SOFTWARE
COPYRIGHT, PATENT OR SOMETHING ELSE?
A Cultural Economics Policy Research Note on the Global Knowledge-Based Economy

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> … intellectual property is, after all, the only absolute possession in the world... The man who brings out of nothingness some child of his thought has rights therein which cannot belong to any other sort of property… (Chaffe 1945)

Introduction

Canadian copyright reform raises many wickedly complex questions requiring thoughtful public policy answers. In this note I will consider two from the perspective of cultural economics. In this view Law is not a technical subject but rather a cultural artifact arising from the unique historical experience of a specific culture with its distinctive patterns of custom, habit and life ways (Schlicht 1998). More to the point, each system of Law has its own definition of what can be bought and sold, *i.e.*, What is Property? My concern is the peculiar case of Canada and its evolving hybrid cross between Anglosphere *copyright* and Francophone *droit d'auteur* – rights of the author – with respect to software.

In both traditions Law must look outside itself for guidance and understanding. The philosopher John Dewey reasoned that when Law looks outside itself for insight, (in his case about corporate legal personality) the results can be unfortunate because "the human mind tends toward fusion rather than discrimination, and the result is confusion" (Dewey 1926, 670). Thus Law looks out with three-faces onto copyright: one sees trade regulation of a State sponsored monopoly; the second, the natural or 'human' rights of the artist/author/creator; and, the third, an ever growing public domain and the learning it engenders.

Law also looks out functionally in three ways – as statutory, regulatory and case law. Statutory is made by legislators in parliaments, congresses, *etc*. Regulatory is made by bureaucrats interpreting and implementing the intent of a statute. Case is made by judges interpreting and enforcing statutory and regulatory law. All three are found in Anglosphere or Common Law as well as Francophone or European Civil Code countries. Only the emphasis varies. As human artifacts, of course, both have strengths and weakness.

When judges "make" Law it is by setting precedent. In the Anglosphere this body of precedent is called the "Common Law". If a similar case was resolved in the past, a current court is bound to follow the reasoning of that prior decision under the principle of *stare decisis*. The process is called *casuistry* or case-based reasoning.

If a current case is different, however, then a judge may set a precedent binding future courts in similar cases. Sometimes such precedent also compels legislators and bureaucrats to change statutory and regulatory law. This is especially true with respect to intellectual property rights (IPRs) such as copyright, patents, registered industrial design, trademarks, know-how, trade secrets, *etc*.

Changing technology, among other things, increasingly brings novel cases before the courts forcing legislators and bureaucrats to keep up or allow casuistry to run its course. The problem is that a court decision in a specific case can, for better or worse, establish 'path-dependency' for emerging techno-economic regimes (David 1990), *e.g.*, in genomics or biotechnology. This reflects the more general psychological *Law of Primacy*: That which comes first affects all that comes after. In Law it is called precedent; in economics it is called 'path dependency'.

Furthermore, precedent established in one jurisdiction may 'spill-over' into others. This is especially true of IPR precedents set by courts in the United States influencing other Common Law countries such as Canada. The sheer scale of the American economy assures that case law will be better developed there than in smaller jurisdictions. This has, for example, been the path followed by software copyright and software patent in Canada, *i.e.*, U.S. case law set the ball in motion.

On the other hand, casuistry must begin again if changes or amendments to statutory or regulatory law have the effect of negating precedent. This would be the case with respect to software copyright and patent in Canada if the findings of this research note were put into effect.

First, I will consider copyright in a knowledge-based economy (OECD 1996) including its place within the national innovation system (OECD 1997).

Second, I will consider whether software – computer or 'dryware' *and* genomic or 'wetware' - is 'best' protected by copyright, patent, trade secrets or something else.

In conclusion I will offer a policy prescription to enhance the competitiveness of nations, especially Canada, in a global knowledge-based economy.

Copyright in Context

In a knowledge-based economy knowledge takes three forms – codified, tooled and personal (Chartrand 2007). Codified knowledge is fixed in an extra-somatic, *i.e.,* out-of-body, matrix (or communications medium) as *meaning*. Sender and receiver must both know the code if the message is to convey semiotic or symbolic meaning from one human mind to another. [i]

Newly codified knowledge is converted, temporarily, into legal Property that can be bought and sold through copyright. Once out of copyright, however, codified knowledge enters the public domain where it is freely available to all. In fact, "encouragement of learning" is the historical statutory justification of Common Law copyright [ii] as well as patent and industrial design protection. As the 'public domain' itself, a term introduced from the French into English only with the Berne Convention of 1886, it is also one of the historical justifications for *droit d'auteur* – rights of the author. It is not, however, the historical root of Anglosphere copyright which is its opposite - censorship and Crown grants of industrial privilege.

Codified contrasts with tooled knowledge that is also fixed in an extra-somatic matrix but as *function* and is protected by patent. Patents began as import patents granted to foreigners bringing new devices and processes into Tudor England. Patents of invention and copyright were the only domestic monopolies that escaped suppression by Parliament with King James I's royal ascent to the 1624 *Statute of Monopolies* (Commons 1924).

Tooled knowledge takes two forms – hard and soft. Hard tooled is the physical instrument or process that manipulates matter/energy. As a scientific instrument tooled knowledge extends the human reach and grasp far beyond the natural meso-scopic level to the micro- and macro-scopics of electrons, quarks, galaxies, the genomic blueprint of life, *et al*. To see and touch such unseen, unreachable spaces and places our tools must go where no human can. They report back in numbers (digital) converted into graphics (analogue) to be 'read' by the human eye. Observation today involves a cyborg-like relationship between a Natural Person and an instrument, *i.e.,* Instrumental Realism (Idhe 1991). Soft tooled, on the other hand, include the standards, *e.g.,* 110 vs. 220 volt, embedded in the instrument, its programming, operating instructions and techniques to optimize its performance.

Both codified and tooled, in turn, contrast with personal knowledge [iii] fixed in a Natural Person as neuronal bundles of memory and trained reflexes of nerve and muscle, *e.g.,* of an athlete, brain surgeon, dancer or technician. Some can be codified;

some tooled; but some inevitably remains 'tacit'. Personal knowledge is legally protected as *know-how*. [iv]

Ultimately, however, all knowledge is personal because without a Natural Person to decode or push the right buttons codified and tooled knowledge remain a meaningless or functionless artifact. [v] It means that Canadian 'know-how' resides in its people and their comparative ability to code and decode *meaning* and machine *function* into matter/energy. This is one gauge of competitiveness in a global knowledge-based economy.

New knowledge, in all three forms, is the raw input into the national innovation system or NIS. Intellectual property rights are the legal vehicle reifying - making concrete that which is abstract – converting knowledge into Property with exchange value in the marketplace (Commons 1924). In the case of trademarks and marks of origin, they are coded knowledge symbolizing a Person – Natural or Legal – or a place. In market terms they fix the 'goodwill' of a going concern, *e.g.*, as a corporate logo. Registered industrial designs are also coded knowledge but as aesthetic details fixed in a utilitarian matrix. Interestingly, industrial designs emerged from copyright in England but from patents in the United States. Trade secrets, on the other hand, may be codified, tooled or personal knowledge, *e.g.*, the formula for Coca-Cola, a new jet engine requiring reverse engineering to extract the knowledge or tax accounting tricks learned over years of practice.

NIS is intended to fast track new knowledge into commercially profitable products, processes and services to enhance national competitiveness including employment in a global knowledge-based economy. In effect, Government networks institutional sources of new knowledge, *e.g.*, universities and the nonprofit arts community, with private sector players through quasi-public/private endowments such as Genome Canada or more traditional funding agencies like Telefilm Canada and the Canada Council. The newer endowments, however, explicitly support joint projects, host meetings, conferences and seminars as well as publish bulletins to facilitate communication and cooperation across the cultural divides separating, for example, the University from Business and Government to more efficiently 'commercialize' new knowledge (Chartrand 2008).

To date NIS has focused on knowledge from the natural & engineering sciences. However, new knowledge also emerges from the Humanities & Social Sciences, *e.g.*, as new management techniques like 'just-in-time' inventory systems, and, from the Arts – both the entertainment and applied arts including advertising and product design. Arguably, all forms of new knowledge from all its domains and practices are grist for the NIS mill.

Software in Perspective

In Canada, software gained statutory copyright protection in 1988 (1980 in the United States with case law decisions of its courts). Until then it was protected as either:

- a 'trade secret' subject to employee/customer confidentiality but open to reverse engineering; or
- beginning in the 1970s with U.S. case law, protected by patent if it performs a function patent law is intended to protect. In essence, case law found that software intended to achieve a patentable objective was patentable.

Extension of patent protection to software was, however, accompanied by the rapid evolution of patent law itself. Initially patents were restricted to traditional *tangibles* such as new and useful compositions of matter (*e.g*., chemical compounds, foods, and medicinal products), machines, manufactured products and industrial processes as well as improvements to existing ones.

From the 1970s onward, however, patent protection was increasingly extended to *intangible* products and processes. These included, for example, patents for microorganisms as well as new plants and animals developed using genetic engineering. In some cases *sui generis* (one-of-a-kind) patent procedures were put in place, *e.g*., deposit of microorganisms in an official depository. Extension also reached to business patents such as Amazon.com's one click sales software.

This evolution involved the changing nature of the matrix. Ideas are not protected by IPRs but rather their expression fixed in a material form, in a matrix. Law, being inherently conservative, traditionally concluded that if a matrix was not perceptible then it was not possible to assess other requirements for protection, *e.g.*, originality, non-obviousness, usefulness, *etc*. An electron might be part of the physical world but if a lawyer could not see, touch or otherwise perceive it then it had no legal standing as a matrix (Keyes & Brunet 1977, 129). [vi]

Beginning in the 1970s, however, instrumental evidence became accepted by the U.S. Courts which then set precedents for the rest of the Anglosphere and beyond. In effect, there is no longer any microscopic (or macroscopic) legal limit to intellectual property being fixed in material form, only a technical one.

Until 1988 copyright in Canada protected only artistic and literary works of words, images, shapes and/or sounds, *i.e.,* human-readable code. [vii] Victor Hugo must have turned over in his hallowed Parisian Pantheon crypt when software was subsequently accepted as 'a work' subject to his 1886 *Berne Convention on the Protection of Artistic and Literary Works.*

Led by Hugo, European artists and writers in 1878 organized the International Artistic & Literary Association (*Association Littéraire et Artistique Internationale*). First in Paris it then met annually in different European capitals. In 1882, at Rome it agreed to organize an international conference of States about copyright. At the Berne conference of September 1883, a draft convention was prepared and brought to the attention of the community of nations by the Swiss Federal Council (Kampelman 1947, 410-411).

The Berne Convention of 1886 was the result. It was not inspired by commerce or censorship but by the need to protect the natural or 'moral rights' of the artist/author/creator, *i.e.,* of a Natural as opposed to a Legal Person. Such rights flowed from the 'Rights of Man' declared in the second or French Republican Revolution of 1789. This, in turn, was inspired by the overthrow of an ancient regime of subordination by birth with the first American Republican Revolution of 1776, which in turn, was rooted in the European Enlightenment and its 'Cult of the Genius' flowing from Renaissance masters then Reformation preachers and scientists. [viii] The individual – the Natural Person – thus became the foundation stone of politics. And, as demonstrated, the Natural Person has since become the foundation stone of the knowledge-based economy because all knowledge is ultimately personal.

Unlike the United States, however, which adopted British Common Law with all its precedents and prejudices concerning copyright, France overturned the Common Law replacing it with one rooted in Enlightenment 'Natural Rights' and called it 'rights of the author'. These include moral rights and responsibilities of the author to the 'public domain'.

Moral rights are separate and distinct from the economic rights associated with a work. The three most important are: (1) the paternity right - the right to be identified as the creator of a work and protected from plagiarism; (2) the integrity right - the right to protection against alteration or deformation of one's work, and the right to make changes in it; and, (3) the publication right - the right not to publish including the right to withdraw a work from publication (Hurt & Schuchman 1966, 424). Moral rights are available *only* to a Natural not a Legal Person.

Britain (and therefore Canada under the *Imperial Copyright Act* until 1921), while signing the Berne Convention and thereby acknowledging moral rights, applied national treatment so that all such rights remain subject to contract or waiver. In fact an employee, with the exception of university professors, do not hold copyright or even the right to claim paternity in the Anglosphere. In continental Europe, Latin America and other 'Civil Code'

countries, however, even employees enjoy moral rights that are "inalienable, unattachable, impresciptible and unrenounceable" (Article 11, Decision 351, Andean Community, 1993). The U.S. did not accede to Berne until 1989 and, arguably, has yet to meet minimum moral rights requirements of that Convention. In essence, copyright is commerce in the Anglosphere but rights of the author are a 'human right' everywhere else. [ix]

Nonetheless, the 1886 Berne Convention established a clear distinction between artistic & literary works and 'industrial property' such as patents, registered industrial designs and trademarks. These were the subject of the first multilateral intellectual property agreement, the 1883 *Paris Convention for Protection of Industrial Property*. [x]

The distinction between 'machine readable' and 'human readable' code, *a.k.a.,* software, fuelled a 1970s Canadian debate about software copyright (Keyes & Brunet 1977). Human-readable code conveys *meaning* from one human mind to another. Such are the works traditionally protected by copyright. The paintbrush, chisel or pen used to make the work does not receive protection.

A computer program, while codified and fixed in a communications medium, is intended to be decoded by a machine not a human mind. It is intended to manipulate the flow of electrons in a circuit. In turn, such circuits may activate other machines, *e.g.,* industrial robots in steel mills, auto plants and fabricating industries. It fixes knowledge as *function*, not *meaning*. It is executable code. It is the paintbrush not the painting.

A distinction can, however, be made between 'executable' and 'base' code. Executable software code is machine language, *i.e.,* it is read by a machine. Base code is what the human programmer uses to 'write' the program. In this sense it is in human-readable form. Nonetheless the intent is not for the work to be read by another human being, excepting 'proof-reading', but rather to become functional instructions for a machine, *i.e.,* it conveys *function* not *meaning*. Nonetheless, what is the legitimate subject of copyright is, for example, what is displayed on the screen and 'read' by a Natural Person, not the software itself.

Similarly, genomic software is being codified and fixed into communications media intended to be decoded by machines and molecules, not a human mind. It is intended to manipulate the chemical bonds of atoms and molecules to analyze or synthesize biological compounds and living organisms with intended or designed characteristics. It likely qualifies for copyright protection under the existing legal regime.

Extension of Canadian copyright to computer software, in 1988, meant that software would be treated as an artistic or literary work. Extension of patent protection to software, however, makes it the only work protected by both. Statutory extension was, however, also accompanied by inclusion of unpublished works. Previously the price of copyright was publication; afterwards protection became available without publication. As will be seen, this has implications for software including the competitive ability to keep critical code from competitors and application creators as a trade secret while enjoying copyright protection. Accordingly, software crosses the legal divides separating copyright, patent and trade secret.

The impact of this unholy trinity of protection is demonstrated by the anti-trust case against Microsoft. In one generation software copyright has become the legal foundation for a massive global industry. Microsoft, for example, is now one of the largest and most profitable corporations in the world. Its foundation is copyright in the Windows operating program and Office suite of business applications.

Using well documented 'sharp practices' and playing off the ineptitude of competitors Microsoft now dominates the market. It has, *de facto*, established its products as industrial standards. As the standard all other products must be compatible if they are to succeed in the marketplace. To Microsoft's credit this standardization has and continues to facilitate the growth and spread of computer-mediated learning as well as the underlying techno-economic regime supporting it, *e.g.*, Wintel CPU's, sound and video cards, WWW, *et al.* In short, Microsoft exercises market power.

In this regard, the first 'W' Bush White House, in 2000, faced an anti-trust case against Microsoft for alleged abuse of its market position brought by the previous Clinton Administration. The new Administration decided on regulatory and procedural penalties. The option of breaking up one of America's largest and most profitable exporters was dropped.

In addition, Windows and Office are used extensively by foreign governments and corporations around the world. This provides the U.S. with a potentially powerful geopolitical weapon. Compliance with changing U.S. security requirements could allow Windows and Office to act as Trojan Horses – gifts bearing Greeks - in the accelerating information wars of the 21st century. At the extreme, 'enemy' computers could be remotely shut down using hidden 'trap doors' with devastating economic and military effect.

In the European Union, however, more serious penalties were applied to Microsoft and more threatened. In addition to massive fines, Microsoft is required to open up its ‘’interface’ code to competitors to allow their products to work smoothly with Windows and thereby compete in the marketplace. This ’interface’ was unpublished and treated as a trade secret by Microsoft as remains the case for the ‘kernel’ of its operating system.

Arguably where market dominance has been attained by a software firm, the EU now requires publication of interface codes. They must be dedicated to the public, *i.e.,* be published. The inner workings or kernel of such software, however, remain a trade secret. Nonetheless, EU case law may soon cause a tidal wave of change in the global software industry. The irony is that, among others, it was American corporate competitors who called on the EU to act against Microsoft. Its decision may soon come back to haunt some of them.

As demonstrated, software is ‘soft-tooled’ knowledge fixing *function* not *meaning* into matter/energy. In this sense it qualifies for patent protection. Software also fixes instructions as code into a communications medium intended to be decoded by a machine not a human mind. Nonetheless, at present, it qualifies for copyright. And, because unpublished works also claim protection some code qualify as trade secrets. The difference in term or duration of protection is striking. In Canada the term is 20 years for a patent and 50 for a corporate copyright, *i.e.,* one claimed by a Legal rather than a Natural Person. In the U.S. it is 20 years versus 70. A trade secret, on the other hand, is potentially perpetual never entering the public domain.

Taken together this analysis suggests that software – computer (dryware) and/or genomic (wetware) – is a *sui generis* work – a one-of-a-kind work - deserving its own intellectual property classification rather than receiving a blend of copyright, patent and trade secret protection.

Conclusions

The cautionary tale of Microsoft should alert policymakers to the potential lock-in costs of industrial standards prematurely established by pioneers of emerging techno-economic regimes. The case of television standards in Europe (PAL) and North America (NTSC) is another example. PAL is higher in resolution (576 horizontal lines) than NTSC (480 horizontal lines) but was developed after NTSC was established as the industrial standard in the United States. This meant that TV video quality was better in Europe, at least until the digital era. Furthermore, the two recording systems were incompatible without initially expensive

conversion of programming including copyrights issues concerning adaptation. On the other hand, adoption of 110/120 volt as the electrical standard in North America reflects its initial inability to produce the high quality iron required to generate the 220/240 volt standard of Europe in the 19th century.

How many generations of software will have passed in 50 years in Canada or 70 years in the United States? Given increasing 'object based programming', which uses snippets of pre-existing base code, overtime such objects or components may need editing to work with new more advanced code. As the sheer size of future software programs grow many such objects may become junk genes, leftovers of a distant generational past. Protected by copyright, patent and/or trade secret, however, editing may constitute infringement. Case law will determine the question but on an evolving case-by-case basis often set by precedent in other Common Law countries especially the United States. Given the unholy trinity currently protecting software this is likely to be a long, drawn out and costly process. Given the dryware/wetware facets of software the outcome will resonate throughout computer and biotech industries – the twin-chambered heart of the emerging global knowledge-based economy.

Sui generis intellectual property rights are now common on the world stage, *e.g.*, typography of integrated circuits, deposit of microorganisms for patent purpose, digital copyright, *etc*. Arguably it was the strategy chosen by the United States where wave after wave of new *sui generis* IPR laws have been introduced and adopted since the 1970s striving, among other things, to put the new wine of digital technology back into the old bottle of printer's copyright.

Development of an appropriate Canadian intellectual property rights regime for software – computer and genomic – will take time and effort but needs to be done. Existing rights and uses can be grandfathered while new rights extended only into the future.

This will require a moratorium on software copyright and patent reform. Why? First, software, as industrial property, fuels the knowledge-based economy – dryware and wetware. It is, however, currently protected by an evolving mix of copyright, patent and trade secret under U.S. and European case law and proliferating American *sui generis* legislation. What is required is some reflection, or as the French would say: *Reculer pour mieux sauter* – step back to better leap forward.

Second, the intellectual property rights regime is a critical policy instrument for the competitiveness of nations in a global knowledge-based economy. Preferential public support for

production of traditional goods & services such as cars is subject to harmonization under the rules of the World Trade Organization (WTO). Intellectual property rights, however, are subject to 'national treatment'. This means, for example, that Canada must extend to the foreign artist/author/creator and proprietor the same rights as granted to a Canadian national. These rights, however, need not and are not generally the same between countries. This allows a country to design an IPR regime best suited to its purposes – commercial and/or cultural.

Third, the national innovation system, if it is to efficiently commercialize new knowledge, requires clearly defined IPRs. Withdrawing software from future copyright and patent reform would simplify the policy environment easing, for example, copyright reform of human-readable code.

The Canadian Copyright Act is a peculiar case. It is an evolving hybrid cross between the commerce of Anglosphere *copyright* and the culture of Francophone *droit d'auteur*. In many ways it is a classic statutory example of Canada's bilingual, bicultural and bijuridic traditions that distinguish it, as a Nation-State, from the United States where the proliferation of economic rights is narrowing the range of 'fair use' and the public domain.

By excluding software from future copyright and patent reform Canada will gain time to develop a globally competitive IPR regime appropriate for software's critical role as industrial property in the global knowledge-based economy.

Many questions need to be answered. What protection should be provided for machine-code? For how long should protection last without prematurely locking in industrial standards? Should it be inclusive of dryware and wetware or separate regimes? How do we differentiate the display read by a Natural Person and the subject of copyright from the underlying machine-readable code – the tooled knowledge?

Certainly if software is withdrawn from copyright then Victor Hugo may again rest in peace content that it is the painting and the rights of its artist/author/creator, not the paintbrush, that is protected by copyright. For this special paintbrush - software - something else is required. Who, however, will be the new Victor Hugo of software?

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Endnotes

I wish to acknowledge Russell McOmand of Digital Copyright Canada for reviewing an earlier draft and correcting some misconceptions. While differing in interpretation and policy approach, I commend his efforts, and those of others, to grow the public domain, *a.k.a.*, open source software. Nonetheless, all errors remain the responsibility of the author.

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[i] Robert Reich in his analysis of the knowledge-based economy notes that workers are symbol makers and manipulators – numbers, words, images, sounds, *etc*. (Reich 1992).

[ii] The titles of both the 1710 Statute of Queen Anne –the first modern copyright act -and the first U.S. Copyright Act of 1790 are dedicated to 'the encouragement of learning'.

[iii] Mainstream discussion of the knowledge-based economy tends to be limited to codified and 'tacit' knowledge (Cowan, David, Foray 2000). There is no discussion of tooled knowledge. Furthermore, tacit is derived from the work of philosopher of science Michael Polanyi whose master work makes clear that tacit is the personal knowledge of a Natural Person (Polanyi 1958). This disassociation of tacit from personal arguably reflects the bias of capitalist economics towards capital and away from labour. In fact one can speak of a labour theory of knowledge and its corollary, the knowledge theory of capital (Chartrand 2007).

[iv] 'Know-how' is generally protected under confidentiality clauses in contracts of employment. It is, however, recognized as a distinct class of intellectual property under NAFTA, WTO treaties and other multilateral treaties (Chartrand March 2007)

[v] Other IPRs such as industrial designs, trademarks and trade secrets are variations on these themes including Legal vs. Natural Person..

[vi] For example, ephemeral displays on computer screens, prior to 1988, received no protection in Canada. See Keyes & Brunet.

[vii] At the experimental level, both touch and smell are in the process of being codified to then be played back to a human reader.

[viii] In medieval France, for example, inspiration and creativity was the work of God not the vessel of His Purpose. No ownership could fittingly be claimed. Subsequently in France, the King, as God's representative on earth, assumed responsibility for all creative works. In 1777, however, the French monarchy acknowledged the individual as the creator granting, just before the Revolution, all rights to them (Hesse 1990).

[ix] This is most evident in the case of motion pictures and photographs. Under Civil Code the creator of a film or a photograph holds copyright. This is sometimes known as the 'auteur theory' of filmmaking. In the Anglosphere the owner of the negative holds the copyright.

[x] "Though copyright is expressed in terms of property, it is not directly analogous to industrial property (patents, trademarks and industrial designs), where the major concern is with the circulation of goods that have economic value apart from their intellectual content. As it deals with purely intellectual matter, copyright can never interfere with a person's physical well-being." (Keyes & Brunet 1977, 3)