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3D Printer: Needs Real Treat to Intellectual Property in Indian Perspective

*Dr. Amitabh Singh**
*Shashank Chandel***

I. Introduction

The internet has driven many changes in the intellectual property community. As a data and resource access tool, it has expanded the reach of every user localized, regional resources, to true global information access. Today the largest segment of business-to-consumer e-commerce involves intangible products that can be delivered directly over the network to the consumer's computer[1]. While these intangible products, by their very nature, are difficult to measure, an increasing amount of the content that is being offered is subject to intellectual property rights[2] This commerce in intangible products raises a number of issues for intellectual property in addition to those that would arise in respect of physical goods. There is a growing need to adopt technological measures in protecting the rights of intellectual property owners. In addition to this, questions of the scope of rights and how existing law applies, jurisdiction, applicable law, validity of contract and enforcement have become more complex and needs to be addressed in an appropriate way.

A number of academics have examined the implications for intellectual property (IP) law as a result of the recent proliferation of 3D printing; there is a lack of empirical evidence to determine whether this emerging technology will have an impact on IP laws. IP rights usually give the creator an exclusive right over the use of his creation for a certain period of time.

II. 3D Printing: Meaning and Concept

According to the World Intellectual Property Organization (WIPO), IP rights serve one basic purpose, namely: "*to foster an environment in which creativity and innovation can flourish*." IP rights create an incentive for innovation, as the creator is granted a monopoly to exploit his creation for usually a limited period of time.

*Asstt. Professor, Deptt. of law, Assam University, Silchar law.amitabh@gmail.com
**Research Scholar, Deptt. Of Law, Assam University, Silchar

[1] OECD (1999), The Economic and Social impacts of e-commerce: Preliminary Findings and Research Agenda, available at http://www.oecd.org/subject/e_commerce/summary.htm

[2] William Daley, WIPO Conference on Electronic Commerce and Intellectual Property , Sep 1999, available at http://ecommerce.wipo.int/conference/papers/daley.html , visited 10 Dec 2005

In Cory Doctorow's collection of fictional short stories titled *Overclocked*, a world is imaginatively illustrated where 3D printing has not only changed manufacturing of goods, but also "laid waste to every industry" that previously relied on copyright patents, and other intellectual property protections[3].

3D printing no longer subsists merely as a science-fiction fantasy; it is quickly becoming the next innovative technology of the modern era, with enough momentum to transform almost every facet of modern culture. The concept of 3D printing (or additive manufacturing), however, has been used for several decades. In the mid-1980's, Chuck Hill designed and utilised a process of solid imaging, also known as stereo-lithography, which utilised a concentrated stream of ultraviolet light to cure and solidify layers of material to slowly create tangible objects in three-dimensions.[4] Different models of 3D printers employ different methods to manufacture these physical objects. The Maker Bot Replicator 2 model 3D printer, for example, injects bio-plastic material heated from a corresponding laser beam that can operate on 3 separate axes to create overlapping layers of resin on the machine base-plate, with this process being repeated several times over to create a series of layers, even as thin and delicate as 16 micrometers (.016 millimetres), that eventually combine to create the target design.[5]

3D Printing uses software that slices the 3D model into layers (0.01mm thick or less in most cases). Each layer is then traced onto the build plate by the printer, once the pattern is completed, the build plate is lowered and the next layer is added on top of the previous one. Typical manufacturing techniques are known as 'Subtractive Manufacturing' because the process is one of removing material from a preformed block. Processes such as Milling and Cutting are subtractive manufacturing techniques. This type of process creates a lot of waste since; the material that is cut off generally cannot be used for anything else and is simply sent out as scrap. 3D Printing eliminates such waste since the material is placed in the location that it is needed only, the rest will be left out as empty space. The implications of this new technology for IP rights are not just theoretical issues. Many parties who hold IP rights already report infringement through 3D printing. 3D printing would cause holders of IP rights to lose at least USD 100 billion in revenue in 2018. If Gartner's prediction turns out to be accurate, the rise of 3D printing will have a tipping-point impact upon the business models of all parties involved, much like the rise of file sharing software radically changed the music and movie industry in the course of the last two decades.

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[3] Doctorow, Cory. ""Printcrime"" In *Over Clocked: Stories of the Future Present*, 1. Philadelphia: Running Press, 2005

[4] "Stereo-lithography." Materialise. Accessed September 1, 2017. http://manufacturing.materialise.com/stereolithography.

[5] Petronzio, Matt. "How 3D Printing Actually Works." Mashable. March 28, 2013. Accessed September 1, 2017. http://mashable.com/2013/03/28/3d-printingexplained/

3D printing technology is likely to disrupt the production and distribution of a number of goods in certain industries, while at the same time creating unseen potential for innovation and consumer involvement. Whether disruptive or not, the intellectual property rights, if applicable, concerning the production and use of existing and new products will very likely be affected. When intellectual property laws were first drafted, computer technology did not exist. At that time, it was not foreseen that it would be necessary to protect information stored by digital means, nor was it foreseen that information would become such a sought after commodity[6]. The Internet, Software, Business methods for e-commerce applications & electronic databases are relatively new territories where innovators have created an environment in which information exists in plentiful quantities and available to many people.

International Covenant on Economic, Social and Cultural Rights (ICESCR) and UDHR[7] guarantees everyone the right to benefit from the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author[8]. With the advent of Information Communication Technologies (ICTs), the relationship between human rights and intellectual property assumes greater significance as the traditional balance between intellectual property holders and users is slightly imbalanced in favour of users.

III. Infringement of Intellectual Property Rights in the Context of 3D Printing

Intellectual property infringement issues may relate to patent, copyright (proprietary versus open source), trademark, and design right law.

When assessing the relevant issues, we will look at two different processes:

1) On the one hand the creation process of
    - The 3D model (object design file) and
    - The 3D replica.
2) On the other hand the dissemination process of
    - The 3D model (object design file) and
    - The 3D replica.

The digital dilemma is that the information technology that is making more current information available more quickly and completely also has the potential to demolish the balancing of public good and private interest that has emerged from the evolution of intellectual property law. The relationship of intellectual property law to new

[6] The Hindu, Technical know-how essential to check cyber crime, available at http://www.thehindu.com/2005/02/06/stories/2005020603910300.htm, visited on 17 May 20017

[7] Art.27(2), Universal Declaration of Human Rights

[8] Art.15(1)(c), International Covenant on Economic, Social and Cultural Rights

technologies that exploit intellectual property works is often perceived to pit intellectual property against progress. Historically, when copyright owners seek to eliminate a new kind of dissemination, and when courts do not deem that dissemination harmful to intellectual property owners, courts decline to find infringement.

However, when owners seek instead to participate in and be paid for the new modes of exploitation, the courts, and law making bodies, appear more favourable to copyright control over that new market. Today, the courts and the legislatures regard the unlicensed distribution of works over the internet as impairing copyright owners; ability to avail themselves of new markets for digital communication of works; they accord control over those markets to copyright owners in order to promote wide dissemination.

IV. Jurisprudential Aspect of intellectual Property in 3D Printer

Property is normative protocols structuring social relations with regard to things (that is, property relations). Property protocols refer to customs, norms, and conventions guiding people's behaviour. These protocols (often understood as patterns of duties, rights, powers, privileges and so on) define certain freedoms or limitations with regard to who may do what with any given thing or resource.

Hohfeld stands as a milestone in the liberal and legal positivist traditions, not much - if any - "politically radical" work has been built on his conceptions; indeed there is a general reluctance amongst anti-capitalists to engage with liberal jurisprudence, including structural analyses of property.

On Hohfeld's account of jural relations, each such relation consists of four basic components: (i) the person or group of persons holding an entitlement (X); (ii) the person or group of persons occupying the position correlative to the entitlement (Y); (iii) the form of the relation (i.e. whether it is, say, a right-duty relation or a power-liability relation); (iv) and the content thereof (the specification of the right-duty relation).

A Hohfeldian explication of proprietary entitlements would hence specify the content of such entitlements. That is, it would specify what Y must do or cannot do, and what X may do or can do. With regard to proprietary entitlements, any suitable specification would necessarily refer to the object or resource with regard to which X and Y have to behave in a certain way. In that sense, the relation of primary importance is the relation between people(X and Y, you and me), even though this relation will concern things. We can begin to understand property relations as social relations between people – all people – with regard to any given thing. The matrix permits us to understand the simple dominion conception – the vision of one individual having absolute, legitimate control over a thing – as implicating everyone else.

Property, according to Harris, has the dual function of governing the use of things and of allocating "social wealth", which for Harris refers to the total of those things and resources which are scarce, that is, over which there might be substantial conflict regarding their use. That is, property functions as both a mechanism for distributing use-privileges (and their concomitant wealth effects, about which more lately), as well as control powers (decision-making authority). If rights of property only conferred on the holder the right to use a resource as she liked but never the right to allow another to use it, then the dual nature of the function of typical property institutions would be split (Harris 1996: 28). For Harris, in property, use privileges come with control over uses made by others.

All property institutions (actual articulations of complex sets of property protocols into property systems or regimes), for Harris, are characterised by the twin notions of trespasser rules on the one hand, and the ownership spectrum on the other (Harris 1996:31-32). The ownership spectrum is made up of a set of ownership interests, which are best understood as the kinds of specifications needed to make sense of the Hohfeldian jural relation. An ownership interest will specify a particular use privilege or control-power. Different ownership interests may obtain for different people for the same resource. All ownership interests (i) specify a juridical relation between an owner and are source, (ii) are open-ended, in that they do not specify exactly the kind of uses that a resource may be put to, they merely express open-ended privileges and powers, and (iii) they authorise the pursuit of one's self-interest on part of the individual or group owner. It is the open-endedness and authorised self-seekingness of ownership interests which are crucial to Harris's account**.**

V. 3 D Printing Technology v/s Intellectual Property

"Like the magic wand of childhood fairy tales, 3D printing offers us the promise of control over the physical world. 3D printing gives regular people powerful new tools of design and production … In a 3D printed future world, people will make what they need, when and where they need it".

Whilst it may be some years, before Lipson and Kurman's prediction is realised, it is true that 3D printing gives people powerful new tools of design and production. However, a 3D printer will only operate on the basis of the instructions provided from a computer in the form of well designed electronic files. In fact, a "3D printer without an attached computer and a good design file is as useless as an iPod without music". Furthermore, the selection of materials is equally important to ensure that an object can be 3D printed.

The technology is not new. The first patent was fled in 1971 and was granted in 1977 to American Wyn Kelly Swainson. Before that, an article written by David Jones on the concept of 3D printing was published in the New Scientist on 3 October 19749. Ultimately, it was 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 Stereo-lithography'.

Since then, the technology has continued to develop significantly and around the year 2000, it was suggested that 3D printed parts could also be used directly as end-use products, eliminating the need for traditional production processes such as moulding, casting and machining. This direct approach to part production was initially called 'Rapid Manufacturing', before being standardised by the American Society for Testing and Materials as 'Additive Manufacturing' (AM).

What distinguishes digital media[9] from conventional media are six characteristics that will make it difficult for existing categories of intellectual property law to adjust to the protection of works in digital form. They are[10]:

1) the ease with which works in digital form can be replicated,
2) the ease with which they can be transmitted,
3) the ease with which they can be modified and manipulated,
4) the equivalence of works in digital form,
5) the compactness of works in digital form, and
6) the capacity they have for creating new methods of searching digital spaceand linking works together.

VI. Copy Rights and 3 D Printer

The legal analysis commences with a consideration of the copyright implications arising from the access and use of online platforms. Whilst 3D printing raises a variety of issues relating to Intellectual Property Rights (IPRs), Section A, focuses particularly on the implications for copyright laws. In particular, Section A considers the copyright implications arising from the (1) creation of an object design file; (2) modification of an existing design; and/or (3) scanning of a physical object. In exploring these scenarios, the Report attempts to answer the following questions, amongst others: can a CAD file be protected under copyright law? Does it qualify as a literary work? Can 'modified' files lead to new derivative works under copyright law?

a. How to prevent liability

Arguably the majority of IP rights qualify as copyright. A copyright is often defined as a legal device thatgives the creator of a literary,artistic, musical, or

[9] "digital media," means intellectual products made available in digital/electronic form, whether operational in computers or other machines capable of "reading" works in digital form.

[10].Samuelson ,Pamela, "Digital Media and Changing Face of Intellectual Property Law", available at http://www.law.berkeley.edu/faculty/profiles/facultyPubsPDF.php?facID=346&pubID=152 , visited on 2 Oct, 2005 performers and producers of phonograms.

other creativework the sole right to publish and sellsuch said work. A copyright appliesto works that are regarded to be the author's "*own intellectual creation*". Though some countries require certain copyright formalities to establishing copyright, most countries (including all EU countries) recognize copyright in any work that is the author's "*own intellectual creation*", without any formal registration required. In the EU, the duration of a copyright is the author's life plus 70 years.

As a vast majority of 3D printed objects are protected by a copyright, copyright infringement can easily rear its ugly head. Parties, who 3D print objects upon customer request, are especially advised to make sure the object and/or the CAD file do not infringe upon any third party rights or at least that liability for infringement lies with the customer. It is therefore essential to have legally-binding General Conditions and other contractual provisions in place, by means of which liability for infringement is shifted from the contractor to the assignor (the customer). Waivers and disclaimers specifically aimed at 3D printing are an important instrument in preventing liability for contractors. These contractual provisions should not only cover possible damages that the contractor would have to pay to third parties, but should also cover the costs of litigation in case of alleged infringement.

b. How to prevent infringement

The advantage of copyright is that it can also be invoked in case of private use, be it that the right holder must be able to identify the end-user first. An important question to clarify by courts and in particular the European Court of Justice would be if and to what extent a CAD file is capable of copyright protection. A 3D CAD file could file hereunder because of its technical drawings, diagrams and models.

For copyright holders it is not only essential to make sure not to infringe on any third party rights, but also to prevent other parties from infringing on their rights as a copyright holder.

A copyright holder who is confronted with third parties infringing on its rights, can take several legal actions against the infringing party. If no amicable solutions can be reached, the matter can be brought to a civil court, and – among others – permanent injunctions and damages can be claimed. However, the past decades have taught an important lesson when itcomes to contesting infringing parties. Typically there is a vast number of infringers, thus it is practically impossible to effectively defend one's rights against all these infringers. The most expeditious option would seem to be focusing on intermediaries, such as the platforms that offer infringing CAD files. That stated, the role of such intermediaries is likely to shrink as it becomes easier to create a CAD file of an existing work, for example by using 3D scanners. Though right holders have instruments available to combat infringement, the

saying 'prevention is better than cure' applies here too. Right holders are therefore advised to proactively manage their IP rights in order to prevent other parties from infringing on these rights. Although technology such as Digital Rights Management (DRM) could play a role, in the long run these types of solutions might turn out to be no more effective than the proverbial drop of water on a hot plate.

The most advisable option would seem to be to follow the music and film industries' lead and develop new business models, such as one that includes a customer-friendly platform that offers authorized CAD files for a reasonable price. Netflix, Spotify, and iTunes could serve as examples of such platforms.

c. Private copy exception

Generally speaking, copyright holders cannot take legal action against private individuals who utilize 3D printing for their own private use. European copyright legislation contains an exception or limitation for reproductions made by a natural person for private use and for non-commercial ends. This means that a private individual is allowed to 3D print a copyright protected work without first obtaining permission from the copyright holder. Furthermore, a private individual is allowed to obtain copyright protected CAD files without permission of the IP right holder. However, a recent judgment rendered by the European Court of Justice makes it clear that downloading CAD files from an illegal source is prohibited, even if the file is intended for private use. The answer to the question whether or not a commercial party printing upon a private individual's request can invoke the private copying exception, is somewhat ambiguous and may vary per country. As pointed out, the private individual is allowed to make a 3D print of a copyright protected work for private use and for non-commercial ends. However, a third party printing for a private individual typically is a commercial undertaking. Applying the existing legislation to this new reality seems to create a peculiar situation: a third party that operates commercially may produce a 3D printout of a copyright-protected physical object, but might not be allowed to create a digital object, like a CAD file, of that same physical object. European law requires member states who create a private copy exception, to also include a form of fair compensation for the income IP right holders lose as a result of the private copying exception. Regarding digital copies, the Dutch legislator has introduced private copying levies on empty data carriers, such as DVDs and hard disks. Despite this European requirement, no compensation has been built into the physical private copying exception – at least not yet. According to the Dutch legislature, incorporating a fair compensation was unnecessary, given the *"negligible interests and amounts"* involved. It has become obvious, however, that the emergence of 3D printing has made *"negligible interests and amounts"* a thing of the past. From a strict legal perspective, the legislator is required to adopt a compensation system for physical copies as well. However, it is difficult

to imagine how, as a practical matter, private copying compensation relating to 3D printing could be structured.

VII. The Digital Millennium Copyright Act (DMCA)

One of the earliest attempts made in the history of cyberspace to protect the interest of the copyright holders in the digital era can be traced to the enactment of DMCA by US. On October 12, 1998, the US Congress passed the Digital Millennium Copyright Act (DMCA), ending many months of turbulent negotiations regarding its provisions. The Act is designed to implement the treaties signed in December 1996 at the World Intellectual Property Organization (WIPO) Geneva conference[11] , but also contains additional provisions addressing related matters[12].

Some of the important features of the DMCA are as follows

a) Makes it a crime to circumvent anti-piracy measures built into most commercial software.[13]

b) Outlaws the manufacture, sale, or distribution of code-cracking devices used to illegally copy software[14].

c) Does permit the cracking of copyright protection devices, however, to conduct encryption research, assess product interoperability, and test computer security systems[15].

d) Provides exemptions from anti-circumvention provisions for non profit libraries, archives, and educational institutions under certain circumstances[16].

e) In general, limits Internet service providers from copyright infringement liability for simply transmitting information over the Internet[17].

f) Service providers, however, are expected to remove material from users' websites that appears to constitute copyright infringement.

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[11] WIPO has made two treaties for the protection of copyright holders - Two treaties were concluded in 1996 at the World Intellectual Property Organization (WIPO) in Geneva. One, the **WIPO Copyright Treaty (WCT)**, deals with protection for authors of literary and artistic works, such as writings and computer programs; original databases; musical works; audiovisual works; works of fine art and photographs. The other, the **WIPO Performances and Phonograms Treaty (WPPT)**, protects certain "related rights" (that is, rights related to copyright): in the WPPT, these are rights of performers and producers of phonograms.

[12] The UCLA Online Institute for Cyberspace Law and Policy, The Digital Millennium Copyright Act available at http://www.gseis.ucla.edu/iclp/dmca1.htm , visited 10 Jan 2005

[13] Sec.1201, Digital Millennium Copyright Act, 1998

[14]ibid

[15] Sec.1201(c)(1) , Digital Millennium Copyright Act, 1998 (Title I)

[16]Sec.1201(d), ibid

[17] Sec.1201(c)(2), Digital Millennium Copyright Act, 1998 (Title I)

g) Limits liability of non-profit institutions of higher education, when they serve as online service providers and under certain circumstances for copyright infringement by faculty members or graduate students[18].

h) Requires that "webcasters" pay licensing fees to record companies[19].

i) Requires that the Register of Copyrights, after consultation with relevant parties, submit to Congress recommendations regarding how to promote distance education through digital technologies while "maintaining an appropriate balance between the rights of copyright owners and the needs of users."[20]

j) States explicitly that "nothing in this section shall affect rights, remedies, limitations, or defences to copyright infringement, including fair use..."

VIII. Patent law in India and 3D Printer Technology

a. Direct infringement

Other than a copyright, a patent right can only come into existence through registration of the invention. By granting the inventor a temporary monopoly in exchange for a description of how to construct or achieve the invention, patents play an important role in catalyzing innovation. Naturally, 3D printed objects could be infringing on existing patents. This risk becomes even larger when printing for third parties. Again, it is therefore essential to have legally binding General Conditions and other contractual provisions in place, by means of which liability for infringement is shifted from the contractor to the assignor (the customer). Like copyright law, patent law also includes an exception for private use. Generally speaking, European patent law only offers patent holders protection against acts the infringing party commits "*in or for its business*". Case law shows that the word "*business*" is interpreted broadly; the organization need not be intended to generate profit or achieve commercial goals. This means that patent holders have no remedy with regard to 3D printouts of a patented product used for private, non-commercial purposes.

"It is therefore essential to have legally-binding General Conditions and other contractual provisions in place, by means of which liability for infringement is shifted from the contractor to the assignor."

Patent holders can, however, pursue a remedy against print shops that fill 3D printing orders, including those filled for private individuals.

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[18] Sec 512 (e) Title II of Digital Millennium C
opyright Act, 1998

[19] Title IV, Sec.112, Digital Millennium Copyright Act, 1998

[20] Title I, Sec.104, Digital Millennium Copyright Act, 1998

b. Indirect infringement

Two important issues concerned with patents and have created controversy over the cyberspace are software patents and business method patents. Sec.3 (k) of the Indian Patent Act, 1970 expressly excludes patenting of business methods and computer programs per se from the subject matter of patentability. Hence in India patents are not available to computer programs per se and business methods either in the real word or in the cyberspace. But countries like United States of America and Japan have already started granting patents for business methods and granting patents for computer software has become well established practice in these countries.

IX. Design rights and 3D Printer

a. Private use

Designs are not protected insofar as their appearance is solely determined by their technical function. Again, holders of design rights have no remedy against those who print their model "*for their private use and not for commercial purposes*". Neither the law nor the legislative history clarify the extent to which a print shop is permitted to make, at a private individual's request, a 3D printout of an object protected by design rights.

Design rights could potentially be the most useful intellectual property right for larger manufacturers to challenge commercial 3D printing of everyday objects. Whether the design rights are registered or unregistered, and valid, the manufacturing of a product incorporating the protected design will be illegal if done by third party for commercial purposes, even without intention and knowledge of the infringing behaviour. This right may therefore especially be useful in the pioneer years where high quality 3D printers are not yet affordable to the large public and where third parties make 3D prints upon the order of end-users. There will however be no design right infringement if the end-user makes the 3D print for personal and non-commercial use.

b. Indirect infringement

Design rights might not always offer a remedy against parties who supply infringing CAD files. The design rights legislation has not yet followed the patent law example of implementing an indirect infringement provision that would provide design right holders to

institute proceedings relating to infringing CAD files. For design rights holders it is therefore imperative to be able to invoke other IP rights, such as copyrights, as well.

X. Trademark law

Trademark law permits private individuals to make private use of 3D printouts of trademarked products, print outs of individual trademarks, or CAD files containing such material. Such printing for commercial purposes is prohibited. It could be contended that intermediaries such as online platforms that supply CAD files do not infringe on trademark rights because they do not use the mark themselves. Naturally, the interpretation would be different for intermediaries whose role goes beyond simply facilitating the exchange of CAD files.

In India, we do not have a specific legislation which prevents cyber squatting as in US, where cyber squatting is regulated by Anti-cyber squatting Consumer Protection Act, 1999. But the definition of "mark" and "trademark" given by Trademarks Act, 1999 under Sec.2 (1) (m) and Sec.2 (1) (z) are wide enough to cover the issues of domain name. It may be noted that a "mark" is used, rightly or wrongly, if it is used in printed or other visual representation as per Se.2 (2) (b). It cannot be doubted that a domain name corresponding a mark is definitely used both in the printed form (electronic form) and by the visual representation. Thus, the provisions of the Trademark Act, 1999 can be safely invoked to fix the liability in cases involving domain names.

X.I. Product liability

Existing legislation not always applicable

3D printing has the potential to turn the home printing consumer in to a semi-professional manufacturer. Many countries have adopted legislation imposing a strict liability regime on manufacturers. Product liability typically refers to a manufacturer or seller being held liable for placing a defective product into the hands of a consumer. All parties in the production and distribution chain that qualify as 'producer' can be liable without fault."This means it is essential for the parties involved to limit their risks as much as possible through contractual provisions."

For example, who should be considered the 'producer'? Will this be the supplier and/or manufacturer of the 3D printer, the CAD file designer, the producer of the raw materials, the print shop and/or the consumer who prints the object in question? The answer to these questions depends heavily on the circumstances and is therefore not always entirely clear.

Another question regards the extent to which the various parties bear responsibility. A product may in fact not be safe enough, and may therefore be defective, because the producer has failed to provide sufficient instructions for use or warnings of the risks associated with the use of the product. For example, A further question is whether CAD files fall within the scope of the product liability regime, which would entail the qualification of CAD files as products – a qualification regarding which no guidance has yet been provided.

The premise of the European directive upon which product liability is based seems irreconcilable with the new reality of 3D printing. The premise at that time was that only producers (manufacturers) could *"influence a product's quality"* and that manufacturers could factor the costs associated with increased product safety and higher insurance premiums into the price of the relevant products. A situation in which consumers would sell objects they have manufactured at home using a 3D printer, or which they would have a print shop manufacture the same way, is clearly different from the one on which that premise is based. Consequently, the question regarding the reasonable allocation of risks must be reconsidered.

Minimizing risks

Since it will be some time before new regulations are issued, the extent of the responsibilities and obligations the various 3D printing parties will bear will have to be determined by case law. This means it is essential for the parties involved to limit their risks as much as possible through contractual provisions. Commercial parties, however, cannot contractually exclude or restrict their liability to consumers, although such contractual exclusions or restrictions may indeed be possible under certain circumstances with regard to other professional parties.

Professional parties can limit certain risks by imposing conditions on consumers, such as the types and quality of the raw materials the latter must use. They can also impose detailed requirements on purchasers (and the purchasers' purchasers by means of a perpetual clause) with regard to the use, presentation and instructions that must be provided to the purchaser of the product. The many uncertain factors on which manufacturers have very limited influence and the potentially enormous risks currently have insurance companies scrambling to formulate appropriate terms and conditions. In any case, it is crucial that companies that use (or wish to use) 3D printers notify their insurers of this fact in order to ensure that they will have proper coverage for any possible cases that may arise in relation to those printers.

XI. Conclusion

Legal, economic and public policy should be undertaken to determine the extent to which intellectual property rights have to be protected in cyberspace. Appropriate modifications in existing intellectual property law have to be made and if necessary new legislations must be enacted to meet the challenges posed by this new technology. Internet being a borderless medium is responsible for the 'death of distance' among nations which has created international jurisdictional problems, international conventions/treaties seem to be more appropriate to protect and promote the interest of the cyberspace entities. Online 3D printing platforms are still a relatively small phenomenon and the intellectual property issues are limited but they will probably grow. At this stage, it may be prudent not to stifle innovation and penalise new technology by acting at the legislative level. Concrete recommendation can only be made after a comprehensive review of the impact made by 3D printing is undertaken. The issue is a cross-cutting one which impacts

not only design rules, but also patent, trade mark, and copyright laws. Thus, 3D printing should be assessed and examined across the intellectual property spectrum, taking into account the different product sectors affected by 3D printing.

Internet is software driven. Software enables the networking of computers and the actual transmission of data. Controversy as to whether computer software should be protected under copyright law or patent law is not yet resolved and still remains as an elusive concept for intellectual property lawyer.

The advent of 3D printing has blurred the traditional boundaries between 'producers' and 'consumers' and has given rise to liability issues for which the European product liability regime does not always provide solutions to India. Another warning for those interested in comparative exercises concernsthe law of the United States of America. It is heavily inûuence by thefact that much of its IP law is derived from its Constitution and its federalnature (although not all trademark, unfair competition or all copyrightissues are federal) and it differs in many respects from the laws of othercommon-law jurisdictions that had or have closer or more recent ties withthe UK, such as Australia and Canada whose federal constitutions did notcreate a similar diversity to another States.

The infringement of design rights through 3D printing moreover raises the issue of fair compensation. Allegedly, this compensation mechanism does not exist under design law, contrary to copyright law. However, it may be argued that 3D printers are new modes of copy of designs, which allow for unlimited unlawful copies to be made, and which make, as such, the introduction of a fair compensation mechanism into design law increasingly relevant.

With regard to intermediaries in the creation and dissemination process of 3D technology, the current e-commerce legal framework and the case law based thereupon seem to offer a legal basis for acting against them in case of indirect infringement arguments. The option of inserting a provision into design law, concerning 3D printing from unlawful sources could be explored.

The existing laws does not sufficiently indicate the extent, use and regulation of 3D printing in the replacement parts, customised goods and high-value small status goods sectors. As such, the current research provides an insight into the use, adoption and regulation of 3D printing in the selected industries whilst outlining the IP implications. The current laws and regulations address these issues and identify the issues that require additional attention. The emphasis will lie on the issues that arise from intellectual property law. Copyright law, patent law, design rights, and trademark law are then discussed, in that order. Paper aims to approach all of these issues from a practical point of view, what are the risks and how can one minimize these risks.

Suggestions

There is evidence that consumer orientated software tools will develop significantly in the coming years, through increased awareness by software vendors relating to design and personalisation demands. Consequently, the technical skill level of consumers will develop along with an increase in creativity driven through the resurgence of making 3D printed products within the home and community. 3D printing continues to grow, it is important

to address the intellectual property issues arising in this area. As such, it will be prudent to take steps to cultivate a climate better suited to tackle impending IP issues more successfully and in a manner, which takes into account the interests of all stakeholders.

There needs to be clearer guidance on defining whether a CAD file is capable of copyright protection. The territorial nature of copyright law, coupled with the exterritorial nature of online platforms and CAD files shared therein could lead to uncertainty and complex issues in the future.

It is recommended that the Indian Intellectual Property Office (IIPO) established by the government ,who create a Working Group to cover the various IP rights which may need to be tackled in the future. The Working Group should also provide clarity on the status of CAD files and how they can best be used in industry. The Group should also consider how best to tackle the traceability of 3D printed spare parts. As mentioned above, 65% of users engaged in the activities of 3D printing on online platforms do not license their work, leaving their creations vulnerable and open to infringement whilst losing the ability to claim authorship.

It is recommended that online platforms provide more awareness and understanding of the different types of licences. This can be achieved by explaining the nuances relating to each licence in clear and simple language, rather than simply 'encouraging' the user to adopt a particular type of licence. Furthermore, online platforms can assign the most appropriate licence as a default with 'opt-out' as an option. As online platforms and use numbers continue to grow it is recommended that spin-offs and by-products offered by the online platforms be monitored.

One recommendation for industry would be to adopt secure streaming of 3D CAD files via an Application Programming Interface (API) thereby embracing a 'pay-per-print' business model, opening up doors to a range of outlets selling 3D CAD files. This will avoid locking the manufacturer into an agreement through a system such as a 'one-stop-shop' for (spare) parts. Although a one-stop-shop may take away the costs of manufacture, transportation and storage whilst reducing potential infringement of IP laws, it can lead to a monopoly-situation, which should be avoided. It is recommended that the automotive industry give consideration to

the traceability of 3D printed spare parts, particularly in relation to the safety and usability of the spare part.

Finally, this paper suggests modifications to be made towards traditional sales models, the Repair-Reconstruction Doctrine, the implementation of the DMCA protections, and our application of the Fair Use Doctrine