일감부동산법학 | 제10호
2015년 2월 161-196쪽
건국대학교 법학연구소

Ilkam Real Estate Law Review
Vol.10, Feb., 2015. pp.161-196
The Institute of Legal Studies, Konkuk Univ.

Will 3-D Printing Technology Change the Face of Copyright of Real Estate In Singapore?

Seow, Samuel*

목 차

3-D 프린팅의 발명으로 인해 전 세계인들은 무엇이든지 프린터를 통해 생산할 수 있게 되었다. 이로 인해 지적 재산권과 부동산의 관계를 검토할 수 있는 기회가 마련되었다 할 수 있다. 3-D 프린팅으로 제조업의 '민주화'라는 것이 가능해지면서, 대중의 창의력을 북돋고 경제발전을 조성할 수 있는 막대한 가능성이 펼쳐지게 되었다.

3-D 프린팅 환경의 맥락에서 저작권 문제가 발생할 수 있는 것이 사실이지만, 이를 통해 설계공정과 제조공정 간의 거리가 더욱 좁혀질 수 있게 되었다. 3-D 프린팅 공정의 효율성을 제고한다면, 소량 생산의 경우에도 대량 생산의 효율성을 달성할 수 있게 된다는 점에서 업계에 완전히 새로운 기회를 제공할 수 있게 될 것이다.

투고일 : 2014. 12. 15. 심사의뢰일 : 2015. 1. 13. 게재확정일 : 2015. 2. 2.

* Advocate & Solicitor, Samuel Law Corporation

저작권과 관련한 3-D 프린팅의 주요 문제는 기존의 시장에 대하여 독립적으로 광범위한 저작물의 사적 복제가 가능해지며, 이는 추적하거나, 방지 및 통제 불가한 방식으로 이루어질 것이라는 점이다. 저작권 침해의 원칙들을 다른 저작권 문제와 동일하게 3-D 프린팅에도 적용할 수 있지만, 저작권법이 3-D 디자인과 소프트웨어의 보호 범위를 어디까지로 할 것인지, 또 어떠한 행위가 침해를 구성하는지를 전부 규율하는 것은 아니다.

3-D 프린팅과 관련한 법적 쟁점의 해결을 도출하는 것은 용이하지 않다. 현 시점에서 3-D 프린팅에 관련된 흥미로운 문제점이 다양하게 발생하고 있다. 그러나 보통법(Common Law) 체계의 특성상 이러한 문제의 해결에 있어 3-D 프린팅을 직접 대상으로 하지 않는 판례에 기초하여 지침과 유사점을 도출해야 할 것이다. 결론적으로, 보다 명확한 법적 준거가 마련될 때까지는 국제 사회가 공동으로 3-D 프린팅 발전의 규범을 수립해 나가야 할 것이다.

[주제어] 3-D 프린팅, 지적 재산권, 부동산, 저작권, 보통법

Ⅰ. Introduction

3-D printing is one of the most exciting innovations of our time. It offers to the public the realistic possibility that anyone, anywhere in the world who has access to a printer, can produce any object he or she may want, on demand. Well, as long as he or she has a digital image of the desired object to start with.

For some people, 3-D printing marks the "democratization" of manufacturing, a new age of mass personalization that promises to boost innovation, foster more efficient use of resources and transform the way things are produced for consumption. Some have gone so far as to characterize it as the "Third Industrial Revolution".[1)]

1) Catherine Jewell, "3-D Printing and the Future of Stuff", Communications Division, WIPO, April 2013, 〈http://www.wipo.int/wipo_magazine/en/2013/02/article_0004.html〉

Over the past decades, copyright laws in Singapore have had to grow and adapt through an astonishing range of new technology which constantly tests the limits of our laws, and challenge the very fundamental "commandment" of the underlying copyright regime: THOU SHALT NOT COPY.

Massively popular sites like YouTube, Facebook and other sites which allow for comments in literary or pictorial or even film formats have looked the anti-copying stance of copyright in the face and have stared down global governments to change their laws to allow for the continued existence of these sites despite copyright.

Copyright laws have, largely, lost the battle against these online Goliaths based on a relatively straightforward and commonsensical approach: websites that establish a platform for sharing of content are not copyright experts. They are not the courts nor the police. As such, "forcing them to police their sites for copyright infringements is neither desirable nor, business-wise, tenable".[2] The "forces that be" have determined that these platforms are the new way forward, and copyright laws have to adapt to allow for these advancements, by way of "safe harbour provisions" and other compromises.

This article explores the phenomenon that is 3-D printing, and considers how it may change the landscape of copyright laws with relation to real property in Singapore.

Many forget that buildings, too, are protected by copyright.[3] With the growing ubiquity of 3-D printing, will copyright laws again have to change

2) Michael Weinberg, "What's the Deal with Copyright and 3D Printing?", Public Knowledge, 2013, 〈https://www.publicknowledge.org/files/What's%20the%20Deal%20with%20Copyright_%20Final%20version2.pdf〉

3) A recent example of copyright infringement of a building can be found in the 1 January 2013 edition of "Arch Daily" under the headline "Zaha Hadid Seeing Double in China".

to allow for these advancements in technology to occur within the legal framework?

3-D printing offers to the world an opportunity to re-examine the way we think about intellectual property and its relationship with real property. We are now able to re-create an article in its entirety by way of a printing process, in the process marrying intellectual property with real property for the first time in human history.

Typically in the past few decades, copyright has been the main obstacle in the way of complete free reproduction of digital content such as movies, music, literary articles, art works and photographs. That connection between copyright and the digital space breaks down as consumers start to move away from reproduction of movies, music, literary articles, art works and photographs; and towards bags, cars, human body parts, and also buildings.

Yes, buildings.

Ⅱ. What is 3-D printing?

A brief introduction to 3-D printing is, perhaps, necessary. Even though commercial usage of 3-D printing is already prevalent in some sectors, it appears to this writer by way of casual conversations with colleagues whilst writing this paper that a wide segment of the public still remains largely ignorant of how the process of 3-D printing is achieved.

3-D printing, also known as Additive Manufacturing (AM) or Direct Digital Manufacturing (DDM), makes it possible to create an object from a simple “printing” process where a meticulously detailed digital file, created using computer-aided design (CAD) software, is sliced into 2-dimensional

representations which are fed through to a "printer" that builds up the printed object layer by layer from its base.

The layers consist of material (in liquid, powder or filament form) which are deposited onto a "build area" and fused together. On 29 October 2014, Hewlett-Packard announced that it, too, is making a big bet on 3-D printing where the material used to produce printed products is the very product HP is famous for - its inkjet print. The company's inkjet technology looks so revolutionary to Forbes analyst Terry Wohlers that he predicts "it could even put some other companies out of business."[4)]

HP's method consists of 3-D print heads that can operate 10,000 nozzles at once, while tracking designs to a five-micron precision. With that many nozzles in action simultaneously, HP has declared that its Multi Jet Fusion printer can "crank out" objects 10 times faster than any machine that is on the market today.

It is immediately obvious that the future of manufacturing could be significantly affected by such new technologies, especially when 3-D printing presents many advantages over traditional manufacturing, including the following:

● The "additive" process minimizes wastage because it generally only uses the amount of material required to make the component. This distinguishes it from traditional "subtractive" manufacturing processes where materials are produced, but cut away to produce a desired form;

● The process of "growing" objects layer by layer also means that, with 3-D printing, it is possible to create more intricate and complex structures

4) George Anders, "HP's 3-D Print Breakthrough Could Push Rivals Out of Business", Forbes, October 10 2014, 〈http://www.forbes.com/sites/georgeanders/2014/10/29/hps-3d-print-breakthrough-could-push-rivals-out-of-business/〉

than can be done using traditional manufacturing techniques, and with less possibilities of human errors;

● 3-D-printed components can be 65% lighter but are just as strong as traditional machined parts, representing huge savings and, when used in relation to the transport industries, reduced carbon emissions. For every 1 kilogram reduction in weight, airlines save around US$35,000 in fuel costs over an aircraft's life. When used with relation to aircraft, therefore, the benefits of 3-D printing are significant;

● It is cheaper than traditional manufacturing because much of the infrastructure required for manufacturing is rendered redundant. There is no need for large factories with the corresponding large payrolls; no need for warehousing and transportation; and no retooling of an entire assembly line. The same printer that creates a piece of art can be used next to print a bike part. And that printer can be kept close to the point of consumption, which has implications for logistics.

Ⅲ. Current applications

3-D printing was originally developed for rapid prototyping purposes, *i.e.* making one or two physical samples. It allowed designers to identify and correct design flaws quickly and cheaply, thereby speeding up the product development process and minimizing commercial risks.

However, improvements in the technology's accuracy and speed, as well as in the quality of materials used for printing, have prompted some commercial sectors to move beyond the use of 3-D printing in their research and development labs to incorporate it into their manufacturing strategies.

Commercially, 3-D printing is now used to make

- jewellery and other bespoke fashion items;
- in dental laboratories, crowns, bridges and implants;
- hearing aids and prostheses, offering patients a perfect fit;
- the electronics, automotive and aerospace industries, by major manufacturers, such as GM, Jaguar, Land Rover, Audi, Boeing and Airbus; and
- use in space by NASA engineers.

1. 3-D printing is also coming closer to home

Business models have evolved where a number of companies today enables a consumer to upload a design to a website and simply press the 'Print' button. They will print the design in 3-D and ship the product to the consumer.

Companies like Sculpteo take it one step further. They help offer a consumer's product in a 3-D marketplace. They will take the orders, print it and send it to the buyer. The consumer collects the profit from the end of it.[5)]

Over the last year or so, many more articles have been written about the capabilities of 3-D printing. Some of the applications really begin to stretch the imagination - a car, handgun and even a liver and ear have been showcased. There are those who speculate that even food could someday be created with this technology.

---

5) Town Hall On-Demand, "How 3-D Printing Will Turn Manufacturing on Its Head", 〈http://www.csc.com/townhall/insights/94525-how_3d_printing_will_turn_manufacturing_on_its_head〉

Photo: Forbes.com

Photo: BBC

Photo: The Design Technology Blog

Traditional manufacturing requires high levels of capital investment and large-volume product runs. By significantly reducing capital outlay, costs and commercial risks, 3-D printing can make it easier for anyone to be part of the manufacturing process and test their ideas.

The full implications of its widespread adoption are as yet unclear, but by making "manufacturing on demand" a realistic possibility, the uptake of 3-D printing could transform the global manufacturing and business landscape. It can reduce the need to carry inventory, and slash warehousing and transport costs, simplify supply chains and significantly reduce the carbon footprint of manufacturing.

Medicine is perhaps one of the most exciting areas of application for 3-D printing. Beyond the use of 3-D printing in producing prosthetics and hearing aids, it is being deployed to treat challenging medical conditions,

and to advance medical research, including in the area of regenerative medicine. The breakthroughs in this area are rapid and awe-inspiring.

Ⅳ. A new era of mass personalization

3-D printing is heralding a new era of mass personalization. In January 2013, Nokia announced it is making the 3-D printable files of its Lumia 820 phone case available to customers, so they can create their own designs and print them on any 3-D printer.

While, as MIT Professor Neil Gershinghoff notes, consumers are unlikely to print what is readily available in the stores, when it comes to making personalized objects, gadgets or irreplaceable parts, the scope for 3-D printing applications is limitless.

Ⅴ. Legal reservations

The popularity of 3-D printing has been increasing dramatically while the prices for such printers have been rapidly decreasing.

This new technology has raised many legal issues. For example, Senator Charles E. Schumer has called for legislation banning 3-D printed guns since manufacturing such plastic weapons could easily circumvent background checks, registration requirements and metal detectors.[6]

3-D printers could also potentially use chemical inks to quickly print legal and useful chemical compositions such as authorized pharmaceuticals and vaccines, but also illegal drugs and chemical weapons such as ricin or chlorine gas.

---

6) The Guardian, "Senator seeks to extend ban on 'undetectable' 3-D-printed guns", 17 November 2013, 〈http://www.theguardian.com/technology/2013/nov/17/3d-printing-guns-ban-senate〉

The implications for commercial real estate would also be significant if this technology advanced to the potential some suggest it would.

The so-called "democratization" of manufacturing that 3-D printing promises has huge potential to unleash the creativity of the masses and foster economic growth.

As earlier discussed, just as the digitization of creative content has forced change within the creative industries and fuelled tensions around existing copyright laws, similar debates are likely to emerge in relation to 3-D printing. Given the global scale of manufacturing, however, the stakes in this debate may be even greater.

3-D printing is both a manufacturing and a digital technology and as such it makes the unauthorized copying of objects easier. Like other digital files, CAD blueprints are easy to copy and difficult to track. Copying is also made easier by the availability of low-cost 3-D scanners, which enable anyone to scan an off-the-shelf product, create a 3-D blueprint and distribute it online.

The brief review above of some of the exciting applications for which 3-D printing is being used suggests that the "paradigm shift in manufacturing" that many refer to is well under way. The implications of the continued evolution and uptake of 3-D printing technologies are far-reaching and promise to have a radical impact on the way things are made and business is done. The last 20 years of technological progress have been captivating, but the next may be even more thrilling.[7] Japan has also introduced the world's first 3-D photo printing booth, eerily signalling the day when even a human form may be 3-D printed.

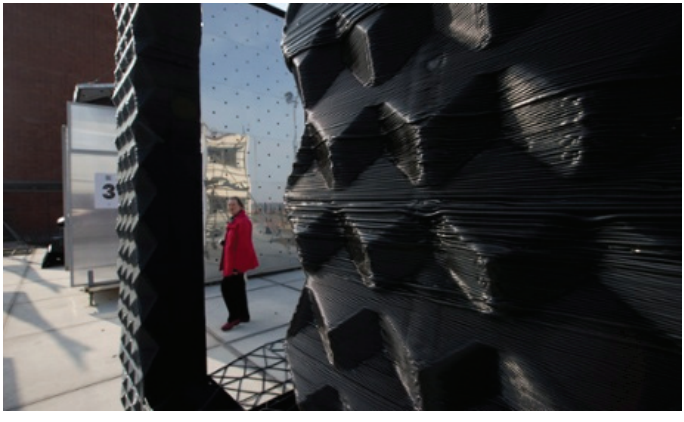
---

7) Michelle FlorCruz, IB Times

Photo: popupcity.net

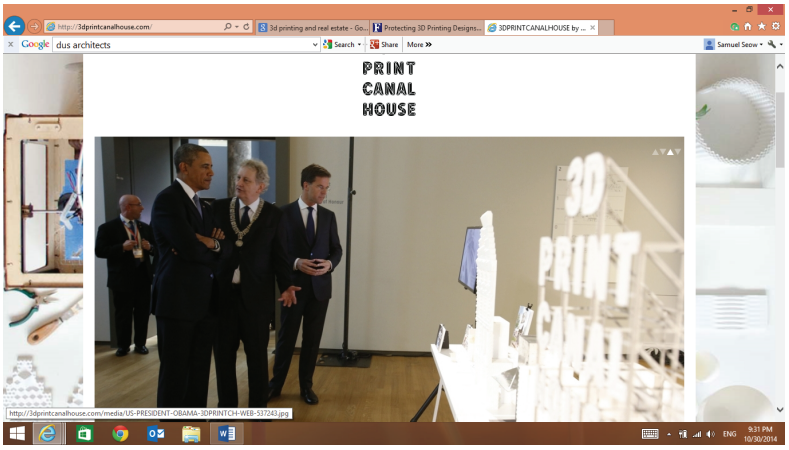
We shall proceed to explore the development of 3-D printing technology specifically in the real estate space and consider the legal implications related thereto.

Ⅵ. 3-D printed houses?



Photograph: Peter Dejong/ASSOCIATED PRESS

A firm of architects in Amsterdam, Dus Architects, have made what they say is the world's first 3-D-printed house, which is presently open for viewing by the general public.



At the centre of the process is the KamerMaker, or Room Builder, a scaled-up version of an open-source home 3-D-printer. It uses the same principle of extruding layers of molten plastic, only enlarged about 10 times, from printing desktop trinkets to chunks of buildings up to 2x2x3.5m high.

While Dus Architects may be the first architects to start printing a full-scale house, they join a number of others who have been experimenting with printing at an architectural scale over the last few years.

Since 2008, researchers at the University of Southern California have been developing a technology, known as contour crafting, that uses a computer-controlled gantry to print structures in quick-setting concrete, which is potentially capable of printing high-rise buildings, with the printer climbing the structure as it grows.

Another Dutch architect, Janjaap Ruijssenaars, is working on a project

to print a house shaped like a looping Mobius strip with the Italian-made D-Shape printer, which uses sand mixed with a binding agent to create a form of synthetic sandstone. So far, only a small pavilion-sized structure has been printed. This looks to be where the technology will remain for the time being: temporary novelty structures for exhibitions and events.

Shanghai-based WinSun Decoration Design Engineering company made waves in April 2014, after saying it successfully constructed 10 full-sized, single-story houses in an impressively fast 24-hour period. But Joe Kempton, an analyst with Canalys, an international technology sector advisory group, says that the company's claims may not match the current capabilities of 3-D printing technology. WinSun has claimed it printed full-sized one-story houses using a large 3-D printer. According to Xinhua News Agency, the firm used four large 3-D printers to make the small houses using a mixture of cement and other construction waste materials. The printers dramatically reduce construction costs by being able to repurpose old construction

Photo: Xinhua News Agency

materials and reducing labour costs, printing each house for under $5,000.

WinSun's chief executive Ma Yihe says he hopes to one day build a skyscraper using 3-D printing technology.

Ⅶ. Copyright Laws

The *Copyright Act (Cap. 63)*(the "Act") governs copyright laws in Singapore. Among other subject matter, the Act extends protection to "original works" of authorship as long as they are "reduced into material form". These original works could be literary works, dramatic works, musical works or artistic works.

Buildings are classified as "artistic works" under the Act, much like it would protect a sculpture.

The Act provides proprietors of artistic works with the exclusive rights:

- to reproduce the work in a material form;
- to publish the work in Singapore or any country in relation to which this Act applies, if the work is unpublished; and
- to communicate the work to the public.

As used in the Act, "reproduce" includes both physical copying and digital copying.

Registration is not a prerequisite to copyright protection or enforcement in Singapore.

Further, although many individuals may believe that the "©" copyright notice is necessary for copyright protection, this is not the case under the Act. Generally, as long as a work is original and reduced into material form, copyright will subsist in the work.

Under the Common Law system, which is applied in Singapore, an important limitation on the scope of copyright protection is contained in the so-called idea/expression dichotomy. Copyright law protects the expression of ideas in any tangible medium but not the ideas themselves. For example, the idea of a star-shaped house would not be protected by copyright. However, when the star-shaped house is designed on paper, and assuming the design is original to the author, copyright will subsist in the artistic work in the said design.

A corollary of the foregoing principle regarding protection of form and not idea is that copyright law usually does not protect functional objects. Therefore, copyright law will protect the aesthetic and decorative aspects of printed objects such as original print and patterns, unique color arrangements and novel combinations of elements (protectable or non-protectable) but, in most cases, not the utilitarian aspects of such objects. Such utilitarian aspects would be potentially protectable under patent law. A 3-D object's design may be protectable only if, and only to the extent that, such design incorporates pictorial, graphic, or sculptural features that can be identified separately from, and are capable of existing independently of, the utilitarian aspects of the article.

Courts have established that the test for separability may be met by showing either physical or conceptual separability.

A design element is considered physically separable when it can be removed from an object and sold separately (e.g., a hood ornament could be separated from an automobile, but a lamp design cannot be separated from its functional aspects), and conceptually separable when it comprises artistic features that do not contribute to the utilitarian aspect of the object and such features invoke an idea separate from the functionality of the object

(e.g., a tribal mask displayed in a museum as a work of art will be deemed conceptually separable, whereas most prêt-à-porter apparel items will be deemed functional even if they include ornamental features).

Ⅷ. Copyright Laws in buildings and models of buildings

Several copyrights are relevant in the case of architectural works.

Firstly, there would be copyright in the architectural and engineering plans and drawings on the basis that they can be interpreted as "drawings" and are thus artistic works under the Act.[8)]

Secondly, the building itself can enjoy its own copyright as a type of original artistic work. In this regard, Section 7(1) of the Act defines artistic works as

"*(a) a painting, sculpture, drawing, engraving or photograph, whether the work is of artistic quality or not;*

(b) a building or model of a building, whether the building or model is of artistic quality or not; or

(c) a work of artistic craftsmanship to which neither paragraph (a) nor (b) applies,

but does not include a layout-design or an integrated circuit within the meaning of section 2(1) of the Layout-Designs of Integrated Circuits Act (Cap. 159A)."

The term "building" is defined widely under the Act, as including "a structure of any kind". In a case in Australia,[9)] questions arose as to whether

8) Lau Foo Sun v. Government of Malaysia [1974] 1 MLJ 28

9) Darwin Fibreglass Pty Ltd v. Kruhse Enterprises Pty Ltd (1998) 41 IPR 649

there was copyright in the "plug and mould" used for the manufacture of the pre-cast fibreglass pools and also in the pools themselves.

On the question of what is a "structure", Mildren J. made a number of observations and points including the following:

- the plain ordinary meaning of the word "building" includes "structures" but not all structures were necessary buildings. The addition of the words "includes a structure of any kind" in the definition of "building" was clearly intended to broaden the concept of what is a building, to include structures which would not ordinarily be buildings; the words are not mere surplusage;
- In the context of the Copyright Act, there was no requirement that the building or structure be intended to be occupied for human habitation, or that it is even occupied by living species at all, as it obviously includes bridges and dams which are not inhabited;
- Structure implied something of substance which is usually erected upon or constructed upon or in the ground with an element of permanence;
- It was not necessary for a building or structure to be built from the ground in situ;
- That there was no single test for what is a building although there were a number of factors which were relevant including: size, the evident proposed use of the object to an independent observer, whether the object is evidently fixed to or under the ground, or whether it is evidently intended to be portable and the degree of permanence in location which it apparently has including the likely life-span of the object.

On the foregoing grounds, Mildren J. found that pre-cast fibreglass swimming pools were "structures" for the purposes of the Copyright Act,

as they were intended to be "relatively permanently located in the same position for many years" and were "sufficiently large to be substantial enough to be described as a structure".

Finally, it is also important to remember that a model of a building can also enjoy its own copyright as an artistic work. As in the case of drawing, buildings and models of buildings are protected, irrespective of artistic quality.

When copyright subsists in subject matter which are artistic works, a third party who reproduces, publishes or communicates the work to the public commits acts of copyright infringement. Bringing this principle to its extreme, given a strict interpretation of the relevant Sections of the Act, every time a photograph is taken which includes a building, a claim in copyright infringement could arise on the part of the copyright owner. This would mean that every time a person takes a photograph before an iconic or tourist building, that photograph could constitute copyright infringement, assuming the building is not in the public domain.

Thankfully, the Act provides an exception to infringement in these cases in Section 64: "*The copyright in a building or a model of a building is not infringed by the making of a painting, drawing, engraving or photograph of the building or model or by the inclusion of the building or model in a cinematograph film or in a television broadcast.*"

It is relevant to note that the Section 64 exception relates only to the making of "a painting, drawing, engraving or photograph of the building or model". Where a person wishes to reproduce the building or model in a manner save as stated within the exception, a claim in copyright infringement may still arise.

It would be interesting to determine how the law would treat a 3-D print

of a building. There are several online publications which refer to 3-D prints as "sculptures". Section 7 of the Act does make reference to "sculptures". Therefore, when the Act leaves out "sculptures" in the Section 64 exception, the Legislature must be taken to have intentionally left it out. Therefore, constructing a substantially similar building without permission via a 3-D print may infringe the copyright owner's rights as the 3-D sculpture infringes the copyright in the building.

Ⅸ. When does copyright infringement of a building arise?

1. The "look and feel" test

When determining if there is copyright infringement in any case, the court will attempt to determine whether the alleged infringing work is "substantially similar" to the copyrighted work. Under the "look and feel" test, relevant works are compared in their entireties through the eyes of the proverbial "reasonable man" to determine whether they are substantially similar.

Therefore, minor changes that do not change the total look and feel of the work may not change the work enough to allow the defendant to escape a claim of infringement of a copyright owner's rights.

2. No need to prove intent to copy

To prevail in a copyright infringement lawsuit, a copyright owner does not have to show an intent to copy or even actual copying. Instead, the copyright owner merely needs to establish that the alleged infringer had

access to the copyrighted work and the alleged infringing work is substantially similar to the copyrighted work. Consequently, a 3-D Builder may be liable for copyright infringement even if he did not intentionally copy a protected architectural work.

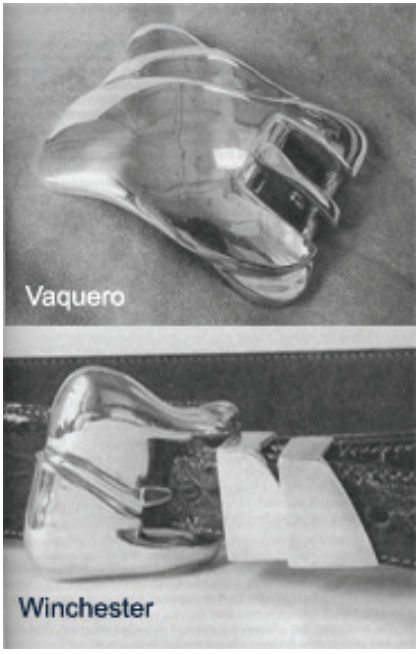
3. Whether the parts copied were useful or not

Sometimes the intersection of 3-D printing and copyright is a clean one. Purely artistic physical objects such as the Merlion will be protected by copyright as sculptural works. Reproduction in a 3-D format of such an object would obviously be copyright infringement.

Photograph: 9to5travel.com

However, as discussed above, copyright law will only protect the aesthetic and decorative aspects of printed objects such as original print and patterns, unique color arrangements and novel combinations of elements (protectable or non-protectable) but, in most cases, not the utilitarian aspects of such objects. What if the object which is reproduced is "kind of" creative, but "kind of" useful?[10)]

In theory (and everything is simple in theory), the law addresses these questions with the straightforward "severability test" described above. If an object possesses both aesthetic as well as utilitarian aspects, copyright would protect only the aesthetic aspects. Simple.



10) Michael Weinberg, "What's the Deal with Copyright and 3D Printing?", Public Knowledge, 2013, 〈https://www.publicknowledge.org/files/What's%20the%20Deal%20with%20Copyright_%20Final%20version2.pdf〉

However, actually applying this test has proven to be something of a challenge.

In the case of *Kieselstein-Cord v. Accessories by Pearl Inc.*,[11] the court was made to consider if a belt buckles designed by the plaintiff enjoyed copyright protection.

The court held eventually that giving the plaintiff a monopoly over belt buckles was a bad thing as no manufacturer should have monopoly over a useful object under copyright laws. However, the court relied on the testimony of expert witnesses that the buckle designed by the plaintiff "rose to the level of creative art, as well as the fact that people had used the buckles as nonfunctional decoration on other parts of their bodies".

Hence the plaintiff's belt buckle was protected, but only the aesthetic portions of it.

Photograph: copyrightcodex.com

11) 632 F. 2d 989 (2d Cir. 1980)

In another case, a differing decision was reached. This was the case of *Brandir International Inc. v. Cascade Pac. Lumber Co.*[12] where the courts were made to consider if the RIBBON rack for bicycles which was actually based on a wire sculpture (which was unquestionably protected by copyright) would be, itself, protected by copyright.

The court held that although the design of the bicycle rack is aesthetically pleasing, it was not protected by copyright because the court could not sever the utilitarian aspects of the product from its aesthetic ones. The court said,

"*If design elements reflect a merger of aesthetic and functional considerations, the artistic aspects of a work cannot be said to be conceptually separable from the utilitarian elements. Conversely, where design elements can be identified as reflecting the designer's artistic judgement exercised independently of functional influences, conceptual separability exists*."[13]

What does it mean? Simply being a creative designer of a useful object is not enough to grant the object copyright protection. The designer cannot primarily concern himself with the functionality of the object. There must at least be elements that are designed largely without regard for functionality.

The bike rack decision was followed in the case of *Pivot Point International Inc. v. Charlene Products Inc.,*[14] where the court was asked to determine if there is copyright over a mannequin head sold to beauty schools. The head in question was designed to imitate what the court described as "the hungry look" of high fashion runway models.

12) 834 F.2d 1142 (2d Cir. 1987)

13) Ibid. at 1147

14) 372 F. 3d 913 (7th Cir. 2004)

Photograph: mannequinmode.com

After a lengthy statutory interpretation and analysis of relevant case law, the appellate panel found that the plaintiff's "Mara" mannequin head features can be identified separately from and are capable of existing independently of the utilitarian features of mannequin heads in general. Such sufficient separateness between the utilitarian and artistic aspects of a work justified copyright protection.

"Conceptual separability exists, therefore, when the artistic aspects of an article can be 'conceptualized as existing independently of their utilitarian function… Applying this test to the Mara mannequin, we must conclude that the Mara face is subject to copyright protection," the court said.

Applying the "severability" principles to buildings, it appears then that not all buildings will be protected by copyright in Singapore, even if such buildings are original (in that they do not copy the design of any other building), and reduced into material form. Buildings which are merely functional, with no aesthetic elements existing independently of their utilitarian function, may not be protected by copyright. The corollary of this is that making a 3-D replica of buildings which are not protected by copyright will be legal and the consent of the original builder will not be necessary to allow a 3-D Builder to print a replica.

It would be important for the local courts to set down a test for "severability" with relation to buildings so that 3-D developers may gain guidance on what and how to reproduce.

4. Is there copyright in digital copies of 3-D objects?

In the world of 3-D printing, physical objects can exist in a digital form, as a .stl file.[15] These files can be thought of as the object equivalents of a .pdf file – they are universally printable by 3-D printers and allow digital copies of objects to be transferred digitally around the world. Digital copies can also be scanned using CAD software.

These digital files have their own copyright protection. Copying of these files would infringe the copyright of the owner of the file.

The learned author of the article "*What's the Deal with Copyright and 3D Printing*?" sets out an easy chart to determine where copyright infringement may arise, where a person copies a digital file of a 3-D product.

15) The .stl file is usually the final version of an object. Often the object is first created in another format with another file extension first, and subsequently converted into .stl format.

	Useful object	Creative object
File created by scan	Not copyrightable – lacks required originality and cannot be a derivative work because underlying object is not protected by copyright	No independent copyright, but will still be a copy/ derivative work of the object itself. Need permission from object creator, but not scanner in order to copy.
File created in CAD	At least copyrightable in theory. However, actual copyrightability will turn on merger analysis. Creating object from the file will not violate any copyright that exists in the file. Copying the file to create object may or may not be copyright infringement (cases differ) but will probably be influenced by merger analysis. If you need to copy the file to create the object, unauthorized copying may be easier to justify.	Independent copyright in file. Object is probably derivative work of the file. Independent copyrightability of object as derivative work possible.

What are the consequences of copyright infringement in Singapore?

When suing for copyright infringement, the types of relief that the court may grant a copyright owner may include the following:

- an injunction (subject to such terms, if any, as the court thinks fit);
- damages;
- an account of profits;
- where the plaintiff has elected for an award of statutory damages in lieu of damages or an account of profits, statutory damages of —

(i) not more than $10,000 for each work or subject-matter in respect of which the copyright has been infringed; but

(ii) not more than $200,000 in the aggregate, unless the plaintiff proves that his actual loss from such infringement exceeds $200,000.

Owners of buildings often solicit designs from multiple architects or designers during the design and bid phases of the project, especially design-build projects. Some owners believe they have the right to share designs obtained through the design/bidding process with other competitive

bidders. This can be problematic depending on the contractual relationship between the owner and the original designer. If the original designer retained all copyrights in the original design, an unsuspecting subsequent designer or contractor may infringe the copyrights of the original designer by refining or constructing a project that is substantially similar to the original design. Therefore, whenever an owner, construction manager or other party provides you with architectural plans, you should ensure that you have the right to construct copy and/or modify those plans before using them.

With 3-D printing, these problems may exacerbate, corresponding to the increasing ease with which new buildings can be replicated.

Ⅹ. Moving forward

Is there a new era beginning with the availability of low-cost 3-D printers? Not so long ago it was unimaginable that people could print products they needed by themselves. They would have to go to the supermarket or order the products they want on the Internet.

Issues of copyright infringement arise because not every item which is produced in a 3-D printer will be the result of the printing individual's own ideas and creativity. On the contrary, the printed article may be downloaded and printed from another person's original design, or a copy can be created from an already existing commercial product.

Basically, there are two common possibilities for the source of a copy: Firstly, the Internet, where intricate and detailed digital specifications for a particular object can be downloaded; and secondly, the 3-D scanner, which is able to scan a physical object and transfer the resulting file to the 3-D printer.

These methods could involve the extraction; use and exploitation of important intellectual property and personal data rights of various individuals. Thus, the question arises as to how 3-D printing may impact the intellectual property law regime; and what changes to the laws (if any) are now required to be made.

The main problem with 3-D printing related to copyrights is the possibility of extensive personal manufacturing of copyrighted objects independent of established markets in ways that cannot be detected, prevented or controlled.

Generally, the principles of copyright infringement apply to 3-D printing as they apply to any other copyrighted material. Nevertheless, not all copyright laws are clear about the degree to which 3-D designs and software are protectable and about the question of which acts may constitute infringement.

It is also likely that the same thing that happened with file-shared music and movies may happen with copyrighted objects, as home 3-D printers become more prevalent. Although 3-D printing of copyrighted objects at home may constitute an infringement, the copyright will become increasingly impractical or impossible to enforce. Technically, a consumer who copies a work by printing an already existing object will be liable for copyright infringement unless the consumer has permission from the copyright owner or only privately uses the printed object.

Copyright will play a crucial role in the 3D printing world's unfolding future. Copyright litigation offers rightsholders a powerful set of tools to combat infringement. Then again, those accused of copyright infringement have some potent tools of their own, like invoking safe harbour provisions, and the defence of fair use.[16)]

16) Peter Hanna, "The Next Napster? Copyright questions as 3D printing comes

As alluded to above, copyright arises without the need for registration. An "original" work is protected by the Act the moment it is fixed in a material form. Moreover, the degree of creativity needed for copyright has been described as "very slight."

Copyright complications may arise in the 3-D printing context.

First, and most simply, copyright protection is available for any work containing even a "slight" degree of originality in expression. In this way, 3-D design prints will be protected to the extent they represent an original work in a material form. This is an issue that comes up frequently in the "stolen source code" context, where programmers assert their code was a copyrighted creative work. Downloading or sharing those files could constitute copyright infringement, although the strength of the protection for such files will turn on whether courts treat them more like blueprints than art.

A more efficient 3-D printing process would allow industry an opportunity it never had before: for production on the small-scale to be as efficient as large scale production. Think about it: using the techniques of traditional manufacturing, the production of one-off items and prototypes is very costly or impossible as the absence of specialised machines and moulds makes production labour-intensive. This labour-intensity has driven many types of production offshore. The flight of relatively low-skilled manufacturing jobs to nations with lower wage rates and a comparative advantage in manufacturing has been one of the largest structural economic shifts over the past 30 years.

The advent of widespread 3-D printing makes it possible for some forms

---

of age", April 6 2011,
〈http://arstechnica.com/tech-policy/2011/04/the-next-napster-copyright-questions-as-3d-printing-comes-of-age/〉

of one-off manufacturing and prototyping to return. For 3-D printers, it does not matter if one item or one thousand items are produced; the price of production per item remains constant.

As a result, 3-D printing has the capability of bringing the design process and the manufacturing process closer together. With greater ease of innovation, small and medium-sized enterprises will be able to experiment more readily with new ideas, and then see the fruits of their creativity produced quickly and with fewer hurdles than at present. This is not to say, of course, that 3-D printing will ever completely replace assembly lines or machining. It will more likely serve to complement, rather than compete with traditional manufacturing.

This goes further than just the question of intellectual property. 3-D printing and similar technologies have led to a further blurring of the lines between goods and services. There are challenges for global trade as a result, associated with measurement, assigning property rights and responsibility for quality assurance. But the opportunities dwarf the challenges.

As the WTO observed in its 2013 World Trade Report, the possibility to edit and create physical objects through 3-D printing will feed the burgeoning global middle class desire for variety and individuality in their goods. This is just one of many technological advances challenging us to change our way of thinking about international trade and economic growth. Advances in robotics, data sharing and medical technology are others.

XI. Conclusion

Many of the legal issues raised by 3-D printing do not have simple, easy answers. Many of the interesting questions are at this point just starting to emerge. The answers to these questions can be answered only by drawing guidance and analogies from cases not involving 3-D printing, as our Common law system is wont to do.

Ultimately the burden is on the international 3-D printing community to set the norms. Until there is better legal clarity, clarity by the community in how they wish for the system to operate may be the best way to protect the development of 3-D printing.

References

Catherine Jewell, "3-D Printing and the Future of Stuff", Communications Division, WIPO, April 2013, <http://www.wipo.int/wipo_magazine/en/2013/02/article_0004.html>

George Anders, "HP's 3-D Print Breakthrough Could Push Rivals Out of Business", Forbes, October 10 2014, <http://www.forbes.com/sites/georgeanders/2014/10/29/hps-3d-print-breakthrough-could-push-rivals-out-of-business/>

Michael Weinberg, "What's the Deal with Copyright and 3D Printing?", Public Knowledge, 2013,

<https://www.publicknowledge.org/files/What's%20the%20Deal%20with%20Copyright_%20Final%20version2.pdf>

Peter Hanna, "The Next Napster? Copyright questions as 3D printing comes of age", April 6 2011, <http://arstechnica.com/tech-policy/2011/04/the-next-napster-copyright-questions-as-3d-printing-comes-of-age/>

Michael Weinberg, "What's the Deal with

Town Hall On-Demand, "How 3-D Printing Will Turn Manufacturing on Its Head", <http://www.csc.com/townhall/insights/94525-how_3d_printing_will_turn_manufacturing_on_its_head>

The Guardian, "Senator seeks to extend ban on 'undetectable' 3-D-printed guns", 17 November 2013, <http://www.theguardian.com/technology/2013/nov/17/3d-printing-guns-ban-senate>

[Abstract]

Will 3-D Printing Technology Change the Face of Copyright of Real Estate In Singapore?

Seow, Samuel*

3-D printing offers to the public the realistic possibility that anyone in the world with an access to a printer can produce any object. For this reason, it offers to the world an opportunity to examine the way we think about intellectual property and its relationship with real property. The so-called "democratization" of manufacturing that 3-D printing promises has a huge potential to unleash the creativity of the masses and foster economic growth.

With all the copyright complications that may arise in the 3-D printing context, 3-D printing has the capability of bringing the design process and the manufacturing process closer together. A more efficient 3-D printing process would allow industry an opportunity it never had before, in that small-scale production can be as efficient as large scale production.

The main problem with 3-D printing related to copyrights is the possibility of extensive personal manufacturing of copyrighted objects independent of established markets in ways that cannot be detected, prevented or controlled. Although the principle of copyright infringement apply to 3-D printing as they apply to other copyright issues, not all copyright laws are clear about

* Advocate & Solicitor, Samuel Law Corporation

the degree to which 3D designs and softwares are protectable and which act may constitute infringement.

Many of the legal issues raise by 3-D printing do not have simple, easy answers. At this point, numerous interesting questions are starting to emerge concerning 3-D printing technology. However, the answers to these questions can only be provided by drawing guidance and analogies from cases that do not involve 3-D printing as the Common law system is wont to do. Ultimately, the burden is on the international community to set the norms on the development of 3-D printing until there is a better legal clarity.

[Key Words] 3-D printing, intellectual property, real property, copyrights, Common Law