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Alternative Intellectual Property Systems for the Digital Age

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Abstract
This paper investigates the current turbulent state of copyright in the digital age, and explores the viability of alternative compensation systems. The paper critically appraises the increased recourse to digital rights management (DRM) technologies, which are designed to restrict access to and usage of digital content. Considerable technical challenges associated with DRM systems have necessitated increasingly aggressive recourse to the law. A number of controversial aspects of copyright enforcement are discussed and contrasted with those arising from alternative levy-based compensation systems. This paper undertakes consideration of alternative models for managing the copyright bargain in the digital era.

Introduction

The digital age promises innumerable opportunities and benefits for society, but for intellectual property (IP) regimes originating in the analogue era it presents many fundamental challenges. Much debate revolves around how to shape modern laws and

digital technologies to retain existing IP regimes, so that traditional commercial and regulatory models can live on. Relatively little is said about alternatives based on the premise that current IP regimes need redesigning to better suit the digital world.

Copyright law was designed to create a regime providing financial incentive and recognition for creators to thereby encourage a rich supply of IP for the benefit of society. Due to the 'public good' qualities of art, movies, music and literature, the dilemma has been that, unless creators and producers are somehow fairly rewarded for their efforts, IP production is likely to decline. Without some form of intervention, the 'non-rivalrous' (use by one person does not diminish enjoyment by others) and 'non-excludable' (providing availability to some does not prevent access by others) characteristics of public goods may undermine incentives for commodification and commercial production. Taxation is one common mechanism applied to overcome production disincentives where societal benefits are perceived to warrant government intervention. Copyright law, dating back to the *Statute of Anne* in 1709, was the novel solution specifically applied to creative works. Copyrights are basically a legal set of exclusive rights provided to content owners, balanced by a carefully considered set of exceptions to equalise public interests in the overall bargain.

Such copyright systems worked well while the resources required to produce and distribute copied material were relatively expensive, and copy degradation was unavoidable. These deterrents no longer exist in the digitally networked content environment. Inevitably, the advent of digital technologies and the internet have led to a dramatic escalation of copyright infringement, more commonly — and misleadingly — referred to as piracy. Since the invention and widespread deployment of photocopiers in the early 1960s, and the subsequent development of home taping, video recorders, and so on, copyright problems have dramatically intensified. The principal industry response has focused on the development of digital rights management (DRM). Many definitions of DRM proliferate, but it can generally be described as the set of technical and legal mechanisms applied to help control access to, and distribution of, copyrighted and other protected material in the digital environment.

Despite ongoing research and developments in DRM, it will always by nature remain a subset of possible deterrents for copyright infringement. A key question, with this inherent limitation in mind, is whether or not the costs and repercussions of DRM justify its status as the primary solution to the current dilemma. Laws which criminalise significant sections of the population should only be implemented when benefits clearly outweigh social costs. Laws which are regularly broken by a wide cross-section of the public, to which authorities frequently turn a blind eye, are most likely in need of change.

This paper compares two different approaches to handling the dilemma of IP in the digital world. The first maintains the current copyright regime, while taking stronger measures to lock up IP in order to sustain it. This entails increased use of technological and legal rights enforcement mechanisms. The second option is to change the current copyright regime to adapt to the digital environment where copying, reuse and repurposing of content are widespread and possess few, if any, technological barriers, and using alternative compensation systems such as levies to suitably reward digital content creators and distributors.

Had the initial instigators of copyright law used some taxation mechanism to achieve the goals of copyright protection, we would have an entirely different scenario today. Drastic changes of an entrenched regime require firm evidence to illustrate that their overall benefits are real and worthwhile. Prototype alternative IP systems are therefore necessary both to collect such evidence, and to experiment with system design. By describing the worsening problems in the current regime whilst facing the difficulties of implementing alternative compensation schemes, it is hoped that further investigation into the problems, and support for alternative IP systems, will be encouraged.

It is possible that the scale of current problems might have persuaded early decision-makers to rethink the copyright and IP regimes. This paper aims to contrast benefits and costs of levy-based systems alongside current approaches. If alternative IP systems can better maximise technological and social benefits in the digital age, whilst fulfilling the

goals behind copyright law, such options ought to be explored more fully. Investigating alternative directions rather than remaining entrenched in an increasingly shaky regime may present a route with fewer obstacles and greater promise for the future.

Problems faced by the current copyright regime

In order to sustain the current copyright regime in the environment of widespread ease of infringement, the technical solution has typically involved greater use of compliant end-user devices, with incorporated virtual machines capable of enforcing content licence restrictions. This is not an easy task since such DRM systems will require client rendering devices with trusted processing, input and output paths (Lacy et al., 1997). Required modifications to current PC architecture will therefore affect motherboards, CPU, display and input devices. The technical complexities necessary for these types of DRMs must make them costly measures. The idea is that users will be unable to tamper with a device without compromising its ability to attest its compliance or trustworthiness (Schechter et al., 2003). Compliant devices can be relied upon to communicate with content providers, using remote attestation mechanisms built into hardware. Embedded unique private keys will enable identification and authentication of both devices and users. Non-compliant or compromised devices, unable to convince content providers of their trustworthiness to comply with licensing conditions, will consequently have reduced content access and usage freedom.

Greater use of Technological Protection Measures (TPMs), enabling end-to-end content protection via closed systems, is currently a favoured solution for copyright owners. If they can maintain greater usage control over their digital content, then pay-per-usage business models can be applied to raise revenue from their works. Their focus is on sustaining current copyright regimes and retaining existing lucrative creative industry business models via increased use of TPMs combined with aggressive legal pursuit of parties violating copyright, contract and controversial anti-circumvention (of protection mechanisms) laws. The trend is towards online delivery of content to consumers subject to a number of conditions and with restrictions. Digital Rights Enforcement (DRE)

systems can attach usage rules to electronically distributed content, along with security mechanisms designed to enforce them. If they fail, as they eventually typically do, the law is waiting in the wings to back them up. Users attempting to circumvent protection measures, or remove embedded copyright information, are in nearly all cases breaking the law. Users who interfere with TPMs and create infringing copies can technically be tracked and exposed to litigation. Legal backup now goes further than this. Laws now prevent the creation, manufacture or marketing of circumvention tools that are designed to compromise technical security measures. This *defence-in-depth approach* to maintain the current copyright regime has numerous far-reaching implications.

Diminished consumer privacy

DRM technologies provide functional capability to monitor consumer viewing, listening and reading habits. An excerpt from a Microsoft definition of DRM clearly illustrates this point: 'DRM is a set of technologies content owners can use to protect their copyrights and *stay in closer contact* with their customers' (Microsoft, 2003, emphasis added). The carefully phrased language disguises potential privacy-invading monitoring capability in a consumer-centric spin. This example of slanted vendor marketing is an illustration of the widespread practice of 'perception engineering', whereby an impression of inevitability about corroding consumer rights is encouraged.

Because valuable collected data can be used for market research, there is a real incentive for consumer monitoring. This represents an unacceptable erosion of personal privacy for many consumers. It was respect for consumer privacy in their own homes that caused Germany to be the first initiator of levy-based systems for private copying (Hugenholtz et al., 2003).

A number of significant concerns surrounding DRM systems have been persuasively articulated by privacy advocates (Cohen, 2003). Although pressure from consumer groups and academics is likely to result in some onus to embed privacy protection measures, because monitoring capabilities are inherent in DRM technologies, there can

be no guarantees that privacy enhancing technology (PET) mechanisms are actually adhered to. This tendency has been illustrated in the area of web privacy policies. With or without their knowledge or consent, DRM technologies have the potential to invade the personal privacy of consumers. Moving into the realm of paranoia, DRM mechanisms could conceivably assist politically motivated entities to survey consumer device hard drives. Critics such as John Perry Barlow argue that: 'Digital Rights Management today is Political Rights Management tomorrow' (cited in Krempl, 2003).

Reduced innovation potential

Trusted platforms enabling compliant systems have 'black box' characteristics that might severely impact upon technological innovation by shielding hidden interfaces under the guise of security. 'Trusted' technologies give software creators the ability to make and lock in decisions about who their applications can interoperate with (Anderson, 2003). The tamper-resistant nature of trusted systems implies that any user producing interoperable software beyond the scope specified must have broken the law by circumventing a TPM. This feature of trusted platform technology challenges future interoperability and innovative adaptation potential. The current capability to adapt software and promote open systems has provided many benefits to date, so any legislative efforts that hold back technological innovation potential might have inconceivably far-reaching consequences.

Proliferating online piracy, particularly in the music industry, has led affected stakeholders to seek out methods to attack peer-to-peer (P2P) file-sharing networks and applications. But the consequences of impeding ongoing development of potentially beneficial P2P technologies, which some have claimed to be 'both the origin and the future of the Internet' (Hausmann, 2002: 210), should not be underestimated. Instead of sabotaging P2P networks, they could instead be harnessed to assist with the implementation of new business models. The effectiveness of 'viral marketing' practices, whereby users promote and share material with friends, might usefully be applied to create more efficient content delivery networks.

Spoiled content fidelity

Two core technologies used for DRM are encryption and digital watermarking. Encryption is, of course, essential to prevent snooping during transit and while in storage. But to be rendered, content must eventually be decrypted, so digital watermarks are designed to remain unobtrusively and persistently hidden within content. The threat to content fidelity is that persistence can only be achieved at the cost of unobtrusiveness. A prominent characteristic of digital watermarking is the existence of numerous unavoidable tradeoffs, affecting cost, complexity and watermark perceptibility (Craver et al., 2000). The likelihood for content fidelity to noticeably deteriorate is increased when robustness is prioritised, a consequence not necessarily in the best interest of either consumers or creators.

Extensive research activity has been dedicated towards developing new ‘robust’ watermarking methods capable of sustaining a subset of typical processing, filehandling and editing functions, and also malicious attacks. File compression in particular presents significant challenges for watermark designers. When robustness is a primary goal, the aim is to insert marks in a manner that will resist accidental or malicious removal without simultaneous destruction of the work. But the current— and arguably permanent — state of watermarking technology is that any existing technique is vulnerable to attack. There are considerable differences in resilience and implementation practicality amongst modern watermarking schemes, and ongoing research continues to generate improved schemes and new attacks. Because the current copyright regime creates incentives for attackers, production of tolerant robust watermarking techniques is currently a high priority.

Ongoing commercial piracy

The current copyright regime invites commercial piracy to flourish, with a motivation proportional to market size and content value. If content prices are inflated and access

restricted, then piracy incentives will be fuelled. History has continued to demonstrate that, with sufficient motivation to attack, any TPM will eventually be broken (Biddle et al., 2002). Anti-circumvention laws will not deter commercial pirates, who have flagrant disregard for the law. Any real attempt to sufficiently deter determined, resourceful pirates requires strong security measures which are generally too expensive for use in protecting low-value content. Information security standards outline how appropriate security measures are selected following a risk assessment process, including a cost-benefit analysis. It is widely realised that no system can guarantee perfect security, so minimisation rather than elimination of commercial piracy is a realistic goal, but only with accompanying increased costs for consumers. Layers of TPMs, including numerous failures, such as the content scrambling system (CSS) protection on DVDs, noteworthy for its widespread use and poor design, tend to lead to escalating costs that are ultimately passed on to consumers. Considerable resources are expended in design and implementation of TPMs, particularly complex watermarking technologies. Although these may result in some reduction of commercial piracy, the subsequent reduction in consumer acceptance due to rising costs and decreased convenience must be taken into account.

Greater imbalance in the copyright bargain between copyright holders and users

There has been much commentary on the trend towards erosion of ‘fair use’ provisions, to the detriment of the consumer rights side of the copyright bargain. The set of exceptions to the exclusive rights of copyright owners were carefully crafted by lawmakers to create the desired balance between owners and the general public. One of the problems arising from attempts to apply technological means to protect copyrights is that it is considered impossible to program fair use exceptions into DRM systems. This is because fair use is a complex legal mechanism, with outcomes dependent on individual aspects of each case. Clearly, case-by-case decisions cannot be defined algorithmically for programming into DRM systems. This is likely to reduce consumer capability to exercise fair use rights if DRM systems remove operation of these copyright exceptions,

thereby tipping the delicate copyright balance further against consumers (Burk and Cohen, 2001).

Copyright-based industries are an extremely powerful force in the world today. They represent one of the most rapidly growing sectors of the world economy in terms of GDP, job growth and international trade (Howkins, 2001; Siwek, 2002; Cutler & Co/CIRAC, 2003). These copyright industries have had sufficient power and influence to successfully lobby for tougher laws, including most controversially the new anti-circumvention provisions introduced by the WCT (World IP Organisation Copyright Tribunal), and enacted by most member states. Such laws provide even ineffective TPMs artificial muscles by simply prohibiting their circumvention. Consumers increasingly are becoming comparatively powerless stakeholders in the copyright bargain.

Alternative compensation systems

A contrasting option to the application of DRM systems outlined above would involve changing the current copyright regime to allow free private copying and online downloading in exchange for levies paid on those devices and services that enable it. Following a brief history of levy systems for IP, some alternative compensation models are next described and characterised.

Existing levy-based systems for IP

There are already in existence around the world, primarily for music and reprography, over 40 private copying exemption systems that use revenue gathered via levies on blank storage media and/or recording devices to distribute amongst content owners (creators and producers) (Australian Copyright Council, 2001).

Copyright protection did not historically extend to private copying by individuals, but as the distinction between public acts and private acts began to blur with the advent of sound and video recording equipment, regulation of private use became inevitable. It was

in response to the fact that infringement claims against individuals creating private home copies were considered unenforceable, due to a person's right to privacy in their own home, that levies were first introduced (Hugenholtz et al., 2003). To compensate rights holders for the common practice of private home copying, the German Supreme Court initiated a statutory equipment levy in 1965. Other member states of the EU soon followed suit with variations of the German regime.

Existing levy systems suffer from a number of flaws and, like all IP systems, need to adjust to the realities of the digital age. There are a number of proposals to extend the breadth of regulated levy systems to incorporate more forms of digital content and distribution channels, including the internet. The existence of public libraries illustrates a long-held community belief in providing free access to expressions of human creativity and knowledge for all people. Public libraries are funded by government taxes, and are already evolving to provide access to digital media as well as books. It has been strongly argued that expressions of human creativity and knowledge, easily accessible due to modern digital networked technologies, have public good characteristics, and hence fall into the category of goods eligible for regulation by government (Fisher, 2004). Following this argument, it seems reasonable that the public library concept, traditionally focused primarily on books, could justifiably be extended and broadened to encompass all forms of digital content.

Fisher's levy based model

William Fisher, the Hale and Dorr Professor of Intellectual Property Law at Harvard University, and Director of the Berkman Centre for Internet and Society, is one of the leading proponents of alternative models. Fisher has proposed a government-administered compensation system, encompassing free online access to music and movies. Fisher's model addresses the growing problem of P2P sharing, not currently encompassed by private copying levy systems. He proposes taxing all goods and services that are used to gain access to music and film. This includes recording equipment, storage media and ISP services, either to download files or to stream recordings from the internet.

Fisher (2004) includes initial rough estimates of percentage revenue losses that the music and movie industries would incur should free, unlimited non-commercial file sharing be introduced, aggregated into an overall US tax rate for 2004 of 15.88 per cent on the sales price of targeted items and services necessary to fairly compensate affected businesses.

In the Fisher system, content owners are paid their proportional share of collected tax revenues based on the relative popularity of their work, ascertained by estimating the frequency of consumption. It is this aspect of any levy-based model that is particularly vulnerable. Any system reliant upon automated online counting is a prime target for compromise via potential fraudulent 'ballot-stuffing' code, by dishonest content owners wishing to acquire more than their fair share of the revenue pool. A number of alternative mechanisms to estimate popularity are being discussed, including the use of sufficiently extensive customer surveys and voting tokens. While there are many specialist customer survey organisations well practised in applying sampling techniques to gather and analyse data, two other problems facing the Fisher system and related models are the problem of achieving incorruptible popularity estimates, and the possibility of tax rates rising over time due to increasing corrosion of affected business revenues. Technological advances are likely to further increase the popularity of online downloading, resulting in reduced spending through traditional channels, and an undermining of traditional forms of audience/user aggregation that have been developed for commercial clients.

Alternative compensation models

Most 'alternative' IP models focus to some degree on encompassing free access to, and non-commercial copying of distributed and networked content, accessed by online or other means. In Brazil, for example, the Ministry of Culture is supporting a new initiative to put all locally produced culture into a central pool made freely available online, to help promote local artists and maintain Brazil's cultural heritage.

Alternative compensation systems can be run on a voluntary basis, along the lines of existing collecting societies, whereby contributed content is centrally administered,

stored and made available to the public. Such a closely regulated system would use some combination of techniques to monitor the relative popularity of contributed works. Consumers could then access content either online or from distributed physical outlets, such as public libraries or educational institutions. Users would then be free to store and copy content obtained from the system at will, for their own private, non-commercial use. Any pooled revenue collected by a voluntary system is divided and distributed according to relative popularity weighting, after administration costs are deducted.

In such a system, content would be centrally registered and marked with a unique identifier, such as the DOI (Digital Object Identifier). This would allow easy tracking, administering, indexing and unique identification of any contributed content.
If content owners were convinced of the merits of the system, and of its capability to provide a fair and regular income, they would be more likely to wish to opt into a voluntary scheme. This means that any levy rates applied must be sufficient to generate the necessary revenue pool needed to attract content owners in. This opt-in style of alternative model is likely to be more palatable to the copyright and creative industries than compulsory schemes, since it leaves more choices open. Content owners who prefer to protect their works using TPMs can then remain free to do so.

Challenges for and characteristics of levy-based systems

Levy rates

Levy-based systems place significant responsibility upon decision-makers, particularly regarding the setting of levy rates and revenue distribution allocations. Because of their impact on quantity of content contributed, as well as on consumer support, levy rates are an especially delicate balancing mechanism for voluntary systems. Levy rates might be kept reasonably modest, since content owners of popular material have opportunity to augment their revenue via familiar value-add methods, such as live performances, cinema attendance and merchandising. Individual levy rates on eligible devices and services might be more fairly imposed based on analysis of their typical usage for activities

involving accessing, rendering, storing, copying and redistributing digital content. Targeted devices and services could then be taxed on sales prices, weighted according to typical usage, as determined by regular consumer surveys.

One of the common objections raised about levy systems is that levies would still be paid on devices, disks or services even if they are not actually used to access, render or copy copyrighted material. Although valid, this criticism can be partially reduced by illustrating that, on average, consumers currently spend more on recording entertainment than they would pay in levies (Fisher, 2004). Industry sectors whose products become targeted by levies, including consumer electronics and ISPs, are likely to object, and to pass on increased prices to customers. Free access to content will arguably create additional demand for such products, and offset disadvantages somewhat.

Content marking

Alternative compensation systems require minimal DRM technology, primarily to mark content for identification purposes. A unique identifying sequence, such as the DOI, can be persistently embedded in digital content using watermarking technology. By restricting the watermark payload to the unique identifier, tradeoffs against perceptibility and robustness are reduced. With extensive research underway in the digital watermarking field, many different techniques of varying degrees of practicality already exist. Watermark method selection depends on the specific requirements of the application. A key issue for most creators is to achieve recognition for their work, thereby satisfying their moral right of attribution. For this application, techniques that 'redundantly' apply a watermark repeatedly throughout the content would be particularly useful. This feature would mean that the minimal invisible/inaudible mark is detectable from even small pieces of a work, making it relatively easy for creators of derived works to incorporate suitably identified samples of others' works within their own compositions. There could then be potential to build plug-ins for publishing applications to read, extract or insert watermarks, and also possibly to perform rights database look-ups to provide further details.

Embedding an identifier, such as DOI, into the content itself provides capability to easily hook into some distributed system of rights databases to extract additional information. Thus the embedded DOI links to records holding comprehensive (yet generally static) content metadata, creator and ownership details, including those of any contained derived works.

Watermarks have many potential applications, but a number of inherent limitations. The most challenging aspect of watermarking is probably striving for robustness (particularly against malicious attacks). While robustness is a priority for DRMs protecting content in the current copyright regime, it loses importance in a system where content is ‘free’. With significantly diminished incentive for deliberate removal of watermarks, content fidelity becomes less of an inevitable tradeoff.

Revenue distribution

One of the significant challenges for any levy system is determining how to distribute collected taxes fairly. Relative values of different genres of creative work must be factored in: clearly a movie is ‘worth’ more than a song, because it costs significantly more to produce. In the current system, market forces efficiently determine the relative value of entertainment genres. Once the revenue pool is divided amongst genres, distribution to individual owners is based on relative popularity estimates.

Alternative systems prototypes

Supporting evidence to justify redesign of the current copyright system in the form of working alternative prototypes is required. Low-cost prototypes can be used to prove the concept whilst providing additional community benefits to justify their existence, such as providing support for new and upcoming local creators. Access to an ‘alternative’ prototype would easily attract content from new emerging creators and free content would obviously be willingly contributed. As a prototype gains exposure and popularity,

and establishes a reputation amongst content creators, higher value content is more likely to be contributed to the system. Initially, a prototype might be funded by some form of grant, but to be commercially viable, the system would need to collect sufficient revenue to cover administration costs and to allow for modest payments to owners of relatively popular content. Adjustment of the levy rates applied will then partially determine the level of higher value content that is attracted into the system, and catalyse expansion of the prototype. Data and social trends can then be collected, monitored and documented to demonstrate the viability and challenges of alternative compensation systems.

Piracy and privacy in levy-based systems

Commercial piracy would effectively be eliminated by a system that provides contributed content freely to all taxpayers. Without the considerable technical challenge of somehow having to disallow copying, fewer restricting TPMs are needed, so in a levy-based regime not only the content, but also technological devices, would be ‘unlocked’ and set free.

Fewer TPMs, and free private copying, remove the need for legal back-up to seek out, catch and prosecute infringers. Along with the obvious cost savings, consumers can maintain anonymity to a far greater degree, without the danger of having their viewing, listening and reading habits being monitored and tracked by external third parties.

Creative artists have greater influence

It is likely that a greater percentage of CI revenues would go directly to creators in a system eliminating many considerable overheads present in the current copyright regime. Regime change enabling greater ease for new artists to contribute or modify existing works and reach an audience would benefit creators as well as consumers. In the digital age, dramatic reductions in costs of production and distribution should in theory lead to an increased variety of artists and works. Without the controlling and editing roles of many of the current regime ‘middlemen’, anyone can publish and share creative material. Thus a levy-based system turns the world into one of controlled cultural anarchy.

Conclusion

As digital rights enforcement technologies continue to develop and roll out into the marketplace, opportunities to redesign the IP system slip away. Because much is at stake for consumers, it is important to open up valid debate to consider alternatives to the struggling copyright regime. DRM technologies may have a crucial role to play in the commercial sector for protecting high-value and critical content, where greater content usage control is required and inherent drawbacks are warranted. It is not so clear, however, that these developing technologies are appropriately applied to protect all IP. A primary goal for copyright owners of most entertainment content is widespread distribution and exposure, primarily to acquire greater recognition and therefore revenue-earning potential. This goal is not assisted by technologies designed to restrict usage and access.

It is important to carefully consider costs and societal repercussions caused by applying DRM technologies to control rampant copyright infringement so easily performed in the digital age. Although the right to make copies is central to the integrity of the current copyright system, it has been suggested that, due to the very ‘centrality of copying to use of digital technology, reproduction is no longer an appropriate way to measure infringement’ (Litman, 2002:132). The time is therefore right to consider alternative models to seek a more workable solution that better suits the modern world and achieves a more even balance in the copyright bargain. It is clearly essential to weigh up the pros and cons of all models aiming to solve the ‘public good’ issues in relation to IP, and to choose the most socially optimal outcomes, before it is too late to change.

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