

# Internet Regulation: A Property Right Perspective\*

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## Abstract:

*Is Internet an ideal model for a self-regulated economy? It seems possible to decentrally organize and render enforceable a property rights system on which inter-individual negotiations could be based. Moreover, traditional State intervention is no longer operable since Internet users can bypass the usual regulatory frameworks. At the same time, the long-term sustainability of the competitive process is not guaranteed in the digital economy, and the fully decentralized setting of a property rights system could result in inefficiencies. These call for the organization of an institutional framework that would avoid the capture of self-regulations by interest groups seeking to exercise monopoly power and that would maintain a minimum consistency in the design of the property right system. Delegating the management of some essential resources — especially the addressing system — to an entity responsible for the regulation in the last resort would enable the construction of such a framework.*

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## 0. Property Rights as a Way to Think Regulations

Regulation (or Public Regulation) often refers to the direct intervention of the State in the management of some resources. By setting rules and commanding the players (when rules do not apply), public agencies govern the allocation and uses of resources in specific domains. Regulation can however be understood in a broader sense that also refers to the way uses rights over resources are settled. Indeed, in any economic space, a set of fundamental rules delineates the rights to use economic resources and allocates them to interacting agents.

This broader definition of regulation is useful for at least two purposes. First, it allows using a common framework to think both the so-called "self-regulation" and the "State regulation", since it does not refer to the entity that set up the "rules of the game" for the "players". Indeed, it can either be some exogenous third part — like the State — or the players themselves that (consciously or not) interact and set collective rules. Second, in the spirit of Coase [1960], this definition makes it clear that the management of externalities, public goods and other sources of "market failures" is a component of the activity consisting in organizing the framework allowing agents to interact and exchange<sup>1</sup>, and that refer the notion of property rights (PRs) system as stated by Barzel [1989] and North [1990]. By delineating and allocating uses rights to economic agents, a PRs system fixes the way they can individually or collectively make decision about the uses of resources. In that general understanding, setting a PRs system implies four major activities: setting rules; supervising their enforcement and punishing infringes; settling conflicts, since there are always ambiguities in rules and therefore different interpretations; and implementing decisions mechanisms when rules do not apply, since there are always some incompleteness in a system of rules.

A property right approach to regulation is useful to analyze the way the Internet is governed, because the cyber-world is increasingly considered as a model for a new regulatory regime based on a decentralized and State-free regulation often qualified as self-regulation<sup>2</sup>. At first sight, the Internet and the Internet based activities have been developing on the basis of governance mechanisms based on contractual agreements or communities' self-regulations whose enforcement is based on competition among alternative coordination mechanisms. This is due both to the global connectivity provided by the Internet (end-to-end) architecture and (open) standards — which allow to easily bypass traditional state norms —, and to the coding and tracking capabilities provided by digital technologies — that allow to implement self-enforceable property rights and collective rules at a (relatively) low cost (see below).

This paper is an attempt to analyze the principles that should inspire an institutional framework, which would be well adapted to the regulation of the Internet and related activities. This will lead to an analysis of why some aspects of the coordination of activities should be centrally managed, and why hierarchical principles should be implemented to

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<sup>1</sup> Indeed «Public Regulation» refers to the setting of limits in the use of resources (or obligations to use them in a specific way). A «regulation» — in the traditional understanding — consist therefore in setting more precisely the user' rights actually granted to the owner of a given asset (like an infrastructure).

<sup>2</sup> However, careful observation of the actual facts lead one to qualify this simplifying view. The establishment of technical standards and above all the management of the addressing system are centralized (cf. Note 3). States also play an essential role. The US Government is the main inventor in the Internet, and remains the owner of the addressing system, even though its management is delegated to non-governmental organizations (ICANN) (see Brousseau, 2001).

organize the relationships among regulatory bodies. We will first review the reasons why the technology challenges the traditional institutional frame (1). We will then analyze the problems raised by the self-delineation (2) and self-enforcement (3) or property rights in the cyber-world. This will lead us to justify the organization of a decentralized institutional framework that should be somewhat centralized on a federal basis (4). Such a framework would be the necessary condition to benefit from the opportunities provided by the Internet and digital technologies, while avoiding the main inconsistencies and illegitimacies that threaten the cyber-world today.

## 1. What is new with the Internet?

In the following pages, we will deal both with the regulation of network activities by themselves<sup>3</sup> and with the content. While Internet technologies enable the separation of the management of the network services from the management of the information services, the strong technical and economic interdependencies between the two call for a simultaneous analysis of their regulation. Today Internet is *de facto* co-regulated by National Governments — that intervene however without strongly co-coordinating among themselves — by professional entities — whose competencies overlap and which are not always legitimate — and instances (Brousseau [2001]) of technical standardization — that are very dynamic, but that lack strong institutional roots<sup>4</sup>. These various entities contribute to design rights of uses over information flows or network components at various levels of centralization.

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<sup>3</sup> Internet is not a network *per se*, but a network of networks that relies on common standards and a decentralized network administration. Two types of essential resources ensure the performing of the network.

- A single *addressing system* enables any information-processing device (IPD) connected to the network to identify the other IPDs to route the requests and the replies among them. On the Internet, the *addressing system* is made of two layers. First, a numerical address is allocated to each of the IPDs connected to the network: the *Internet Protocol Number*. *IP Numbers* are machine only readable addresses. Second, a "user-friendly" addressing system — the *Domain Name System* (DNS) — is implemented to allow Internet users to express their request in a language that is closer to natural language.
- *Standardized languages* have to be spoken by the IPDs to manage both communications among them and co-operative information handling processes. Internet is based on the use of two types of standards. The *Internet Protocol* (IP) is the common communication protocol that makes it possible to manage data flows among IPDs. *HyperText Markup Language* (html) is the multimedia language that enables any IPD to transform any kind of information (data, sound, image, etc.) into codes that can be "understood" by any other IPD. This is a common programming language that allows heterogeneous devices to inter-operate when processing information.

There is therefore some of centralization and hierarchy within the Internet. The management of a decentralized network of networks implies a single addressing system and a set of common languages in the last resort

<sup>4</sup> Today the "technical" regulation of the Internet is performed by three main organizations:

- ICANN (*Internet Corporation for Assigned Names and Numbers*; <http://www.icann.com/>) is a non-profit organization incorporated in the US that was set up in 1998. Under a delegation contract with the US Government (*Department of Commerce*), ICANN is responsible for distributing IP numbers and Domain Names.
- IETF (*Internet Engineering Task Force*; <http://www.ietf.org/>) is *de facto* the entity responsible for the standardization of the communication protocols: the IP system. It has no legal status, and is only a working group of the *Internet Society* (ISOC), a non-profit scientific organization aimed at promoting the development of an open and efficient network.
- W3C (*World Wide Web Consortium* ; <http://www.w3.org/>) is responsible for the development of the HyperText Markup Language (html). It is a kind of club where access is reserved to those organizations that can afford the relatively high membership fee.

The fuzzy set that regulates the Internet draws from a recent, but rich, history during which computer scientists working within US governmental agencies progressively established the technical principles that govern the management of a decentralized network. This effort was then transferred to private initiatives when the Internet became commercial and open to private investments (Leiner & alii [2000]). Early and later, regulation initiatives bypassed the traditional intergovernmental mechanisms of international standardization and regulation (Brousseau [2001]; Brousseau & Curien [2001]). Four main reasons explain this. First, the velocity of innovation in both digital networks and multi-media technologies was quite incompatible with the slowness of these international or intergovernmental agencies. Second, until 1998, Internet was essentially a US network, and it is still dominated by US players today. Third, the liberal ideology of, respectively, the inventors and the entrepreneurs of the Internet, explains their mistrust of international or intergovernmental bureaucracies. Fourth, technology enabled to implement regulatory principles on a decentralized basis.

This present institutional framework is problematic for at least two reasons: it is partly inefficient in the sense that there are incompleteness, conflicts, and defaults in enforcement in the set of implemented rules; and the current processes used to establish these rules do not guarantee that the interests of all the stakeholders are fairly taken into account. It is therefore necessary to investigate what should be the basic principles of the regulation of the cyber-world and why it differs from the real one. Indeed, many specialists advocate that, beyond a common minimal technical regulation —the publication of open standards and a transparent management of the addressing system — the Internet and its uses should be decentrally self-regulated. The combination of an abundance of essential resources, strong competition among information and network service providers, and the ability to decentrally configure the services supported by the network according to the preferences of the users is supposed to allow adaptation to each and everybody's preferences, without fearing conflicting uses and capture (as summed up by Frishcman [2000] and Elkin-Koren & Salzberger [2000]). Let us first go back to these arguments.

According to Barzel [1989] and North [1990] a PRs system is a set of rules and mechanisms that delineates right of uses over economic resources and allocates them to decisions makers so as to enable them to take economic actions. It is based, first, on a delineation of these uses rights — consisting in setting the frontiers among different ways of using resources and among regimes for appropriating the output of these uses — and on a process of allocation of these rights — that are granted to individuals or groups — that together generates measurement costs. Second enforcement mechanisms implement these uses rights by excluding every unentitled agent from access to the protected resources, or from capturing the output of its use. This refers to controlling access, supervising uses, granting authorization for uses and punishing unauthorized uses (either to get damages or to dissuade potential infringers) and generates enforcement costs.

The Internet standards and digital technologies have an essential impact on both measurement and enforcement costs especially when these operations are carried out by individuals. Indeed, due to the low cost of information processing, but also to the increasing capabilities of chips, computers, storage devices, transportation networks, individual agents have access to capabilities that were not available before. This enables Internet users to self-delineate (A) and makes self-enforceable (B) property rights. Moreover the efficiency and the credibility of traditional regulatory frames are challenged by digital technologies (C). These three reasons combine to explain why traditional regulatory frames are challenged. In the same time, there are still scarcities in the digital world. They call for the implementation of a PRs system (D).

## **A) Coding and Tracking as a way to decentrally design and enforce property rights**

Digital technologies seem to allow the implementation of a self-enforcing and complete system of property rights over information goods and services. Indeed any set of information that is codified in a computerized system can be either encrypted to control *ex-ante* its uses (code of access) or easily, instantaneously and cheaply tracked to control *ex-post* how it has been used. Moreover, ICTs allow controlling or tracking any single use of information or of digital networks components.

These capabilities bring transaction costs down. Moving contents across information networks costs almost nothing. Above all any transfer of uses rights can be controlled a very low cost because encryption and codes of access (qualified as "code" in the following) enable the cheap self-enforceability of contracts covering information exchanges (Elkin-Koren & Salzberger [2000]). Also, it becomes easier to customize the transferred right of uses according to the peculiarities of transactors and to the nature of the exchanged content.

These leads to a more "decentralized" setting of property rights as it could be deduced from the Barzel [1989] and North [1990] framework<sup>5</sup>. Generally, PRs are "measured" and "enforced" both "centrally" by a last resort authority, and "decentrally" by the users of resources. In more developed societies, PRs tend to be centrally designed because it reduces transaction costs<sup>6</sup>. However centralization has a cost because the central authority provide solutions that are poorly adapted to the specific needs of users that faced contrasted constraints and have different preferences; cf. Brousseau & Fares [2000]<sup>7</sup>.

In the case of information goods, because such goods induce high costs of measurement and enforcement and because they have essential public goods features, the traditional central

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<sup>5</sup> Elkin-Koren & Saszverber [2000] make a similar point, but their reasoning is based on the framework developed by Calabresi & Melamed [1972]. A property rule — i.e. a rule that implements negotiable uses rights — has to be preferred when bargaining costs are lower than the costs generated by a central agency in charge of *ex-post* assessing the damages endured by third party because of the activity of any economic agents. In the opposite case, a liability rule — whereby damages will be due to the victim in the case of losses due to the activity of a third party — is preferable. Digital technologies affect the relative costs of the alternative solutions. First, search negotiation and contract settlement costs all decrease because it becomes possible to perform these operations on line. Second and essentially, enforcement costs decrease strongly thanks to encryption and access codes. Cyber-space is therefore more likely to be a space in which negotiable rights of uses over intangibles will be negotiated, than a world in which instances will *ex-post* organize compensation between information producers and information users on the basis of notarial and judicial assessment of welfare transfers among agents.

The above mentioned argument can however be contested, because the impact of ICTs on search costs is not systematically (and significantly) negative due to the strategic behaviors of transactors and to the strong adverse-selection problem raised by information exchanges (Brousseau [2000a]). Moreover, they do not consider that the systematic and low costs of tracking uses of information in digital networks can generate a decrease of supervision costs by a central agency that will be responsible for calculating and allocating damages *ex-post*.

<sup>6</sup> First, users do not have to directly bear the costs of measuring and enforcing PRs. Second, as pointed out by Brousseau [2000] and Bessy & Brousseau [1998], collectivization of rules design and governance can, generate economies of scale, scope and learning

<sup>7</sup> Rules that applies to a wide set of situations are either quite incomplete or provide inefficient solutions. In the first case, agents have to complete them by inter-individual specific agreements. In the second case the agent has to bear maladaptation costs. In both cases they have to implement decentralized solutions that better fit the specificities of their individual situations

systems of intellectual property rights are very incomplete and leave to the users the responsibility for actually delineating and enforcing their exclusive uses rights. Indeed, this is a good way to solve the traditional production-diffusion dilemma associated with information and knowledge, since only the more valuable information goods are actually privatized by their creator, and because exclusiveness will automatically be limited by the costs of maintaining an absolute exclusivity of use. Agents therefore bear high costs when they try to benefit from their theoretically granted property rights. To reduce these costs they tend to bundle transaction, both by managing collectively transactions, and by bundling the transfer of uses rights without taking into account the actual uses that will be performed by the users or third parties, resulting in maladaptation costs (more customized governance would have increase welfare). Digital technologies allow the transferring of each copy with a code that will fix and self-enforce the customized uses rights transferred to the buyer.

Moreover, the new technological context impacts on the efficiency of the former rules. For instance, digital technologies and digital networks overwhelm the economics of many copyrighted material, resulting in huge opportunity costs for copyrights owners that previously got their revenues from selling copies. On the one hand, copies are perfect, costless and can be spread on a very large scale. On the other hand, cryptographic and tracking techniques can be used either to forbid any buyer of a copyrighted material from reproducing it (and, moreover, to set out very precisely how he is authorized to use the digital copy he has bought), or to oblige any buyer that wishes to copy and transmit a digital sequence to pay the required fee to the initial producer of the sequence.

Digital technologies thus make it possible to finely tune at reasonable costs the transfer of uses rights over intangibles among economic agents and to benefit from a more efficient system of property rights management. Moreover, they provide content creators and network operators with means to de facto self-claim and implement property rights by enabling them to control access to their resources.

### ***B) Subscriber lists as a way to organize communities***

Nonetheless property rights can be individually measured and enforced, but also collective rules can be "decentrally" designed and enforced. Virtual communities on the Internet allow implementing self-regulations. As long as the size and the nature of a community allow an efficient circulation of information among its members and the implementation of credible threats (such as ostracism) to punish those who infringe its constitutive rules, a community is able to bound individual behaviors so as to implement collective rules. Well known by historians and anthropologist (e. g. Bernstein [1992, 1996], Cooter [1994, 1996], Granovetter [1985]), these self-enforced self-regulations allow communities to implement collective order either to organize collective action or to solve coordination difficulties among individuals. However, the efficiency of such mechanisms decreases when communities become larger and more diverse. Indeed, each infringer is less visible because information circulates less efficiently. Moreover, each member of the community has fewer incentives to practice retaliations since they are costly and since a member's individual action is less visible (Milgrom & alii [1990]).

Internet enables an increase in the relative efficiency of community self-regulation as compared to State driven regulations. First tracking and facilitated exchanges of information among the members of a community, increase transparency, and facilitate therefore the detection of rules breaking. Second, digital networks allow implementing last resort

retaliation mechanisms allowing the enforcement of self-regulations, because they make it possible to expel infringers from virtual communities. Lists of subscribers and address-books — the registers — that makes it possible to include or exclude users from access to the resources used to share information — whatever they are: a Website, a discussion list, a forum, etc. — allows control of entry to or expulsion from the community. Controlling it allows both to set the boundaries of the community, and to credibly threat potential infringers of the essential rules of the community.

The credibility of such mechanism is bounded by the existing alternatives. If network externalities are strong within the community, if membership is costly — for instance, because a scarce resource (attention) has to be dedicated — if switching costs are not negligible, then those who control the access to virtual communities can exercise control and use this control to make the "law" of the community enforceable.

### ***C) How ICTs Challenge Traditional Institutional Frames***

#### **A trans-territorial and global network**

Nonetheless digital technologies favor the implementation of self-regulations, but digital networks make traditional institutional framework less effective. Internet is a-territorial by nature, while traditional regulations are implemented on a territorial basis. Internet's interconnection ability is the basis of its ability to support the sharing of communication capabilities and contents. Its decentralization guarantees its reliability, its efficiency and its ability to develop. Consequently, Internet is necessarily the support of a worldwide connectivity that overwhelms existing regulations based on territorial legitimacy.

On the one hand, any state based regulation of the content can be bypassed through the Internet because no governmental agency would be able to efficiently supervise the exchanges of information among citizens (or the organization that acts under their jurisdiction) and between them and foreign third parties that are not submitted to the same regulations. Moreover these exchanges can be faked, and the potential infringers can use a wide set of technical means to access contents whose access would be denied by some technical means operated by the state. The generalized interconnectivity as well as the possibility to break codes, and reciprocally to strongly encrypt limits the ability of Governments to control network-based activities.

On the other hand, building an Internet that would be bounded to national borders would result in wide losses of positive network externalities. Moreover, it would necessitate the ability to effectively forbid any interconnection with a foreign network to avoid creating a gateway.

Thus, even when the Internet does not challenge the legitimacy of state intervention, its efficiency is questioned. A massive bypass of state regulations is possible. It results in a direct confrontation and a brakeless competition among norms, since services and contents providers can locate their information processing devices (i.e. in territories where the norms that are the most in accordance with their preferences apply).<sup>8</sup>

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<sup>8</sup> This destabilizes existing legal frameworks, despite the fact that international conventions could be set up to implement common legal principles. On the one hand, inter-governmental regulations are submitted to a prisoner

## A Unified Information Space

Traditional institutional frames are also challenged because some of their features are not any longer justified since the new technological basis renew the very nature of some problems related to scarcities or the consequences of contents diffusion. Because Internet is becoming the technological platform that will support the exchanges, the processing and the storage of all information flows, whatever their nature (voice, image, text, data) and content, the differentiation among the former regulations that were applied to telecommunications, broadcasting TV and radio programs, the press, publishing, etc. is challenged. Indeed, such a differentiation was largely linked to the contrasted economics of these technical networks that had neither common functionalities nor similar cost structures<sup>9</sup>. Because the present Internet is still an imperfect substitute for most traditional network services existing regulations can be temporarily maintained. However, the development of the broadband Internet, and the rise of a wide set of complementary technologies will turn digital networks into a unified support for the diffusion and use of any type of content. Due to this technical mutation, traditional regulations will become ineffective and illegitimate.

As compared to the question raised by the a-territoriality discussed above, The destabilization of the present regulatory framework does not only result from the ability to bypass it. It is also due to the fact that some constraints disappear, especially bottlenecks in broadcasting contents and the ability to discriminate among users.

### ***D) Is a PR system needed? Divisibility in the digital word***

Digital technologies and the Internet thus make it possible to implement self-regulation and challenge the traditional PRs frameworks. Is a new framework needed? Some authors argue that information and digital resources are almost pure indivisible and a non-rival goods that make useless the implementation of common rules since these rules will be spontaneously and decentrally produced by agents and communities implementing self enforcing property rights and rules. If a resource does not cause conflicting claims among its potential users, scarcity does not arise and there are no economic problems. As pointed out by Frischman [2000], there are however scarcities in the cyber-world, even if some sources of scarcity in the real world are removed. In addition, Lemley [1999] pointed out that the solutions that were used to solve these problems in the non-commercial Internet are not necessarily legitimate and viable in the present Internet that serves a large number of heterogeneous users.

The first source of scarcity in the Internet is the addressing system. Because of the required standardization and of the hierarchization of the system used to identify each of the information processing devices connected to the network, there is a limited number of roots to create IP addresses. This causes a problem of allocation. With the implementation of the

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dilemma. To stimulate their national economies some States can decide not to ratify these conventions, thus bounding their impact (digital paradises). On the other hand, the capacity to agree on common norms is quite difficult because the various legal systems result from contrasted historical and philosophical traditions, which bring us back to divergent ideologies of human nature, of social logic, or of economic activity.

<sup>9</sup> For instance, broadcasting licenses were granted because a scarce resource — the hertzian spectrum — had to be managed in some way. The contrasted regulations between audiovisual programs and printed material in terms of content was due to the technical difficulty of screening the content according to the receiver in the mass-media system.

Internet of third generation, a new addressing system will become available (IP v 6). This should reduce scarcity<sup>10</sup>. The actual source of scarcity is the Domain Name System. The numbers of available names and expressions of the natural language that can be the base of meaningful addresses is obviously bounded. Moreover, there are many potential conflicts of interests. The global character of the Internet generates conflicts among legitimate exclusive users that were previously using the same name in different spaces (or to the opposite conflict between agents seeking to appropriate names that were considered as not individually appropriable and other agents).

The second source of scarcity is the available communication capacity — the bandwidth. At any moment in time, it is bounded by the capacity of the infrastructure and by the capacity of the critical nodes of the network (whether they are interconnection points or servers). Two types of problem then arise. First, a criterion to allocate the available bandwidth at each period has to be established<sup>11</sup>. Second, the Internet operators have to be incited to invest to limit the risk of network congestion, while they are not able to capture the marginal collective surplus of their investments, since the technical features of the Internet enable information packets to automatically select the available bandwidth to be routed. In the absence of correction mechanisms, Internet operators would therefore have strong incentives to behave opportunistically (Frischman [2000]).

Moreover, another set of reasons calls for the implementation of a IPRs system. Since individual agents can decentrally generate self-enforceable PRs, they could generate artificial scarcities. Collective agreements implementing rules to control or even to avoid these scarcities have to be set up to increase welfare. Since investing in the production of contents and of network components is often risky and costly, and since they are indivisible and non-rival goods, collective rules have to be implemented to incite agents to invest and enable them to cover fixed costs. More generally basic uses rights have to be set up before any use of resources to avoid conflict and to allow an efficient way of using them. This raises the question of the efficient way to implement this PRs system.

## **2. The limits of a property right system based on self-claim**

While strong arguments call for a decentralized PRs settlement process in the digital world, other arguments lead to the mitigation of this initial view. Two questions have thus to be discussed to assess the efficiency of a decentralized process aimed at delineating and granting uses rights. First, one should wonder whether decentralized self-claim and decentralized negotiation among claimants could result in a complete system of property rights able to ex-ante avoid any further conflicts about the uses. Indeed the more incomplete PRs, the more inefficiencies due to over-use, capture or conflict. Second, one should ask whether a decentrally sat-up PRs system would result in a delineation and allocation of uses right that

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<sup>10</sup> It has however to be pointed out that the actual implementation of this new addressing system is still uncertain. Indeed, ISPs and hardware manufacturers tend to promote an alternative solution based on the development of independent addressing systems in each sub-network associated with the implementation of Network Address Translator (NAT). This would solve the scarcity problem but would strongly decrease the transparency and the reliability of the network

<sup>11</sup> In the commercial Internet, this question of priority management is essential because it influence the quality of all the services for which just-in-time communication is essential: telephony, videoconference, TV , etc.

would minimize transaction costs and provide individual with incentives to uses resources in a way that would maximize collective welfare.

In answering these questions we will discriminate between two types of arguments. Generic ones will refer to the fundamental justifications for the fact that an efficient PRs system cannot systematically result from decentralized negotiation and self-claim. More specific arguments can also be developed in the case of digital activities. Indeed, Information and digital resources are characterized by fixed costs, non-rivalries and indivisibilities that can call for specific property right regimes to solve the protection/diffusion dilemma. Moreover, the digital world overlaps with the physical and traditional one.

### **A) Centralization and Completeness**

In a sense, the cyber-world is a new economic space in which value can be created and captured. Can a complete system of property right emerge in that space on the basis of the sole self-delineation and assignation of uses rights by Internet users?

#### **Centralization and Transaction Costs**

First, in an economic space in which there are no *ex-ante* legitimate exclusive uses rights, a full decentralization of the delineation and claims of exclusive uses rights would result in overlaps among uses rights and inconsistencies.

Overlaps would generate conflicts and some types of ultimate (and legitimate) court of appeal (or Leviathan) would be needed to arbitrate them so as to avoid violence or anarchy. Even if overlaps among individual claims do not induce conflicts, it can have negative impact on economic efficiency. Libecap [2002] documents this in the case of oil fields on which incompleteness in the PRs system cannot be solved efficiently by inter-firm negotiations aimed at designing a complete set of property rights. The reason is simple: if there is *ex-ante* a free resource — i. e. when a complete set of exclusive uses rights is not set up —, designing exclusive uses rights and allocating these rights to the parties that were using the common resource impact on the distribution of wealth among users. A consensual choice cannot be made since the individual preferences among possible distributions result in a problem of collective choice à la Condorcet [1785] and Arrow [1951]. Some type of external arbitrage is therefore needed to reach an «agreement» — that is economically needed since incompleteness of PRs impacts negatively on individual incentives to use resources efficiently.

Inconsistencies would also generate conflicts and inefficiencies. First, if there is no coordination among individuals, chances are high that exclusive rights of use would not be claimed *ex-ante* for several potential uses of many resources, resulting either in the genesis of «free» resource (associated to over-use), or in *ex-post* conflicting claims, that would drive us back to the above-mentioned problems. Second, while the delineation and the allocation of exclusive uses rights can be contrasted as being different tasks, there are overlaps between the two. Indeed, the delineation of uses rights per se constrains allocation. The ability to finely discriminate among each single use and the choice to bundle or un-bundle the allocation of these distinct elementary rights of uses constrain the choices as concerns the allocation of these rights. A fully decentralized process of self-delineation and self-claim of exclusive uses rights would lead to inconsistent individual claims in the delineation and bundling of uses rights, resulting again in multiples conflicting uses in practice.

Overlaps and inconsistencies due to the decentralization of the delineation of PRs would result in tremendous enforcement costs because the probability of conflicting use would be high, and because it would be rational for any agent to seek to permanently widen the scope of its self-claimed exclusive uses rights. Moreover, if there were no authority in charge of making the "recognized" rights enforced in last resort by the force, conflicts would have no solution and would tend to be permanent, resulting not only in inefficiencies due to the destruction (or un-production) of resources, but also in threat over the viability of the social community. A property rights system has therefore to be recognized (defined) and made enforceable by some authority in last resort.

### Is the Cyber-world an exception?

Second, while Internet is a new space, it strongly overlaps with old ones where pre-existing property rights and norms existed. The uses rights that are self-claimed on the Internet can be inconsistent with the pre-existing norms.

First, in the real world many contents are not eligible for legal protection. There is a wide range of information — ranging from mathematics theorems to the comparative performances of the competitive shopkeepers in a specific area — that cannot be protected through Intellectual Property tools. Claiming exclusivity in the cyber-world can result in an illegitimate capture of common resources. This leads us back to the problem pointed out above.

Second, if any individual could claim for exclusive uses for any information goods it would infringe those exclusive uses rights granted to economic agents in the non-cyber-space. Intellectual property rights in the cyber-space tends to be recognized, since it avoids illegitimate capture of past investments made by IPRs owners, that would desincite such investments in the future.

Third, as mentioned above, the global character of the Internet generates conflicts among legitimate exclusive users that were previously granted with exclusive uses rights over information in segmented legal spaces. Decentralization would hardly solve the conflicts between these legitimate owners whose past investments and rights could be captured by some other parties.

Fourth, in many cases recognized uses rights are complex and fuzzy in the real world. One can mention personal data — ranging from identifying codes that refer to specific human beings to the information that allows the description of the various characteristics in terms of preferences, opinions, wealth, etc. — on which uses rights are imprecise and complex because they are contingent to various situations (related to who produces the information, who uses it and for what purpose). Uses rights over this information are quite incomplete and self-claims might result in inconsistencies, overlaps and capture

For all these reasons, it would not be easier to decentrally create a complete set of PRs over information goods and network components in the cyber-space and the general reasoning made in the earlier section apply. A last resort arbitration mechanism should be implemented to cope with conflicting claims (including the conflict that exist among parties that claim for individual uses rights and the community that seek for the «communization» of some uses rights).

As pointed out by Lemley [1999], a common wisdom denies however the usefulness of implementing a mechanism aimed at solving conflicts among norms in digital activities since if two groups of users want to apply contrasted norms, it should be easy for them to create two different virtual communities. This argument relies on the assumptions that no Internet-user needs to get in touch with members of both communities, and that the members of these two communities do not bear any welfare losses by belonging to different communities resulting in a low-intensive interconnection among them. Because there are huge positive network externalities in Internet based activities, this is a strong assumption. In addition, even if a competitive process applies to conflicting norms, nothing can guarantee that the most efficient one will be selected. This is a well-known result of the literature on the competition among technical standards (David [1985], Arthur [1989], Cowan [1990]).

In the case of the cyber-world, a second point has to be made. Behind the argument that a complete system of PRs could be decentrally settled, the implicit assumption is that property rights settlements cost nothing thanks to ICTs. This assumption is often made implicit because one would need the same assumption to argue that a complete PRs system can be centrally created. A low level of transaction costs does not mean that these costs are zero<sup>12</sup>. Coding digital information does not result therefore in a perfect control over its future uses and additional methods should be used to set up property rights, such as inter-individual agreements. This would result in non-zero transaction costs. Positive measurement and enforcement costs lead, first, to incompleteness since the marginal cost of establishing exclusive uses rights would exceed the marginal benefit. Second it induces that PRs should be both centrally and decentrally set up since mixing the advantage of centralization and decentralization (Cf. § 1A) could reduce the costs to establish PRs (Barzel [1989], North [1990]), while obviously it will not lead to completeness<sup>13</sup>.

## **B) Centralization and Efficiency**

Our first line of argumentation was to question the capability of a process based on self claim to generate a complete set of PRs. Our second line of analysis is to question ability of such a decentralized process to generate private norms that would lead to optimal results. The literature on private norms refers often to historical experiences (as the medieval "Law of Merchants") or to those norms that regulate many ethnic communities to point out the efficiency of decentralized self-regulation (Cf. Bernstein [1992, 1996], Cooter [1994, 1996], Granovetter [1985]). However some papers also point out the limit of self-regulations (e.g., Milgrom, North, Weingast [1990]). We pursue here such type of analysis.

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<sup>12</sup> First, data processing costs are not zero and encrypting information is costly (e.g. it takes time, generates failures, etc.). Second information-processing costs are often fallaciously assimilated to data processing costs. ICTs impact less the first category than the second. Indeed, the human brain that associates various types of cognitive processes is unavoidable when complex information processing occurs.

<sup>13</sup> The costs of a complete set of property rights are prohibitive. A complete set of property rights means being able to *ex-ante* forecast all the possible uses of any resource, to associate rights to any of the potential uses, and to make these rights enforceable. There are obviously many uses for which it would be too costly to perform these operations if one considers the value generated. Moreover, being able to identify and make enforceable in the last resort these exclusive uses rights would mean that decision and information costs are equal to zero and that infinite computing capabilities are available. This is why, as pointed out by North [1990], property rights systems are always incomplete, generating public goods and externalities.

## The variety of stakeholders interests and complementarities among processes

Two arguments have to be made here. First, some mechanisms to aggregate individual preferences have to be designed to select (even arbitrarily and imperfectly) a collective regulatory frame that would seek to result in the best collective outcome. Second, decentralized and centralized processes for establishing norms have contrasted properties and efficiency can result from their mixing.

If one admits that stakeholders can have conflicting interests, one should admit that some type of centralization is needed to compare the various possible PRs in term of collective efficiency so as to choose the most efficient one, whatever the efficiency criteria is. The important point here is to design a process in which the interest of the wider set of stakeholders would be taken into account. Historically, primitive systems of property rights developed in a decentralized manner. However it was in a logic of capture and pre-emption that did not guaranteed at all neither efficiency, nor peace. As pointed out by North, economic history can be interpreted as a process of selection of more efficient system of property rights, even if path dependency and rent seeking can prevent some societies to evolve toward more efficient PRs. In that process, the State often played a central role in arbitrating among the various interests under its jurisdiction — which does not mean that it is fair, benevolent, and efficient — to help to implement PRs allowing either to reduce transaction costs or to sustain growth.

The procedures used to design norms in the present Internet do not guarantee at all that the interest of all the stakeholders will be respected. Most of the existing norms result from a «first claimant, first served» process. Inventors and early adopters were able to capture much resource. However, since the Internet is becoming the basis of many social interactions involving a wide range of different types of agent, there is no legitimacy to systematically adopt and enforce the norms that were designed by the first entrants, the stronger players, or the best-organized lobbies. Berman [2000] discusses this issue by pointing out that cyber-norms settlers do not have to enforce any constitutional principle that would guarantee that the fundamental rights of the various stakeholders of the Internet are enforced. The argument is also made by Lemley [1999]. Decentralized process result in private captures of uses rights that do not guarantee the best uses of resources.

Moreover, since there are interdependencies between the cyber-world and the actual one, even if norms would result from a consensus ratified by the community of cyber-citizens, nothing would guarantee their efficiency, in the sense that the interest of every stakeholder would have been taken into account<sup>14</sup> (Lemley [1999]). An efficient and fair distribution of resources requires processes and instances able to manage these externalities between the cyber-world and the real world.

As recalled in section 1A, there are contrasted advantages to the central and decentralized design of rules in terms of transaction costs. As a result, transaction costs can be minimized by mixing centrally and decentrally designed set of rules to balance economies of

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<sup>14</sup> For instance, if systems that allow large scale barter of private copies of digital contents (e.g. Napster or Gnutella) develop, the revenues of the creators of content will be affected, unless taxpayers are asked to compensate by contributing more to the funding of the production of works of art. In both cases, it is clear that the norm of free exchange applied by the members of an on-line community affects the welfare of members of off-line communities

centralization with costs of maladaptations.

Decentralized and private norms have also a dynamic advantage. They enable groups to create norms that are well tailored to their specific needs. They allow individual and organizations to innovate more easily in norms, resulting in an institutional framework that is more innovative and dynamic than when innovation processes are centralized. In particular self-legitimated norms that are particularly efficient would be able to emerge and be adopted by the members of an emerging community even if there is no social consensus about it. In a sense this is what happened with the norms that govern freeware communities. Moreover, individuals are able to submit new «regulatory» principles to the test of users and to the competitive selection process without needing to benefit from an a-priori legitimacy (that would be granted by their past reputation, labels or qualifications, or delegation provided by pre-existing authorities). The boundaries of that decentralized innovation process are obvious. First they can result in inconsistencies. Second they reduce the enforceability of existing norms (resulting in raising transaction costs). Third, since competition can be biased, efficient norms do not systematically survive (as pointed out by the literature on technology diffusion). For these reasons as well, mixing centralized and decentralized process of setting norms is a way to maximize efficiency.

### The specificity of knowledge and networks

While information becomes a good which uses are now eligible for exclusion, it remains a non-rival and indivisible good. It is therefore legitimate to question the optimal property regime (i.e. the optimal level of protection) within the traditional debate that balances the advantages of strong incentives to create with those of a strong diffusion (Cf. Besen & Raskind [1991]). The examples of freeware or virtual communities point out that sharing information on a very large scale maximizes the benefit of disclosure. In some cases, mandatory disclosure rules — especially if disclosure rules could be tailored to different audiences — would be collectively optimal. Such rules could spontaneously emerge as it happened in the open-source software communities. However, there are also many situations in which it is doubtful that they will. Since investors in digital sequences creation (or network components) could fear to not get any return for disclosing without limitation their creation (or for enabling access to their network capacities), and since they can self claim property rights by controlling access, they should be incited to decentrally implement a PRs system that would overprotect resources, in the sense that the collectivity will be deprived from the potential positive externalities of open access (externalities of diffusion, spill-overs, etc.) This calls for some centrality, both to select the collectively optimal system, and to compensate the losers of a switch from a system of without limitation to private property to a system in which PRs are bounded.

Thus, the «public» nature of information and of digital network components makes it optimal to centrally design the PRs system in order to bound claims of exclusive uses rights. There is an additional reason for bounded PRs. There are a tremendous number of alternative (and often non-rival) uses of the same set of information. Moreover, the ability to use a specific set of information often depends upon the access to complementary information. A complete system of uses rights should take into account all the alternative possible uses of information as well as their context. Again, it would be inefficient, if it were not prohibitively costly, to design such a complete set of property rights.

To conclude, there are some logical inconsistencies in assuming that a completely decentralized system of self-claim could allow solving the problems generated by the use of information and digital networks. Since a complete set of property rights cannot be implemented, some forms of centralized non-market based allocation processes have to be implemented. Since a decentrally self-claimed based system of PRs would not probably be optimal, some form of supreme arbitration mechanism has to be implemented. In both cases, self-regulated communities are obviously one of the possible solutions. However, unarticulated self-regulatory processes would result in the same inefficiencies and impossibilities because the limits of totally decentralized coordination solutions among individuals (to set up a complete system of property rights) would be replicated among communities (conflicting self-regulations). These call, in the last resort, for some type of central coordination.

### **3. The boundaries of self enforcement**

The efficiency of pure self-enforcement — i.e. enforcement without any intervention of a superior third part — can also be questioned. Again there are two types of arguments. Generally speaking, if self-enforcement is inefficient or costly, then centralized capabilities could provide PRs owners with more efficient means to protect their uses rights. Specific arguments relate to the necessity to ensure a minimum transparency of the digital world.

#### ***A) Breakable codes and bounded credibility of ostracism***

As recalled above, North [1990] points out that centralized mechanisms to delineate or enforce PRs allow agents to reduce transaction costs. This is why the enforcement of PRs rely on owners effort together with the intervention of some third part of last resort that benefit from lower costs and greater credibility in punishing infringers. At least two reasons justify the intervention of such mechanisms in the Internet.

First, not any cryptographic system is inviolable. Code based protection and self-enforcement are therefore imperfect. This call for an entity able to guarantee enforcement in last resort by being able to punish infringes. In that case, centralization is justified for two reasons. First there is obviously a need for some exercise of constraint in last resort. Second, a central mechanism granted with power of constraint could guarantee a minimum transparency so as to control how the protected contents are actually used. Indeed, virtual communities could organize to hide the sharing of decrypted digital contents without the consent of owners. Third, supervision of uses implies at least a mechanism that will register claims of exclusive uses rights over information — implying a categorization of the various types of material eligible for protection — and that will check for the legitimacy and the absence of overlap among these claims.

Second, the enforceability of norms founding virtual communities is also in question. A good example is given by the code of conduct — the *Netiquette* — that was in force before 1995 and that prohibited commercial practices over the Internet (Lemley [1999]). This self-sustained norm disappeared within a matter of months because it became no longer operable with the enlargement of the community of Internet users. Indeed the enforcement mechanism was based upon ostracism and this mechanism did not apply any longer when the members of the Internet community became too diverse. Post-1995 adopters had very different preferences from the early developers and adopters, and they did not support the enforcement

of this pre-commercial code of ethics. More generally the power of coordinators of virtual communities is obviously bounded by the ability of Internet users to access alternative communities providing them with the same type of service, and by the ability of the providers of means of access to identify the users (because the only identity that is certain over the Internet is that of the computers). As pointed out by Lemley [1999], when ostracism does not apply, norms have to be enforced by external coercion mechanisms that can exercise some power of last resort over those who are supposed to enforce these norms. This is also the result raised by Milgrom et al. [1990] studying merchant law in medieval Europe.

### ***B) Market Power and Sustainable Monopolies***

The digital network economy is often considered an economy in which competition is sustainable because the decentralized nature of digital networks and the low level of barriers to entry seem to enable any victim of the exercise of monopoly power to bypass its service provider. Contestability (Baumol et al [1982]) is thus supposed to be strong. In the same time, the peculiar economics of networks effects, combined with the specificities of information as a good, make monopoly power sustainable in the digital economy (both because monopolies are stable, and because monopolies avoid duplication).

However, one should also take into account the ability of monopolies to generate negative welfare effects by capturing rents, and by reducing innovation. There are three causes for these anti-competitive threats:

- Increasing returns: Due to the combination of increasing returns and positive network externalities — that are characteristic of information activities — incumbent benefit from strong protection once their market share is established.
- Asymmetries in Network Externalities. Crémer et al [1999], Frishman [2000], Posner [2000]), or Tirole et al [2001] analyze cases where large service providers benefit from less externalities than small ones. They are therefore incited to downgrade the quality of interconnection with the small networks or sites to attract the subscribers and consolidate concentration.
- Switching costs are generated by network externalities among components of network goods and services, since users willing to change a part of a package they consume can have to change several of its components to maintain its consistency (e.g. between an operating system, a computer and softwares)<sup>15</sup>. This tends to lock-in users into their past choices.

The long term viability and intensity of competition is therefore an essential challenge in the digital economy featured by strong trends toward the emergence of viable monopolies. (Cf. Shapiro & Varian [1999], Noe & Parker [2000]). This leads to bind the encryption capabilities of agents (e.g. mandatory registration of code keys to trustworthy third parties) to maintain a minimal level of transparency aimed at enabling supervision by antitrust authorities. Moreover, reducing encryption capabilities limits de facto the levels of barriers to entry and therefore the strength of monopoly power. More generally, self-enforcement of PRs has to be

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<sup>15</sup> More precisely, substitutability among alternative components is high if they refer to a common standard. It is weak if they refer to alternative standards.

supervised by some last resort authority to ensure that encryption and self-regulation are not combined to develop and exercise monopoly power, and to maintain competition in the long run. Indeed competition is the best solution to provide agents and communities with incentives to implement efficient solutions.

In that respect, it has to be pointed out that there is a strong transparency-security dilemma over the Internet. On the one hand, the long-term sustainability of the competitive process in information networks calls for a minimum level of transparency. This is essential to enable users to compare alternative supply conditions. This is also crucial for supervising potential anti-competitive behaviors. On the other hand, the protection of contents (both the privacy of information exchanges and property rights) leads to encryption. This raises complex problems, because even if it is not justified to broadcast publicly the content of all information exchanges, it is necessary to verify that information exchanges are not harmful for the collectivity as could be the case if they were aimed at settling collusive agreements, infringing intellectual property rights or performing criminal activities.

#### **4. Federalism and Centralization**

Digital technologies challenge the relative efficiency of the existing alternative institutional frames. However, the decentralized and unorganized process of production of self-legitimated norms does not at all guarantee that the resulting norms will be efficient. Nor does it solve the problems raised by conflicting norms. Moreover, it does not provide the users with a coordination framework that would be secure and that would guarantee the long-term enforcement of norms. All these call for the organization of an institutional framework that will enable these weaknesses to be overcome.

Stakes are huge since Internet as an infrastructure is becoming an essential facility on which economic activity takes place, on which individuals communicate and share information and knowledge, and through which collective goods are provided to citizens. Moreover due to the nature of information and network services, and to the unavoidable incompleteness of PRs, a large number of complex externalities have to be managed. In that context, too weak and incomplete PRs could generate under-investment (Frishman [2000]) and too strong and inconsistent ones could lead to an inefficient allocation of resources in particular by generating under-diffusion of information and under-use of networks capabilities.

The central idea in that paper is that the decentralized process of PRs settlement based on self-claims and virtual communities self-regulations that is made possible by the use of digital technologies has to be combined with central coordination aimed at avoiding overlaps and inconsistencies among «local» regulations, at implementing most efficient solutions by taking into account the interests of the wider possible set of stakeholders, at guaranteeing an efficient enforcement of granted exclusive rights of use, and at preventing capture of the PRs system to set-up and exercise monopoly power. Central coordination does not mean that traditional direct State intervention is required. The type of regulation that can apply can be based on jurisdiction that would supervise the enforcement of basic ethical, moral and efficiency — let us say, constitutional — principles. Moreover, one can imagine some new ways to set up these basic principles that will govern the regulation of the cyber-space.

To conclude, one of the necessary conditions to benefit from an efficient institutional framework is to implement a unique and legitimate institutional organization of last resort regulation — legitimate in the sense that it would be able to take into account the interests of

the wide set of Internet stakeholders. It would have to design and make enforceable constitutional principles aimed at guaranteeing some fundamental rights of Internet users, and would be aimed at solving conflicts among decentralized regulations set-up by communities and second-rank institutional organizations. Indeed self-regulations based on specialized norms and private institutional organizations enable agents to benefit from coordination frames that are well adapted to their specific needs and preferences. The last resort institution overlooking private and specific institutions is essential to maintain the consistency of specific regulations, to ensure their enforceability<sup>16</sup> and to avoid their capture by individual interests. This calls for a federal institutional model enforcing a subsidiarity principle. The central and last resort institution is there to guarantee the efficiency of a decentralized mode of self-regulation, not to directly regulate uses.

This last resort regulation device should be submitted to democratic control and responsible for enforcing a basic constitution aimed at preventing capture and at protecting essential natural rights. It should act more as a jurisdiction than as a government. However, it has to be made clear that, as a regulator — indeed, it will be the regulator of the (self) regulators — it will both settle conflicts and set the basic rules that will constitute the constitution.

Beyond its logical justification, the implementation of a regulation in the last resort is made possible by the necessity to centrally manage the addressing system of the Internet. The mastering of the management of the addressing system by the entity that would be responsible for the regulation in the last resort will allow this entity to dispose of the means of its assignment. Indeed, it would enable it to dispose of a credible threat of excluding agents from the access to the cyber-world that it could use to have its decisions and regulations respected. In turn, only a well-designed and democratically controlled entity should be allowed to control the system of inclusion/expulsion from the Internet.

Such a last resort entity does not contradict the principle of self and decentralized regulations developed within communities. One of the interests of the Internet is precisely its ability to structure communities emancipated from geographical constraints. The decrease in enforcement costs allows the building of self-enforceable regulations on a larger scale than before, whose sole boundaries is the minimal consistency of these communities (whose members should share values and preferences). The second main advantage of Internet and related digital technologies is that codes allow a strong customization of the management of uses rights, reducing maladaptation costs born by agents in the pre-existing PRs systems. Last but not least, the ability of individuals and communities to self-organize and to design innovating coordination processes is a strong source of technical, organizational and institutional innovation. A supervision of these innovating practices is nevertheless unavoidable to be able to guarantee the long-term viability of the competitive process and the openness of the network.

More broadly, the problems raised by the regulation of the Internet are very similar to those raised by Global Governance. They are not specific to network or digital industries. The

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<sup>16</sup> Indeed, since these local regulations can be considered as components that participate in the general efficiency provided by the institutional framework, it is legitimate to reinforce the enforceability of these self-regulations when necessary. The authority responsible in last resort for the regulation of the system has therefore to use its credible threats to punish infringers of self-regulations. This is a common practice in the real world when the State becomes the guarantor of the enforceability of self-elaborated norms, like professional codes of conducts, by making them legally binding.

perspective adopted in this paper could therefore be deepened, applied to and tested with other issues. By assimilating regulation — in the broad understanding adopted here — with the design of a property right system, I pointed out that several features of the design of an Institutional Framework could be analyzed in a common analytical perspective. By considering private and public order complementary, by recognizing that the pooling of resources management can be made thanks to very different types of organizational arrangements — ranging from bureaucracies to self-regulated communities —, I tried to point out that the design of a regulatory framework can be think, first, in terms of trade-off between the efficiency/costs of establishing general rules or negotiating inter-individual agreements, second, in terms of delineation of the impact of these rules on the individual welfare of each of the stakeholder in the system. Indeed, the fully decentralized «measure» of (individual or collective) uses rights over resources can generate problems of incompleteness, overlapping, capture, etc. Moreover, full decentralization can be inefficient in terms of enforcement. Designing of institutional frameworks that mix inter-individual contracting, communities' self-regulations, and global regulations can therefore bring down measurement and enforcement costs. In that perspective, such notions as legitimacy or hierarchy can be theoretically grounded from an economic point of view (by taking into account the notion of externalities and property rights costs). The advances made by Ronald Coase and Douglas North proves again their fruitfulness in analyzing issues at the frontier of law, economics, politics and ethic.

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