Chris McKinley; 3D Printing and Patents; IP Theory Fall 2014; Professor David Friedman

**Introduction**

3D printing is to patents what Napster was to copyrights. Several practitioners and scholars agree that this simple analogy outlines the impact that the proliferation of 3D printing devices will have on the patents of tangible goods. (Citation). The basic, generally accepted argument provides that: (1) a copyright prohibits copying creative works; (2) formerly, copyright holders were primarily concerned with copying by manufacturers since they alone had the resources to copy on a large scale and policing small-scale copying was cost prohibitive; (3) the creation of digital media and the widespread use of peer-to-peer file sharing programs such as Napster transferred the power of copying into the hands of the individual; (4) the newly formed ability to copy digital media in the home weakened the strength of copyrights and was detrimental to the entertainment and media industries because enforcement on all infringers was impossible; and (5) patents of tangible goods will be weakened in like manner as the use of 3D printers grows since the bulk of manufacturing will occur in the home, making enforcement on the infringer impossible. (Citation).

As with other technologies, however, advancements in 3D printing occur incrementally such that broad based home use is not an imminent concern in the immediate future. Recall that in the media context, VCR and tape recorders existed long before the advent of digital media and file sharing programs, but those technologies did not impact copyright in the same way as future technologic developments. (Citation). This difference can be attributed to the quality of the copied product through different mediums, wherein VCR and tape recorders, although capable of copying, did not product the same quality product as did the copying of digital media. (Citation).

With 3D printing, the same gap in product quality exist that makes broad home-use copying unlikely, at least in the immediate future. The reason for this is that current home-use 3D printers have a limited printing capacity and can therefore print only small plastic items. And although this is useful, more complex or finely detailed items are still only printable by small firms or larger manufacturers using more advanced printers, not modified for broad based home-use. So if a person wants to avoid buying an item already produced by a large manufacturer or wishes simply to produce something more complex than his own 3D printer has the capacity for, he can contact a small firm to perform the manufacturing job that the home-use printer cannot. According to this model, one can imagine small 3D print shops arising that are capable of printing custom items for the designer incapable of manufacturing the item themselves. This model presents interesting legal issues with regard to direct and indirect infringement. (citation). This article seeks to explore those legal issues in the interim period between now, when complex items can only be printed by small firms, serious hobbyists, or established manufactures, and later, when more sophisticated 3D printers are available for broad based, in-home use.

This article will therefore examine the history of copyrights in the digital age and the manner in which peer-to-peer filing sharing weakened copyrights and impacted the entertainment industry generally. It will then describe 3D printing, its mechanics, and some of the challenges present with enforcement in the changing landscape; then analyze what the landscape of patents will look like in the interim period described above and beyond. It concludes by examining what patent holders can do to prevent the weakening of patents, as was the case with copyrights during the early adoption of digital media, and discussing whether those measures will be effective moving forward.

**Napster and such**

**RIAA Lawsuit Campaign**

**Why was the lawsuit campaign ineffective?**

 Consider why the individual illegally downloads copyrighted media in the first place. The answer seems simple: the cost of buying a song, album, or movie exceeds the cost of downloading the same from a file sharing website. Where costs are purely economic, few would argue with this logic. In fact, it makes economic sense to do so as it achieves a more efficient result for the individual. However, rarely is there ever a system wherein costs are purely economic. Examining how additional, noneconomic costs factor into the transaction gives further detail on why individual downloads content illegally and why the lawsuit campaign failed. In his article, *3-D Printing You Way Down the Garden Path: 3-D Printers, the Copyrightization of Patens, and a Method for Manufactures to Avoid the Entertainment’s Industry’s Fate*, Joseph C. Storch argues that, in addition to economic costs, an individual’s decision to download copyrighted media includes consideration of legal and moral costs.

The legal cost was essentially zero since, at Napster’s inception, most users were largely unaware that their conduct constituted a violation of copyright. Indeed, consideration afforded to what liability will result from a violation of the law is nonexistent when the bad actor does not know that his conduct is subjecting him to legal liability. Once awareness of illegality grew, that calculus changed as will be discussed. The moral cost was, ethically, the weight ascribed to the act of downloading otherwise purchasable music for free by the individual. People were concerned about denying the artist benefits otherwise gleaned from a legal purchase. Varying of course from person to person based on their individual beliefs, the identification of such conduct as a wrongdoing increased as awareness of the act’s illegality increased. Prior to the RIAA’s implementation of the lawsuit campaign, these costs were, according to Storch, unascertainable yet substantial enough to give pause to the prospective user of a file-sharing program. However, this paradigm shifted when lawsuits were filed in large number since introduction of the lawsuit campaign changed the issue from a moral question to an economic one.

Strorch explains this result by analogizing it to a study performed by behavioral economists Uri Gneezy and Aldo Rustichini, wherein the classical deterrence theory was shown to be ineffective when a singular moral issue is given a price. There, Gneezy and Rustichini observed a daycare facility that had the problem of parents picking their children up late. When the parents were late, the daycare workers were forced to stay late and provide extra care. Originally, there was no penalty for this, but parents rarely arrived late. The researchers reasoned that parents felt bad about requiring the daycare worker to provide unpaid, extra care for their children. This was the moral cost that, by itself, was sufficient to prevent widespread late arrivals. Per the study, the daycare was split up and a fine was introduced on one half of the daycare (“fine group”) requiring parents to pay a late fee. The other half continued to have no late fee (“control group”). The study found that late arrivals increased dramatically after the fine was introduced in the fine group and that the rate of late arrivals in the control group remained the same. This result was counter to the deterrence theory as a means of behavior modification which generally provides that punishment, or the threat thereof, deters future unwanted conduct. Gneezy and Rustichini reason that the result occurred because the moral question – “Should or should I not take advantage of the daycare worker?” – changed into a purely economic one – “Should I show up on time or pay the fine?” The fine therefore had the effect of quantifying the parent’s tardiness, and, with that information in hand, parents were able to weigh the financial cost of being late. The study also suggests that the moral question weighs more heavily on the individual when no known value can be ascribed to it. Prior to the fine, the parents asked themselves, “How bad is it to show up late and make the daycare worker provide extra care to my child?” Not knowing the correct answer, they assumed it bad enough that they would show up on time. But when the fine was introduced, parent knew that showing up late was only ten dollars bad, or whatever the small fee was. From then on, that value entered into their individual cost-benefit analysis.

Storch argues that the RIAA campaign worked in like manner. He contends that the moral question of whether to participate in the file sharing of copyrighted media was strong enough on its own to quell widespread use; that the lawsuit campaign set a price, (Cite: Eventually the price settled at around $3,000 to $4,000 through pre-litigation settlement offers. This price coupled with the near zero probability that the file sharer would actually be caught participating, made the cost to file share extremely low; almost zero.), on the act of illegally downloading copyrighted media; and because that the price was less than the cost of acquiring media legally, the use of file sharing programs to illegally download copyrighted media increased.

In my view, the more likely reasons for the lawsuit campaign’s failure is that the technology was just too good, too easy use, and too difficult to detect for any deterrence mechanism to stop its natural progression. It was really quite extraordinary. Music was digitized and the MP3 format allowed for high quality copies of music; dial-up was abandoned in favor of broadband which increased bandwidth and transfer speeds; and file sharing programs made it easy to download a library of music at no cost within a few hours. The confluence of these factors created a freight train that was impossible to stop. Further, there were, and still are, technological and administrative limits on enforcement that make the threat of being caught illegally downloading copyrighted media too low to register as a substantial cost. The lawsuit campaign was a failed effort to chase a runaway train. Had the RIAA done nothing, the train would have still powered along the tracks of technological progress.

Just as it ever was (pre-lawsuit campaign), file sharing is essentially cost free. What remains, then, is a moral question, i.e., a moral cost that must be considered. Few people today are unaware that file-sharing copyrighted media is illegal, but many continue to participate in the activity. Others do not. For those that do not, the moral cost is experienced in an individual’s conscience. Generally, a person will not participate in an act that they believe to be wrong regardless of whether there are no economic costs of doing so. In this way, it can be seen that, contrary to Storch’s argument, the moral question still remains even after the lawsuit campaign’s failure.

[Think of other ways to distinguish the daycare study from file sharers of copyrighted material.]

Whatever the reason for its failure, the RIAA’s lawsuit campaign remained largely ineffective in preventing widespread, illegal downloading of copyrighted media. Not only that, the lawsuit campaign was detrimental to the public’s perception of the entertainment industry in general. For one, because enforcement on all was an impossibility, only a select few were subject to lawsuits. (Cite to how many lawsuits were filed compared to the estimated number of users; discuss how even after the RIAA targeted universities, the number of file sharing was large by comparison). Consequently, a feeling among the public developed that the defendants were being arbitrarily singled out. Other concerns arose when some defendants litigated their cases to a verdict. Judgments in those cases were steep, (cite to large judgments) and the public took notice. And although it is probably true that such judgments had some deterrent effect, a growing disdain for the entertainment industry grew as the penalty for file sharing appeared disproportional compared to the harm done through illegal file-sharing. (CITE to judgments against low income families, and parents whose children downloaded copyrighted media). Furthermore, artists were propped up as being denied benefits owed to them through the legal purchase of media, but they received no part of the revenue generated from the lawsuit campaign. (Cite to artist’s unsuccessful attempts to get part of the money recovered from the lawsuit campaign). To avoid these pitfalls, patent holders should be careful to not follow the same path as the entertainment industry lest they be subject to similar public perception woes.

Joseph C. Storch, *3-D Printing Your Way Down the Garden Path: 3-D Printers, the Copyrightization of Patents, and A Method for Manufacturers to Avoid the Entertainment Industry's Fate*, 3 NYU J. Intell. Prop. & Ent. L. 249, 263 (2014).

Uri Gneezy et al, *A Fine Is A Price*, 29 J. Legal Stud. 1 (2000).

**Before Napster**

 Before the advent of digital media and file sharing programs such as Napster, methods of copying media already existed. Videocassette recorders (VCR) could make copies of video displayed on television, and tape recorders could make copies of audio broadcasted on the radio or from a cassette tape. In hindsight, it can be seen that these inventions, though valuable as personal copiers, did not impact the entertainment industry like subsequent file sharing programs. However, when they were introduced to the market, the industry thought otherwise.

Fearing that the VCR would signal the death knell for video sales, the entertainment industry responded by attempting to ban its introduction into the market by suing VCR makers for contributory copyright infringement. When contributory copyright infringement is alleged on the sale of a commercial item, the plaintiff must show that “the defendant sold equipment with constructive knowledge of the fact that their customers may use that equipment to make unauthorized copies of copyrighted material;” however, if the item is a staple article of commerce – an item having substantial non-infringing uses – the plaintiff is barred from recovery. Sony Corp. of Am. v. Universal City Studios, Inc., 464 U.S. 417, 439-41 (1984). In the seminal case Sony v. Universal, Universal brought suit against Sony claiming that the sale of Sony’s VCRs constituted contributory infringement since customers would use VCRs to make copies of copyrighted movies, shows, and videos broadcasted on television. Much like the file sharing scenario, studios feared that people would opt to create a library of recorded movies instead of buying them retail. There, the court held that Sony was not a contributory infringer since the VCR had substantial non-infringing uses, i.e., performing authorized recordings, time shifting, and playing purchased video cassettes. From this, it can be seen that the entertainment industry has maintained a constant vigilance with regard to emerging technologies and the manner in which they disrupt the existing construct. But again, as with other efforts to stay the progress of new tech, the legal solution proved ineffective.

Also, the studios lagged behind in making motion pictures for sale on videocassette. That is, if a person wanted a movie on tape, they had to record it from the television since they could not buy the same in a store. The demand for movies on tape was being met by the VCR and, still, the movie industry’s prediction that people would hurry to create their own libraries proved wrong. “[T]his technology did not tumble the walls of intellectual property law, at least in part because copies usually had poor (and increasingly diminishing) quality, it was time and work intensive (copying required physical effort and was not instantaneous), required purchase of blank media, and there was [little] economic reward to be reaped by selling or giving away such tapes.” Joseph C. Storch, *3-D Printing Your Way Down the Garden Path: 3-D Printers, the Copyrightization of Patents, and A Method for Manufacturers to Avoid the Entertainment Industry's Fate*, 3 NYU J. Intell. Prop. & Ent. L. 249, 257 (2014). After Sony v. Universal, studios accelerated their efforts to bring motion pictures from the screen into the home by making, distributing, and selling movies on VHS tape. When faced then with the decision to buy a high quality VHS tape of their favorite film or record a poor quality version, consumers frequently choose the former. So much so that what resulted was the creation of an entirely new medium for viewing cinema favorites and a healthy revenue stream to boot. U.S. Supreme Court Decides Universal v. Sony, as VCR Usage Takes Off, http://www.history.com/this-day-in-history/us-supreme-court-decides-universal-v-sony-as-vcr-usage-takes-off (last visited Oct. 18, 2014).

**3D Printing**

 3D printing (also known as additive printing) is a manufacturing process that forms three dimensional objects from digital files. What is 3D printing?, http://3dprinting.com/what-is-3d-printing (last visited Oct. 18, 2014). Objects are formed thorough the additive process, wherein successive layers of material are laid down in order to form the desired shape. Each layer “can be seen as a thinly sliced horizontal cross-section of the eventual object.” What is 3D printing?, http://3dprinting.com/what-is-3d-printing (last visited Oct. 18, 2014).

 There are different methods by which printers lay down layers or slices of material to form the object. The first method, developed in 1986, used a process known as stereolithography, wherein light sensitive plastic in liquid form was dispensed and immediately cured with ultraviolet light, thereby hardening the material and setting the layers in place. Other methods include laser sintering, where a laser is applied to metal, glass, plastic, or ceramic powders to form a solid structure through the process of sintering. (CITE: explain sintering). Fused deposition modeling (“FDM”) is another method that uses a heated nozzle to extrude plastics that subsequently set as they cool. Regardless of the method employed, the layer forming step is repeated until the object is fully formed, but not all methods are created equally. FDM most commonly employed in small 3D printers used by hobbyist and the like that are available for purchase for around $1,000. (On October 18, 2014, a quick search on amazon.com revealed low-end extrusion printers priced between $600 and $1,350. Amazon, http://www.amazon.com/FlashForge-Structure-Optimized-Platform-Extruder/dp/B00I8NM6JO/ref=sr\_1\_1?ie=UTF8&qid=1413683051&sr=8-1&keywords=3d+printer.) “More capable 3D printers cost tens of thousands of dollars, and big industrial systems, like the laser-sintering machines capable of printing aerospace parts in titanium, cost as much as $1m.” How 3D Printers Work, http://www.economist.com/news/technology-quarterly/21584449-how-3d-printers-work (last visited Oct. 18, 2014).

**Is the Home 3D Printer More Like a VCR or Napster?**

 So with the ever increasing availability of 3D printing from home, there looms a threat that manufacturing will become decentralized, causing rampant patent infringement by the home user. Not so fast. Due consideration should be giving to whether the burgeoning 3D printing technology is more analogous to the VCR, which could not create high quality duplicates, or peer-to-peer file sharing programs, which were able to reproduce high quality MP3s. Recall, that the VCR’s (and the tape recorder) recording capacity resulted in products of lesser quality than studio produced ones which is believed to be the reason for its inability to have the same effect as Napster decades later.

As of October 2014, most 3D printing home printers suffer from several limitations, many of which are drawn towards build quality. Nick Allen, Why 3D Printing Is Overhyped (I Should Know, I Do it For a Living), http://gizmodo.com/why-3d-printing-is-overhyped-i-should-know-i-do-it-fo-508176750 (last visited Oct. 18, 2014). For one, printed objects “are not as strong as their traditionally-manufactured” counterparts. The reason for this is because the creation of several layers forms bonding points where each layer connects together. Such bonds are more inclined to fail when select forces are applied unlike an item formed by a traditional injection molding method where no bonds are present. This is certainly relevant when considering that many printed objects are intended to undergo stress when used in operation and are not merely ornamental. Another limitation is that the home 3D printer can print only plastic items, which limits substantially its utility as a stand-alone manufacturing apparatus. There is limited use for only plastic items. Indeed, most manufactured items include some blend or combination of materials, e.g., plastic and metal. This, of course, does not mean that there is no use for solely plastic items. Plastic items can be used on their own or combined with other parts to form more complex pieces, but that simply adds to production process, which is counter to the “easy” home 3D printing model. One veteran 3D printer notes that the idea of acquiring a CAD file to perform the print is not as easy as it seems since most people do not know how to create their own and CAD file sharing sites include several unprintable designs. Also, finished products have unsightly surface finishes on their exterior that include seams separating the layers of material previously laid down. Additionally, 3D printing is both costly, as the raw material used to build printed objects can be expensive, and timely, as printing even simple items can take hours or even days.

Each of the abovementioned limitations are likely to be remedied at some point in the future so long as human ingenuity is applied to seek out a solution. This means that there will likely be a 3D home printer capable of creating high quality products in like manner to traditional manufacturing methods, but today is not that time. Still, consideration should be given to the legal issues and possible solutions that exist in the interim, when 3D home printing is more like the VCR, and thereafter, when it is more akin to file sharing.

**The Intermediary Print Shop and the Online Forum: Shapeways and Thingiverse**

**Shapeways efforts to avoid liability**

Shapeways’ terms and conditions require the user to indemnify Shapeways for any liability resulting from an infringement action. This is only a partial solution since it ignores the fact that the patent holder already looked over the user when identifying which actor in the supply chain to sue. The strength of an indemnification clause is primarily a function of how well equipped an indemnifier is to secure the actor against liability. Indeed, the end user is an undesirable target of litigation by the patent holder since they are likely judgment proof – they do not have the resources to pay awarded damages. The patent holder is not privy to any agreement between Shapeways and the user; thus, Shapeways is still exposing themselves to liability by printing, i.e., making, a patented product. Regardless of the terms of the agreement between Shapeways and the user, Shapeways will have infringement judgments levied against them. That the user, then, has agreed to indemnify Shapeways is of little importance in light of the fact that most users are judgment proof.

http://www.shapeways.com/terms\_and\_conditions; http://www.daviddfriedman.com/Academic/Course\_Pages/IP\_Theory\_13/Papers2Discuss/Figel\_3D\_printing.htm#\_ednref27

**DMCA like rules provide no added benefit**

The Digital Millennium Copyright Act (DMCA) accomplishes two tasks. First, it provides copyright holders with an easy way to remove allegedly infringing material from hosting websites, and, second, it creates a safe harbor for host websites that comply with its provisions. The latter task can be explained by understanding how host websites were exposed to liability prior to the DMCA’s enactment.

Formerly, when a user uploaded copyrighted material to a website, the host would be subject to copyright infringement liability since the act would constitute reproduction of a copyrighted work. (Copyright Act citation). Because the host merely provided a forum or platform through which the work could be distributed, they could not avail themselves to a primary defense to copyright infringement – independent creation. That defense allows the accused to avoid liability by arguing that the alleged infringing work was not a copy of the protected work; rather, it was created independently from the copyrighted work. However, the host website could not argue independent creation since, by simply providing a forum or platform for exposure, the host did not create anything. The DMCA therefore stepped in to provide the host with a safe harbor, allowing for the avoidance of liability so long as the host complies with the provisions of the act. They require the host to remove allegedly infringing content upon receipt of a notice from the copyright holder. (Cite to DMCA). Of note, is that the host cannot access the safe harbor and therefore avoid liability if he knows that the infringing work is copyrighted. In this way, the DMCA limits the liability of the hosting website.

In contrast to copyright, under patent law, the host of a file sharing website like Thingiverse is not liable for direct infringement since, by acting as a passive host for content and allowing CAD files of patented products to be uploaded, the host is not making, using, offering to sell, selling, or importing the patented work into the United States. (35 USC 271(a)). The patent of a tangible products protects a physical embodiment of an idea, not the CAD file representing its form. As such, no DMCA-like law is required to limit liability to host websites from claims of direct infringement.

Further, claims of indirect infringement are likewise inapplicable since they have a knowledge requisite. This means that the host will only be liable for indirect (contributory or inducement) when the patentee can show that the host knew that the: (1) CAD files depicted a patented product; and (2) resulting use by another would be infringing. Aro Mfr. Co. v. Convertible Topo Replacement Co., 377 US. 476, 488 (1964) (“271(c) does require a showing that the alleged contributory infringer know that the combination for which his component was especially designed was both patented and infringing.”). Thus, when websites such as Thingiverse play the role of passive host and allow users to upload content onto their website, they lack the requisite knowledge required for an indirect infringement action. Thingiverse and other similar websites further sure up their position as passive actors by requiring the user to warrant that the content that they upload is done so legally and does not infringe on another’s intellectual property rights. (Thingiverse Terms and Conditions).

Typically, in practice, a patentee will send hosting websites demand letters informing the host of their patent and providing them with notice of their potential liability for indirect infringement. With this letter in hand, it can no longer be said that the host has no knowledge of the underlying patent, but a demand letter is not per se evidence of knowledge that the alleged use is infringing. Thus, upon receipt of a demand letter, it is standard practice for the host to seek the advice of counsel regarding the merits of the claim in the form of an opinion letter. Although opinion letters are not required, they go a far in the way of showing that the accused did not knowingly contribute to another’s infringing act or induce another to infringe. This generalized practice demonstrates that, in the patent context, a notice-and-takedown procedure already exists; thus, the value of a DMCA-like law with regard to host websites appears to be low, if any value exists at all.

http://www.daviddfriedman.com/Academic/Course\_Pages/IP\_Theory\_13/Papers2Discuss/Figel\_3D\_printing.htm#\_ednref27

**DRM would be ineffective or overly burdensome**

 Digital Rights Management (DRM) software is a tool used by the original producers of a work to control the manner in which the digital work is subsequently handled after purchase. In the most common case, an audio or video file purchased online from an authorized seller will be limited to a certain number of downloads on certain devices. After excess downloads, the file will not be readable on the desired medium and therefore not play. The effectiveness of this approach is largely a function of whether the digital work is sourced from an authorized seller or not. This is evidenced by the fact that a user can download songs from an unauthorized source or independently create a copyrighted work and not be subject to the constraints of DRM software. This limitation makes the analogous use of a DRM-like protection in the patent context insufficient.

 Scholars have suggested that a DRM-like protection on CAD files would prevent infringing 3D printing. The software would prevent printers from printing CAD files representing patented products lacking sufficient authorization. The technology already exists as evidenced by a patent issued to Inventive Controls in 2012. The problem with this approach is that it suffers from the same deficiencies as DRM protected media in that, unless the file is sourced from an authorized seller or producer, it will not prohibit the printing of independently created files or files acquired from another non-authorized party.

Some suggests that the only way for DRM-like protections to truly be effective is to prohibit 3D printers from printing ***any*** non-authorized work. This example of “reduction to the extreme” illustrates how inadequate a DRM-like approach is in the 3D printing context. Such an approach would severely limit future home use printing as it would curtail the ability of an individual from printing items designed by themselves (whether infringing or non-infringing), and thus be overly burdensome to the burgeoning 3D printing industry. Indeed, the driving force behind 3D printing is to allow individual creativity to manifest itself in tangible products, not otherwise possible through traditional measures. As such, the DRM-like solution either does too little or too much, if reduced to its extreme.

Although this technology does not yet exist, consider what would result if 3D printers had the ability to recognize CAD files as depicting patented products, and refused to print such a design on that basis. This, of course, is not currently possible since DRM software is file specific; that is, it simply checks to see if the file has proper authorization to proceed. It cannot, however, determine whether or not a CAD files will produce an infringing product. The difficulties of identifying whether a product is an infringing one is clear to anyone who practices patent litigation or who is merely an observer of how long patent disputes take to resolve. Patent validity, claim construction, and the ultimate determination of infringement are often complex and require careful consideration and argument to reach a result. (Cite on the complexity of patent litigation.) And even then, different courts presented with the same evidence can disagree as to the ultimate finding of infringement. (Cite to statistics how often appellate courts, under de novo review, overturn the trial court’s ruling in patent infringement cases). Determining whether a printed product infringes on a patent is far more complex than identifying whether a file has adequate authorizations. If ever the technology to accomplish such a task – determining infringement – becomes sufficiently sophisticated, thousands of patent lawyers can start looking for new jobs since they will no longer be needed.

http://www.daviddfriedman.com/Academic/Course\_Pages/IP\_Theory\_13/Papers2Discuss/Figel\_3D\_printing.htm#\_ednref27

**The Innocent Infringer Exception**

 Another suggested solution to the problem home 3D printer users will face in the years ahead will be to construct an innocent infringer exception that prevents them from being exposed to potential liability. Under this approach, home use of 3D printers to make patented items does not constitute infringement so long as the item is not being made for a commercial purpose. Also, the exception does not apply if the home user knows that the printed item is patented. As previously stated, claims of direct patent infringement have no knowledge requisite. This means that ordinarily, for direct infringement, the accused infringer’s knowledge or ignorance about the printed item being patented is immaterial to the determination of liability. (CITE: However, willful infringement carries a penalty of up to three times the damages otherwise awarded for infringement, i.e., the sum of reasonable royalty and lost profits). However, here, the knowledge requisite would step in to create a safe harbor for otherwise infringing home use. There are three main issues to this approach.

 First, “commercial purpose” is undefined. An argument can certainly be made that the home user who prints a tool or a replacement part does so in order to avoid going to the store and buying the same. They would essentially be removing themselves from the market in order to save on purchasing costs. This circumstance, although in an entirely different field, is similar to the wheat farmer whose stored grain was held to have a substantial effect on interstate commerce. (Cite: In *Wickard*, the defendant was prohibited from growing and storing grains on his farm for personal use because it had a substantial effect on interstate commerce. The court held that the collective effect of others performing the defendant’s conduct impacted the national price of grain by withdrawing grain from the marketplace. Therefore, Congress has the authority to regulate non-economic personal conduct when it has a substantial effect on interstate commerce).

 Second, “knowledge” is satisfied when a defendant copies an item without finding out whether or not it is patented.

 Lastly, for the reasons explained above, home users are already unlikely targets for these lawsuits as they do not make economic sense. That is, they are too costly and, because damage awards are so small, they will not act as an effective for other infringers. As such, so long as the home user limits the manufacture and use of patented items to small numbers within the home, he is already adequately protected from liability.

Figel, *3-D Printing*, (Oct. 4, 2014) http://www.daviddfriedman.com/Academic/Course\_Pages/IP\_Theory\_13/Papers2Discuss/Figel\_3D\_printing.htm#\_ednref27

**Lawsuit Campaign by Patent Holders**

Any lawsuit campaign will be ineffective in the patent context since it does not make financial sense. Notwithstanding the fact that a lawsuit campaign would be largely ineffective because it would not achieve its intended deterrent effect, damage awards in patent infringement cases are quite different from those awarded in copyright. Copyright violations carry penalties of statutory damages that can prove costly in the aggregate. (17 U.S.C. §§ 504-05. “In general, anyone found liable for civil copyright infringement may be ordered to pay either actual damages or ‘statutory’ damages affixed at not less than $750 and not more than $30,000 per work infringed. For ‘willful’ infringement, a court may award up to $150,000 per work infringed. A court can, in its discretion, also assess costs and attorneys' fees. Willful copyright infringement can also result in criminal penalties, including imprisonment of up to five years and fines of up to $250,000 per offense.” Summary of Civil and Criminal Penalties for Violation of Federal Copyright Laws, http://www.bloomu.edu/technology/copyright\_penalties (last visited Oct. 18, 2014). (While it is true that the entertainment industry did not likely consider the lawsuit campaign an efficient way to recover losses from illegal file sharing, they at least saw it as a reasonable deterrent mechanism since the potential damages could be so high. There, damages were awarded on a per work basis, meaning that if a person downloaded 15 songs, each download was the basis for both statutory and willful infringement penalties. Those same songs being uploaded by others using he program constituted infringing acts as well. Thus, it is easy to see why damage awards in this context were potentially steep. The same is not true of damages in the patent infringement context as will be discussed.). However, in a patent infringement suit, the patentee can recover only a few types of damages – a reasonable royalty, lost profits, treble damages, and attorney’s fees. Attorney’s fees are rarely awarded and only in exceptional cases. (CITE, Octane/Highmark). Treble damages are awarded when there is a finding of willful infringement, which seldomly occurs. (CITE, *In re Seagate Tech*, 497 F.3d 1360, 1371 (Fed. Cir. 2007) (“To establish willful infringement, a patentee must prove by clear and convincing evidence that the infringer acted despite an objectively high likelihood that its actions constituted infringement of a valid patent . . . [and] that this objectively defined risk was either known or so obvious that it should have been known to the accused infringer.”) The most common case is where the accused is unaware that the technology being used is patented. Here, the patentee can recover at least a reasonable royalty, which is an amount that the parties would have agreed to had they entered into a licensing agreement prior to the defendant’s infringing use. Lost profits represent the amount of money lost because of the infringement. They are not often granted since the patent must show the absence of non-infringing alternatives in order to prove that absent the infringement, the patentee would have made a profit.

Now consider whether these damages will be awarded to a patentee seeking to recover from the individual, home user. Assume that the home user designs and prints a reusable coffee cup and lid. Turns out the cup and lid are patented, the patentee sells set (cup and lid) directly for twenty dollars, and that patentee sues the home user for infringement. What can the patentee recover? Well, attorney’s fees and treble damages are out of the question since this is not an exceptional case (it is rather ordinary) and the infringement was not willful as the home owner designed the cup and lid himself. The patentee would have difficulty proving lost profits since there are several non-infringing reusable coffee cups and lids available at retail stores that the home owner could have purchased instead of making one for himself. What remains then is a reasonable royalty which we can assume is less than the twenty dollars that the patentee sells the set for. Indeed, the license to make the cup is certainly something less than the cost to purchase the fully assembled. Making the cup has a cost to the home user, e.g., the cost of electricity to run the computer and printer, and the cost of plastic material used in printing. The home user’s manufacturing costs will therefore include the licensing fee, but that fee cannot make the manufacturing cost exceed the cost of buying the set outright. If it did, the home user would buy the set instead of making it. In the end, the patentee is entitled to a reasonable royalty which is something less than twenty dollars. Even if the homeowner made 100 sets, a reasonable royalty would still be something less than $2,000 ($20 x 100 sets). And because the transactions cost associated with a patent infringement suit are so high, Kimberly A. Moore, *Empirical Statistics on Willful Patent Infringement*, 14 Fed. Circuit B.J. 227 (2004) (“[P]atent litigation is an expensive endeavor with median litigation fees of two million dollars per side for a patent case that goes to trial.”), it makes no economic sense to see a case against a home user through trial.

Injunctive relief is no different in the home use context. The most sought after relief in a patent suit is an injunction. This is largely used as a bargaining tool to force accused infringers to enter into licensing agreement for continued use of the patented technology. This is true because, often times, a patented technology is incorporated into a product in such a way as to make removal of said technology impractical. Thus, an injunction enjoining the defendant from using the patented technology results in the prohibited use of the entire product. This has a potential damaging effect. (CITE: NTP v. BlackBerry; but see eBay Inc. v. MercExchange, L.LC., 547 U.S. 388 (2006)). So does it make sense for patent holders to enjoin home users from printing their patented product? Not likely, especially if the patentee is printing only a few items for their own personal use. There, the patentee will not be interested in recovering modest licensing fees from home users since the transactional cost will likely exceed any revenue received therefrom. An injunction would only be a desirable outcome for those infringers whose enjoined production creates for them an incentive to enter into a licensing agreement with the patentee. These are the infringers who are active in the market and seek continued use of the patented technology, i.e., large enough to mass produce and sell the product. It is only here that the injunction would serve its intended purpose. Accordingly, even an injunction is of little value when the accused infringer is of the personal-use, home variety.

 This demonstrates that the effectiveness of a lawsuit campaign in the patent context is extraordinarily low. Patentees should therefore look to other solutions to protect against widespread infringement by home users.

Joseph C. Storch, *3-D Printing Your Way Down the Garden Path: 3-D Printers, the Copyrightization of Patents, and A Method for Manufacturers to Avoid the Entertainment Industry's Fate*, 3 NYU J. Intell. Prop. & Ent. L. 249 (2014).

Uri Gneezy et al., *A Fine Is A Price*, 29 J. Legal Stud. 1 (2000).

**There is No Ideal Legal Response, Only the Market.**

The model already exists. Lego, for example,

**Conclusion**