

MODULE No. 8

**CONSIDERATIONS ON INTELLECTUAL
PROPERTY RIGHTS IN THE FIELD OF 3D
PRINTING**

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General considerations

3D printing is a process used for several decades in industry, where it is also called rapid prototyping. This technology emerged in the 1980s and was initially used in a small number of fields.

3D printers make it easy to produce a prototype in no time at all. It can thus be tested and reshaped quickly, considerably reducing the time needed to move from prototype to finished product.

With the Internet facilitating the illegal copying of songs and films for more than 20 years, it is now even possible to replicate or counterfeit physical products.

Although 3D printing technology is used on a relatively small scale, counterfeit replicas of goods protected by intellectual property rights have already begun to emerge.

Thus, a file exchange website, *The Pirate Bay*, incorporates a special category dedicated to 3D models.

There are few instances in which holders of intellectual property rights have turned against those who have used AM technologies to infringe specific rights.

The first recorded case concerns the Thingiverse website, which was accused by *Games Workshop*, a gaming company, of illegally hosting a model from the *Warhammer* game, over which the company owns the intellectual property rights.

Even though Thingiverse withdrew the print from the site, it soon appeared on *The Pirate Bay* platform, a sign that the fight against piracy in the 3D domain will be at least as difficult as that against the illegal downloading of files containing literary, artistic and scientific works and creations.

The European and national legislative framework has not been able to keep pace with the fast changes in AM, which is why special regulation is needed, addressing issues such as:

standards and certification, intellectual property, consumer protection, health and safety at work and the environment. ¹

AM is now regarded by both users (individuals and businesses) and the legislator as a cheap 3D printing technology that can be easily implemented even at home. Trends, barriers and research priorities differ fundamentally. Topics like standardisation, intellectual property rights and liability must be considered completely different depending on what technology and applications you look at.

Concerns have been expressed in the literature about intellectual property issues, which will be generated by the increasing adoption of AM technologies ²

Additive manufacturing could have a major impact on intellectual property legislation, since the objects described in a digital file could be much easier to copy, distribute and counterfeit, as has been the case for many years in the music and film sectors.

The protection of the intellectual property rights of those who create the models is a major problem, similar to the protection of rights in the film and music industry. AM must find solutions for the protection of intellectual property rights.

On the other hand, there are even concerns that AM technology itself may be controlled by a few entities, which would restrict competition and prevent the identification of new applications.

¹ OPINION OF CCMI/131 of the European Economic and Social Committee on Living in the future. 3D printing - a tool to strengthen the European economy", Brussels, 28 May 2015

² The National Law Journal, Is intellectual property law ready for 3D printers? The distributed nature of Additive Manufacturing is likely to present a host of practical challenges for IP owners, (Is intellectual property law ready for 3D printing? The decentralised nature of additive manufacturing will pose a number of concrete challenges for intellectual property rights), 4 February 2013.

Regulatory framework at European level.

In order to respond to these challenges, the European Parliament adopted its Resolution of 3 July 2018 on three-dimensional printing, a challenge in the field of intellectual property rights and civil liability.

That Resolution stresses, inter alia, that, in order to anticipate problems relating to civil liability or infringements of intellectual property rights which 3D printing may cause in the future, the European Union may have to adopt new legislation and adapt the existing rules to the specific case of 3D technology, having regard in particular to the decisions of the European Union Intellectual Property Office (EUIPO) and the relevant case-law of the courts of the Union and the Member States.

It is also stressed that public awareness of the protection of intellectual property rights in the field of 3D printing needs to be improved both in the case of copyright infringements and in the case of infringements of model, trademark and patent rights.

The European Commission has also issued two Communications to the European Parliament, the Council and the European Economic and Social Committee calling for the adoption *of a balanced intellectual property enforcement system to address today's societal challenges and setting out guidelines on certain aspects of Directive 2004/48/EC of the European Parliament and of the Council on the enforcement of intellectual property rights.*

Intellectual property rights

The continental system of law, in the area of intellectual property rights, prevents ambiguities regarding the applicable rules. The intellectual property rights on which 3D printing can have a major impact are **copyright, patents** and, most importantly, **industrial design** rights.

Under copyright law, a 3D CAD file (but not a 3D scan of an existing object) may fall under this legal regime as it comprises technical drawings, diagrams and models. Also, the 3D CAD file can be considered a work derived from an original one.

However, specific materials and forms, some of which have a purely technical function, are not covered by copyright legislation.

At the same time, it is also possible to protect computer applications (software), which in turn fall under the copyright regime. Secondly, patent protection rights may arise if a patented invention is replicated.

Therefore, both **the originality and the innovation and technology** contained in the object are protected.

For example, a CAD file containing a plan for the patented technology will be protected under the patent law, but the aesthetic appearance of the object will not fall under this legal regime.

Rights to the protection of designs shall protect the external shape and characteristics of all or part of the object in question. Thus, the aesthetic aspect and the distinctive elements of the object will be protected.

It can therefore be presumed that any CAD file containing a plan, design or model of an existing object will infringe the rights, while raw materials, interior parts which are invisible during use or drawings which depict purely technical features are exempted from protection.

Also, the design elements configured for the mechanical equipment to another product (e.g. spare parts) are also not protected by the legislation on drawings and models.

Thus, it can be seen that intellectual property rights, relevant in the context of additive manufacturing processes, can range from copyright and design rights to patents and trademarks. All such rights may be subject to infringement by the end-user or intermediaries in the technological process of creation and dissemination.

Compared to the classic methods of counterfeiting goods, 3D printing has the novelty to allow end users to obtain counterfeit goods without the intervention of commercial counterfeiters, thus taking piracy to a decentralized level.

While holders of intellectual property rights may take action against those who produce and put into circulation counterfeit goods for commercial purposes in the context of 3D printing, it is much more difficult to hold end-users liable.

It can be appreciated that copyright theoretically offers the best protection of intellectual property against counterfeiting, either on a large scale or by individual end-users, because it allows the tracking of users using the 3D-printed object for private and non-commercial purposes.

This is not the case for trademarks and design rights, where private and non-commercial use will not be considered an infringement. In addition, trademarks must be registered before their protection can be invoked.

Accountability of individual end-users producing or ordering 3D printed objects can be difficult and costly. Currently, IPR holders lack an effective protection strategy and judicial practice will depend on how courts will react to the legal challenges of 3D printing.

Multiple intermediaries can be involved in the 3D printing process, from the creation and dissemination of the model for 3D printing, in the form of computer-assisted design (CAD) files, to the actual creation and dissemination of the 3D-printed object.

However, the role of intermediaries tends to be reduced as high-quality 3D scanners and 3D printers become more accessible to households.

In practice, right holders may prefer to go against intermediaries instead of end-users (who are often exempted from liability because there is no commercial purpose).

The most involved intermediaries in the supply chain are those platforms that allow users to make CAD files available for 3D printing. This usually means that they host or communicate the related files, either with or without the consent of the owner of the intellectual property rights. Other intermediaries may be third parties performing the print jobs on behalf of the end-user.

The role of these intermediaries in the enforcement of intellectual property rights in the context of 3D printing is particularly relevant and needs to be taken into account in the regulatory and standardisation process of AM technologies.

The challenges posed by 3D printing and by intermediaries are largely similar to those previously posed in the context of the digitisation of books or music and the sharing of digital files between end-users.

As with the sharing of digital audio-visual content files, the likelihood of liability for committing or facilitating infringements of intellectual property rights will be higher when the intermediary becomes more actively involved in the infringement process.

As regards the distribution of files and software over the Internet, platform operators are required to block and remove content. In practice, it will be most effective for right holders to send a notification to online platforms. According to the literature, the first removal notification for a 3D-printed object would have been sent in 2011 and several such requests followed in the following years.

Use of industrial-scale 3D printing technology

Patent protection seems to have played a considerable role in the 3D industrial printing sector.

Patents protect the technology that underlies 3D printers, the components of such printers, and the manufacturing processes of 3D printing. Patent protection is not only an important strategy for these parts of the 3D printing ecosystem, it can also cover raw materials used in the printing process (such as dust, filaments, liquids).

The field of 3D industrial printing is not only based on patent law. The protection of trade secrets also plays a considerable role, making it an attractive protection tool for the 3D printing industry, as 3D printers and 3D objects often do not reveal the details of the manufacturing process, making reverse engineering difficult.³

CAD and *slicer* software are often protected by copyright law. As a result, a complete industrial 3D printing system will prejudice various intellectual property rights: patent rights to 3D printing components, raw printing processes and materials, protection of trade secrets of 3D printing manufacturing processes, protection of copyrights for software control, protection of industrial designs and designs, and protection of trademarks for the 3D printer itself.

³ Wohlers Associates, Wohlers Report 2014: 3D Printing and Additive Manufacturing State of the Industry (2014), available at: <http://www.wohlersassociates.com/2014report.htm>

Using 3D printing technology for personal purposes

While the relationship between the 3D printing industry and intellectual property law does not pose particular problems in relation to the industrial 3D printing sector, the use for personal purposes poses a number of challenges for holders of intellectual property rights, as well as a number of fundamental questions regarding mechanisms to stimulate innovation in the 3D printing sector.

Patent holders for 3D printers or 3D printing processes face new challenges in a world where end users share files containing 3D designs and models in specialized markets and print 3D objects on their own 3D printers.

From a legal point of view, whether a consumer infringes patent law by printing 3D objects with his own printer or by sending them to a 3D printing service depends on the extent to which patent protection also covers consumer actions for private purposes.

In the laws of certain states, such as the United States, there is no exception for private or non-commercial use.⁴ In other countries, including most European countries, patent laws contain specific provisions that exclude private and non-commercial use.⁵

From a practical perspective, taking legal action against a significant number of consumers who use their own 3D printers to reproduce objects is not a viable option for patent holders. The identification of all these users is complicated and costly and the possibility of actually obtaining compensation is limited.

⁴ Desai D, Magliocca G (2014) Patents, meet napster: 3D printing and the digitization of things in *Georget Law Journal*, no. 102:169

⁵ WIPO Standing Committee on Patent Law, exceptions and limitations of patent rights: private and/or non-commercial use, SCP/20/3 (2013), available at: http://www.wipo.int/edocs/mdocs/patent_policy/en/scp_20/scp_20_3.pdf

The increase in the number of personal 3D printers, which can even be built by end users and which can partially replicate themselves, could therefore lead to a number of massive infringements of intellectual property rights.

It has been held in the literature ⁽⁶⁾ that action by a consumer may constitute a potential infringement of patent rights, but not every use of an invention is sufficient to bring about an infringement of Community law.

If a consumer wishes to repair his own product, such repair – which does not constitute patent infringement – must be distinguished by a reconstruction of the patented invention – which would constitute a violation. Thus, 3D printing technology creates new challenges for this distinction between repair and reconstruction, which exists in many patent systems ⁷.

Consumers can not only own and operate their own 3D printers, but they can also feed them with files containing 3D drawings and models, which they have previously downloaded from an online marketplace. Moreover, they can modify existing files with specialized software and create three-dimensional reproductions of such modified 3D models, resulting in derivative works.

From a legal perspective, the form of an object and its digital representation in a 3D file can be protected under different types of intellectual property legislation. If the shape of an object has a **sufficient level of originality** and is not merely a functional design, it can be protected by copyright.⁸ May also be subject to protection under design law (in certain States, *Design Law*)

⁶ Mendis D (2013) ‘‘The Clone Wars’’: Episode 1. In European Intellectual Property Review

Mendis D (2014) ‘Clone Wars’ Episode II. in Law Innov Technol

Bechtold S (2004) Digital rights management in the United States and Europe. in American Journal of Comparative Law

⁷ See also the case of using 3D printing in force majeure situations

⁸ Mendis and Secchi, A Legal and Empirical Study of 3D Printing Online Platforms and an Analysis of User Behavior (2015), pp. 7–15, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/421546/A_Legal_and_Empirical_Study_of_3D_Printing_Online_Platforms_and_an_Analysis_of_User_Behaviour_-_Study_I.pdf

The digital representation of an object, in a 3D file, may be protected by copyright as an artistic work or computer program, but this protection may raise issues regarding the standards of originality and judicial practice in different states.⁹

The three-dimensional reproduction of such a file may in itself be a violation of copyright and of the protection of designs and designs.

If a user modifies an existing 3D file and creates a three-dimensional representation of such a design, it may violate reproductive rights.¹⁰

However, 3D printing of household articles or spare parts cannot infringe copyright, since the reproduction of original articles may be covered by exceptions to law concerning personal use which are not of a commercial nature.¹¹

Finally, whether and to what extent the 3D designs are protected by copyright and whether their reproduction infringes copyright protection will depend on the level of originality.

Depending on the type of object being printed and the classification of the object as a work of art, there may also be implications for the scope and duration of protection in some countries.¹²

Generally speaking, from a practical perspective, design rights holders face similar problems as patent owners with regard to the production or processes of 3D printers; it is thus difficult and far too costly to identify infringers.

Intellectual property rights are difficult to enforce vis-à-vis final consumers in the context of the development of personal 3D printing. When it becomes difficult to protect rights

⁹ Desai D, Magliocca G (2014) Patents, meet napster: 3D printing and the digitization of things in *Georget Law Journal*, no. 102:169; Dasari H (2013) Assessing copyright protection and infringement issues involved with 3D printing and scanning in *AIPLA Q J* 41:279

¹⁰ Mendis D (2014) 'Clone Wars' Episode II. *Law Innov Technol* 6:265

¹¹ Mendis D (2013) "The Clone Wars": Episode 1. In the *European Intellectual Property Review*

¹² Recent case-law of the European Court of Justice increasingly harmonises standards of originality in European copyright law. In the context of 3D printing, see Li P (2014) 3D bioprinting technologies: patents, innovation and access. *Law Innov Technol* 6:282

against directly infringing parties, right holders often tend to take legal action against other parties that indirectly facilitate or even encourage such infringements.

An example of this is the liability of the intermediary for the providers of internet services and online content for copyright infringement.¹³ 3D printing faces a similar discussion, in the context in which platform operators should be liable for infringements of intellectual property rights, in the case of files shared through those platforms.

As the costs of incurring direct liability of users become increasingly high, holding intermediaries accountable tends to become a solution available to right holders.

On the other hand, an excessive increase in the liability of intermediaries would reduce innovation in distribution and production technologies.

Such issues are not only relevant for 3D printing markets and service providers, but may also affect entities that provide funding to 3D printing developers. In 2012, 3D Systems filed a patent infringement suit against FormLabs for infringement of a stereolithography patent.¹⁴

3D Systems also sued the Kickstarter platform, claiming that the Kickstarter operator promoted FormLabs and helped it raise \$2.9 million from a *crowdfunding*¹⁵ campaign to create a printer that competes with 3D Systems.

These developments indicate a serious risk of widespread infringement of intellectual property rights related to 3D printing by end-users and right holders appear to continue to have limited possibilities to effectively protect their rights.

¹³ Landes W, Lichtman D (2003) Indirect liability for copyright infringement in Journal of Econ Perspect

¹⁴ Wohlers Associates, Wohlers Report 2014: 3D Printing and Additive Manufacturing State of the Industry (2014), available at: <http://www.wohlersassociates.com/2014report.htm>

¹⁵ Crowdfunding is a technique of financing projects using online resources (forums, social media platforms, etc.)

It is certain that the 3D printing industry has reached the same crossroads that other digital industries have reached in the past – from software and web development to the audio-visual industry.¹⁶

Activating in such an environment will present substantial challenges for industry participants. Generally speaking, companies can adopt various strategies. First, they can use their resources to protect their intellectual property rights. Unfortunately, experience in the creative industries raises doubts as to whether this strategy is viable in the long term.¹⁷

Secondly, industry actors can try to use technical measures to protect their business models. Thus, in 2012, Intellectual Ventures obtained a patent on the application of digital rights management technologies to 3D printing technologies. The patent describes a system in which a 3D printer assesses whether a 3D design file has an authorization code that grants access for printing. The system implements copy control technologies for 3D design files. Other companies are exploring different watermark techniques to identify unauthorized reproductions.

At the level of industrial use, other situations arise in which intellectual property rights (especially patents) become relevant. Thus, 3D printer manufacturers can devise business strategies where they derive considerable revenue from the supply of raw printing materials such as dust, filaments, liquids, etc. If a 3D printer manufacturer manages to be the dominant provider of printing raw materials. Examples from other technology industries show that intellectual property rights can play an important role in controlling these secondary markets for product supply. Secondary market control through intellectual property rights raises complex legislative policy issues in areas such as competition law and intellectual property law.

¹⁶ Depoorter B (2014) Intellectual property infringements & 3D printing, in *Hastings Law Journal* 65:1483

¹⁷ *Idem*.

On the one hand, protecting secondary markets through intellectual property rights can provide the necessary incentives for inventors on primary or secondary markets. On the other hand, such protection may allow inventors to monopolise secondary markets.¹⁸

In terms of business strategies, companies can try to benefit from the disintegration of value chains caused by 3D printing technologies. End-consumer oriented companies could specialize in designing products and selling them under their own brand, while operating actual production in specialized 3D printing departments, or to service providers located near the consumer. In the case of this business model, inspired by Apple, the most important intellectual property right becomes the one related to the brand.¹⁹

In general, digital technologies have shown that industries are often forced to deal with counterfeit problems by changing their business strategies and engaging in infringing behaviour rather than fighting against it.²⁰

Open access policy and 3D printing

The 3D printing industry has to deal with intellectual property infringements in the personal 3D printing sector. This raises a number of questions about the failure to implement a strategy and the enforcement of intellectual property rights at a time when the personal 3D printing sector was still at an early stage.

In other words, it is not obvious how an open-source 3D printing ecosystem could evolve, given that many of the technologies used in this ecosystem were originally covered by 3D printing patents.

¹⁸ Hovenkamp H, Janis MD, Lemley MA (2015) IP and Antitrust. Wolters Kluwer Law & Business

¹⁹ Desai D, Magliocca G (2014) Patents, meet napster: 3D printing and the digitization of things in *Georget Law Journal*, no. 102:169; Dasari H (2013)

²⁰ Lemley M (2015) IP in a world without scarcity. *N Y Univ Law Rev* 90:460

Practice suggests that the growth of the open-source 3D printing ecosystem has been closely linked to the expiration of key patents.²¹

RepRap and most other open-source 3D printing platforms rely on the fused deposit modelling technique developed in the late 1980s. Open-source implementations of merged filing modelling only appeared after the fundamental patents had expired. Prices for 3D printers based on molten deposition modelling have fallen considerably in this context.

Most fundamental patents on 3D printing technologies expired by 2015.

This indicates that patents on 3D printing technologies may influence the development of open-source 3D printing solutions.

Control systems and software libraries as well as online markets have all contributed to a digital communication network that is crucial to the collaborative innovation ecosystem on which the open-source 3D printing community is built.

Developers in the field of open-source 3D printing also learned from the open-source software community and adopted similar approaches to usage policies.

The development of open-source 3D printers would not have been possible without the progress made by industrial 3D printer manufacturers over the past 25 to 30 years. The emergence of the open-source 3D printing community can therefore be a good example of learning and adopting technology from one market – large-scale, industrial – to another – for individual consumption.

²¹ Wohlers Associates, Wohlers Report 2014: 3D Printing and Additive Manufacturing State of the Industry (2014), available at: <http://www.wohlersassociates.com/2014report.htm>

Intellectual property rights in situations of force majeure

At the height of the COVID-19 pandemic, in March 2020, the Chiari Hospital in Brescia was in a state of emergency. The stock of valves, required for the operation of the fans, was decreasing and the manufacturer was unable to supply them. Fablab Milano, one of the pioneers of 3D printing in Italy, wanted to temporarily produce the valves using 3D printers.

The manufacturer of the valves and the holder of the intellectual property rights did not agree to provide the plans / moulds for the realization of the valves, so FabLab resorted to a process called reverse engineering. The plastic piece was remeasured, drawn as a 3D model and finally printed in less than a day at a low cost. The replica was not certified, but the devices were subsequently used on more than 10 patients in Italy.

Subsequently, against the backdrop of an increasingly serious global situation, in which many supply chains were cut off, several other producers collectively followed Brescia's example and supplied hospitals in many parts of the world with spare parts for life-support technology. While in normal circumstances they should fear copyright and patent lawsuits or regulatory interventions, their contribution was essential to saving lives.

The European Association of Machine-Tool Industries and Related Manufacturing Technologies first had to find a way to address a number of imminent problems: firstly, it was necessary to balance the needs of the pandemic context with the protection of intellectual property rights; secondly, to identify an optimal response to the control and public criticism that followed the industry's reaction to the actions of Fablab Milano. It should be noted that, in this context, there were requests from the European Commission (on March 20, 2020) to relax the mechanisms for the protection of intellectual property rights during the crisis.

The debates about the risks in the COVID-19 pandemic were complemented by aspects regarding the resilience strategies for hospitals facing supply problems in the face of an unforeseen crisis.

Canada's regulators launched, in mid-April 2020, a series of guidelines for the production of medical accessories by private individuals, collective manufacturers and small manufacturers with access to 3D printers.

Beyond the current discussions between industrial actors, politicians and decision makers, many frontline medical experts have started (despite possible risks) to use consumables and 3D prints at the level of medical entities. Some examples are the ventilation valves and PPE produced by Fablab in Milan, previously analysed.

The World Intellectual Property Organisation (WIPO), which is the world's leading source of information, resources and services related to questions about global intellectual property rights, did not react in its COVID-19 response strategy to 3D printing for medical infrastructure.

Concluding Remarks

3D printing technologies have their roots in the production inventions of the 1980s. Although it was originally used to accelerate prototyping processes, 3D printing is increasingly used to print product components or even finished products. Over the years, technology has evolved in two distinct directions. In the 3D industrial printing sector, patent protection appears to have played an important role, as is the case in most industrial sectors.

In the new sector of using 3D printing for personal purposes, the intellectual property system faces new challenges. Developers of personal 3D printing services have to deal with large-scale infringements of intellectual property rights by end-users. This is well known and is often the case in the creative industries and in the digital environment.

At the same time, the expiry of the fundamental 3D printing patents has undoubtedly contributed to a thriving ecosystem of hardware and software for open-source 3D printers. Once the open-source 3D printing community has started to develop, mechanisms to protect intellectual property rights are being circumvented.

As in many areas of innovation policy, it is difficult to establish a causal link between the level of protection of intellectual property and innovation in the 3D printing sector. Empirical research suggests that the impact that the intellectual property system has had on the evolution of the 3D printing sector is complex. The protection of intellectual property has played a beneficial role in 3D printing technologies in some cases and may have played a neutral or harmful role in others.

Therefore, an analysis of the progress of 3D printing technologies gives us a clear picture of the complicated relationship between intellectual property and innovation in general.

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