3D printing – a new disruption to law?

by Angela Daly

Additive manufacturing, better known as 3D printing, has emerged into the public consciousness in recent years as one of the latest technological innovations with the potential to "disrupt" many areas of our lives, from healthcare to trade. 3D printing is actually a group of technological developments which permit the construction of objects, usually by building them up layer by layer. In this way, industrial prototypes can be created more cheaply and quickly compared to previous "subtractive" manufacturing techniques, and can also be done in a way which involves less wasted material. The legal history of 3D printing can be traced initially to various patents granted in the 1970s and 1980s; the 1990s and early 2000s saw the development of more 3D printing techniques for industrial applications. However from the mid-2000s onwards, 3D printers have begun to come down in price to an extent that they are now affordable for, and marketed to, the average consumer in developed economies. With 3D printers such as the MakerBot Replicator Mini retailing for under £1000, the ability to produce complex objects quickly and cheaply has been "democratised" – at least economically.

It has been speculated that the consequences of this "democratisation" of production brought by 3D printing may be as profound for society at large as the internet revolution's "democratisation" of information that we have experienced over the last 20 years. From a legal perspective, the internet has proved a disruptive force - notably to copyright law and the cultural industries whose revenue streams were based on this form of intellectual property law - with the development of digitised content and peer-to-peer file-sharing. The decentralised nature of the internet has also proved troublesome (although not fatal) to the effective enforcement of laws of all stripes, with the ability of entities to "shop" virtually for the most favourable jurisdiction for their activities. 3D printing has already been framed as a successor technology to the internet in terms of its disruptive potential for intellectual property, and the development of the 3D printed gun, the Liberator, suggested that this disruptive potential goes far beyond intellectual property to many other areas of law such as gun control.

Indeed, there is a convergence in practice between the internet and 3D printing due to online 3D printing design file-sharing sites. These are sites where users can upload computer-aided-design (CAD) files for 3D printable objects and download the files of others to print out on their own printers. Some of these sites, such as Thingiverse, are owned by 3D printer manufacturers (in this case, Makerbot). Other sites, such as Shapeways, provide a 3D-printing-on-demand service, where users can choose a design, uploaded by another user, and specifications which the site-owner will print in-real-life and ship to the buyer. The position of these sites as internet-based intermediaries places them in a similar situation to those which have been the site of battles over policing the legality of user content online, such as search engines (Google), social media networks (Facebook) and web advertising (Google again). This has given rise to case-law from various jurisdictions over the rights and responsibilities of these platforms when it comes to enforcing the intellectual property rights of others through the US Digital Millennium Copyright Act (DMCA) takedown notices (and their equivalents in non-US jurisdictions), protecting user privacy and taking down offensive content.

Other intermediaries in the 3D printing space are printer manufacturers, raw material manufacturers and 3D printing software providers. An important development, though, has been the emergence of the RepRap printer, created by Adrian Bowyer, a Senior Lecturer in mechanical engineering at the University of Bath. The RepRap is an initiative to create a 3D printer which is able to re-print most of its own components, and in this sense is "self-replicating". The RepRap project releases all the designs it produces under the GNU General Public License, a free software licence which is being repurposed to extend free and open licensing principles to the nascent Open Hardware movement in 3D printing of which the RepRap forms a part. While the RepRap is overwhelmingly socially beneficial, the fact that individuals are able to make their own 3D printers using its openly-available designs entails that regulating intermediaries such as 3D printer manufacturers in order to enforce laws in the 3D printing sphere has its limits if individuals are able to make their own machines.

In theory, 3D printing and its major applications so far intersect with various areas of law. Intellectual property is

an obvious example, given the aforementioned use of digital design files to create 3D printed objects, which bring up similar copyright concerns to those which accompanied the internet. However, the fact 3D printing also results in material objects being designed and printed brings these intellectual property issues into another "dimension". Areas of intellectual property such as patents which were not previously much at issue in the internet sphere have attracted much more attention with the advent of 3D printing. Since 3D printing permits the creation of complex objects that previously would have been too difficult and/or expensive for most people to make, some of the "architectural" constraints that have protected patents are now compromised. This new state of affairs may require a re-evaluation of issues such as intermediary or secondary liability for patent infringement, and some of the exceptions to patent infringement found, for instance, in the UK Patents Act 1977 for private, non-commercial use and experimental purposes.

Yet, as far as intellectual property is concerned, the practice with 3D printing has been more complex than the mass-infringement predicted by some. Already, 3D printing file-sharing sites have been directed to enforce the intellectual property rights of others vis-à-vis their users, particularly via the US DMCA takedown notice scheme. However, in some cases this has actually resulted in an over-enforcement of IP rights: for instance, where it is unclear that there has been a copyright infringement in the circumstances at hand, or when in fact it is another area of IP which may have been infringed (such as trade mark protection) but the tools of copyright intermediary liability have been used. This goes back to the point in the previous paragraph, and highlights the reforms which have occurred in copyright law as a result of digital technologies and the internet (such as the DMCA take down notices) but which do not exist for other kinds of IP. However, given the controversies that have accompanied the DMCA regime and its equivalents elsewhere, law and policy-makers ought to approach an extension of these schemes to other areas of IP with caution. The potential benefits of increased access to innovation and creativity for society at large should not be frustrated by an over-zealous enforcement of IP.

Furthermore, other trends in 3D printing and IP are apparent. The fact that large brands are integrating 3D printing into their own business models (such as Hershey and Mattel) may entail that 3D printing is not a threat to their existing IP and revenue streams. Also, consumer take-up of 3D printing appears to be less widespread than initially predicted, despite the fact that entry-level machines retail for prices that are within the purchasing power of most people in developed economies.

However, law and policy-makers should be alert to possible "disruptions" than more widespread 3D printing may bring, if machines are developed which are easier to use and able to produce higher quality outputs. Not only might patents be affected, but also other areas such as consumer safety, given the possibility of printing objects to be sold to others which may not be compliant with these laws and may cause harm to consumers. While the Liberator 3D printed gun may be more of a libertarian political experiment than an easily-constructible firearm at the moment, advances in technology may entail that our legal restrictions on guns have to be revisited.

In matters of technology law and policy, especially for emerging technologies such as 3D printing, law and policy-makers would do well to monitor the state of the technology and market developments as well as the more theoretical literature from law and other disciplines about conceptual obstacles that the affordances of technologies pose for existing legal and policy regimes. The example of 3D printing so far fits squarely into this description, as a potentially highly disruptive technology for many areas of law, but whose progress in practice is deviating from some of these predictions. Empirical monitoring of 3D printing's development will assist academics, lawyers, law-makers and others in determining the extent to which any "disruption" needs managed through reform.

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