

# Tragedy of digital anti-commons

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S-38.042 Seminar on Networking Business, Autumn 2004

## Abstract

This article presents conceptual frameworks that help to understand Internet intellectual property right regulation issues. The applicability of metaphor 'cyberspace as a place' is analysed, types of intellectual properties and property rights are discussed and the applicability of the concept 'tragedy of digital anti-commons' is challenged. Finally the special issues from the mobile Internet perspective are introduced.

## 1 Introduction

Considering the extensive and profound changes in business and consumer operations facilitated by the Internet technology, it is no wonder that a number of complex intellectual property rights related social and economical issues have emerged. The Internet intellectual property right (IPR) regulation should solve and prevent the conflicts.

The purpose of this article is to help to understand some important IPR issues that are relevant for the IPR regulation planning and to help in evaluating the possible impacts on technology adoption and on the industry structures. The subjects of IPRs and the related regulation are so broad that the scope of the article is limited to certain concepts only.

The IPR issues are different in the fixed Internet and in the mobile Internet. The concepts presented in the article are originally from the fixed Internet side but also some characteristics from the mobile Internet perspective are introduced at the end.

## 1 Regulation

Lawrence Lessig [1] [2] has divided the regulatory constraints in real world as well as in the Internet into four modalities.

First, law orders people to behave in certain ways, it threatens to punish not allowed behaviour and gives rights and obligations for various actions. It has been claimed that due to anonymity and the extension of actions over multiple jurisdictional areas, the Internet regulation is not possible. The claims may have been correct to a certain extent but it does not mean that the

Internet couldn't be regulated quite efficiently in the future.

Second, the social norms constraint people's behaviour. The social norms stating what is considered right and wrong, are defined and enforced by the community. The Internet has many communities with their own norms and some norms that are more widely followed. The laws and norms are related and influence each other.

Third, the markets regulate people behaviour by the related costs. The willingness to pay depends on the expected benefits and the other alternatives available. The law and the social norms influence on the market operations and price level and on the other hand the requirement for efficient markets is a driving force for laws and social norms.

Fourth, the architecture or the nature regulates people behaviour. Our actions are limited not only by the laws of nature but also by the way the environment has been implemented. In the Internet the environment is implemented according to a certain architecture. This architecture defines available actions and how feasible it is to enforce the regulation.

## 2 Metaphors

Metaphors facilitate and influence our thinking [3]. They play important but different roles in our thinking and in the language we use. Internally in our minds the metaphors help us to understand new things based on old and familiar things. Externally in our language they provide us words for communication. The metaphoric words used tell about the internal metaphors in our minds.

The metaphors can also lead us wrong, intentionally when somebody wants to influence the thinking of an other person, or unintentionally when the differences between the old and familiar thing and the new thing are not properly understood.

## 2 Place vs Cyberspace

### 1 'Cyberspace as a place' metaphor

The often used words in the Internet context like ENTERING, VISITING, ADDRESS, LOCATION, SITE are words we use also for real places. They can be interpreted to indicate that in our minds we have a metaphor of cyberspace<sup>1</sup> as a place [3].

Dan Hunter (2003) argues that thinking cyberspace like the physical world that can be divided into landholdings and be just like property holdings in the physical world leads the regulation to wrong direction.

### 2 The Internet is not like a place

Even the metaphor 'Cyberspace as a place' may guide our thinking, the fact is that actually the Internet is not [4] just like a real place, it is not even experienced like a real place and there are obvious differences in the constraints of actions between the Internet and the real places.

Anyway, there are several cases where the courts seem to be misled by the metaphor [3]. Not applicable features from the real property<sup>2</sup> have been extended to the Internet. The following case is from the U.S.

Register.com v. Verio. Verio collected recently registered publicly available domain name information from Register.com and used it for marketing purposes. It has been argued that the metaphor misled the court to extend the scope of the Computer Fraud and Abuse Act (CFAA) beyond the original purpose of the law when it criminally liable under CFAA.

### 3 The metaphor doesn't have to mislead

The risk of wrong guidance by the metaphor can be avoided by 1. considering the variety of the real property rights and 2. the limits of the metaphor [4].

The land ownership rights vary. First, not all land is even privately owned. In the real world we have public spaces like parks and oceans. (In the Internet we have top level domain names and protocols that are not owned by anybody.) Second, even if the land is privately owned, also the public may have certain rights for the land, the owner's own use of the land may be limited and the

<sup>1</sup> In this article the words cyberspace and the Internet are used for the same meaning.

<sup>2</sup> The real property means here the ownership rights for the real estate i.e. for the land and anything permanently affixed to it.

rights may change over time. Public rights may be based on several principles based on various usage histories or ancient claims [5]. (In the Internet anybody can access a privately owned public server and by doing so consume the CPU resources of the server and the server Internet connection band width.) Third, even the unwanted entering into privately owned land is not necessarily illegal. Under the law the harm of e.g. loud music next door shall be assessed against the rights and benefits associated with the unwanted incursion. (In the Internet one shall assess the level of caused nuisance against the purpose of the action.)

There are also several cases where the courts seem to have understood the limits of the metaphor [4]. The following case is from the U.S.

The courts have applied the dormant commerce clause from the physical world differently for the Internet. The courts have taken into account not only the extra burden of complying with multiple state regulations but also the malleability of the service.

## 3 Digital Intellectual Property

There are several types of digital intellectual property. A useful classification for this article is based on usage. The content can be directly consumed or it can be indirectly used as a system component or tool. See table 1 for the key characteristics.

**Table 1: Digital intellectual property classification characteristics**

	Direct Consumption	Indirect usage as a component or a tool
Purpose	Experience	Utilization and creation
Examples	Listening and watching	Business and scientific work, and SW
Content discovery	The search target is known	The search target may be unknown
Network	Fixed and mobile	Fixed

### 1 Property

According to the worldIQ.com [6] reference tool

“Within the law, property is a general legal category for rights of ownership in land, money, tangible objects, intangible objects, etc.

Property is defined as the right to use, enjoy or possess a determinant thing, and the right to exclude others from doing the same.”

Property can be characterized based on rivalrousness and excludability [7]. Rivalrous means that consumption of a good by one person prevents it being available for other persons. Goods suffering from scarcity are rivalrous. Excludable means that it is possible to limit the consumption of a good to selected persons. See Figure 1 for a matrix representation for the different combinations of rivalrousness and excludability. The items 'Tragedy of the Commons' and the 'Tragedy of the Anti-commons' in the figure will be explained later in chapter 4.

Pure public goods like national defense or law enforcement are non-excludable and non-rivalrous. Common pool resources like grazing lands and clean water are non-excludable and rivalrous. Toll goods like a bridge with a toll or protected intellectual property are excludable and non-rivalrous. Private goods like a hamburger are excludable and rivalrous.

	Non-rivalrous	Rivalrous
Non-excludable	Public Goods	Common Pool Resources <b>Tragedy of the Commons</b>
Excludable	Toll Goods <b>Tragedy of the Anti-commons</b>	Private Goods <b>Tragedy of the Anti-commons</b>

**Figure 1: Property matrix**

It is clear that the strong property ownership rights in form of excludability have been important for the acquisition of wealth for the owners. It is also widely believed that the strong property rights have been crucial for the overall economic success in the developed countries.

## 2 Intellectual property

'Intellectual property refers to creations of the mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce.' World Intellectual Property Organisation [8].

Intellectual property is non-rivalrous. Without intellectual property rights created by law, the digital intellectual property content would be a pure public good. The first copy of a creation could be copied by and eventually, the "free" copies would dominate the market and destroy the incentives for creative work.

New intellectual creations are always based on existing thoughts and ideas. This means 1. None of the existing intellectual property is solely based on the creation by the owner 2. Creation of new intellectual property needs access to existing information.

The economical and social impact of strong intellectual property rights is a highly controversial subject. Naturally the intellectual property owners argue for the rights and emphasize the importance of the incentives for the creative work. Others often argue for the importance of utilizing the results widely and point out that intellectual property creation success can be achieved also without strong property rights and the strong property rights may even prevent the success. E.g. the Internet itself was originally created and developed based on open sharing of intellectual property as Lessig [1] points out.

## 3 Protecting digital property

The society's purpose for the intellectual property rights is to encourage creation, invention, and discovery in order to the society to benefit from them. The creators purpose on the other hand, may be to maximize the own economic benefits of the results.

The usage of digital property may be regulated by the four modalities explained in the introduction. The fourth regulative modality, the markets and pricing is a bit different. Instead of exclusion it is oriented towards releasing the intellectual property to the users in order to achieve the economical goals.

The legal protection is based on

1. laws on industrial property, including patents and trademarks,
2. laws on copyright, including literary and artistic works and
3. agreements between the content provider and the content receiver which may take the form of written contracts, shrink wraps, click wraps or other means to get the receiver consent to the terms of use stipulated by the content provider.

Especially the institutions driving intellectual property owner interests try to influence on the norms people have on using copyrighted content [9], [10], [11].

Various technical architectures and cryptographic applications can prevent the access to digital content without the permission of the content owner. (Burk 2003). This together with the Digital Millennium Copyright act, which outlaws the action of circumventing the access preventing mechanisms as well

as the provision of tools for such purpose. This effectively extends the property right coverage beyond the protection provided by the patent and copyright law. This is natural to raise concerns in the minds of people who are worried about the accelerating cyberspace enclosure movement [1], [3], [4].

## 4 Tragedy of Digital Anti-commons

Tragedy of commons is a widely known scenario and it is used here as an introduction for the the model we use for the analysis. The analysis is then extended to the scenario of digital anti-commons and the definitions in the literature for the scenario is criticized. Finally a scenario more applicable for the digital content is presented.

### 1 Tragedy of commons

Ecologist Garrett Hardin [12] made the concept of "The Tragedy of the Commons" popular.

'Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons.'

'As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility to me of adding one more animal to my herd?" This utility has one negative and one positive component.

1. The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly + 1.
2. The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing [destroying the ability of the land to sustain cattle] are shared by all the herdsman, the negative utility for any particular decision making herdsman is only a fraction of - 1.

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another.... But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy.'

In the tragedy of commons the resource is rivalrous and non-excludable. See Figure 2.

In a mathematical model we may denote the positive production component for one consumer by A. Let's assume that the negative component has a coefficient B

and is a fraction of the total production of the resource and grows linearly with the number n of consumers. Then the total production function can be expressed with the number of consumers as

$$\text{Production}(n) = nA(1-Bn) = An - ABn^2.$$

This is depicted in the upper part in Figure 2 with the Production line. Each consumer has an alternative not to use the same resource but an other resource. The production function for this alternative is linear in the model (Alternative Production).

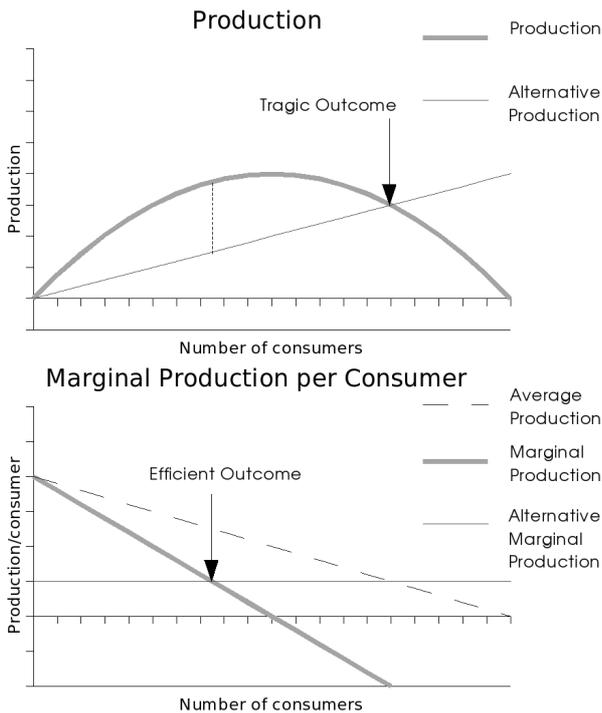
The lower part of the Figure 2 shows the marginal production per consumer for the production function

$$\text{Marginal\_Production}(n) = A - 2ABn$$

and the alternative. Also the average production per consumer for the production function is shown.

$$\text{Average\_Marginal\_Production}(n) = A - ABn$$

The efficient and tragic outcomes are marked in the figure. The total production is maximized when the derivatives of the production and alternative functions are the same. The individual consumer decisions aimed to maximize the individual production however, lead towards the tragic outcome equilibrium because until that point it is more favourable for a consumer to select the production instead of the alternative. It shall be noted that if the alternative was worse then the tragic outcome would also be worse - the production function equilibrium approaches zero when the alternative approaches zero.



**Figure 2: Tragedy of commons**

## 2 Tragedy of anti-commons

Michael Heller [13] describes why prime storefronts in vast Soviet-era stores were vacant while tiny kiosks served brisk retail trade. The buildings were under-utilized because property rights were divided and widely dispersed. The right to sell a building, to collect money for leasing it, to occupy the building and to utilize the land beneath were owned by different institutes. Each partial owner could block the implementation of the usage plans of the others.

Kiosks, were authorized solely by local mafia and without unnecessary bureaucracy.

Heller named the phenomenon the 'tragedy of the anti-commons.' and defined it.

'In an anticommons, by my definition, multiple owners are each endowed with the fight to exclude others from a scarce resource, and no one has an effective privilege of use.'

In the tragedy of anti-commons the resource is excludable. See figure 1.

## 3 Tragedy of digital anti-commons

The tragedy of anti-commons concept has been applied also in the context of digital intellectual property. Shapiro [14] explains how the current patent system is creating a patent thicket where licences from

overlapping set of patent rights are required for the commercializing of new technology.

Unfortunately in many cases, e.g. by Hunter [3], the concept usage has been inaccurate and the concept has been interpreted and used beyond the original definition. The cases of Terms of Use of a web site have nothing or little to do with 'exclusion' and 'multiple owners'.

The mathematical and graphical model we used for the Tragedy of Commons would not be interesting for the Tragedy of Digital Anti-Commons as defined by Heller, because there would be no production at all.

However, if we replace the total exclusion by additional costs accrued by taking e.g. the site terms of use into account we may well describe the outcome with the same mathematical and graphical models.

With digital content, the consumer experienced value is a better unit for analysis than the production of the resource. The difference here is that the production does not take into consideration the different valuation or utility that the same production units may have for different individuals. Let's assume that the cumulative value function for the digital content for the consumers is increasing and concave, e.g.

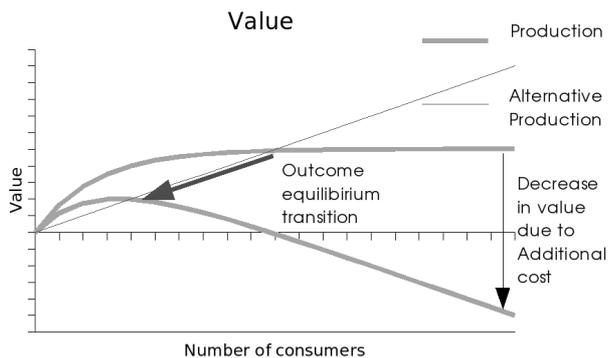
$$\text{Value}(n) = C*(1-e^{-D*n})$$

Where the C is the total value for all consumers and D is related to the value for the consumer who values the content the most.

We may effectively take the additional cost of accessing the digital information into account by discounting from the value function the cumulative additional cost

$$\text{Additional\_Cost}(n) = E*n$$

Figure 3 depicts how the outcome equilibrium will transit due to additional cost.



**Figure 3: Tragedy of additional cost on digital content**

## 5 Mobile networks perspective

Mobile networks have some features that shall be taken into account in the presented concepts.

### 1 Content

The digital content used in mobile networks belong to the direct consumption class in the Table 1, not for creating. It is not easy to identify how the concept of digital anti-commons could be applicable for the digital content usage in the mobile networks.

### 2 Transaction cost

Due to relatively poor user interface in mobile devices when compared to fixed Internet devices the complex terms of use are very inconvenient to check. If, however the terms of use usage will be used more in future that means relatively large transaction costs for the checking of the terms.

### 3 Digital Right Management

Special mobile network digital rights management (DRM) solutions have been introduced that may emphasize the role of technical solutions in the control of content usage.

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