulatively; i.e., the use should be both private *and* non-commercial in order for the exception to apply.[187]

It can be argued that an SME by its very nature is a business that supplies products and/or services in exchange for remuneration. In this sense, the 'non-commercial' exception would not be applicable here.

However, private use raises some interesting questions, from the perspective of bureau services and sharing of CAD files, as considered in *example 1* below.

Applying the scenario of bureau services as discussed in the previous chapter to the present exception of private use, it can be questioned whether SMEs can benefit from the exception of private use, when carrying out their services for consumers, wishing to print an object for themselves.

[185] In the UK, the private use exception does not exist. It was briefly introduced as part of the Hargreaves Reforms in 2014; however, it was later overturned through judicial process as the exception had been introduced without a sufficient compensation system. See, *World Intellectual Property Organisation, International Survey on Private Copying: Law and Practice* (WIPO, 2015), 5.
[186] ibid.
[187] *See* L Bently & B Sherman, *Intellectual Property* (Sweet & Maxwell, 2014), 543.

Example 1

Bureau Services and the use of the Private and Non-Commercial Use Exception?

Diagram 18 (Source: 3D Print Bureau; GoPrint3D; 3DPrint.Direct.co.uk)

The above diagram represents three bureau services which operate in the capacity of SMEs and are involved in printing 3D objects for their consumers, in return for a remuneration.

In this scenario, the 3D printer is placed in a public location, for the public to access; however, the object which may be printed for a consumer, in return for remuneration, could be for their (consumer's) private use, rather than for wider dissemination. Can this scenario come under private use?

As a third party (bureau service) has been used for the service to be supplied, the use of this exception would be excluded. In other words, the exception would only extend to persons who would personally enjoy the result of such conduct, and not for the benefit of a third party.

This would be the case, particularly in copyright law.

However, in some cases, both conditions of private *and* non-commercial are required by law.

For example, under design law, Article 20 of the Community Registered Design Right (CRDR) provides for certain limitations of the rights conferred by design law. One such exception applies to acts done privately *and* for non-commercial purposes.[188] Article 27(a) of the Unified Court Patent Agreement (UCPA) provides the same – that acts done privately and for non-commercial purposes will be exempted.[189]

As such, it is insufficient that an act be done for non-commercial purposes—it must also be *private*. [190] Therefore, non-commercial public use falls outside the present exception. Interestingly, this double restriction (private *and* non-commercial) is not required by

[188] Council Regulation (EC) No 6/2002 on Community Designs, Art. 20(1)(a).
[189] Article 27(a) Agreement on a Unified Patent Court, OJ EPO 2013, 287.
[190] A similar wording is found in Council Directive (EC) 87/54/EEC on the legal protection of topographies of semiconductor products [1986], art. 5(2).

international sources,[191] and therefore, for countries outside the EU, the double restriction will not apply.

6.2 Experimental Use

However, where the conduct is of mixed purpose (private and non-commercial use), it seems necessary to look at the *intention* of the user, even if the resulting information has a commercial benefit.[192]

For example, a SME may wish to use a protected work for purposes of *citation and teaching*[193] or for *experimental use*[194]. These are exceptions which exist under design and patents law and which can be invoked successfully by commercial entities.

'Citation and teaching' is not further defined, and it seems any act is allowed that reproduces a design as long as it is in accordance with fair trade practices and does not prejudice the normal exploitation of the design.[195] *Bently & Sherman* offer the example of a book about design, where designs of shapes (3D) are reproduced. In such a case, there is no need to look to the exception, as the design would not be applied to a product and therefore would not be considered as the 'normal exploitation of the design'. However, should that not be the case, the present exception will be helpful.[196]

Apart from the 'normal exploitation of the design', mentioning the source[197] is another criterion of this exception, although once again, its meaning is obscure with a lack of definition for *source* or for *designer*. *Bently & Sherman* observe that it is unclear who – among the manufacturer, the designer and the design proprietor – should be taken as the source, and cautiously suggest mentioning all three.[198] Musker and Stone, on the other hand, both believe that the designer/author needs no recognition, limiting the mention to the manufacturer or the supplier, at least with a CUDR, since in the case of a registered design, a mention of the CD Bulletin number will suffice.[199]

In the case of patents, there are very few examples in case law which test the parameters of this exception and it is an area where there is considerable diversity of approach around the world, including within Europe.

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[191] TRIPs agreements only require protection against acts of commercial purposes; *see* Art. 26(1).
[192] L Bently & B Sherman, *Intellectual Property*, (Sweet & Maxwell, 2014), 543.
[193] Council Regulation (EC) No 6/2002 on Community Designs, Art. 20(1)(c).
[194] Article 27(a) Agreement on a Unified Patent Court, OJ EPO 2013, 287; Council Directive (EC) 87/54/EEC (Topography Directive) art. 5(3); Council Regulation (EC) No 6/2002 on Community Designs, Art. 20(1)(b).
[195] But only reproductions constituting a citation in the sense of to 'serve a[n] intellectual debate', and thus not advertising, as held in Case I ZR 56/09 Deutsche Bahn v Fraunhofer-Gesellschaft [2012] GRUR 12/2011, 1117 reported in David Stone, *European Union Design Law – A Practitioners' Guide,* 2nd Edn, (OUI, 2016), 20.71.
[196] L Bently and B Sherman 760-761.
[197] D C Musker, Community design regulation 390. *See,* D Stone, European Union Design Law – A Practitioners' Guide, 2nd ed. (OUI, 2016), 20.74.
[198] ibid.
[199] ibid.

Example 2 provides an insight into a potential scenario of invoking an exception for experimental use under design.

Example 2

Teaching and citation and experimental use – relevant exceptions for SMEs

Diagram 19 (Source: Ellen Smith, 'The Adidas Ultra Boost Nests were Inspired by an Olympic Stadium' 29 May 2017)

At the same time that the initial 3D printing patents were reaching their expiration in 2008, the Beijing Olympics was reaching its completion in the iconic Bird's Nest Olympics Stadium. Top preserve the memory of the stadium designed by Herzog and de Meuron, a pair of *Adidas* sneakers reflecting a textured lacing system to resemble The Bird's Nest was produced, using 3D printing technology.

A SME involved in the manufacture of shoes, may draw inspiration from the distinctive *Adidas* sneakers for producing their own brand of shoes. In doing so, an SME can carry out commercial experiments, using the *Adidas* shoes, in order to determine the best design or to find designs, which are most attractive to consumers.

6.3 The Future of 3D Printing and Spare Parts

The use of 3D printing to create spare parts has generated a high degree of interest in recent years.[200] It is a seemingly obvious application for the technology and many people can immediately appreciate the advantage of being able to create spare parts on demand. The idea of low prices for essential parts, a shorter waiting-time for the delivery of critical and specialist parts and being less dependent upon manufacturers to support aging products provides many benefits for SMEs – particularly in the context of 3D printing.[201]

In addition to the consumer benefits, 3D printing has the potential to help businesses improve their supply chains and reduce operating costs. For any company engaged in the

[200] In addition, websites such as *Kazzata* are dedicated to offering 3D printable spare parts for consumers. For further details, *see* www.kazzata.com

[201] P Reeves and D Mendis, *The Current Status and Impact of 3D Printing Within the Industrial Sector: An Analysis of Six Case Studies* (UK Intellectual Property Office, 2015)

manufacture, distribution or sale of products, replacement or spare parts represents an on-going business concern. Companies want to maintain customer loyalty and positive brand recognition by providing responsive and cost effective after sales support including replacement parts. These parts may be required when original components malfunction through wear and tear, or break through accidental damage. Moreover, within a product's warranty period, companies are obligated to provide customers with after sales support including spare parts".[202]

However, companies are reluctant to 'carry' excessive levels of replacement parts. As such, an inventory represents tied-up working capital, has associated storage costs and risks becoming obsolescent, at which point it must be written off and disposed of. In an ideal world, replacement parts would be made-to-order as and when required, but in reality such a solution is rarely economical or practical using production methods such as plastic moulding or metallic machining.[203]

3D printing could therefore provide a possible solution to these compounded business problems, as in theory spare parts could be manufactured to order using just digital design data. This would mitigate stock holding and the associated risk of stock obsolescence.

This is particularly true in the case of 'complex products' – which may only be considered to be new and to have individual character if the component part, once it has been incorporated into the complex product, is visible to the user in ordinary use.[204] This does not mean that the *design should be visible to the user at all times*; what is important is that the design should be capable of being seen. Accordingly, parts of an engine, or the entire engine, not visible during the normal use of the complex product – i.e., the car – of which the engine is a component part – are excluded from protection.[205] Engine parts would nonetheless be protected if visible during normal use, such as in the case of cyclones within transparent bins of a vacuum cleaner.[206]

Therefore, one point to note is that EU design law does protect 'invisible' designs, so long as the design is not for a spare part. Take for example, the case of a pacemaker. Once fitted, it cannot be seen, unless through an x-ray machine. Design law, however, currently protects the appearance of the pace maker (if it is otherwise valid) even though it is not visible whilst in normal use, as it is not a spare part.[207] Therefore, it is the spare part aspect which is important.

However, even if a component part is visible, the *design should not be solely dictated by the technical function* of the product (thereby excluding maintenance and repair)[208]. In other words, this also means that component parts within complex products which cannot be seen

[202] ibid. See also, Trading Standards Institute http://www.tradingstandards.gov.uk/advice/problemswithgoods-sum16.cfm
[203]
[204] CDR 2002, Art. 4(2).
[205] Mary Vitoria et al, Laddie, Prescott and Vitoria: The Modern Law of Copyright and Designs (4th edn, Lexis-Nexis 2011), 2028.
[206] *Dyson Limited v Vax Limited*, [2011] EWCA Civ 1206.
[207] D Stone, Should Design Protect Things You Can't See? (26 January 2016) at https://blog.oup.com/2016/01/design-rights-commercial-law/
[208] CDR 2002, Art. 4(3).

at all and are dictated by the technical function of the product, will not be eligible for protection[209].

Over and above the general exclusion of 'technical function', design law provides for a further exclusion known as the 'must fit' exception which was incorporated to ensure that designs do not lead to monopolies in technical replacement products such as exhaust pipes, fan-belts, washers and dishwasher brackets amongst others[210].

The essence of the above criteria is that most products manufactured in the replacement parts industry will *not* qualify for protection as they are deemed to be hidden in everyday use, and therefore are excluded under the requirement for novelty and individual character in accordance with CRDR. As a result, the spare parts market is an area where 3D printing SMEs can flourish, as the issue of infringement does not arise. *Example 3* illustrates this point further.

Example 3

3D Printing and the Future of Spare Parts: A Spark Plug, Interior of Chocolate Eggs and a Car Wing Mirror – Do they Fall Outside Design Protection?

Diagram 20 (Source: Pixabay)

A spark plug will be precluded from protection as it is not visible during 'normal use', is dictated by technical function and classed as a spare part (as opposed to something like a pacemaker)

Diagram 21 (Source: Pixabay)

[209] *P B Cow v Cannon* [1959] RPC 347. It was decided in this case that the design of a hot water bottle is not dictated solely by function and the design of the hot water bottle in question, was not considered to be the only possible design for a hot water bottle and therefore it was registered.
[210] *Amp v Utilux* [1972] RPC 103. Section 1C(2) of RDA 1949.

The design of the interior of chocolate eggs was eligible for protection, even though it was not visible to the user at all times, but, could be seen once the chocolate egg was open. Also a chocolate egg is not a spare part (again, similar to the pacemaker example).

Diagram 22 (Source: Pixabay)

The wing mirror of a car, although a spare part, is visible to the user during normal use and is not dictated by technical function. Therefore, it is eligible for protection.

Whilst the spare parts market has it doors open widely for 3D printing manufacturers, what is apparent from the above examples is that the situation is not perfectly clear at the moment whether or to what extent non-visible features of simple products are protected.

Having said that, SMEs entering this field has the opportunity to benefit from a few exceptions as outlined above.

Chapter 7

Enforcement: SMEs and New Business Models in the 3D Printing Sphere

Key Points Explored:

- Enforcing rights through other means, apart from IP law
- The role of blockchain in 3D printing
- Providing protection through trade secrets
- Providing protection through the database directive
- Providing protection through the E-Privacy regulation

7.1. Enforcing Intellectual Property law in the 3D Printing World

> Enforcement may become even more complex in the future with the emergence of 3D printing … and hence it is necessary to question exactly how rights will be enforced in the future … Enforcing infringement laws is likely to become a complicated process with the decentralised nature of 3D printing counterfeit and piracy… Furthermore, the anonymity and perception of safety that comes along with infringement inside private homes along with the ease and low-cost of 3D printers contributes to these complications.[211]

The above quote captures the complexities surrounding the enforcement of IP laws in a future 3D printing world. Enforcement of IP laws, in any context, is challenging and its application to 3D printing, as the quote stipulates, could prove to be particularly so, in the future.

7.2 The Role of the Blockchain in 3D Printing

The blockchain promises a future without middleman – and therefore is in complete contrast to the above discussion on intermediaries.

The main characteristic of the blockchain technology is enabling a validated transaction of digital assets between two parties over the internet without any intermediary. “Prior to the invention of the blockchain, it simply was not possible to coordinate individual activities over the Internet without a centralised body being involved to ensure that no one had tampered with the data”.[212] The blockchain, however, provides the benefit for a group of unrelated individuals to confirm that an event had occurred or verify that a particular transaction was not fraudulent or invalid without relying on a central authority.[213] Hence, the emergence of

[211] *Economic Review of Industrial Design in Europe* (MARKT2013/064/D2/ST/OP) (Europe Economics; 2015), p. 13.
[212] V Gupta, ‘The promise of a blockchain in a world without middlemen’ (6 March 2017) at https://hbr.org/2017/03/the-promise-of-blockchain-is-a-world-without-middlemen
[213] ibid.

the blockchain and the potential for 'decentralisation' has led to the assurance of "a world without middlemen".[214]

In terms of IP laws, the blockchain has been suggested as a solution for the distribution of creative works protected via IP laws. Wallach proposes *"A Decentralized Network for Royalty and Licensing Payments"*[215] based on the blockchain which would identify and determine the correct rights holder, the accurate distribution of royalties or license payments for the use of such works.[216] Above all, the blockchain, provides the potential for an effective enforcement mechanism through its ability to identify each and every transaction.

In other words, the potential to identify the uploading and sharing of CAD files and any unauthorised use, could be a solution for tracking and tracing such design files in the future, particularly with the aim of enforcing IP rights. At present, there is very limited literature on this topic – but it is certainly an area worth exploring in the context of enforcement.

7.3 Application of Soft Intellectual Property Rights to 3D Printing

Apart from the four main IP rights of copyright, design, trade marks and patents, soft IPRs could also be instrumental in protecting and exploiting innovation in the 3D printing field. In particular, trade secrets, contract law and the application of database protection is of much relevance to the present discussion. Apart from the above mentioned laws, there is also the draft *E-Privacy Regulation* COM (2017) 10 final (EPR), which is applicable. As this regulation has not yet come into effect, it will be considered in brief, for the sake of completeness.

The significance of the application of soft IPRs in the 3D printing sphere is particularly important in the digital era which opens up the possibility of sharing design files on online platforms, which makes the protection of data a key factor. Along with the protection of data, the protection of the materials for 3D printing as well as 3D printing processes are often protected as trade secrets in the industry, as opposed to relying on patent law.[217]

7.4 Providing Protection Through Trade Secrets

Trade secrets and contractual mechanisms, as well as technical protection measures are often used to protect data and in the context of 3D printing, it is used to particularly protect CAD data.[218] It is an area that has attracted much attention in recent times, although its

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[214] ibid. See also, M Swan, *Blockchain: Blueprint for a New Economy* (O'Reilly Media, Inc., 2015), chapter 1.

[215] D A Wallach, *Bitcoin for Rockstars: How Cryptocurrency Can Revolutionise The Music Industry* (2014) at *https://www.coindesk.com/bitcoin-rockstars-cryptocurrency-music-industry*

[216] D Mendis and H Brorsen, Losing Grip Block by Block: Regulating Mass Copyright Licensing in the Blockchain Era (Forthcoming, 2019).

[217] *Magic Leap Inc. v Bradski* et al (2017) Case Number 5:16-cvb-02852; W Molinski and J Heath, 3D Printing Company Sues Under New Defend Trade Secrets Act, Orrick (22 June 2016) https://blogs.orrick.com/trade-secrets-watch/2016/06/22/early-returns-part-1-of-2-3d-printing-company-sues-under-new-defend-trade-secrets-act/#more-1910; Marcia Heroux Pounds, 'Magic Leap Settles Trade Secrets Lawsuit with Former Execs', Sun Sentinel (23 August 2017) http://www.sun-sentinel.com/business/fl-bz-magic-leap-settles-executive-lawsuit-20170823-story.html

[218] See for e.g. R M Ballardini, J Lindman, & I Flores-Ituarte, Co-Creation, Commercialization and Intellectual Property Management – Challenges with 3D Printing Technology (2016) 3(7) *European Journal of Law and Technology*.

importance and significance for protecting confidential information has been covered extensively by academics and professionals over the years.[219]

Recent developments at the European level, through the introduction of the Trade Secrets Directive[220] provides for provisions, which addresses the unlawful acquisition, use and disclosure of trade secrets. Member States are therefore required to provide for measures and remedies to prevent, or obtain redress for, the unlawful acquisition, use or disclosure of their trade secret.[221] What this means is that companies, inventors, researchers and creators will be put on equal footing throughout the Internal Market, and the European Union will have a common, clear and balanced legal framework which will discourage unfair competition, and facilitate collaborative innovation and the sharing of valuable know-how to make the EU a stronger and more competitive economic region.[222]

However, some challenges relating to the application of trade secrets within the 3D printing field has also been identified. For example, Vogel notes that that 'detecting and proving misappropriation in the complex and rapidly changing additive manufacturing arena can be challenging.'[223] This was illustrated in a recent US case involving a 3D printing company, *Magic Leap*, who sued two if its former employees under the Defend Trade Secrets Act 2016 in Federal Court in the Northern District of California.[224] In 2018, the issue of trade secrets was again at the heart of a case involving 3D printing, involving Desktop Metal Inc. who launched litigation against Markforged Inc. and Matiu Parangi in relation to intellectual property and metal 3D printing.[225] As well as complaints of patent infringement, Desktop Metal Inc. alleged that the defendants had engaged in acts of trade secret misappropriation, unfair and deceptive business practices, and breach of contract.[226]

In looking ahead to the future in the context of 3D printing and trade secrets, Mendis, Lemley and Rimmer puts forward the following suggestion:

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[219] F Gurry, *Breach of Confidence* (Oxford University Press, 1984); T Aplin, L Bently, P Johnson and S Malynicz, *Gurry on Breach of Confidence: The Protection of Confidential Information* 2nd edition (Oxford University Press, 2014); W van Caenegem, *Trade Secrets and Intellectual Property: Breach of Confidence, Misappropriation and Unfair Competition* (Kluwer Law International, 2014).

[220] Directive 2016/943 on the protection of undisclosed know-how and business information (trade secrets) against unlawful acquisition, use and disclosure at http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016L0943

[221] Article 4(1) Trade Secrets Directive. See also, D Mendis, M Lemley and M Rimmer, The Future of Printcrime: Intellectual Property, Innovation law and 3D Printing, in D Mendis, M Lemley and M Rimmer (eds.) *3D Printing and Beyond: Intellectual Property and Regulation* (Edward Elgar, 2019) (Forthcoming).

[222] European Commission, 'Trade Secrets' at http://ec.europa.eu/growth/industry/intellectual-property/trade-secrets_en

[223] B Vogel, 'Intellectual Property and Additive Manufacturing/ 3D Printing: Strategies and Challenges of Applying Traditional IP Laws to a Transformative Technology' (2016) 17 (2) *Minnesota Journal of Law, Science and Technology,* 881-905 at 898.

[224] W Molinski and Jacob Heath, 3D Printing Company Sues Under New Defend Trade Secrets Act, Orrick (22 June 2016) https://blogs.orrick.com/trade-secrets-watch/2016/06/22/early-returns-part-1-of-2-3d-printing-company-sues-under-new-defend-trade-secrets-act/#more-1910; and K Leswing, Bombshell lawsuit reveals drama at Magic Leap, the secretive multibillion-dollar startup backed by Google, Business Insider Australia (25 October 2016) https://www.businessinsider.com.au/magic-leap-lawsuit-secrets-revealed-2016-10?r=US&IR=T

[225] *Desktop Metal, Inc. v Markforged, Inc. and Matiu Parangi* (2018) Case Number 1:18-CV-10524

[226] See, D Mendis, M Lemley and M Rimmer, The Future of Printcrime: Intellectual Property, Innovation law and 3D Printing, in D Mendis, M Lemley and M Rimmer (eds.) *3D Printing and Beyond: Intellectual Property and Regulation* (Edward Elgar, 2019) (Forthcoming).

> Future research could explore the role and function of trade secrets protection in respect of 3D printing; trade secrets enforcement at a civil and a criminal level; and the role of defences. Furthermore, it could be productive to consider the tensions between trade secrets and consumer rights, competition policy, and employment law in the context of 3D printing and additive manufacturing.[227]

7.5 Providing Protection Through the EU Database Directive

The *sui generis* database protection provided under the EU database directive[228] could be a further mechanism for specifically protecting data or datasets generated in the course of designing a 3D model for 3D printing as represented through a CAD design file. The possibility of seeking protection for CAD data through the application of the database directive has contemplated in the literature[229] however, it does pose some limitations, as discussed below.

For example, in accordance with Article 1.2 of the Database Directive, the sui generis protection applies to databases as a "collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means".

An analysis of the above wording indicates that it does not extend to data *per se*.[230] The wording also indicates that it has to be a "collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible". Accordingly, the sui generis protection does not protect data which falls outside the scope of the above definition – i.e., masses of data. which, although might be of economic value, do not qualify under the definition of digital databases. The CJEU has further developed the criteria mentioned in the Directive in the case of *Fixtures Marketing Ltd v. Organismos prognostikon agonon podosfairou AE (OPAP)* by stating that 'independent works' refer to the fact that "a database consisting of any collection of works, data or other materials are separable from one another without the value of their contents being affected".[231] The court went on to state that independent material must have autonomous independent value".[232] Specifically, "systematic or methodical way of arrangement" and "individual accessibility" means that the collection of data should be contained in a "fixed base".[233]

Drawing on the analysis of Article 1.2 of the database directive as well as the judgement in OPAP, it questionable whether CAD data falls within the remit of the sui generis right. On the one hand it may be argued that it seems unlikely that the requirements of systematic or methodological arrangement and individual accessibility would be fulfilled in the CAD data

[227] ibid.
[228] Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases.
[229] T Pihlajarinne and R Ballardini, Owning Data via Intellectual Property Rights: Reality or Chiemera? in R Ballardini, O Pitkänen and P Kuoppamäki, *Regulating Industrial Internet through IPR, Data Protection and Competition Law* (Kluwer Law Int., 2019) (Forthcoming).
[230] Article 7(2)(a) Database Directive forbids the acts of 'extraction' and 're-utilisation' of individual data included in the databases only as far as such data form a "permanent or temporary transfer of all or a substantial part of the contents of a database to another medium".
[231] C-444/02 ECJ´s ruling *Fixtures Marketing Ltd v. Organismos prognostikon agonon podosfairou AE (OPAP),* paras 29, 32.
[232] Ibid, para 33.
[233] Ibid, para 30.

context. This is because data is usually captured, analysed and utilised immediately, without using any fixed base.[234] On the other hand, new ways of capturing and generating databases arising in today's digital era, may well provide some solutions for the future. Particularly, Article 7.1 of the database directives addresses this.

Article 7.1 of the database directive asserts the importance of expending qualitative and/or quantitative substantial investment in either obtaining, verifying or presenting "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". The *British Horseracing Board*[235] case shed light on what is meant by "investment" In this case the CJEU clarified that the database directive does not protect the creation of data; rather it exists to promote the creation of storage and processing systems for existing information. In this sense, the creation of data, through the use of CAD programmes to design a 3D model will fall out with the database directive.

On the other hand, in the case of *Ryanair Ltd v PR Aviation BV*[236], the CJEU held that where database operators are unable to protect "screen-scraping"[237] activities under the database directive, they may be able to do so under the website's terms and conditions. In arriving at this decision, the CJEU acknowledged that the definition of "substantial investment" can create uncertainty in light of new ways of capturing and generating databases.[238]

The *Ryanair* decision provides some hope for the future of those working with design models and those who may wish to protect those design within a database for future consumption. For example, jewellers who portray 3D models of pieces of jewellery on their websites for mass customisation and 3D printing, are burdened with the issues of screen scraping which could now be addressed following the *Ryanair* decision.

7.6 Providing Protection Through the E-Privacy Regulation

Under the *General Data Protection Regulation* 2016/679 (GDPR); and, the draft *E-Privacy Regulation* COM (2017) 10 final (EPR), three new possible rights have been envisaged and discussed.[239] However as mentioned above, the *E-Privacy Regulation* is in draft and therefore, a brief discussion is provided for the sake of completeness.

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234 Taina Pihlajarinne and Rosa Ballardini, "Owning Data via Intellectual Property Rights: Reality or Chiemera?", in R Ballardini, O Pitkänen & P Kuoppamäki, *Regulating Industrial Internet through IPR, Data Protection and Competition Law*, Kluwer Law Int. (Forthcoming in 2019).

235 C-203/02 *British Horseracing Board v William Hill* (9 November 2004).

236 C-30/14 *Ryanair Ltd v PR Aviation BV* (15 January 2015).

237 "Screen scraping" is the action of using a computer program to copy data from a website.

238 C-30/14 *Ryanair Ltd v PR Aviation BV* (15 January 2015). *See also*, Joint Institute for Innovation Policy and Technopolis Group, *Study in support of the evaluation of Directive 96/9/EC on the legal protection of databases; A Study Prepared for the European Commission DG Communications Network, Content and Technology* (European Commission, 2017) at http://www.technopolis-group.com/wp-content/uploads/2018/07/Study-in-Support-of-th-Evaluation-of-the-Database-Directive-.pdf

239 S Stalla-Bourdillon, A Knight, E Rosati, E Simperl and Johanna Walker, *'Building the European Data Economy' – Position Paper on the Proposal for a New Right in Non-Personal Data* (April 2017) at http://ec.europa.eu/information_society/newsroom/image/document/2017-30/consultation_data_eco-knight_65284C58-BC45-BD3E-6F27AD94A35F71EC_46162.pdf *See also,*

The three possible rights include (a) possible manufacturer's right; (b) possible data producer's right; and (c) possible shared right. Of these, (a) and (b) are most relevant to the present discussion and will be considered.[240]

Possible manufacturer's right: "More data would become available for re-use if the companies active in the production and market commercialisation of sensor-equipped machines, tools or devices were awarded an exclusive right to license the use of the data collected by the sensors embedded in such machines, tools and/or devices (a sort of sui generis intellectual property right)".

Possible data producer's right: "More data would become available for re-use if the persons or entities that operate sensor-equipped machines, tools or devices at their own economic risk ("data producer") were awarded an exclusive right to license the use of the data collected by these machines, tools or devices (a sort of sui generis intellectual property right), as a result of the data producer's operation, to any party it wishes (subject to legitimate data usage exceptions for e.g. manufacturers of the machines, tools or devices)".

At a general level, there appears to be some confusion by companies regarding which legal regime might apply in the future, in addition to determining how the new rules under the E-Privacy regulation (when it becomes law) and the GDPR will apply.[241] As the Commission itself has pointed out, there is a need for a coordinated and pan-European approach to make the most of data opportunities in the future and this may also be true if there is any scope of its application in the manufacturing field as has been proposed.[242]

Toreador (EU Research and Innovation Project funded by the European Commission) at http://www.toreador-project.eu/

[240] For a consideration of all three rights, see, D Mendis et al, *'Study into the Intellectual Property Implications of Industrial 3D Printing'* (European Commission; Forthcoming, 2019).

[241] ibid. *See also*, Bird & Bird, White Paper, 'Data ownership in the context of the European data economy: proposal for a new right', 1 January 2017, pp. 5 and 112.

[242] See, D Mendis et al, *'Study into the Intellectual Property Implications of Industrial 3D Printing'* (European Commission; Forthcoming, 2019).

Conclusion

The above discussion has discussed and considered the application of the current IP framework to 3D printing and 3D scanning and questioned its application through case studies, expanded through a number of illustrative examples. The discussion has attempted to demonstrate the challenges, whilst also highlighting areas of the law that could potentially be applicable to 3D printing, such as the trade secrets directive.

For businesses entering the field, the IP framework should not act as a barrier, but, should rather be a mechanism for enhancing a company's innovation. Therefore, in looking ahead to the future and whilst time is on the hands of the policy maker and legislator, it is imperative for the uncertainties to be ironed out and clarify the law, for the sake of all stakeholders in this field. This sentiment is also captured in the European Parliament's recently adopted resolution which states that "legal experts are of the view that 3D printing has not fundamentally altered intellectual property rights, but files created may be considered a work and whereas, if that is the case, the work must be protected as such; whereas in the short and medium term, and with a view to tackling counterfeiting, the main challenge will be to involve professional copyright intermediaries more closely".[243]

On this latter point of intermediaries, a further challenge will the enforcement of the law – for a technology that is decentralised in nature. Whilst this challenge is not specific to 3D printing per se, it does raise important questions. In the disussion above, the the role of intermediaries, blockchain and other possible avenues were considered. Whether they will prove to be the way forward, only time will tell. Until then, we should "adapt to this technology and adopt new business models"[244] as a complement to the IP framework.

[243] European Parliament, Three-dimensional printing: intellectual property and civil liability at http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2018-0274+0+DOC+XML+V0//EN&language=EN

[244] 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(3) *European Intellectual Property Review* 155 at 164.