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REVERSE ENGINEERING: RECONCILING TRADE SECRET LAW WITH 3D PRINTING AND SCANNING

❖ NOTE ❖

Prateek Viswanathan *

I. INTRODUCTION

Trade secret laws are unprepared for 3D printing and scanning's effect on reverse engineering. These laws give inventors a cause of action if another party misappropriates their trade secret.[1] However, these inventors cannot prevent competitors from reverse engineering and using their trade secrets.[2] Reverse engineering, the study of a product to discover its trade secret, benefits society by advancing innovation and reducing prices, but does not prevent the first inventor from recouping R&D expenses before facing competition, because it costs time and money.[3] However, if reverse engineering becomes too cheap, it may cause market destructive effects; Inventors cannot rely on such trade secrecy protection,[4] and would incur societal costs by submitting too many patent applications or implementing costly reverse engineering countermeasures.[5] 3D printing and scanning can cheapen reverse engineering and

1. *See* Defend Trade Secrets Act, 18 U.S.C. Section 1832.; *See also* UNIF. TRADE SECRETS ACT (UNIF. LAW COMM'N 1985); *See also* Economic Espionage Act, Section 1, 18 U.S.C. Section 1831; *See also* Restatement Third of Unfair Competition, Chapter 4, Appropriation of Trade Values.

2. *See* 765 ICLS 1065/2 (a)-(d). The Illinois trade secret statute finds that reverse engineering is a proper means of appropriation.

3. *See* RICHARD A. POSNER & WILLIAM M. LANDES, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 365 (2003).

4. *See* Samuelson & Schotchmer, *The Law and Economics of Reverse Engineering*, YALE LAW JOURNAL, 1595 (2002.) (providing a full treatment of reverse engineering's law and economics circa 2002.)

5. *See* POSNER, *supra* note 3; Samuelson, *supra* note 4 (providing a full treatment of reverse engineering's law and economics circa 2002.).

*J.D. Candidate, Class of 2021, University of Illinois College of Law.

undermine trade secrecy laws in multiple industries. This method duplicates engines and medical devices in weeks,[6] but can duplicate even food compositions or circuit boards.[7]

This Note proposes requiring competitors to sell original products if they reverse engineer competing products with 3D scanning and printing. This proposal would mitigate market destructive effects by providing first inventors lead time to recoup R&D expenses. Part II of this Note provides background on 3D printing and scanning, Illinois's trade secrecy law, and reverse engineering. Part III analyzes how 3D printing and scanning may make reverse engineering market destructive and stress the patent system. Part IV proposes a localized solution by amending Illinois's statute to require originality in competing products.

II. BACKGROUND

3D scanning uses electronic and light-based probes to determine the exterior and interior structure of an object and render it into a computer-readable file.[8]This technology can be applied to cars, aircraft, and other high-precision industries.[9] 3D printing, otherwise called "additive manufacturing," is a collection of techniques that build a product in layers according to a digital map, instead of removing pieces from a block.[10] These techniques have reduced reverse engineering time in industrial manufacturing,[11] prototyping,[12] in circuit boards and semiconductor chip layouts,[13] and in food manufacturing.[14] Complete reverse engineering can

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6. *See* Beau Jackson, 3DP Applications (last updated Dec. 15th, 2016 3:04 PM), https://3dprintingindustry.com/news/3d-printing-reverse-engineering-world-101166/; *See also* 3D Scanning Services, ARRIVAL 3D, https://arrival3d.com/3d-scanning-services/ (quoting 3-5 days for a simple scan); 3D Scanning FAQs, 3D SCANCO, https://www.3dscanco.com/3d-scanning-faqs/ (quoting 2 weeks or less for any scan); General Questions, ULTIMAKER, https://ultimaker.com/en/resources/11721-general-questions (10 minutes for simple low-quality printing to a few hours for high quality complex products).

7. *See* Ian Steadman, *Open Source cola and the Napster moment for the food business*, WIRED MAG. (Apr. 15, 2013), https://www.wired.co.uk/article/trade-secrets-open-source-cola. (Arguing that while barriers to chemical and food reverse engineering currently exist, they will be surmounted.); *See also* Scio Solutions, SCIO (Last updated 2017), https://www.consumerphysics.com/business/solutions/ (showing the business website of a chemical scanner, promising to determine the molecular composition – while it does not read out the recipe immediately, it shortens reverse engineering time.); See Lucas Mearian, *Desktop 3D Printer presages the future of multi-layer circuit design*, COMPUTERWORLD (May 10, 2017), https://www.computerworld.com/article/3195839/3d-printing/desktop-3d-printer-presages-the-future-of-multi-layer-circuit-board-design.html (discussing Nano Dimensions' Dragonfly 2020, a desktop printer capable of reducing circuit board prototypes from weeks to hours); See *Loud and Clear: 3D Scanning Perfectly Reproduces Miniaturized Printed Circuit Boards for Microphone Products*, LASERDESIGN, *https*://www.laserdesign.com/loud-and-clear-3d-scanning-perfectly-reproduces-miniaturized-printed-circuit-boards-for-microphone-products/ (discussing the use of 3D scannings to replicate a microphone's circuit board.)

8. Bernadini and Rushmeier, *The 3D Model Acquisition Pipeline, Computer Graphical Forum*, 2002, 1.; See also Jim Romeo, https://blog.grabcad.com/blog/2018/09/20/why-3d-scanners-are-the-hot-new-craze-in-reverse-engineering/

9. Bernadini, *supra* note 8.

10. Cecile J. Gonzalez, *The Engineering Behind Additive Manufacturing and the 3d Printing Revolution*, NAT'L SCI. FOUND. (Dec. 3, 2013), https://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=129780 ("Additive manufacturing is a way of making 3-D objects by building up material, layer upon layer, with the guidance of a digital design.")

11. *See* John Hagel et. Al., *The Future of Manufacturing: Making Things in A Changing World*, DEL. UNIV. PRESS., 2015 at 20 (illustrating the decrease in barriers to commercialization); *See also* Jim Romeo, *Why 3D Scanners are the Hot New Craze in Reverse Engineering,* GRABCAD (Sept. 20, 2018), https://blog.grabcad.com/blog/2018/09/20/why-3d-scanners-are-the-hot-new-craze-in-reverse-engineering/, (illustrating the different applications of 3D scanners.)

12. *See* Jackson, *supra* note 6

13. *See supra* note 7.

14. *See* Ian Steadman, *Open Source cola and the Napster moment for the food business*, WIRED MAG. (Apr. 15, 2013), https://www.wired.co.uk/article/trade-secrets-open-source-cola. (Arguing that while barriers to chemical and food reverse engineering currently exist, they will be surmounted.); *See also* Scio Solutions, SCIO (Last updated 2017), https://www.consumerphysics.com/business/solutions/ (showing the business website of a chemical scanner.)

range from weeks to hours, depending on the industry.[15] In addition, printer prices have dropped by an order of magnitude,[16] and have become user-friendly even to students.[17] 3D scanning and printing forces a reconsideration of the scope of the reverse-engineering defense.

Under trade secret laws, an inventor who uses reasonable efforts to keep his invention secret can sue another for misappropriating his invention if that person used improper means to obtain the secret and if the trade secret holds independent economic value by being secret.[18] For example, Illinois's Trade Secret statute defines a trade secret as:

> [I]nformation, including but not limited to, technical or non-technical data, a formula, pattern, compilation, program, device, method, technique, drawing, process, financial data, or list of actual or potential customers or suppliers, that: (1) is sufficiently secret to derive economic value, actual or potential, from not being generally known to other persons who can obtain economic value from its use; and (2) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy or confidentiality.[19]

Trade secret laws come from several sources. They were first developed through state common law, and then were codified in model publications such as the Uniform Trade Secrets Acts or the Restatement Third of Unfair Competition.[20] Now, state trade secret statutes follow either model. Federal statutes on trade secrets arise from the Federal Defend Trade Secrets Act of 2016[21] or the Economic Espionage Act.[22]

These sources of trade secret laws do not forbid reverse engineering.[23] The Uniform Trade Secrets Act, which informs Illinois's statute,[24] states that reverse engineering shall not be an improper means of appropriating a trade secret.[25] The original Illinois statute clause on reverse engineering reads:

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15. *See supra* note 6.

16. Nick Bilton, *Disruptions: On the Fast Track to Routine 3-D Printing*, N.Y. TIMES: BITS (Feb. 17, 2013, 11:00 AM) http://bits.blogs.nytimes.com/2013 /02/17/disruptions-3-d-printing-is-on-the-fast-track/ (The price of 3-D printers has also dropped sharply over the last two years, with machines that once cost $20,000, now at $1,000 or less.)

17. Laura Diamond, *Georgia Tech Opens Newest Student Makerspace*, GEORGIA TECH NEWS CENTER. (Sept. 27, 2018), https://www.news.gatech.edu/2018/09/27/georgia-tech-opens-newest-student-makerspace. (Illustrating the introduction of 3D printers to students.)

18. *See* Defend Trade Secrets Act, 18 U.S.C. Section 1832.; *See also* UNIF. TRADE SECRETS ACT (UNIF. LAW COMM'N 1985); *See also* Economic Espionage Act, Section 1, 18 U.S.C. Section 1831; *See also* Restatement Third of Unfair Competition, Chapter 4, Appropriation of Trade Values.

19. 765 ICLS 1065/2 (d) (d).

20. *See* John Thomas, *The Role of Trade Secrets in Innovation Policy*, CONGRESSIONAL RESEARCH SERVICE, (Jan 15, 2014.) at 9. (articulating the history of trade secrecy law.)

21. *See* Defend Trade Secrets Act,18 U.S.C. Section 1839(6)(B).

22. *See* Economic Espionage Act, Section 1, 18 U.S.C. Section 1831.

23. *See* Craig L. Uhrich, *The Economic Espionage Act-Reverse Engineering and the Intellectual Property Public Policy*, 7 MICH. TELECOMM. & TECH. L. REV. 147, 152 (2001) (Noting Reverse Engineering's acceptance by a wide variety of sources.)

24. 765 ICLS 1065/2 (d) "Trade secret" means information, including but not limited to, technical or non-technical data, a formula, pattern, compilation, program, device, method, technique, drawing, process, financial data, or list of actual or potential customers or suppliers, that: (1) is sufficiently secret to derive economic value, actual or potential, from not being generally known to other persons who can obtain economic value from its disclosure or use; and (2) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy or confidentiality.")

25. 765 ICLS 1065/2 (a) ("Reverse engineering or independent development shall not be considered improper means."); Comments to the first section of the Uniform Trade Secrets Act indicate that reverse engineering is a proper means of appropriation. UNIF. TRADE SECRETS ACT § 1.1 (UNIF. LAW COMM'N 1985) ("Improper means" includes theft, bribery, misrepresentation, breach or inducement of a breach of a duty to maintain secrecy, or espionage through electronic or other means".)

> 'Improper means' includes theft, bribery, misrepresentation, breach or inducement of a breach of a confidential relationship or other duty to maintain secrecy or limit use, or espionage through electronic or other means. Reverse engineering or independent development shall not be considered improper means.[26]

Even in common law, the Supreme Court found in *Kewanee Oil Co. v. Bicron Corp.,* that reverse engineering is not an improper means of acquiring information.[27] Reverse engineering benefits society by fostering competition, reducing prices, and advancing science,[28] but harms society by incentivizing inventors to complicate their products to prevent reverse engineering, which may cost consumers both in prices and product safety.[29] Reverse engineering typically does not harm inventors because it costs the reverse-engineer time and money,[30] which provides the inventor lead time between when their product enters the market and when a second-comer's product enters.[31] Reverse engineering may harm inventors if it is market destructive. Market destructive reverse engineering involves (1) cheaply reverse engineering a product and (2) selling an identical copy in the same market.[32] Market destructive reverse engineering is easy and cheap enough to trivialize the first inventor's lead time.[33]

Market destructive reverse engineering incurs both benefits and costs on society. It can reduce prices quickly for consumers by reducing the cost for competitors to enter the market.[34] However, it deters the first inventor's participation in the market, because the first inventor might not recoup R&D expenses.[35]

Market destructive reverse engineering also deprives consumers of access to new technology.[36] First, market destructive reverse engineering reduces innovation in a market by (1) deterring the first inventor from sharing innovation if they cannot recoup expenses,[37] and (2) deterring the second comer's independent innovation, because a rational competitor would incur less cost by copying the first product than by inventing his own competitive product.[38] Furthermore, even if inventors participate in the market, they may increase manufacturing costs

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26. 765 ICLS 1065/2 (a)-(d).

27. *Kewanee Oil Co. v. Bicron Corp.,* 416 U.S. 476, 472 (1974) (considering whether an Ohio trade secret law conflicted with federal intellectual property law's goals and finding no such conflict in that case.)

28. *See* Craig L. Uhrich, *The Economic Espionage Act-Reverse Engineering and the Intellectual Property Public Policy*, 7 MICH. TELECOMM. & TECH. L. REV. 147, 152 (2001) (Noting Reverse Engineering's acceptance by a wide variety of sources.); *See* RICHARD A. POSNER & WILLIAM M. LANDES, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 365 (2003).

29. *See* Samuelson, *supra* note 4 (providing a full treatment of reverse engineering's law and economics circa 2002).

30. *See* Shane Curtis et al., *The Fundamentals of Barriers to Reverse Engineering And Their Implementation Into Material Components,* REV. ENG. DESIGN. 245, 248 (2011) (illustrating the technical barriers that an inventor can place into a device to make reverse engineering more difficult., as well as external barriers such as access to equipment and the skill of the engineer, and also showing the depth of verification required in the process which scanning and printing may not directly address.)

31. *See* Samuelson, *supra* note 4; *see also* Shane Curtis et al., *supra* note 30.

32. Samuelson, *supra* note 4.

33. *Id.*

34. *Id.*

35. *See* Samuelson, *supra* note 4.

36. *See* Paul Heald, *Federal Intellectual Property Law and the Economics of Preemption*, 76 IOWA L. REV. 959, 985 (1991) (arguing that imitation is not innovation.)

37. *See* Samuelson, *supra* note 4.

38. *Id.*; s*ee also* Heald, *supra* note 36

through technical features that stymie reverse engineering, which extends their lead time but passes on extra costs to customers.[39]

Market destructive reverse engineering may also stress the patent system by overencouraging patent applications. Studies show that not all firms rely on patent protection in the first place, but as the possibility of reverse engineering increases, the volume of patent applications increase.[40] The United States Patent and Trademark Office evaluates each patent application under stringent standards: "utility" evaluates if the invention is patentable subject matter,[41] "novelty" evaluates if the invention has already been disclosed to the public,[42] and "nonobviousness" evaluates if a person of ordinary skill in the art could make this invention from existing prior art without undue experimentation.[43] An overworked Patent Office spends less time on each patent application, increasing the probability of false allowances or rejections.[44] False allowances create anti-competitive consequences for the market, while false rejections decrease the inventor's economic viability.[45]

III. ANALYSIS

3D printing and scanning threatens to make reverse engineering "market destructive" in multiple industries, therefore deterring innovation and increasing the likelihood of Patent Office mistakes. 3D printing and scanning can currently replicate products cheaply in different industries: machines,[46] semiconductor chips layouts,[47] and recipes.[48] This cheap replication may deter the first inventor's innovation if it trivializes his or her lead time.[49] With such cheap replication, second inventors may incur fewer costs in copying products than designing their own.[50] If the first inventor still participates in the market, they may input technical features only to complicate reverse engineering, passing on the related costs to the consumer.[51]

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39. *See* Shane Curtis et al., *supra* note 30.

40. *See* Petra Moser, *Why Don't Inventors Patent?*, NAT'L BUREAU OF ECON. RESEARCH, Working Paper No. 13294 (2007). (Moser studies over 7000 inventions in the United States and Britain between 1851 and 1915. She finds that as reverse engineering an invention becomes more feasible, inventors are more likely to turn from secrecy to patent protection); *See* Alexandra K. Zaby, *Losing the Lead: The Patenting Decision in the Light of the Disclosure Requirement*, 19 ECON. INNOVATION & NEW TECH. 147, 159–60 (2010) ("In an industry sector with a high propensity to patent, such as [p]harmaceuticals[,] the easiness of reverse engineering is rather high so that the effective headstart of an inventor is low."); *See also* Jay P. Kesan, *Economic Rationales for the Patent System in Current Context*, GEORGE MASON L. REV. 897, 901 (2015) (Summarizing studies concluding that firms do not rely solely on patents and indeed may capture the value of their invention through lead time and secrecy).

41. 35 U.S. Code § 101 (process, machine, manufacture, or composition of matter)

42. 35 U.S. Code § 102

43. 35 U.S. Code § 103 ("A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.")

44. *See* Christopher R. Leslie, *The Anticompetitive Effects of Unenforced Invalid Patents*, 91 MINN. LAW. REV. 101, 106, (discussing reasons why invalid patents exist based on the time each examiner spends in examining, and the sources therein).

45. *See* Joan Farre-Mensa et. Al., *What is a Patent Worth? Evidence from the U.S. Patent Lottery,* (Dec. 22, 2018) (showing that patents awarded do correlate with start-ups survival) at 8; *see in general* Leslie, *supra* note 44.

46. *See supra* note 6.

47. *See supra* note 7.

48. *See* Steadman, *supra* note 7.

49. *See* Samuelson, *supra* note 4.

50. *Id.*

51. *See* Shane Curtis et al., *supra* note 30.

In addition, 3D Printing and scanning may stress the patent system by increasing the number of patent applications. As discussed earlier, firms may choose to protect their inventions with secrecy instead of patent protection.[52] Economic historian Petra Moser shows that scientific breakthroughs lead to an increase in patenting because such breakthroughs make maintaining secrecy more difficult.[53] Here, 3D printing and scanning may be the scientific breakthrough that pushes more inventors to patent.

However, 3D printing and scanning may threaten inventions that firms cannot protect with patents, and therefore uninformed inventors may pursue patent protection for inventions of questionable patentability.[54] Patentable inventions must be "processes, machines, manufactures, or composition of matter."[55] While not true for all inventions, most inventions reproducible by 3D scanning and printing are patentable subject matter: semiconductor chip layouts,[56] machines[57] and food recipes.[58]

In addition, the invention must be novel[59] and non-obvious.[60] 3D printing and scanning affects both inventions that meet these requirements and inventions that do not. Patent applications on machines and semiconductors deal regularly with the novelty and non-obviousness requirements because of the depth of existing prior art. However, food recipes face greater challenges in these requirements; many food recipes are not novel or nonobvious because they have been individually developed without disclosure for long periods of times, and because most recipes are combinations of known elements with predictable results.[61]

For the above reasons, 3D printing and scanning may reduce the strength of trade secret protection and incentivize more firms to pursue patent protection. Because inventors may apply for more patent applications for both patentable and questionably patentable inventions, the Patent Office will receive more applications to sort through and will thus be more likely to make mistakes.[62] A patent wrongfully denied may cost a business its livelihood, while a patent wrongfully issued will have anticompetitive effects.[63]

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52. S*ee* Moser, *supra* note 40 at 18 (describing the patenting rate across different industries).; *See also* Jay P. Kesan, *Economic Rationales for the Patent System in Current Context*, GEORGE MASON L. REV. 897, 901 (2015) (Summarizing a number of studies concluding that firms do not rely solely on patents and indeed may capture the value of their invention through lead time and secrecy); *See also* John Thomas, *The Role of Trade Secrets in Innovation Policy*, CONGRESSIONAL RESEARCH SERVICE, (Jan 15, 2014.) at 13 (discussing reasons to choose trade secrecy over patent protection, such as the delay in examination and lack of foreign protection provided by patents .)

53. S*ee* Moser, *supra* note 40.

54. *See* UNITED STATES PATENT AND TRADEMARK OFFICE, *Can Recipes be Patented?*, INVENTOR'S EYE, (Jun. 24, 2013).

55. 35 U.S.C. § 101 (listing the categories of patent eligible subject matter).

56. The chip layouts are also protected under the Semiconductor Chip Protection Act which imposes sui-generis protection on maskworks and forbids layout copying. The process and manufacturing behind the individual chip layouts are themselves patentable.

57. Machines are by definition in the list in 35 U.S.C. § 101.

58. Recipes are patentable subject matter as "composition of matter". *See also Can Recipes be Patented?*, *supra* note 54; *See also* Gene Quinn, The Law of Recipes: Are Recipes Patentable?, IP WATCHDOG (2012), https://www.ipwatchdog.com/2012/02/10/the-law-of-recipes-are-recipes-patentable/id=22223/;

59. 35 U.S.C. § 102

60. 35 U.S.C. § 103

61. Food patents are difficult on novelty and non-obviousness grounds, especially if the recipe is merely the predictable sum total of individual parts. *See Can Recipes be Patented?*, *supra* note 54. *See also* Quinn, *supra* note 58.

62. In *Kewanee,* the Supreme Court, in facing a trade secret federal preemption issue, discussed the potential consequences of eliminating trade secret protection, including the likelihood of inundating the Patent Office with more applications. Further discussion is infra. *Kewanee* (wheat and the chaff comment); *See also* Leslie, *supra* note 44.

63. *See* Joan Farre-Mensa et. Al., *What is a Patent Worth? Evidence from the U.S. Patent Lottery,* (Dec. 22, 2018) (showing that patents awarded do correlate with start-ups survival) at 8; *See in general* Leslie, *supra* note 44.

3D Printing and scanning threatens to disrupt trade secrecy in many industries, and thus requires careful legal treatment to maintain competition while incentivizing innovation.

IV. RECOMMENDATION

This Note proposes modifying Illinois's trade secret statute by amending the reverse engineering clause to limit market destructive reverse engineering.
The original Illinois statute reads:

> Improper means includes theft, bribery, misrepresentation, breach or inducement of a breach of a confidential relationship or other duty to maintain secrecy or limit use, or espionage through electronic or other means.[64] Reverse engineering or independent development shall not be considered improper means.[65]

This Note proposes amending the reverse engineering clause to below:

> Reverse engineering, for the purpose of duplicating any manufactured product or product part by use of 3D scanning or printing, and for the purpose of selling a same or similar product to consumers, shall not be considered an improper mean, if the reverse engineer or another incorporates the results of such conduct into an original design sold or distributed to consumers.

The clause, "for the purpose of duplicating any manufactured product or product part by use of 3D scanning or printing," targets one element of market destructive reverse engineering by limiting 3D scanning and printing to maintain the inventor's lead time.

The other two clauses target the other element of market destructive reverse engineering. First, "for the purpose of selling a same or similar product to consumers," limits enforcement of the statute to competitors selling copies of products. Second, "if the reverse engineer or another incorporates the results of such conduct into an original design sold or distributed to consumers," requires an original design, as in the Semiconductor Chip Protection Act,[66] to incentivize the second comer's own innovation. The original design itself must also be made for sale or distribution. "Reverse engineer or another" indicates that a competitor that hires another to reverse engineer the device, and then manufactures the product copy themselves, would still be required to incorporate the trade secret into an original design.

This proposal addresses only some of the intellectual property issues caused by 3D printing and scanning. Furthermore, this proposal addresses only some of the trade secrecy issues posed by 3D printing's speed, low cost, and accessibility. It should mitigate costs to innovation from the cheapness and speed at which products can be copied by 3D scanning and printing, but in

64. 765 ICLS 1065/2 (a).

65. 765 ICLS 1065/2 (a)

66. This definition of "originality" is borrowed from 17 U.S.C. 1301 (b)(1) in the Semiconductor Chip Protection Act. While "original" is a generic term, courts interpreting the Semiconductor Act have relied on finding adequate paper trails and found differences between substantially identical and substantially similar, ultimately finding that even a copying of a portion of someone else's work counted as copying.

limiting protection to avoid federal preemption, this proposal leaves unaddressed the potential of recreational inventors to reverse engineer a product and disclose its secrets.

Even if this proposal is limited, it may compare favorably to other possible solutions to limit 3D printing's intellectual property problems. For instance, design patents protect the form of manufactured products, but these applications may still overwork the patent system and would only protect inventions reliant on visual forms. Illinois has unfair competition laws targeted at knockoffs, but the inventor would only be liable if they created a risk of "confusion and misunderstanding."[67] Copyrights might be extended to protect the computer-readable file resulting from 3D scanning, but enforcement challenges might make this avenue less desirable for inventors.[68] Digital Rights Management (DRM) software may be included in 3D printers to check if the user has rights to the design, but DRM applications in other contexts have been unpopular due to degrading functionality.[69] Congress might also create more copyright-like *sui-generis* rights for product categories,[70] but such rights would be industry-specific and inefficient when 3D scanning and printing can affect many industries. An originality requirement on using 3D scanning and printing for reverse engineering would target each industry without overworking the patent system or affecting 3D printer customers.

This proposal would not deter all reverse engineering, because it is targeted only towards market participants who introduce identical products quickly. It would have differing effects on recreational inventors, reverse engineering firms, and direct competitors to the inventor of the original product.

This proposal would target only some recreational inventors. A recreational inventor owns a 3D scanner and printer for recreation, not for business purposes. If this person uses that technology to reverse engineer, he poses two kinds of risks: (1) disclosing the invention to another, or (2) building and selling individual copies.

This proposal would not target recreational inventors who disclose the secret to another, because they do not reverse engineer for the purpose of selling a same or similar product. This inventor contributes to society by reverse engineering a product, driving down costs, and advancing science through disclosure. Furthermore, they do not trivialize the first inventor's lead time because the recreational inventor does not introduce a competing product.

This proposal would target recreational inventors who build and sell copies, because they reverse engineer for the purpose of selling a same or similar product and do not include an original design. While the recreational inventor benefits society by driving down costs, he or she trivializes the first inventor's lead time,[71]and has not advanced science through disclosure. These inventors may be targeted by Illinois's unfair competition laws, but only if they created a risk of "confusion and misunderstanding" with the original product.[72]

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67. 815 ILCS 510/2 Section 2 (a)(2) ("causes likelihood of confusion or of misunderstanding as to the source…").

68. Menell, 3D Printing & US Copyright Law, 2016 at 4; See also John Hornick, Anti-Copying Technology for 3D Printing: A Survey, 3DPrint.com, (May 30, 2018), https://www.finnegan.com/en/insights/anti-copying-technology-for-3d-printing-a-survey.html

69. *See* John Newman, *Digital Rights Management for 3D Printing?,* DE247 DIGITAL ENGINEERING, (Oct. 12, 2012), https://www.digitalengineering247.com/article/digital-rights-management-for-3d-printing/. ***See also*** **U.S. Patent 8,286,236.**

70. *See* the Vehicle Hull Protection Act and the Semiconductor Chip Protection Act discussed *infra* in the footnotes of the Federal Preemption section.

71. *See* Samuelson, *supra* note 4.

72. 815 ILCS 510/2 Section 2 (a)(2) ("causes likelihood of confusion or of misunderstanding as to the source…").

This proposed statute would not affect reverse engineering firms. Reverse engineering firms are defined as firms that specialize in receiving products and reverse engineering them for clients. The statute does not target these firms because while they can reverse engineer very quickly, with domain expertise and specialized equipment, they don't sell competing products, let alone identical ones.[73] While they may indirectly contribute to reducing an inventor's lead time, that harm is outweighed by the societal good they perform by reverse engineering.

This proposed statute would target direct competitors if they reverse engineer and release copies quickly for profit. A direct competitor is an inventor who reverse engineers to sell competing products. Direct competitors are most able and inclined to incorporate trade secrets into competitive products – recreational inventors may not have as much base knowledge, and reverse engineering firms are not marketing their own products.[74] If able to copy on the cheap with 3D scanning and printing, direct competitors can compete with the original inventor on the same scale before the inventor recoups R&D expense, likely deterring the inventor's further innovation, limiting their own innovation, and over-incentivizing patent applications. Therefore, any statute restricting reverse engineering should be focused on the activities by direct competitors.

Because this proposal is a state-level modification, it may risk federal preemption. Historically, statutes restricting reverse engineering risk federal preemption if they conflict with federal intellectual property goals[75] or upset the balance between intellectual property protection and free competition.[76] In brief, this statute would support patent law's goals of advancing science by disclosure in return for limited monopolies, by providing limited protection to inventors with questionably patentable inventions and freeing those inventors to apply for patents only on potentially breakthrough inventions.[77] Even if this statute deters disclosure, it coheres with patent law because the protection it provides would be similar to the "prior commercial use defense" offered by recent patent law, which allows an inventor to defend against a claim of infringement by a later inventor who secured a prior patent on the invention – the first inventor's protection against infringement claims is not contingent on disclosure.[78]

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73. *See supra* note 6.

74. *Id.*

75. *Kewanee Oil Co. v. Bicron Corp.,* 416 U.S. 470, 472 (1974) (considering whether an Ohio trade secret law conflicted with federal intellectual property law's goals and finding no such conflict in that case); See in general Sharon Sandeen, *Kewanee Revisited: Returning to First Principles of Intellectual Property Law to Determine the Issue of Federal Preemption*, 12 INTELLECTUAL PROPERTY L. REV. 299 (2008)., for a modern treatment of intellectual property preemption; *See* Paul Heald, *Federal Intellectual Property Law and the Economics of Preemption*, 76 IOWA L. REV. 959, 985 (1991) (articulating an economic treatment of intellectual property preemption.)

76. *See Sears, Roebuck & Co. v. Stiffel Co.,* 376 U.S. 225, 230–31 (1964) and *Compco Corp. v. Day-Brite Lighting, Inc.,* 376 U.S. 234, 235 (1964). *See also Bonito Boats, Inc. v. Thunder Craft Boats, Inc.,* 489 U.S. 141, 161 (1989). (holding that a trade secret law perpetually banning a method of reverse engineering was preempted by patent law). The proposed statute does not ban the use of 3D scanning and printing to reverse engineering products but requires that the knowledge be incorporated in original products.

77. Kewanee differentiates between questionably patentable and patentable inventions. The Court wants more clearly patentable applications, and fewer questionably patentable applications, on the assumption that more questionably patentable applications would lead to more invalid applications. *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 488 (1974) ("those who might be encouraged to file for patents by the absence of trade secret law will include inventors possessing the chaff as well as the wheat. Some of the chaff—the nonpatentable discoveries—will be thrown out by the Patent Office, but in the meantime society will have been deprived of use of those discoveries through trade secret-protected licensing."); *See in general* Leslie, *supra* note 44.

78. 35 U.S. Code § 273(a). An inventor may defend against a subsequent patent owner's infringement suit if the inventor had used that subject matter in connection with internal commercial use.

This proposal would not interfere with other federal intellectual property laws either. Congress has used copyright law to limit market destructive reverse engineering by imposing an originality requirement on certain reverse engineering activities.[79] Furthermore, current trade secret federal laws do not preempt state laws.[80]

This Note's proposal would weigh free competition more heavily than intellectual property protection, because the monopoly is dramatically limited – an originality requirement on one method of reverse engineering only for that exact product. Competitors would still be able to participate in the market by selling competing products, and recreational inventors and reverse engineering firms would be free to disclose the trade secret should they discover it.[81] Furthermore, by providing protection for questionably patentable inventions, the statute minimizes the workload of the Patent Office, and thus the costs of either wrongful patent rejections or issuances.[82]

V. CONCLUSION

Reverse engineering is a social good, because it advances science. However, cheap reverse engineering deters innovation and can over-incentivize patent applications, stressing the Patent Office with anti-competitive consequences. 3D scanning and printing can be market destructive because it can be done cheaply, quickly, and by anybody. Adding an originality requirement to Illinois' reverse-engineering clause, limited to 3D scanning and printing methodologies by competitive sellers, would mitigate the harm of market destructive reverse engineering without inhibiting scientific progress.

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79. Vessel Hull Design Protection Act, 17 U.S.C. Section 1301 (a) (1) (2) (protected hulls from plug-molding) and Vessel Hull Design Protection Act, 17 U.S.C. Section 1302 (1) (requiring designs to be original to receive protection); See also Semiconductor Chip Protection Act, 17 U.S.C Section 906 (a) (2) (limiting enforceability if the semiconductor is reverse engineered and the results of such conduct are incorporated into an original product).

80. Defend Trade Secrets Act (18 U.S.C Section 1838) and Economic Espionage Act (18 U.S.C. Section 1838) don't preempt, much to scholars' chagrin; *But see* Craig L. Uhrich, *The Economic Espionage Act-Reverse Engineering and the Intellectual Property Public Policy*, 7 MICH. TELECOMM. & TECH. L. REV. 147, 152 (2001) (The EEA does not explicitly provide a defense of reverse engineering, and Urlich argues that the EEA's ambiguity regarding reverse engineering's legality chills the activity.)

81. Reverse engineering, for the purpose of duplicating any manufactured product or product part by use of 3D scanning or printing, and for the purpose of selling a similar product to consumers, shall not be considered an improper mean if it incorporates the results of such conduct into an original design sold or distributed to consumers.

82. *See* Leslie, *supra* note 44.