“No genius without copying”: how loosening the “tyranny of intellectual property protection” will stimulate innovation

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"No Genius Without Copying": How Loosening the "Tyranny of Intellectual Property Protection" Will Stimulate Innovation

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Abstract: We live in an "open source" era; however, value extraction from innovation is still largely based on an aged model of protecting intellectual property. Firms are reluctant to create new products and services if they are going to be copied quickly. This principle applies across industries ranging from mobile devices to pharmaceuticals. As a counterpoint, and by synthesizing ideas and evidence from across a wide spectrum, this paper argues that a shift in outlook regarding intellectual property may be required to keep up with developments in technology and how markets operate. First, as described by Eric von Hippel, information "spillovers" are increasingly frequent: few trade secrets remain so for very long. Second, the availability of tools such as 3D printers and the Raspberry Pi means that the process of replicating or improving a product has become simpler. Finally, the ubiquity and unruly nature of the internet means that both information spillovers and the availability of advanced tools and knowledge are becoming increasingly prevalent. Under these circumstances, the paper argues that is increasingly difficult to maintain a traditional stance on intellectual property; rather, it is apropos to examine more open models of innovation, such as that of Lyon silk weavers in the 18th century. For example, a leading Lyonnaise silk weaver, Phillipe Lasalle, conducted his trade as if there were "no genius without copying" (Foray, 2006, p. 175). This paper also argues that in more a diffuse innovation paradigm, traditional modes of IP enforcement may act as an inhibitor by preventing this "copying" from taking place. Finally, the paper states that value extraction could alternatively be tied to voluntary payments and reliance on product ecosystems instead of IP enforcement.

Keywords: open source, copyright, patents, innovation, intellectual property

Introduction

Innovation is defined as "something new or different introduced" (innovation, 2016); in this paper, this term refers to the creation of new products, creative works and services. Firms perceive protecting intellectual property as a significant means by which value is accrued in return for investment in the research required to create innovations. As President Abraham Lincoln wrote, "The Patent System added the fuel of interest to the fire of genius" (Malone, 2002). This "fuel" continues to burn brightly: in the Fiscal Year 2015, 324,425 patents and utility models were registered in Japan alone, this was an increase of 2.6% on the previous year (Japan Patent Office, 2016).

In his 2012 work "Common as Air", Professor Lewis Hyde clarified alterations to the boundaries of this "second enclosure" as defined in American intellectual property laws: since Lincoln's time, the system has simultaneously become more restrictive and yet expanded in scope. For example, in 1998, the Sonny Bono Copyright Term Extension Act extended copyright protections to 70 years after the death of the author (Rifkin, 2014, p. 228). Furthermore, as Hyde noted, "it used to be patents were granted only for useful inventions...now patents are issued for DNA sequences whose purposes are wholly obscure. As one wit has said, in the United States, 'you get utility if you can spell it'" (Hyde, 2012, pp. 60 &61). Furthermore, as Hyde adds, "the law grants nearly perpetual private rights to nearly every creative expression appearing in any media now known or yet to be discovered!" (Hyde, 2012, p. 59) To secure more revenue, firms are now willing to pursue these protections beyond the purchase of a product: recently, the tractor manufacturer John Deere argued in court that its ownership of the software in its vehicles extended beyond the point of their products' sale (Coyle, 2016).

However, an emphasis on intellectual property protection may be mistaken for the following reasons:

1. **Previous Innovation Models**: breakthroughs in industry and science were once reliant on a paradigm that emphasised information sharing and "copying".
2. **No Safe Harbour**: It is more difficult than ever to protect intellectual property; the reasons for this include:

   a. 
   b. 
   c. 


a. **The Ubiquity of the Internet** has increased the velocity and availability of protected information; it is also extremely difficult to constrict.

b. **Spillovers**: secrets no longer being so has always been a limitation upon the efficacy of intellectual property protection. The prevalence of “teardown videos” and similar expositions has increased spillover opportunities.

c. **Inexpensive (or free) Tools** such as 3D printers, the Raspberry Pi computer and open source software have made replicating advanced products simpler than ever.

3. **Inhibited and Combined Innovation**: the current prevailing model has inhibited the capacity for product improvement by emphasizing product release schedules over innovation and knowledge recombination.

4. **New Revenue Streams**: an emphasis on protecting designs and information may create a myopia to new sources of revenue.

**Previous Innovation Models**

The current intellectual property arrangements may appear to have existed since beyond the beginning of the industrial era. As Hyde states: "It sometimes seems...as if the real point of the creative ownership is simply to preclude debate through a sort of conceptual enclosure. Once we accept that houses and ideas may be lumped together as the same kind of property...there is little left to argue about" (Hyde, 2012, p. 215).

However, a different philosophy once prevailed, as exemplified by a statement penned by Thomas Jefferson: "The field of knowledge is the common property of mankind" (Daly, 1997, p. 150). In the case of the English iron industry in the 19th century, the "copying" of furnace designs was commonplace. An analysis of this period led the Canadian academic Robert Allen to state in a 1983 paper entitled "Collective Invention": "...if one examines a sector like the blast furnace industry and determines the inventions whose diffusion were important for the growth in efficiency, it proves impossible to attribute their discovery to any single inventor. Certainly, no one received a patent for many of these advances. Thus, the increase in furnace height and blast temperature that were so important for productivity growth in England's Cleveland district evolved through the actions of many individuals over a twenty-year period." (Allen, p. 1, 1983) Nor was this confined to England; as Allen states, "The development of fast driving in the United States was similar" (Allen, 1983, p. 1).

The economist Dominique Foray detailed other examples of regions sharing manufacturing knowledge in his 2006 work, "The Economics of Knowledge": “ Lyons in the case of the circulation of techniques and inventions relating to the silk industry (Hilaire Perez 2000)...the Clyde area in the case of collective invention in shipbuilding (Schwerin 2000): and the Cornish mining district in the case of collective invention related to pumping engine technology..." (Foray, 2006, pp. 174 & 175). Foray cited the example of Lyonnaise silk weaver Phillipe Lasalle as an avatar of this ethos, stating, “for him, there was no genius without copying” (Foray, p. 175, 2006). According to Foray, the city of Lyons and its silk weavers were a particularly potent example of how “open source” inventions could speed improvements in technology, which led to general growth: "In Lyons, a good example is the diffusion of the Jacqard loom....the new loom immediately spread and the mental mobilisation it entailed resulted in several useful improvements. Jacqard’s invention could then be improved by other loom builders, who made hundreds of them, compared to Jacquard who built only fifty-seven." (Foray, 2006, p. 176). The ethic driving this knowledge sharing was clear: "...collective belief...of being part of a positive sum game plays a key role... the inventors knew full well that the prosperity of the local system to which they belonged directly influenced their own individual prosperity" (Foray, 2006, p. 176).

**No Safe Harbour**

**Ubiquity of the Internet**

The Internet is ubiquitous; knowledge can be created, distilled and remixed and then shared with a global audience with devices as easy to use and prevalent as a mobile phone. As Hyde states, "the heavy, slow and local became light, swift and global" (Hyde, 2012, p. 11). Constraining information is difficult; Stewart Brand, the founder of the Whole Earth Catalog and the WELL online community, elucidated the paradox at a hackers' convention he organised in 1984: "On the one hand...information wants to be expensive, because it’s so
valuable. The right information in the right place just changes your life. On the other hand, information wants to be free because the cost of getting it out is getting lower and lower all the time." (Turner, 2006, p. 136)

Attempts at IP enforcement have proved increasingly difficult even when a repository is known to host material to which it is not legally entitled. At the time of writing, a Swedish torrent archive, The Pirate Bay, is still in operation; in November 2015, the Stockholm District Court blocked copyright holders from taking action against the internet service provider which hosts it (Gibbs, 2015). The presence of the so-called "dark web" is indicative of repositories that are unconstrained and difficult to assess; the Economist estimated in July 2016 that the dark web's store of information about electronics and e-books constituted part of an $800,000 illegal market (Economist, 2016).

The difficulties of information constraint were further illustrated by the Egyptian revolution of 2011. Protests centered on Cairo's Tahrir Square destabilized President Hosni Mubarak's regime (Shearlaw, 2016). Social media, including Facebook and Twitter, provided up to date information to the protestors and a locus of organization. The regime's attempts to "switch off" the Internet were problematic: when Egypt's Internet connection was shut off to activists, the hacker group Anonymous and others reacted. (Kanalley and Bialer, 2011). These countermeasures were further clarified by Gabriella Coleman in her 2015 tome about Anonymous, "Hacker, Hoaxer, Whistleblower, Spy: The Many Faces of Anonymous":

"In order to re-establish some connectivity, Anonymous teamed up with another hacktivist crew, Telecomix... if there is an urgent or interesting enough problem to solve – like getting communications access to people in need – hackers can put aside differences to work together. A number of Anons contributed to the Telecomix-led effort to figure out how old modems, faxes and phones could be used to connect circuitously to the Internet" (Coleman, 2015, p. 192).

It follows logically that if an authoritarian regime such as Egypt with the tools of repression to hand, found it impossible hold back social media postings, more open societies will be even more constrained in locking down information, protected or otherwise.

Spillovers

A "spillover" is defined as "the act of spilling over"; (spillover, 2016) In this paper, a spillover indicates protected information or designs "falling out" of the control of its originator. This is an inherent feature of releasing any patentable product or publishable work, indeed, in the eighteenth century, the potential for "spillover" was an accepted part of granting a patent, as Hyde notes in relation to a court case relating to the invention of the achromatic lens: “Lord Mansfield, Lord Chief Justice of England, asserted that a patent is a contract between the inventor and the public. The commercial advantage which the inventor gains is his reward, not for having made the invention, but for having disclosed it to the public so that when the limited period of his patent has expired, the public gains the free use of the new idea.” (Hyde, 2012, p. 51)

In his 2006 work, "Democratizing Innovation", Eric von Hippel stated that spillovers were commonplace; innovations get revealed regardless of intellectual property laws (von Hippel, 2006, pp. 80 & 81). Also, he stated that firms often have similar information (von Hippel, 2006, p. 82). Spillovers can occur in a variety of contexts, including what can be termed "design spillovers" whereby a product reveals information by the very existence of its design and the components used therein.

Design spillovers are commonplace in what is known as the "teardown video". For example, shortly after the launch of Apple’s new iPhone 7, iFixit Video "tore down" the product in a ninety-second video, revealing its components and features (iFixit Video, 2016). iFixit Video’s motivation in this instance is to make the components in the proprietary iPhone more accessible and thus easier to repair; this extends the lifetime of the product. However, this contravenes Apple’s preference for a cycle of planned obsolescence as evidenced by their annual release schedule. Replacing the battery without Apple’s involvement is not a service option covered by the product warranty (Apple.com, 2016).

Other teardown videos reveal the inner workings of complex, industrial products such as oscilloscopes.
The Electronics Engineering Video Blog (https://www.youtube.com/user/EEVblog) regularly features videos that show the dissection of industrial products; this enables users to perform advanced calibrations as well as provides detailed information about patented designs. A single teardown video regarding a handheld oscilloscope (as seen in Figure 1) generated more than 67,500 views at the time of writing: this information has been shared without bias to geography or status.

The prevention of spillovers is complicated further, as per von Hippel, by firms having similar information: for example, manufacturers often rely upon sets of similar components or ingredients. The Cortex-A9 processor core offered by the chip manufacturer ARM has been used to power over twenty mobile communication devices and single-board computers (Wikipedia, 2016). Under these circumstances of similitude, “trade secrets” and “patented mechanisms” are increasingly difficult to maintain.

Inexpensive Tools

New technologies have previously had a huge impact on the production and distribution costs of cultural products; the musician David Byrne claimed that “recording costs dropped almost to zero (it used to cost $15,000 to make a studio tape; now ‘an album can be made on the same laptop you use to check email’) and manufacturing and distribution costs also dropped to zero…” (Hyde, 2012, p. 64).

Similar price reductions now apply to the manufacture of complex physical goods: Chris Anderson, in his 2012 book, "Makers: The New Industrial Revolution," detailed a personal case study which illustrated the increasing ubiquity of inexpensive tools for the purposes of manufacturing new products. In the 1960’s, Anderson’s grandfather created a new automatic sprinkler system; however, this was expensive to develop and required specialist engineering knowledge as well as large company to manufacture and distribute it (Anderson, 2012, pp. 1-6). By way of a contrast, Anderson illustrates the modern situation in which a proposed “OpenSprinkler” system makes use of open source software and hardware to create a far more inexpensive product, easier to manufacture and distribute (Anderson, 2012, pp. 28-30). Mark Hatch, in his 2013 work, "The Maker
Movement Manifesto,” estimated that there was a "greater than 70%" reduction in the cost of advanced tools including the lathe and mill (Hatch, 2013, p. 85).

The Raspberry Pi is emblematic of the new tools: it is a fully featured single-board computer that was launched in 2012 with a price point of $35 (Gibbs, 2015). This price has been maintained despite continuous improvements in its feature set: e.g., upgraded processor technology and embedded wireless networking technology. Inexpensive computing power as availed to the Pi reduces the costs of invention: a high-end manufactured product created using home or small workshop-based tools can match and even surpass the characteristics and feature set of a mass manufactured product. This was noted by one of the creators of the Raspberry Pi, Eben Upton, in 2015: "The profusion of small businesses, often start-ups, that are building products around the Raspberry Pi have been using the device platform as a way of producing consumer or industrial grade products at a much lower scale without having to reach large volume to access cost efficiencies" (Bell, 2016).

Open source software may limit the value of previously patented features; for example, the open source Pocket Sphinx software package (developed by Carnegie Mellon University) provides voice control functionality (GitHub, 2016). This enables the home developer to create voice-controlled applications which are like those offered by Amazon (Alexa), Apple (Siri) and Microsoft (Cortana).

Inhibited and Combined Innovation

Intellectual property protection can betoken an emphasis on extracting value from ideas rather than developing them to their full potential. The writer Steven Levy chronicled this process in his tome about the Hacker movement. The "Hacker Ethic", as Levy describes it, consists of two portions: the first is the impulse to explore: "if we all acted on our drive to discover, we'd discover more, produce more and be in control of more" (Levy, 2012, p. 86). The second part is an emphasis on what Hackers call "The Right Thing,":

"The Right Thing implied that to any problem, whether a programming dilemma, a hardware interface mismatch, or a question of software architecture, a solution existed that was just...it. The perfect algorithm. You'd have hacked right into the sweet spot, and anyone with half a brain would see that the straight line between two points had been drawn, and there was no sense trying to top it" (Levy, 2012, p. 69).

However, in a world punctuated by shareholder expectations, there can often be a fundamental tension between the desire to create "The Right Thing", and the need to deliver a minimum viable product in a timely manner. This became apparent when hacking moved "mainstream" via the medium of the video game, one of the many new industries to emerge from the burgeoning developments in technology during and after the 1960s. As Levy continues:

"At first, the artistic goals of the hacker coincided neatly with the marketplace, because the marketplace had no expectations, and the hackers could blithely create the games they wanted to play, and adorn business programs with the nifty features that displayed their artistry. But as more non-technical people bought computers, the things that impressed hackers were not as essential...The Hacker Ethic, of course, held that every program should be as good as you could make it (or better), infinitely flexible, admired for its brilliance of concept and execution, and design to extend the user's powers. Selling computer programs like toothpaste was heresy. But it was happening" (Levy, 2012, pp. 365 & 366).

Restrictions on intellectual property may also prevent the possibilities of knowledge recombination that can occur via collaboration with others outside of the boundaries of a single entity. Ideas are additive, and to use Foray’s term, “non-rival”; the concept is further clarified by a quote attributed to the writer George Bernard Shaw: "If you have an apple and I have an apple and we exchange apples, then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas” (Hyde, 2012, p. 45). In other words, ideas are inexhaustible; given the right conditions, they can create a bricolage that supports the creation of additional inspiration and inventions.

Chris Anderson further described the value of recombination of ideas in fostering innovation: "When you share, community forms, and what community does best is remixing, exploring variation in what a product can
be and in the process improving it and propagating it far faster than any individual or single company could." (Anderson, 2012, p. 74) Anderson states that this form of innovation can lead to significantly reduced costs and more time-efficient design processes: for example, the Chevrolet Volt, developed by General Motors by itself cost $6.5 billion and took 6 years. Local Motors, which uses an open, community driven model, developed the Rally Fighter car in 18 months and for $3 million (Anderson, 2012, p. 133).

This collaborative, open approach is neither novel nor new. Benjamin Franklin’s experiments with electricity (and the resulting invention of the lightning rod) were conducted in concert with other researchers in Europe. As Lewis Hyde states, "the actual experimentation was highly social; the theory came out of a four-man laboratory furnished with materials sent by friends in London" (Hyde, 2012, p. 179). Franklin was generous with his scientific findings; as he stated in one of his letters, "since even short Hints, and imperfect Experiments in any new Branch of Science, being communicated, have oftentimes a good Effect...you are at Liberty to communicate this Paper to whom you please; it being of more Importance that Knowledge should increase" (Hyde, 2012, pp. 135 & 136). Furthermore, "Franklin published...detailed instructions for how to how to make a lightning rod" (Hyde, 2012, p. 116), thus creating an early example of "open source hardware".

Given the innovative potential of recombining ideas, the increasing length and severity of intellectual property protections may be having a negative impact on the number of groundbreaking innovations available to society. The economic historian Robert Gordon stated in his 2016 work "The Rise and Fall of American Growth" that innovation had plateaued, and that the improvements in living standards and economic growth which had characterized much of the twentieth century were no longer available.

New Revenue Models

In 2007, the popular rock music band Radiohead released their new album, entitled "In Rainbows." Rather than ask for a price for their work, they operated an "Honesty Box" system, whereby purchasers paid what they wanted, or more precisely, what they felt the work was worth. At the time, this model was treated with derision; the lead singer of another rock band (Kiss), Gene Simmons, stated bluntly: "That's not a business model that works. I open a store and say 'Come on in and pay whatever you want.'...Do you really believe that's a business model that works?" (NME, 2012) The album was copied regardless of its voluntary price: according to an internet metrics firm, in "its first 24 days, the album notched up 2.3m torrent downloads" (NME, 2012). Nevertheless, "In Rainbows" was an outstanding commercial success; per Radiohead’s lead singer Thom Yorke, "...in terms of digital income, we've made more money out of this record than out of all the other Radiohead albums put together, forever — in terms of anything on the Net" (NME, 2012).

Radiohead’s experiment with the "honesty box" is indicative of a wider phenomenon; revenue can be secured regardless of intellectual property protection and indeed, by giving the product away. There is evidence that users will pay if they value a product or wish to partake in an ecosystem.

"In Rainbows" was not the first experiment with an unprotected work sold at a nominal or voluntary price. Tom Pittman, an independent software developer, created a BASIC interpreter that he sold for five dollars. His rationale? "(Bill) Gates was moaning about the ripoffs, and people were saying, 'If you didn't charge $150, we'd buy it.' I decided to prove it" (Levy, 2012, p. 238). The result was nearly immediate: "He sent an ad...within days of its appearance he had fifty dollars in his mailbox" (Levy, 2012, p. 239). Furthermore, "Some people sent in ten dollars or more saying the five was too little. Some sent in five dollars with a note saying not to ship anything to them – they’d already copied it from a friend" (Levy, 2012, p. 239).

Chris Anderson’s tome "Free", written in 2009, also presented a model based upon free and open products rather than charging for the use of intellectual property. This development has been facilitated by the changing nature of commerce: as he states, "Only thirty-two of the Top 100 companies today make things you can hold, from aerospace and motor vehicles to chemicals and food, mental bending and heavy industry. The other sixty-eight traffic mostly in ideas, not resource processing...as commodities become cheaper, value moves elsewhere" (Anderson, 2009, p. 52). Anderson also presented the example of Cliff Harris, a software developer. "(Harris) decided to find out why people pirated his software...the perception was they were overpriced and DRM was seen as a legitimate signal to take the free route. Harris slashed the price of the
game and removed the copy protection. He also increased the length of free demos and improved the quality of the games" (Anderson, 2009, p. 72).

An “open” approach to intellectual property may be successfully adopted by manufacturers, particularly if their products require a support ecosystem: Anderson’s company, 3D Robotics, designs and produces advanced drones. When informed that a Chinese-made copy of his product was available, he took no action. As he stated: “A Chinese company can make a clone of our products and maybe sell it cheaper, but it won’t have our community, and if our community can spot the clone, they will probably decline to help those who chose not to support the ‘home team’...our communities exist because our products are hard to use...members help each other navigate confusing and uncharted territory” (Anderson, 2012, p. 113).

Discussion

The current system of protecting intellectual property is regarded as integral to value extraction for firms and individuals. These protections, particularly in the United States, have become more restrictive and extensive in recent years. However, this emphasis may be mistaken: innovation has traditionally been a collaborative process, as illustrated by industrial centres such as the silk weavers in 18th century Lyons and the iron industry in 19th century England. Leading thinkers and inventors in the 18th century like Benjamin Franklin regarded publication and sharing of knowledge (which allowed for the possibilities of combining and recombining knowledge) without restriction as a key component of the process of scientific discovery and advancement. Additionally, the ability to maintain restrictions on intellectual property, even the designs of advanced manufactured goods is diminishing: the internet is everywhere, design spillovers are readily available via the common "teardown video", cheap components allow replication of advanced products, and free and inexpensive tools enable sophisticated functionality to be ubiquitous. Finally, reliance on protected intellectual property has the potential to distract from the exploitation of other revenue channels, whether it is via the "honesty box" proffered by Radiohead or by the maintenance of an ecosystem for a sophisticated product such as an advanced drone.

There is a growing awareness of the limitations of the present intellectual property regime. The Mozilla Foundation, the organization behind the web browser Firefox, has undertaken the cause of copyright reform to this end (Mozilla Advocacy: Reform Copyright, 2016). Professor Diane Coyle of the University of Manchester stated in an article in the September 29, 2016 issue of the Financial Times: "Ownership in trust with free public access would be an efficient model for (knowledge assets’) use, and more in line with social norms than the corporate model of private appropriation. Some models such as open source and open access are evolving for digital assets — which of course differ greatly from tangible assets — but they are so important now that it is time to give careful thought to the institutional structures that embed the public’s rights to use them" (Coyle, 2016).

Further research will be required into potential intellectual property and revenue models that will allow for firms to be viable yet permit open information sharing and recombined innovation. Additional study should further elucidate how firms can transition from current models to an open paradigm.

References


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