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“Clone Wars”: Episode II - The Next Generation

The Copyright Implications relating to 3D Printing and Computer-Aided Design (CAD) Files

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Abstract

The future market potential of 3D printing will rest on the dissemination of Computer Aided Design (CAD) files. Without clear instructions from a CAD file, a 3D printer will not function. In fact, “a 3D printer without an attached computer and a good design file is as useless as an iPod without music”. The importance of CAD-based design files, therefore, cannot be underestimated. Drawing on UK and EU copyright laws and their application to 3D printing and CAD files, this paper will, first, question whether CAD files can be protected by copyright law before considering the copyright implications thrown up by the modification of CAD files as a result of scanning and the use of online tools. Highlighting some of the challenges for rights holders and users existent in the present law the paper advocates new business models over a premature call for stringent intellectual property laws before concluding with some recommendations for the future.

Keywords: 3D printing; Computer-Aided Design files; copyright law; scanning; online tools; business models

Introduction

According to Lipson and Kurman, “[i]n a 3D printed future world, people will make what they need when and where they need it.”¹ Furthermore, as 3D printing opens up new frontiers, “[m]anufacturing and business as usual will be disrupted as regular people gain access to power tools of design and production.”² With this, it is clear that 3D printing is expected to bring both challenges and opportunities and its significant growth in the consumer market has been reflected in *Gartner’s 2014 Hype Cycle*³.

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¹ H Lipson & M Kurman, *Fabricated: The New World of 3D Printing* (Indiana: John Wiley & Sons, Inc.; 2013), p. 11.

² H Lipson & M Kurman, (n 1) at 7.

³ *Gartner’s 2014 Hype Cycle for Emerging Technologies* at www.gartner.com/newsroom/id/2819918 (Consumer 3D printing reached the ‘Peak of Inflated Expectations’ in 2012)

The recent introduction of home-based 3D printing has further enabled consumers to engage in the manufacture of products using digital data bought or ‘shared’ online circumventing much of the traditional manufacturing and retail value chain⁴. As such, 3D printing provides the potential for designing, sharing and reproducing physical objects. Recognising this potential, Lipson and Kurman predict that ‘intellectual property law will be brought to its knees’.⁵

However, the position in relation to the technology as well as intellectual property laws remains under-developed. For example, the design barriers, such as the lack of a straight-forward ‘print’ button for 3D printing,⁶ means that at present 3D printing continues to be largely reserved for those with technical ability and technical knowledge. However the bigger obstacle to the ‘3D printing evolution’ is that few consumers or designers have the ability to operate the software, which is used to render objects and turn them into files that can be printed. “A lot of people are 3D printing other people’s designs, but they can’t yet model their own”⁷. This is further exacerbated by access to online sharing platforms⁸, which facilitate⁹ the creation and dissemination of 3D object designs or Computer-Aided Design (CAD) files for download and printing¹⁰.

www.gartner.com/newsroom/id/2124315 and has continued in this position through 2013-2014 although it is now closer to the ‘Trough of Disillusionment’).

⁴ See, Technology Strategy Board (now known as Innovate UK), Materials KTN: *Shaping Our National Competency in Additive Manufacturing* (September 2012), p. 4. As a digital technology, ‘Additive Manufacturing’ (more commonly called 3D Printing, see also *infra*, ‘Introduction to 3D Printing’) is progressively being integrated with the Internet enabling consumers to engage directly in the design process, and allowing true consumer personalisation.

⁵ H Lipson & M Kurman, (n 1) at 7.

⁶ A Regalado, Wanted: A Print Button for 3D Objects (24 April 2013) *MIT Technology Review* at www.technologyreview.com/news/514071/wanted-a-print-button-for-3-d-objects/

⁷ *Ibid.*

⁸ Online platforms for 3D printing, include amongst others, *Thingiverse, Shapeways, Sculpteo, GrabCad, 123D, Cubify, Ponoko and Pirate Bay.*

⁹ In the UK, under *Copyright, Designs and Patents Act 1988* (CDPA 1988) the law prohibits the ‘authorisation’ of infringement. “Section 16(2) –. Copyright in a work is infringed by a person who without the licence of the copyright owner does, or *authorises another to do*, any of the acts restricted by the copyright” (*emphasis added*).

¹⁰ Pokémon targets 3D printed design, citing copyright infringement (21 August 2014) *World Intellectual Property Review*, Available at www.worldipreview.com/news/pok-mon-targets-3d-printed-design-citing-copyright-infringement-7067 In this particular scenario, Netherlands-based *Shapeways* received a cease-and-desist letter from The Pokémon Company International demanding that the design, which allegedly resembled the character *Bulbasaur*, be removed.

This paper will set out a brief introduction to 3D printing before turning to consider the copyright implications surrounding design files through the use of CAD software. Design object files (also referred to as CAD-based design files in the context of this paper) which provides the ability to create, share and disseminate 3D designs for download and printing are highly relevant in the 3D printing landscape. Without the CAD file, or 3D design, a 3D printed product will not come into being. Furthermore, in considering 3D models and 3D designs, it is apparent that online tools (or “apps” as they are known)¹¹ play a significant role amongst users in designing and re-designing the models. This is of particular importance once again to 3D designs or CAD files the transformation or modification of which raises interesting copyright issues.

For example, can a CAD file be protected under copyright law? Does it qualify as a literary work? Where the file is modified by other users – either by scanning or through the use of online tools – what are the implications for copyright and in particular, originality? Therefore, whilst 3D printing raises a variety of issues relating to Intellectual Property Rights¹², this paper will focus particularly on the implications for copyright law.

A consideration of these issues amongst others, which arise from the *use* and *access* to online platforms and CAD files shared therein, requires an exploration of the implications for copyright law. As such, this paper will consider the application of UK and EU copyright law to 3D printing before concluding with some thoughts for the future.

An Introduction to 3D Printing

¹¹ 123D (owned by Autodesk) acts as a portal to a variety of software tools that are available online or for download. Amongst these are *123 Creature*, *123 Sculpt*, *123D Catch*, *123D Circuits*, *123D Design*, *123D Make*, *Meshmixer* and *Tinkercad* to name some. See all apps and their functions at www.123dapp.com/create

¹² For a discussion on the implications of 3D printing as it relates to various intellectual property laws, see, 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* pp. 155-169; and S Bradshaw, A Bowyer & P Haufe, The Intellectual Property Implications of Low-Cost 3D Printing’ (April 2010) Vol. 7, Issue1 *Script-ed* at www.law.ed.ac.uk/ahrc/script-ed/vol7-1/bradshaw.asp

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. In fact, “a 3D printer without an attached computer and a good design file is as useless as an iPod without music”¹³.

Therefore, by using software programs such as CAD, which has the ability to send descriptions of each individual layer to a 3D printer, a three-dimensional object is created, layer-by-layer. This process of creating a product layer-by-layer led to the adoption of the term ‘additive layer manufacturing’ or ‘additive manufacturing’. It should however be noted that this direct approach to part production was initially called ‘Rapid Manufacturing’, but was later standardised by the *American Society for Testing and Materials* as ‘Additive Manufacturing’ (AM)¹⁴. As the term AM failed to gain popularity the term 3D printing has been adopted widely amongst the media and the general public¹⁵.

The end products can be printed in many ways, depending on the technology that is used. These include, amongst others, Fused Deposition Modelling (FDM), Selective Laser Sintering (SLS), Electronic Beam Melting (EBM) and Polyjet Matrix¹⁶. Amongst these patented technologies are two open-source initiatives: RepRap and Fab@Home. Replicating Rapid Prototype (RepRap), the invention of Bath University academic Dr. Adrian Bowyer was the first low-cost open-source 3D printing initiative to be developed in the UK¹⁷. Fab@Home, an American initiative, allows users to build 3D printers themselves using ‘online blueprints’ and a kit of components¹⁸.

¹³ H Lipson & M Kurman, (n 1) p. 12.

¹⁴ R Hague & P Reeves, Additive Manufacturing and 3D Printing [June 2013] Issue 55, *Ingenia* pp. 38-45 at pp. 39-40.

¹⁵ Additive Manufacturing refers to the production of end-use layer manufactured parts produced within a business-to-consumer supply chain. 3D Printing is used to refer to the manufacture of layer-manufactured products within the home or community.

¹⁶ For various 3D printing methods see, V Braun & M Taylor, 3D Printing [2012] 18(2) *Computer and Telecommunications Law Review*, pp. 54-55.

¹⁷ Replicating Rapid Prototype (RepRap) uses a variant of FDM and calls it Fused Filament Fabrication (FFF) to avoid any infringement of the protected FDM technology. See <http://reprap.org/wiki/RepRap>

¹⁸ Cornell University, Fab@Home at <https://sites.google.com/a/cornell.edu/fahteam/home>

However, the concept of 3D printing can be traced back to the 1970's to an article written almost 40 years ago, on 3 October 1974, by David Jones¹⁹. This was followed by a patent granted in 1977 to American Wyn Kelly Swainson²⁰, for the same idea described by Jones, although Swainson had filed the patent in 1971 before Jones' article was published. Ultimately, it was American Charles Hull who led the way for the launch of the first *commercial* 3D printer in 1988 made possible by a patent granted in March 1986 for an 'Apparatus for Production of Three-Dimensional Objects by Stereolithography'²¹.

Since then, the technology has continued to develop significantly and has led to the creation of various end products in the medical field, transport industry, food industry, the toy and hobby industry and the fashion and cosmetic industry to name a few²². It has also opened up doors to controversy following developments such as the 3D printed gun²³. However, it is clear that any disadvantages²⁴ of this technology are outweighed by the many advantages. Lipson and Kurman outline ten significant advantages of the technology as perceived by businesses, consumers and the general public. These include, the freedom from manufacturing complexity; freedom of variety; easy assembly; ability to print-on-demand taking away the lead-time; unlimited design space; lack of need for high level manufacturing skills (as mentioned above a 3D printer receives its guidance from a CAD design file); compact, portable manufacturing; generation of less waste by-product; providing for infinite shades of materials; and the ability to create precise physical replication²⁵.

¹⁹ D Jones, 'Ariadne' Column, 3 October 1974, *New Scientist*, p. 80.

²⁰ 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.

²¹ 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.

²² For recent developments, see, AK France, *Make: 3D Printing* (Sebastopol, Canada: Maker Media; 2014); S Hoskins, *3D Printing for Artists, Designers and Makers* (London, New York: Bloomsbury Publishing; 2013); H Lipson & M Kurman, (n 1).

²³ R Morelle, Working gun made with a 3D printer (6 May 2013) *BBC News* at www.bbc.co.uk/news/science-environment-22421185

²⁴ For disadvantages, see, D Mendis, (n 12) p. 157.

²⁵ H Lipson & M Kurman, (n 1) pp. 20-24.

The final advantage of creating precise physical replicas can also be seen as a disadvantage in the context of Intellectual Property laws. The next part of this paper will consider the challenges for copyright law as a result of 3D printing, particularly from the point of view of software such as CAD and the proliferation of online tools provided by various online platforms.

CAD Design Files: Three Scenarios

Every object produced by a 3D printer begins its design process with a CAD based digital object design file. “The object design file is similar to the architectural blueprints for a building or the sewing pattern for a dress – it is a digital 3D model which the printer uses to build the object using the specifications defined in the design”²⁶. The interesting question to consider in this regard is, how a user accesses a CAD-based design file. There are several ways in which these files can be obtained, namely:

- (1) An individual creates and initiates an object design file using CAD or similar software specially designed for creating 3D object designs for 3D printing (scenario one);
- (2) By looking through online repositories/platforms which provide online design files created by others which can be modified (scenario two); and/or
- (3) By scanning the object with a laser scanner (scenario three).

Each of these options give rise to Intellectual Property implications and in the present context copyright implications – whether it is a original CAD file; one obtained from online platforms or one which has been generated by scanning an object. The following discussion will consider issues arising from the three scenarios mentioned above. In particular the discussion below will consider whether a CAD file is capable of being protected as a copyright work and if so, the implications it presents as a result of scanning and modifying the CAD files utilising the software tools (or “apps”) made available on online platforms.

²⁶ SM Santoso, BD Horne & SB Wicker, *Destroying by Creating: Exploring the Creative Destruction of 3D Printing Through Intellectual Property* (2013). Available at www.truststc.org/education/reu/13/Papers/HorneB_Paper.pdf

Scenario I – CAD-Based Object Design Files and Implications for Copyright Law

Where creators initiate and design an ‘original’ 3D model or 3D design for downloading and printing, the Intellectual Property (hereinafter IP) and particularly copyright should rest with the creator in accordance with copyright law²⁷. This begs the question whether such CAD files are capable of being protected by copyright as a literary work. Matt Simon argues that even if it is determined that 3D design files are capable of being protected by copyright for example, issues arise when considering items such as food, living cells, and organs for which 3D printing is used²⁸. He opines that copyright protection “cannot exist for ... scientific progress because that is protected solely by patent law”²⁹. This view is further supported in the USA by case law and leading academic commentators. In the US case of *Oracle v Google*, Judge William Alsup dismissed *Oracle’s* copyright claim in its entirety after a detailed review of US jurisprudence of software copyright. He held that there was no infringement by *Google* as “copyright law does not confer ownership over any and all ways to implement a function or specification, no matter how creative the copyrighted implementation or specification may be”³⁰.

Professor Nimmer, who observes that recipes are copyrightable also “seems doubtful because the content of recipes are clearly dictated by functional considerations and therefore may be said to lack the required element of originality, even though the

²⁷ Section 1(1)(a) *Copyright, Designs and Patents Act 1988* (as amended) (hereinafter CDPA 1988). There is no express requirement of ‘originality’ as such in relation to films, sound recordings, broadcasts and typographical arrangements of published editions although copyright does not exist in such works which have been copied from previous sound recordings, broadcasts or published editions. See section 1(1)(b) CDPA 1988. See also, *University of London Press v University Tutorial Press* [1916] 2 Ch 601.

²⁸ M Simon, When Copyright Can Kill: How 3D Printers Are Breaking the Barriers Between “Intellectual Property and the Physical World (Spring 2013) 3(1) *Pace. Intell. Prop. Sports and Entertainment Law Forum* pp. 59-97. Available at <http://digitalcommons.pace.edu/pipsself/vol3/iss1/4>

²⁹ *Ibid*, at p. 71.

³⁰ *Oracle America Inc., v Google Inc.*, 872 F. Supp. 2d 974 (2012) (D (US)). See also, I Connor & I Bhattacharya, Copyright Protection of Software: A Convergence of US and European Jurisprudence? [2013] 18(2) *Communications Law*, pp. 45-48.

combination of ingredients contained in the recipes may be original in a non-copyright sense”³¹.

Rideout takes a different view and asserts that a CAD based digital object design file *resembles* computer software as opposed to stating that *it is* computer software (*emphasis added*).³² Rideout reasons that CAD files will not be considered as copyrightable software in the USA:

What differentiates 3D CAD files from other computer programs is that the 3D CAD files are basically just a triangular representation of a 3D object. The files themselves do not control how 3D printers operate ... they merely serve as more of a blueprint for software to utilize³³.

As such, Rideout does not consider a 3D design file to be a literary work and states that a CAD file will more likely be considered under “pictorial, graphic, and sculptural works” including “technical drawings, diagrams and models”³⁴.

Interestingly, such examples would fall under the category of artistic works under UK copyright law³⁵. However before applying the law to 3D object design files or CAD files, it will be useful to consider the meaning of a computer program as defined in the EU and UK.

³¹ MB Nimmer & D Nimmer, *Nimmer on Copyright*, § 2.18[1] at 2-204.25-26 (May 1996). For further insight into copyright law, from a USA point of view, see also M Weinberg, *What’s the Deal with Copyright and 3D Printing* (2013) available at www.publicknowledge.org/news-blog/blogs/whats-the-deal-with-copyright-and-3d-printing ; M Weinberg, *It Will be Awesome If They Don’t Screw It Up: 3D Printing, Intellectual Property and the Fight Over the Next Great Disruptive Technology* (2010) available at www.publicknowledge.org/news-blog/blogs/it-will-be-awesome-if-they-dont-screw-it-up-3d-printing

³² B Rideout, Printing the Impossible Triangle: The Copyright Implications of Three-Dimensional Printing [2011] 5(1), *Journal of Business Entrepreneurship & Law* pp. 161-180. Available at <http://digitalcommons.pepperdine.edu/jbel/vol5/iss1/6>

³³ *Ibid*, at p. 168.

³⁴ *Ibid*.

³⁵ Section 4, CDPA 1988 (as amended).

EU Perspective:

The Recital of the EU Software Directive provides a definition of computer programs as follows:

For the purpose of this Directive, the term “computer program” shall include programs in any form including those, which are incorporated into hardware. This term 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 stage³⁶.

An analysis of the above quote establishes that “the protection is ... bound to the program code and to the functions that enable the computer to perform its task. This 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 (i.e. functionality itself is not protected, since there could be a different code that may be able to produce the same function)”³⁷. In other words, copyright protection will attach to the *expression of the computer code* and will not extend to the functionality of the software (*emphasis added*).

At the same time, Court of Justice of the European Union (CJEU) cases, notably, *Infopaq International A/S v Danske Dagblades Forening*³⁸; *Painer v Standard Verlags GmbH*³⁹ and most recently *Football Dataco Ltd v Yahoo! UK Ltd*⁴⁰ concluded that a “copyright work”, should demonstrate the “own intellectual creation of its author”⁴¹ thereby placing the emphasis on the right form of authorial input as opposed to the category of copyright works.

³⁶ Directive 2009/24/EC Of The European Parliament And Of The Council of 23 April 2009 on the legal protection of computer programs, Recital (7).

³⁷ *SAS Institute Inc., v World Programming Ltd.*, (C-406/10) [2012] 3 CMLR 4; [2013] Bus LR 941. See also P Guarda, Looking for a feasible form of software protection: copyright or patent, is that the question? [2013] 35(8) *European Intellectual Property Review* pp. 445 – 454 at p.447.

³⁸ (C-5/08) [2010] FSR 20.

³⁹ (C-145/10) [2012] ECDR 6 (ECJ (3rd Chamber)).

⁴⁰ (C-604/10) [2012] Bus. L.R. 1753.

⁴¹ Case C-5/08 *Infopaq International A/S v Danske Dagblades Forening* [2010] FSR 20. See also, A Rahmatian, Originality in UK Copyright Law: The Old “Skill and Labour” doctrine under pressure [2013] 44(1) *International Review of Intellectual Property and Competition Law*, pp. 4-34.

Applying the *Software Directive* and cases such as *Infopaq*, the CJEU considered the status of computer programs in *Bezpečnostní*⁴² and *SAS Institute Inc., v World Programming Ltd.*,⁴³. In *Bezpečnostní*, CJEU stated, following the principles expressed in *Infopaq*⁴⁴ that notwithstanding the position under the *Software Directive*, the ordinary law of copyright could protect the graphic user interface of a computer program⁴⁵. In *SAS Institute Inc.*, the CJEU concluded (unsurprisingly) that functionality, language and data file formats are not protected by copyright under the *Software Directive* since they did not constitute forms of expression. However, the Court suggested that the *programming language and data file formats* “might be protected, as works, by copyright under [the Copyright] Directive ... if they are their author’s own intellectual creation”⁴⁶ clearly drawing on the decision of *Bezpečnostní*⁴⁷.

However, its consideration in the UK High Court and Court of Appeal highlighted the issues with the CJEU decision. For example, the decision does not answer the question as to whether copyright protection might extend to underlying elements of the program, such as its programming languages and the format of data files, under the Copyright Directive. Lewison LJ in the Court of Appeal stated that the language used by the CJEU was at times, “disappointingly compressed, if not obscure”⁴⁸. Simply, the situation remains unclear and begs the question whether CAD files can be copyright protected according to the CJEU case law and UK law.

⁴² *Bezpečnostní Softwarová Asociace – Svaz Softwarové Ochrany v Ministerstvo Kultury* (C-393/09) [2011] ECDR 3.

⁴³ *SAS Institute Inc., v World Programming Ltd.*, (C-406/10) [2012] 3 CMLR 4; [2013] Bus LR 941.

⁴⁴ *Infopaq International A/S v Danske Dagblades Forening* Case C-5/08 [2010] FSR 20.

⁴⁵ *Bezpečnostní Softwarová Asociace – Svaz Softwarové Ochrany v Ministerstvo Kultury* (C-393/09) [2011] ECDR 3 at 35 and 38.

⁴⁶ *SAS Institute Inc., v World Programming Ltd.*, (C-406/10) [2012] 3 CMLR 4, para. 39. The CJEU also 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).

⁴⁷ *Bezpečnostní Softwarová Asociace – Svaz Softwarové Ochrany v Ministerstvo Kultury* (C-393/09) [2011] ECDR 3 at 35 and 38. 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.

⁴⁸ *SAS Institute Inc., v World Programming Ltd.*, [2013] EWCA Civ 1482 at [5].

According to Toft, the CJEU case law gives “developers the freedom to reproduce the functionality of software in the knowledge they cannot be pursued for copyright infringement ... the same cannot be said for the initial software developer”⁴⁹.

UK Perspective:

In the UK, the *Copyright, Designs and Patents Act 1988* (as amended) states that a computer program and its embedded data for example is recognised as a literary work under copyright law⁵⁰. Applying the current law to the 3D printing context, it can be established that a computer program encompasses a CAD-based object design file within its definition and is therefore capable of copyright protection in the UK as a literary work. Bradshaw *et al*⁵¹ and Mendis⁵² applying the law to object design files clarify that a CAD file is an original work of authorship, which may be protected by literary copyright in the same manner as other types of computer software. Further support for this view can be found in *Autospin (Oil Seals) Ltd., v Beehive Spinning*⁵³ where Laddie J makes reference, *obiter dictum*, to three-dimensional articles being designed by computers and states that “a literary work consisting of computer code represents the three dimensional article”⁵⁴.

It is also interesting to consider whether 3D models, which come into being from a CAD-based file, infringe the artistic copyright of that object design file. The question can be considered from the perspective of making of a 3D copy of a 2D object and vice-versa⁵⁵. A number of legal decisions in the UK have attempted to clarify artistic

⁴⁹ 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. 62.

⁵⁰ Section 3(1)(b), (c) CDPA 1988 (as amended).

⁵¹ S Bradshaw, A Bowyer & P Haufe, The Intellectual Property Implications of Low-Cost 3D Printing’ (April 2010) Vol. 7, Issue1 *Script-ed* at www.law.ed.ac.uk/ahrc/script-ed/vol7-1/bradshaw.asp at p. 24.

⁵² D Mendis, (n. 12) at p. 163.

⁵³ *Autospin (Oil Seals) Ltd., v Beehive Spinning* [1995] RPC 683.

⁵⁴ *Autospin (Oil Seals) Ltd., v Beehive Spinning* [1995] RPC 683 at 698. See also, *Nova v Mazooma Games Ltd.*, [2007] RPC 25. Jacob LJ referring to the Software Directive 2009/24/EC implemented by CDPA 1988 confirmed that for purposes of copyright, the *program* and its *preparatory material* are considered to be one component as opposed to two.

⁵⁵ Section 17(4) CDPA 1988 (as amended).

works and in particular the meaning of ‘sculpture’⁵⁶ – which includes 3D works such as models, with *Lucasfilm v Ainsworth*⁵⁷ being the most recent decision to attempt clarification. The case was illustrative of the point that a 3D object which comes into being from a design document or CAD file does not infringe copyright⁵⁸ if the CAD-based file or model embodying a design is used to create an object for anything *other than an artistic work (emphasis added)*. In *Lucasfilm*, the Supreme Court, agreeing with the Court of Appeal’s decision in 2009 held in favour of the defendant, Andrew Ainsworth, claiming that the *Star Wars* white helmets were ‘utilitarian’ as opposed to being a work of sculpture⁵⁹.

Future Challenges

This case is reflective of the future challenges, which manufacturers of 3D objects could face in the UK. In accordance with the case it appears that copyright protection for a sculpture (or work of artistic craftsmanship) is limited to objects created principally for their artistic merit – i.e. the fine arts.

However, as mentioned above, recent developments from the CJEU—*Infopaq International A/S v Danske Dagblades Forening*⁶⁰; *Painer v Standard Verlags GmbH*⁶¹ and most recently *Football Dataco Ltd v Yahoo! UK Ltd*⁶²—arguably point to the fact that the category of copyright works is less important; rather the emphasis is on the right form of authorial input⁶³, the cases concluding that a “copyright work”, should demonstrate the “own intellectual creation of its author”.

⁵⁶ *Wham-O Manufacturing Co., v Lincoln Industries Ltd* [1985] RPC 127 (CA of NZ); *Breville Europe Plc v Thorn EMI Domestic Appliances Ltd.* [1995] FSR 77; *J & S Davis (Holdings) Ltd., v Wright Health Group Ltd.* [1988] RPC 403; *George Hensher Ltd., v Restawhile Upholstery (Lancs.) Ltd.*, [1976] AC 64; *Lucasfilm Ltd. & Others v Ainsworth and Another* [2011] 3 WLR 487.

⁵⁷ *Lucasfilm Ltd. & Others v Ainsworth and Another* [2011] 3 WLR 487.

⁵⁸ This point was further established in *Mackie v Behringer UK Ltd. & Ors* [1999] RPC 717. The Court held that held that a circuit diagram of a piece of electrical equipment was a design document according to the section 51 definition and copyright could not be relied upon for the circuit diagram.

⁵⁹ *Lucasfilm Ltd. & Others v Ainsworth and Another* [2011] 3 WLR 487, para 44.

⁶⁰ (C-5/08) [2010] FSR 20.

⁶¹ (C-145/10) [2012] ECDR 6 (ECJ (3rd Chamber)).

⁶² (C-604/10) [2012] Bus. L.R. 1753.

⁶³ Case C-5/08 *Infopaq International A/S v Danske Dagblades Forening* [2010] FSR 20. See also, A Rahmatian, Originality in UK Copyright Law: The Old “Skill and Labour” doctrine under pressure [2013] 44(1) *International Review of Intellectual Property and Competition Law*, pp. 4-34.

Estelle Derclaye states that the requirement for a work to be the intellectual creation of its author in order to be capable of copyright protection changes the current UK test of sufficient skill, judgement, labour and capital that still applies to all works except databases and computer programs⁶⁴. In other words, it also means that establishing own intellectual creation in relation to computer programs and databases means that books, films, paintings and architecture do not carry a consistent definition of what is meant by a ‘copyright work’⁶⁵.

This requirement may appear on the face of it a more onerous test when determining whether to confer copyright protection on 3D digital models of physical objects. However, subsequent case law illustrates that that the test has been used successfully in protecting photographs, for example.

In the case of *Painer* it was held that portrait photographs attracted copyright protection. The Court stated that a portrait photograph could be protected by copyright if such a photograph “is an intellectual creation of the author reflecting his personality and expressing his free and creative choice in the production of that photograph”⁶⁶. Furthermore, “its protection is not inferior to that enjoyed by any other work, including photographic works”⁶⁷. Applying the same reasoning to 3D digital files and models, where a sufficient amount of creative choices have to be made in designing the CAD-based file, it can be argued that there is no reason why such digital models should, as a rule, fail to meet the requirements.

In concluding this part of the discussion and in reflecting on the status of a CAD-based object design file, from the USA/UK perspective, it is clear that there is a lack of consistency and clarity in relation to their protection under copyright law. Whilst

⁶⁴ E Derclaye, *Infopaq International A/S v Danske Dagbaldes Forening* (C-5/08): Wonderful or Worrisome? The Impact of the ECJ Ruling in *Infopaq* on UK Copyright Law [2010] 32(5) *European Intellectual Property Review* pp. 247-251 at p. 248.

⁶⁵ See also, *Berne Convention for the Protection of Literary and Artistic Works 1886, Article 2*. For further analysis, see, C Handig, The “sweat of the brow” is not enough! - More than a blueprint of the European copyright term “work” [2013] 35(6) *European Intellectual Property Review*, pp. 334-340 at p. 334.

⁶⁶ *Painer* at [99].

⁶⁷ *Painer* at [99].

USA commentators take the view that a CAD file is incapable of being protected as a literary work, UK commentators have taken the opposite view, which has been supported UK case law, whilst CJEU has left questions unanswered. However, to be protected as a copyright work, a CAD file will also have to demonstrate sufficient originality. Where a 3D digital model is not initiated by the creator, but instead is created from scanning an existing object or modifying an existing object found on an online platform, then meeting the originality requirement under copyright law will be challenging as discussed below.

Scenario II: Modification of an Object Design File and Implications for Copyright Law

Online platforms dedicated to the dissemination and sharing of 3D designs offer online tools (or “apps” as they are known) such as *Meshmixer*⁶⁸, *123D Catch*⁶⁹, *MakerBot Customizer*⁷⁰, and *Workbench*⁷¹ for users to create, edit, upload, download, remix and share 3D designs. In the present context, the discussion will focus on whether the modification of design files made possible by these online tools or through scanning infringes the copyright of the existing CAD-based design files, thereby not meeting the originality threshold.

‘Originality’ is not defined in the *Copyright, Designs and Patents Act (as amended)*. However, the meaning of ‘originality’ has been developed in a line of UK cases ranging from the *Graves’ Case*⁷² to *Walter v Lane*⁷³, *Interlego AG v Tyco Industries*

⁶⁸ *Meshmixer* is provided by 123D. Available at www.meshmixer.com

⁶⁹ *123D Catch* is provided by 123D. Available at www.123dapp.com/catch

⁷⁰ *MakerBot Customizer* is provided by Thingiverse. Available at www.thingiverse.com/apps/customizer

⁷¹ *WorkBench* is provided by GrabCad. Available at <http://grabcad.com/workbench>

⁷² *Graves’ Case* (1868-69) LR 4 QB 715.

⁷³ [1900] AC 539 (HL).

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Inc. and Others,⁷⁴ *Antiquesportfolio.com Plc v Rodney Fitch & Co. Ltd.*⁷⁵ and *Sawkins v Hyperion Ltd*⁷⁶ amongst others.

In *Interlego v Tyco*, the Court was clear in concluding that the plaintiff's engineering drawings of its interlocking toy bricks, re-drawn from earlier design drawings with a number of minor alterations, did not amount to copyright protection⁷⁷. Lord Oliver further demonstrated the English Courts' approach to acts of copying even where the copying may have involved much skill, labour and judgement.

Take the simplest case of artistic copyright, a painting or photograph. It takes great skill, judgement and labour to produce a good copy by painting or to produce an enlarged photograph from a positive print, but no one would reasonably contend that the copy painting or enlargement was an 'original' artistic work in which the copier is entitled to claim copyright. Skill, labour or judgement merely in the process of copying cannot confer originality⁷⁸.

On the point of 'modified *Lego* designs' Lord Oliver stated that the copying should involve:

... some element of material alteration or embellishment which suffices to make the totality of the work an original work ... even a relatively small alteration of addition qualitatively may, if material, suffice or convert that which was substantially copied from an earlier work into an original work... But copying, *per se*, however much skill or labour may be devoted to the process, cannot make an original work⁷⁹.

A reading of Lord Oliver's dictum implies that it is the *extent* of the change, which will qualify the work as an original work thereby drawing a new copyright.

⁷⁴ *Interlego v Tyco Industries Inc., and Others* [1988] RPC 343.

⁷⁵ *Antiquesportfolio.com Plc v Rodney Fitch & Co. Ltd.* [2001] FSR 23.

⁷⁶ [2005] EWCA Civ 565.

⁷⁷ *Interlego v Tyco Industries Inc., and Others* [1988] RPC 343. See also, B Ong, Originality from copying: fitting recreative works into the copyright universe [2010] (2) *Intellectual Property Quarterly* pp. 165-199 at p. 172.

⁷⁸ *Interlego v Tyco Industries Inc., and Others* [1988] RPC 343 at 371 *per* Lord Oliver.

⁷⁹ *Interlego v Tyco Industries Inc., and Others* [1988] RPC 343 at 371 *per* Lord Oliver.

Furthermore, the change should be ‘material’. However, as Ong opines, it is important to note that the Privy Council’s decision in *Interlego v Tyco* was made in “response to a narrow factual context”⁸⁰. The decision was based on a very specific policy concern – that copyright law should not be used as a vehicle to create fresh intellectual property rights over commercial products after the expiry of patent and design rights, which had previously subsisted in the same subject matter⁸¹.

This case suggests that where a 3D digital model faithfully reproduces a copyright work, like a sculpture for example, then the 3D digital model will not be sufficiently original to constitute a copyright work even where copyright in the original work has expired. However, cases such as *Walter v Lane*⁸² have held that verbatim short hand reports of a speech, which have later been transcribed, corrected, revised and punctuated carries the necessary skill, labour and judgement required for copyright. The House of Lords in this case adopted the view that a speech and a report of a speech are two different things.

Similarly, where an object design file or model is created from a scan or where the file has been transformed through the use of online tools, does the processing of the scanned data and the ‘cleaning up’ required to re-create and reverse-engineer the scan, attract new copyright as a result of the skill, labour, effort and judgement expended in the scanning and reverse-engineering process? Some guidance for this question can be drawn from Dietz who states that there must be “a relation of creation between the work and the author whatever this act of creation (sometimes only presentation) means”⁸³.

⁸⁰ *Ibid*, at 365-366.

⁸¹ See also, B Ong, Originality from copying: fitting recreative works into the copyright universe [2010] (2) *Intellectual Property Quarterly* pp. 165-199.

⁸² *Walter v Lane* [1900] AC 539 (HL).

⁸³ A Dietz, Artist’s Right of Integrity under Copyright Law – A Comparative Approach [1994] 25 *International Review of Industrial Property*, pp. 177-194 at p. 182.

Scenario III: Modifying Object Design Files Through Scanning and Implications for Copyright Law

In considering whether a scanned 3D digital model of an artistic work is capable of being protected by copyright, it must first be pointed out that scanning a work, which is in copyright constitutes copying⁸⁴ requiring permission to avoid infringement. However, the fact that permission is required to scan the object and create the 3D digital model does not preclude the model from copyright protection.

Li *et al* reflecting on their study into 3D printing chocolate⁸⁵ states that commonplace artistic techniques and skills are not generally protected by copyright; so, if these are the elements that are copied, there will be no infringement. However, they reason that what is important is the basis of copyright, not the medium in which a product is being 3D printed⁸⁶. In other words, 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”⁸⁷. As Li *et al* go on to state, “it will continue to be an infringement if the size changes⁸⁸, dimensions are altered⁸⁹; elements of the original work are left out or bits added⁹⁰”.

Thus making an exact replica of a work that is in copyright or taking a substantial part, will infringe copyright. However, 3D printing, allows the recreation and restoration of ancient works, which can now be scanned, reverse-engineered and printed thereby creating a ‘new’ work. This leads to the following question: what is

⁸⁴ *Infopaq International A/S v Danske Dagbaldes Forening* (C-5/08) [2010] FSR 20 at [24].

⁸⁵ See, ChocEdge at <https://chocedge.com>

⁸⁶ P Li, S Mellor, J Griffin, C Waelde, L Hao & R Everson, Intellectual Property and 3D Printing: A Case Study on 3D Chocolate Printing [2014] 2 *Journal of Intellectual Property Law and Practice*, pp. 1-11.

⁸⁷ *Ibid.*

⁸⁸ *Johnstone Safety Ltd v Peter Cook (Int.) Plc* [1990] FSR 16; *Antiquesportfolio.com v Rodney Fitch & Co Ltd.* [2001] FSR 345.

⁸⁹ *Wham-O Manufacturing Co., v Lincoln Industries Ltd.* [1985] RPC 127 (CA of NZ); *Johnstone Safety Ltd. v Peter Cook (Int.) Plc* [1990] FSR 16 (‘substantial part’ cannot be defined by inches or measurement).

⁹⁰ *Brooks v Religious Tract Society* (1897) 45 WR 476.

the copyright position where the scanning involves the restoration and reconstitution of out-of-copyright works or even works in copyright? The case of *Sawkins v Hyperion Records*⁹¹ provides some direction here. For example, the performance score of Lalande's music in *Sawkins* was considered an original work irrespective of the fact that it was *derived* from the original music in which copyright had expired (*emphasis added*). However, the performance score would still have been original if it had been created when Lalande's original music was still in copyright⁹².

The Supreme Court of Israel in *Dead Sea Scrolls*⁹³ case came to a similar ruling to that of *Sawkins* and sheds further light on the issue. The Court held that Professor *Qimron*'s reconstitution of the 2000-year old *Dead Sea Scrolls* was an original work for purposes of copyright. *Qimron* therefore had copyright in the deciphered text as a literary work in the same way *Sawkins* had a musical copyright in the performing editions.

Ong supports the view that copyright can subsist in recreative works, which have been scanned from out-of-copyright works on the basis that skill and judgement has been exercised in the recreation of such works. He argues that copyright should not only 'incentivise' works, which are 'materially altered' from the pre-existing work. He states 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 both⁹⁴.

This view is also supported by the cases of *Antiquesportfolio*⁹⁵ and *Painer*⁹⁶. In *Antiquesportfolio* photographs of antiques were held to be copyright works taking into

⁹¹ *Sawkins v Hyperion Records Ltd.* [2005] EWCA Civ 565.

⁹² P Torremans, (ed.) *Copyright Law: A Handbook of Contemporary Research* (Cheltenham: Edward Elgar Publishing; 2009), pp. 32-38. See also, A Rahmatian, The concepts of "musical works" and "originality" in UK copyright law – *Sawkins v Hyperion* as a test case [2009] 40(5) *International Review of Intellectual Property and Competition Law*, pp. 560-591.

⁹³ *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*, pp. 128-133; Lim T., H MacQueen & C Carmichael (eds), *On Scrolls, Artefacts and Intellectual Property* (Sheffield) Sheffield Academic Press; 2001).

⁹⁴ B Ong, Originality from copying: fitting recreative works into the copyright universe [2010] (2) *Intellectual Property Quarterly* pp. 165-199 at p. 174.

⁹⁵ *Antiquesportfolio.com Plc v Rodney Fitch & Co. Ltd.* [2001] FSR 23.

⁹⁶ See *Painer* at (n **Error! Bookmark not defined.**).

account the positioning of the object, the angle at which it is 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 level⁹⁷ but sufficient to demonstrate a degree of skill for copyright to exist in the photographs⁹⁸.

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 the skill, effort and judgement, which will be expended in the reverse-engineering process. The application of the European ‘authorial input’ as seen in cases such as *Infopaq* discussed above, will however, require the personal touch of the creator (rather than being verbatim or a replica) before it can attract new copyright. As such, it could be argued that by making creative choices such as selecting particular views of the 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”⁹⁹ in its production.

Yet, it is clear that where a work is ‘copied’ without authorisation it will constitute an infringement of copyright. As Bradshaw, Bowyer and Haufe point out “trafficking in copies of a manufacturers’ official 3DPDFs (3D object design files) (*sic*) for spare parts would be illegitimate”¹⁰⁰. This highlights the issues, which can surface from the sharing of 3D design files on online platforms, which can be modified numerous times by using online tools such as *Meshmixer*, *MakerBotDigitizer* (for purposes of scanning) for example.

The increase in scanning devices coupled with the low threshold needed for copyright to subsist as discussed could prove problematic in the 3D printing world for those wanting to protect their IP. A further problem also arises from the perspective of the

⁹⁷ *Antiquesportfolio.com Plc v Rodney Fitch & Co. Ltd.* [2001] FSR para. 36.

⁹⁸ *Ibid*, at para. 37.

⁹⁹ *Painer* at para. 99.

¹⁰⁰ S Bradshaw, A Bowyer & P Haufe, The Intellectual Property Implications of Low-Cost 3D Printing (April 2010) Vol. 7, Issue 1 *Script-ed* pp. 1-31 at p. 25.

current law. Whilst on the one hand scanning 3D digital models representing (rare) artefacts or works appears to attract copyright status, it is also clear that 3D digital models of works of artistic craftsmanship manufactured on an industrial scale (functional) will not¹⁰¹.

Conclusion

This paper considered whether a CAD-based design file can be copyright protected and established that whilst there is a lack of support for copyright protection in USA, a CAD-based design file may be protected by copyright in the UK. At the same time, recent CJEU cases have left a number of questions unanswered. However, the territorial nature of copyright law coupled with the international nature of online platforms and CAD-based design files shared therein could lead to uncertainty and complex issues in the future. Therefore there has to be clearer guidance about the status of CAD-based design files.

The second part of the paper deliberated the implications for copyright law, as a result of scanning and reverse engineering through the use of online tools. This was considered by drawing on a line of decisions from *Walter v. Lane* to *Interlego AG v Tyco Industries Inc. and Others*, *Antiquesportfolio.com Plc v Rodney Fitch & Co. Ltd.*, *Sawkins v Hyperion Ltd.*, and *Eisenmann v Qimron*. The paper suggested that copyright can subsist in scanned objects provided there is skill, labour, judgement and effort in re-creating those objects or by making creative choices such as selecting particular views of the physical object thereby reflecting the creator's personality and expressing his free and creative choices as required by European case law. However, the paper also outlined that 3D digital models of works of artistic craftsmanship manufactured on an industrial scale (functional) will not attract copyright. Taking these points together, it does mean that copyright law as it stands today does not lend very much support to rights holders who may find it difficult to construct a case against those who scan and reverse engineer their products. With strong support for derivative works, but little support from the current law for rights holders, there will clearly have to be a re-consideration of the current copyright law.

¹⁰¹ *Lucasfilm Ltd., & Others v Ainsworth and Another* [2011] 3 WLR 487.

In the meantime, it is suggested that the future market potential of 3D printing will arise from the dissemination of CAD-based (or similar) design files. This author's previous paper, *Clone Wars: Episode I* submitted that the future of the 3D printing industry lies in adapting to this technology and adopting new business models – and the same view is upheld in the present paper¹⁰². Whilst a re-consideration of the law is necessary, it is important not to stifle this emerging technology by applying stringent IP laws in haste.

As such, the author continues to uphold the option of creating a 3D parts store – a convenient one-stop-shop – similar to the *iTunes* model for buying digital object *design files* for 3D printing, for a small fee¹⁰³. These already exist in the form of “bureau services”¹⁰⁴; however more specialised bureau services for different types of content (toy and hobby; spare parts etc.) could be the way forward.

At the same time, it is important to avoid an *Apple-iTunes* type relationship, which could lock the manufacturer into an agreement, which will ultimately be managed by the distributor and their relationship with the customer. Bearing this drawback in mind, another option would be to license 3D files more widely¹⁰⁵. The reasoning here is that manufacturers may lack the expertise to sell their final product to consumers – for which they will need the help of stores. In this context if manufacturers are willing to license their 3D files, they will open doors to a range of intellectual property rights holders and a vast range of outlets. As time goes by more shops will provide for 3D designs, which can be printed in the convenience of one's home. It is these kinds of stores that manufacturers should target.

¹⁰² See, D Mendis, (n 12) p. 168. “It is suggested that “adapting” to 3D printing technology by “adopting” new business models is the way forward”.

¹⁰³ *Ibid*, at pp. 168-169.

¹⁰⁴ Bureau services' are akin to existing services such as *Amazon*, from which products can be ordered and paid for online. Examples of Bureau Services include Shapeways www.shapeways.com, Sculpteo www.sculpteo.com/en/ and iMaterialise <http://i.materialise.com>

¹⁰⁵ M Weinberg, *Public Knowledge* White Paper on 3D Printing (November 2010), Available at www.publicknowledge.org/news-blog/blogs/it-will-be-awesome-if-they-dont-screw-it-up-3d-printing

A further recommendation can be drawn from companies such as *Authentise*¹⁰⁶, *FabSecure*¹⁰⁷, *Secure3D*¹⁰⁸ and *ToyFabb*¹⁰⁹. These companies allow for the secure streaming of 3D CAD files via an Application Programming Interface (API) and adopt a ‘pay-per-print’ business model¹¹⁰. This model removes the need for a CAD file to be sent to the consumer¹¹¹; instead the build instructions are sent directly to the printer, which, in turn, prints out the number of objects that have been purchased. It is an effective business model for manufacturers and designers who wish to protect their intellectual property whilst giving the consumers the option of printing toys and other smaller products at home¹¹².

As 3D printing continues to grow, it will certainly give rise to challenges and opportunities as articulated by Lipson and Kurman¹¹³. However, an impulsive or a reactive call for legislative and judicial action in the realm of 3D printing could stifle the public interest of “fostering creativity and innovation and the right of manufacturers and content creators to protect their livelihoods”¹¹⁴. As such, and in looking to the future it will be sensible to adopt a symbiotic approach between developing the existing copyright law and embracing new business models. In other words, it will be prudent to pave the way for a legal and technological landscape that is better suited to tackling impending intellectual property issues arising from 3D printing.

¹⁰⁶ *Authentise* at www.authentise.com

¹⁰⁷ *FabSecure* at www.fabsecure.com

¹⁰⁸ *Secure3D* at <http://secured3d.com>

¹⁰⁹ *ToyFabb* at www.toyfabb.com

¹¹⁰ See *Authentise*’s API at www.authentise.com/api

¹¹¹ However, companies such as *ToyFabb* allow for both options. Customers can either buy the 3D design file as an STL file or it can be streamed directly to the customers’ 3D printer. See, www.toyfabb.com/get-creative

¹¹² *Secure3D* states on their website: “Intellectual property is at the core of any business, and protecting your 3D IP is the single most important thing to ensure you can sustain a viable competitive business”.

¹¹³ See, H Lipson & M Kurman, (n 1).

¹¹⁴ M Susson, Watch the World “Burn”: Copyright, Micropatent and the Emergence of 3D Printing [January 2013] *Chapman University School of Law*, Available at http://works.bepress.com/matthew_susson/3 at p. 39.