From Laws for Cyberspace to Cyber Laws (literally): Integration of Legal Norms into Internet Protocols & Law for Closed Digital Management Communities

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Abstract

This paper is an introductory summary of a large-scale project, which I first outlined in more detail during the assessment for my Masters degree and is currently under development. It describes what I call the "Cyber Law Protocol", an automatic system capable of enforcing legal rules into networking operations.

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1. As an introduction…

The following discussion introduces the dialectical transition from the "code is law" concept to an active "law is code" software application. It advocates the redevelopment of network protocols into reflections of contemporary legal systems as a practical method for creating a new form of self-enforcing law online.

The electronic environment's inherent openness for radically altering its apparent natural dimensions through bespoke modifications in the programming code's structure is its main advantage over our physical reality. The world as we know it is governed by both unchanging laws of physics like gravity (*natural law*), and human-imposed norms and rules (*positive law*). In an online world, this dichotomy between natural and deontic law becomes precarious.[1] In this respect, the added value of electronic artificial landscapes is the specific freedom to inject behavioural modules into their digitised physics (the computer programming language), with an unlimited potential for integrating human positive law with computer's "natural law".

Starting from this general assumption, which echoes Lessig's theoretical approach, I will attempt to build a simplified online community, as an example of the technological potential for bypassing (or even obviating) legal ambiguities. Moreover, I will explore the prospect of defining software operations for network communities (*protocol*) based on established models of diverse legal systems**.** For the sake of this brief paper, the case study will focus on developing an application that automatically manages issues of possession, ownership and distribution of files between the members of an imaginary closed online community.

In short, the general idea is to transform the patterns of networking protocols (like the TCP/IP set),[2] which arrange communications and the transfer of data between computer systems, to execute automatically Private Law behavioural modules without further human intervention. Normative law, what *ought to* be done, is translated into quasi-physical restrictions of what *can* be done.

2. Developing CyberLaw

The main feature of an application that would ideally realise the above principles and successfully implement them online would be the direct incorporation of law in the network's software protocol mechanisms. An example could be the TCP/IP set of protocols for Internet communications, which are structured on mathematical logic and patterns chosen for their technical adequacy. However, the latter are not immutable, and new, different models of communication protocols have been proposed and are currently under development.[3]

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[1] Computer games can illustrate this point: whether or not a character in this fictional context is capable of defying a hypothesised natural law of gravity and of flying over his enemies is expressed in the programming code as a normative constraint: he is *allowed to* perform certain actions.

[2] C L Hedrick "Introduction to the Internet Protocols" (1987) @: <*www.eeng.brad.ac.uk/help/.xferfile/.inetproto.html*>

[3] The European IPv6 Task Force envisions development and implementation of a new Internet protocol, available online at <*http://www.ipv6-taskforce.org/europe.php*>

Two different elements will contribute to achieving the aspired goals. The first is the careful selection of legal rules that will regulate appropriately online environments. The second is the effective, accurate transfer of legal methodology into computer language. Both of these procedural steps are discussed below in a process that I have arbitrarily called "Codification".

2.1 Restructuring the virtual space

Before going through these successive steps, it is crucial to define, in advance, the regulated area's dimensions, as successful application of law is indissolubly bound up with both the natural and social parameters of a given and potentially regulated space. In the fictional example discussed below, the community is, therefore, assumed to operate on a shared online platform, open in membership, though closed in access (meaning, active via typing allocated passwords), and in general performing similarly to a typical Web browser. This then allows e-mail communications and stereotypical data exchange, graphical on-screen representation of websites and an additional set of assisting applications and accessory tools.

Additionally, it is important to identify entities that represent subjects and objects within this electronic world. The online social structure, as a real-world metaphor, includes active participants and static objects in analogously operating digitised projections. Both users and their autonomous software, which may execute a variety of prearranged tasks on the formers' behalf, are defined as "actors".[4] According to typical online functionalism, documents, pictures, sounds, programmes and contiguous exchangeable information are classified as "movable objects", while IP addresses, including single web-sites and hosted secondary platforms,[5] constitute a class of "immovable objects".

2.2 Codification

Common use of the word "codification" originally captured the lexical confusion between a certain method for legislating and the graphic expression of written law,

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[4] In legal literature the connection between autonomous programmes and users focuses on the institution of agency. However, to facilitate the use of agent technology the proposed protocol enables intentionally a uniform personification for users and programmes through individualised software. This means that the legal debates that divide theorists on the status of machine-negotiated contracts cannot be represented in CyberLaw. Eventually, concerns over agents' liability will fade, as protocol/software traffic shape autonomous activity, rendering it more reliable than the actual human source. S Wettig & E Zehendner, "The Electronic Agent: a Legal Personality under German Law?"(2003) *LEA 2003: The Law and Electronic Agents*, *Institut for rettsinformatikk, Oslo,* 102-109; E Weitzenboeck, "Electronic Agents and the Formation of Contracts" (2001) *Electronic Commerce Legal Issues Platform*, @: <*www.eclip.org/documentsII/sum/research.htm*>, 11-14; M J Radin, "Humans, Computers and binding commitment" (2000) *Indiana Law Journal,* @: <*http://eon.law.harvard.edu/ilaw/Contract/Radin_Full.html*>; I R Kerr, "Providing for Autonomous Electronic Devices in the Uniform Electronic Commerce Act" (1999), @: <*www.law.ualberta.ca/alri/ucl/current/ekerr.htm*>; M B Sapherstein "Intelligent Agents and Copyright: Internet Technology Outpaces the Law...Again' (1997) *Intellectual Property and Technology Forum Boston College,* @: <*www.bc.edu/bc_org/avp/law/st_org/iptf/articles/content/1997102801.html*>

[5] Platforms within the platform, for example private communication and data exchange channels.

leading today to a dual-conception of both the method of codification and the instrument of code.[6]

In the legal world, codification serves a number of substantial needs, offering:

- accessibility,

- completeness and cohesion in representation,

- consistency

and

- certainty.[7]

However, in developing a networking protocol that will articulate legal norms through automated transmissions, "Codification" means actually "encoding" into computer language the existing legal norms, changing them from passive text into an active, automated regulatory framework. In other words, it means cutting the text of law into pieces and reinstating it in the form of processible code.

2.2.1 The law in " zeros and ones"

Where a state codifies abstractly private law concepts like "obligation" in functional linear clauses,[8] the corresponding encoded form (readable by the electronic system) would be rephrased and interpreted in Boolean logic as:

    <Obligation>

        TO <perform>

            <furnish/deliver>

                <item><individual>OR/AND<quasi-generic>

                OR/AND <money>[9]

            TO <creditor> - <identified>

      OR   NOT TO <perform>

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[6] E Steiner, *French Legal Method* (2002), 31.

[7] Performing on a centralised basis, codification justifiably is considered to have been the first form of computerised legal intelligence, a tool simplifying effectively jurisprudential choice. See P N Gray, *Artificial Legal Intelligence* (1997).

[8] The "if then" clauses of statutory law: "If there is an obligation, then the following actions ought to be performed".

[9] Implying "money" in general, though without setting out a precise amount or pre-arranging currencies. The proposed scheme does not incorporate connections to the real world regarding the offline-identity of users, their credit card numbers and their traceable identities through ISPs or other established technical means. Money transferring, though, has indeed become an ordinary practice on the Internet as countless credit card numbers are being distributed online on a daily basis. However, in a hypothetical example where the platform co-operates with (or even integrates) online banking, and relevant procedures are concluded automatically without further human interference, inclusion of <money> as an executable variable value seems theoretically feasible. Additionally, alternative methods of automatically executable payments have proposed in conjunction with credit card payments, for instance "electronic money". See A Guadamuz "Electronic Money: a Viable Payment System?" (2003) *Formatex 2003 - Techno-Legal Aspects of Information Society and New Economy: An Overview*.

<described activities>[10]

What is presented here indicates more than just a legal provision. It is a communication logic that imposes automatic interactive behaviour for running software. The computer would read, for example:

<Concept 567>   (is)

    TO <Proceed into>

        <Execute command 12>   (over)

           <data><specified>OR/AND<data>+<data>+...

           OR/AND <data 2>

        TO <URL> - <Request Input URL >

   OR   NOT TO <Proceed into>

           <Execute command 11>OR/AND<Execute command 13>

By redesigning a complete networking protocol according to rules deriving from existing legal systems, we substantially transform it into an alternative form of indirect "invisible" legislation. Eventually, external state enforcement over e.g. online contract procedures and obligations arising from them would be redundant, as long as the rules were automatically imposed and put into force by the online system itself. The following examples take place within the limits of our fictional online community, which is run by a purpose made protocol:

If the debtor in the above "obligations" concept is an online library, liable under a previous contractual agreement with another participant of the platform to deliver 10 to 20 document files in .pdf and .doc formats with the subject "International arbitration" (i.e. set within the above Boolean arrangement as [<item> <quasi-generic> etc.]), or if she is a natural person, restrained - due to a dispute precedent - from retrieving text or picture material from a specific web site (activity prescribed in the second part of the "obligations" clause: [NOT TO <perform> <activity> <retrieve> <item> etc.]), while checking on the users' personal preferences, the electronic system detects the existence of the pre-set obligation and proceeds accordingly.

Therefore, in the first scenario, the library, through the use of autonomous agents that operate on the platform and are guided by the protocol's parameters, will be e.g. automatically forced to comply with the required specifications ("forced" according to the agreed terms and conditions of the prearranged contract and the platform's capacity to impose behaviour).[11] Additionally, the user/clerk will be automatically

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[10] The example combines provisions found in the German Civil Code, sections 241 and 243 (before the 2002 amendments).

[11] This imposition of behavioural patterns takes place on a second level of protocol operation. The software application which constitutes the online platform may conduct the prescribed activity automatically, without the user's explicit consent, or may block access to the common platform allowing only execution of the expected task on the user's part. There are a variety of possible online "measures" that would ensure behavioural compliance:

- The system activates a peer-to-peer reaction, blocking the infringer's further activity on the shared platform, except to the extent that he will be able to comply with a requested module.

notified of the library's current online status or independently executed activities. In the second case, neither the user nor her agents will be allowed to obtain the indicated items. Provided that the appropriate technical adjustments have been developed, the platform will successfully restrict unauthorised acquisition even if the items are hosted on a different URL than the rightful owner's.[12] This illustrates the point made above about the conflation of physical and deontic worlds: because the user in this case ought not to receive the items, she also can not receive them.

2.2.2 Objectives and method of implementation

Codification requires the development of a translatable legal logic that preserves law's desired regulatory impact on social behaviour and interaction. As these pre-set rules reflect the distinctive character of the electronic reality and, at the same time, direct its operation, codification's objectives may be summarised as follows:

- "scalable" clarity, thus requiring a complete and comprehensive regulatory framework that maximises internal compatibility between the variety of inducted legal themes,

- open provisional structure for assimilating future file formats and models of data distribution,

- precise representation of real-world legal knowledge, in processible, mathematically arranged logical sequences, and

- creation of a uniquely identifiable and well ordered interactive setting, capable of preventing online participants' evasive behaviour while exercising their exchange practices.

The first two objectives are realised through the first step of the codification procedures, and define the selection of law that will eventually run through the online community. As online activities substantially remodel real-world patterns of contact and association, the claim is made here that the required framework, from which the most suitable legal rules will be extracted, already exists in the form of statute law. Continental codifications carry the advantage of exhibiting ordered text-layout in concise logical sequences, which can easily be transcribed in computer language patterns as shown previously with the "obligations" example. Moreover, they bring to the point common universal "abstract rules and principles which apply to all of the specific circumstances."[13]

A scheme for efficiently running online environments would incorporate the core protocol of these codifications. At the same time, however, it would allow the online community to evolve through more relaxed common law practices that take place within the platform's software sequences. While the platform's legal evolution will be

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- The individual's connection to the community's platform is deactivated, although a few options are left to the user in order to allow him to amend the harm inflicted on another user.
- The individual's software instalment mobilises its autonomous agency workforce to comply automatically with the prescribed requests.

[12] There are technical means capable of detecting mis-distributed data online. In the extended form of this paper I propose a virus-like programme which performs as a tracking device only within the application's operational limits, without interfering with the user's hardware or infringing privacy rights.

[13] N Foster, *German Legal System and Laws* (1993), 2-3.

implemented through online interactivity, with the extended use of autonomous agents, the computer code will progressively integrate precedents with the potential for altering the community's "legal" standards. This issue will be explained and addressed briefly in the last part of the paper.

The third of the above objectives reflects the second step of the codification procedure. In short, it includes formation of a legal ontology, assessed by evaluating the induced concepts along with the individual objects and variables that they prescribe (persons, items, quantitative elements etc.) Following the analysis and adaptation of legal concepts to the community's standards, a finite number of common key notions are revealed to the protocol's designers/creators. These key notions are essentially determined by the frequency and functionality of the used terminology. Therefore, simple or complex terms consisting of different sub-notions are easily marked down to complete a legal ontology that will eventually be transcribed as computer code.

An idea of what this ontology would look like can be gained through the previous Boolean rephrasing of "obligation". "Obligation" shares certain aspects with concepts like "contract" or "ownership". Moreover, variables like "item" (varying in the electronic environment from audio files to executable programmes) or "creditor" (emerging from an e-commerce agreement as the seller or the buyer), frequently appear in everyday online communications. A concept itself may include another concept, or may also use shared legal terminology.

While determining the applied law's structure involves mainly assistance from legal experts, the second step requires additional technological support, A.I. expertise in the field of ontological modelling[14] and the relevant computer programming skills. Practically, this is the part of the procedure where the law becomes essentially encoded.[15]

2.3 The CyberLaw platform

Users participate in the community by accessing the platform through their browsers. The platform itself constitutes the common network application, which operates under the protocol's standards and rules. Browsers, with the appropriate software development, allow users to observe current online communal legal preferences and to customise their participation by becoming fully or partially subject to the protocol's normative standards.

For example, B selects to activate the concepts of ownership and possession *erga omnes*, with regard to the content of his personal web-page. This page includes pictures of famous expressionist paintings (*possession*) and one original article

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[14] Observing the construction of the application through the protocol design stage, as well as picturing the way in which the combined activities of users and autonomous agents would be interacting with its system core and guided simultaneously by it, an additional point is whether this online system itself is indeed an advanced form of computer intelligence, with regard to regular network standards.

[15] Furthermore, I have divided the law regarding its active or monitoring function over interactivity into "conductive" and "receptive" concepts. Although this categorisation offers ground for prolific legal analysis, I prefer at present to exclude this subject from the discussion. It goes deeper into deciding the application of law by describing legal provisions and their role within standardised legal structures; additionally it supports the technical/operational part of the proposal, which I mention above in note 11.

(written by B) on "The power of coloured lineament in the art of Van Gogh" (*ownership*). Either acquisition of his uploaded material is blocked or, supposing that this option lies technically unfeasible, pre-set conditions generate the appropriate automatic procedure (i.e. tort) as prescribed by the law/protocol in case of breach.

Conversely, he might also reject "ownership", meaning that he declines rights of property over his article, and nonetheless opts to remain within the general regulatory setting of possession. However, his personal refusal of "ownership"[16] does not authorise him to infringe the rights of other participants who have subscribed to this specific concept. If private law practices are adopted as community standards they take on public law significance and create legal preferences and obligations *erga omnes*, thus limiting the users' range of options in customising their online profiles. Hypothetically, if the "liability of possessor as against owner"[17] concept becomes part of the system's *jus cogens*, B will not be allowed to exclude himself from its community-wide compulsory effect, although he may choose to deactivate his software from pursuing the prescribed legal effect against others automatically.

Users may alter their preferences at any instance provided, of course, that no existing cyberrule or regulation will block their request. The platform offers the possibility of legal cross-fertilisation through the exchange of practices between users.[18] Individual modifications and subsequent *inter partes* agreements between the community's members are spread across the platform. The system's collective intelligence spots popular selections and may convey them to users for approval. Once a practice becomes widely embraced, the platform has flexibility to adopt it and establish it as a system preference, thus partially standardising it as *jus dispositivum*, optional law that does not defy the original protocol's operational principles. [19]

Uniform imposition of these procedures over humans and autonomous software ultimately substantiates code both as natural and positive law. We have also examined the community's evolution through common law practices. Finally, the delicate issue of enforcing the appropriate measures for applying justice will be determined by the community, since this form of "justice" is established to serve the collective

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[16] And not "personal rejection of ownership".

[17] BGB §§987-993.

[18] Including e.g. "tit for tat" waivers of legal entitlements. This means that "property free" networks along the model of the copyleft movement can evolve.

[19] For example, an online distributor of photographic images takes requests on his platform for high-resolution files of online pictures. He uses a contract form with his customers that provides for delivery within fifteen days from payment (or else the system blocks him causing harm to his business). The platform detects the frequency of transactions, as the website has become popular among professionals in the community, as well as different practices and suggests it to other similarly operating on-payment basis users. Through p2p connections, personal platforms report to each other on the new contractual practice. Once widely adopted, it marks the introduction of a new alternative standard.

perception, not a centralised governing entity,[20] thus becoming one of CyberLaw's "selling points".[21]

3. Animating CyberLaw: an example

The following example illustrates the ideal performance of an online community operating with the CyberLaw networking protocol and using the appropriate software platform. It revisits the unauthorised retrieval of files introduced above.

Mr L, a famous photographer, uploads on his platform portal (his webpage)[22] pictures from his upcoming book to "tease" consumers/community participants. The site contains explicit warnings against unauthorised online retrieval.

M, a user, intrigued by the images, tries to copy two pictures. Her software asks the hosting platform for authorisation to deliver visual material to M. Since there is no prior relevant input/instructions from the rightful owner, the platform responds negatively to M's demand. Next, the autonomous software inspects M's personal settings for any previous legal relationship that would justify a claim for transferring the pictures; it conducts a quick "legal" search through the full range of the online "allowed" concepts. Failing to discover any valid link between M and L, the shared platform is alerted, informing M's personal browser that there is no authorisation and, thus, the terminal is unable to perform the requested transfer.

M does not give up. She e-mails L asking for permission; L, however, declines until the book is published. Alerted by the email, he "reads" on his software all recent attempts to download his pictures and he instructs it (via his browser's interface) to communicate with corresponding platforms in order to enforce an obligation against deprivation of his property. Furthermore, he institutes the same condition *erga omnes,* in order to prevent further attempts to download the indicated material in the future. His agents travel across the platform and impose the condition on all participants, notifying them against specific contact with L's website.

M persists and she sends her agents in search of a picture using L's name and an additional description "y" that accompanied the photo on the previous site. The agents discover "L's unofficial fan club" URL, which supports fanatically L's work and has been rewarded with a sneak preview of his new material. Unable to contain their enthusiasm, L's fans have uploaded by chance picture "y", the very same that M desires, without adjusting the necessary restrictions for banning its further transfer.

M's agents converse with the file and they demand acquisition, which, resembling BGB §854,[23] follows the pattern: "NOT<obtain> IF (NOT<consent><other

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[20] This seemingly superfluous reference highlights the divergence from variations of the Social Contract theory that justify subjection to the absolute monarch's rule, but most importantly it underlines the potential for establishing a highly democratic *de facto* regime on the Internet, reflecting the values and principles that reside within the carefully selected legal structure. However, as with every innovative application, the CyberLaw protocol follows the classic technology conundrum, showing enormous potential for good and equally enormous potential for abuse if misapplied.

[21] There is a reference to exemplary measures for this "contractarian justice", as in note 10 above.

[22] Always under the presumption that the platform operates similarly to a typical web-browser. However, I am repeating my aspirations that the platform not be pictured as a strictly web-based software application.

possessor>)". Since there is no restriction from the Fans' URL, M's autonomous agents pick the file without further denial.

However, as the file comes into M's possession, the application identifies import of the marked item "y" and detects direct conflict with L's previous conditional rule,[24] which, alerted in turn, immediately identifies import of the marked item "y". Thereafter, through the application, L is informed about the conducted breach.[25] Under the scope of the "default by debtor" concept another subsequent "compensation for default" concept comes automatically into effect to demand compensation from M. Ultimately, the same procedure would take place simultaneously between L and an infinite number of users/participants.

In terms of community structure and operation, the practical nature of "compensation" would need to be explicitly defined. It might constitute online payment, destruction of a specific file's copy,[26] or a ban from distributing it online. Failure to comply with the "creditor's" notice, possibly within a certain period of time, would cause the software to process and impose "communal" measures against the "debtor". However, a system-placed blockade, for example, could be terminated automatically if M complied with the requested "compensation".

4. Conclusions: potential and applicability

These simplified examples underline the key element of this distinctive merging of law into technology: the automation of regulating interactivity.

From the lawyer's perspective, within this new system resides inherent potential:

   a) for overcoming legislative ambiguities that emerge from transnational networking communications, and

   b) for shaping global regulatory frameworks.

The CyberLaw protocol's structural logic facilitates the introduction of indirect legal harmonisation for the online community's various participants, regardless of their national origin or status. In this respect, typical conflicts of international private law that emerge from the global online context (e.g. jurisdiction) give way to the CyberLaw's main operation of precluding disputes through computer code by keeping

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[23] §854: **Acquisition of possession** – "1. Possession of a thing is acquired by obtaining actual power of control over the thing. 2. Agreement between the most recent possessor and acquirer is sufficient for the acquisition, if the acquirer is capable of exercising power of control over the thing." Additionally, §858 ("unlawful interference") describes acquisition against the will of the most recent possessor.

[24] Summarising previous examples, the pinpointed condition combines a "default by debtor" concept (enforcing automatically a specific obligation after a breach has been conducted) and a developed congeries of ownership rights, originating to BGB §903 ("powers of the owner"), §985 ("claim for delivery") and §1007 ("Claims of former possessor").

[25] Primarily found within the Penal Law framework, another major legal principle that obviates the retroactive effects of law (*nullum crimen, nulla poena sine lege praevia*) would have overridden L's claim in the specific case, when the latter had not been conveyed to M's platform before the acquisition of the file.

[26] Depending on the system's set standards and the application's selected degree of expansion over hard-disc equipment, this objective may acquire feasibility without violating rights of a private nature.

behavioural activity in compliance with the law at the precise moment of its execution.

Additionally, as the adopted legal policies are merely a minimalist restatement of the fundamental principles of private law, they are easily understandable across the network community. Exploring the protocol's functionality on this basis, a wide range of areas and issues of law that have required additional legislation for their Internet manifestations (and the institution of further, more complex and ambiguous terminology) revert to familiar legal concepts that outline and prescribe the fundamental proportions of fixed social systems, e.g. copyright in CyberLaw is ideally dealt with in the traditional ownership context.

However, the creation of electronic-legal hybrids that would substitute and eventually circumvent the effect of real-world law, is not the intent of the CyberLaw protocol. On the contrary, the protocol provides a practical prevention mechanism against the increasing Internet-related litigiousness that places unsuspecting individual users in costly judicial battles with gigantic international entities.

Moreover, the transparency of the automatically imposed behavioural limits and restrictions over online interactivity is brought under narrow scrutiny. Law enforcement within democratic structures is characterised by clarity and its availability to the public for criticism and debate, a principle social institution, which the "invisible" computer language sequences presumably challenge in practice. However, the protocol does not constitute an administration of justice mechanism but, rather, an interactivity management system which replicates private law methodology.

Since CyberLaw acknowledges the community system in a Luhmannian sense[27] the CyberLaw protocol's explicit incorporation of law enhances the respect for the human participant as legal actor, unlike the arbitrarily created software platforms, which currently monopolise the global electronic market. Protection and security through the protocol, though, are provided equally for both the individual and the service provider, reflecting the universality of Law in the electronic environment. Therefore, in assessing the added value for international online transactions, the private sector as well as state authorities are invited to contribute to the development of the CyberLaw protocol, in pursuit of satisfactory regulatory schemes for the Internet.

Referring initially to basic legal modules, the law through the protocol becomes alive: a collective autonomous innovation that, by hosting a series of small cross-operational tasks, evolves ultimately only through the initiative of its masters/subjects. In this respect, cyber-democracy, capable of presenting its own tailor-made law, is not just a digital utopia.

Beyond the above-explored option of building local, independent communities, the Internet as a whole is the protocol's ultimate and most ambitious challenge. It is arguable whether the Web has the capacity to integrate globally new socio-legal solutions, especially since a framework of universally shared formal laws was not ab initio cultivated across the users' community. In addition, the commercialisation of the Web has led to the fragmented administration of cyberspace by innumerable, and thus uncontrollable, private operators.

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[27] Borrowing, in particular, terms such as "management" and "control" from the systematic approach to law.

Encouragingly, however, as long as many, and technically more advanced, electronic network constructions are still underway,[28] the CyberLaw protocol proposal offers the

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[28]The future of telecommunications (both technically and legally) seems to be moving towards the merging of existing models, as well as to the production of multi-operational amalgams (i.e. the combination of the Internet with mobile phone communications), instead of expanding individual technological sectors to their extreme limits. However, the invention of new structures and means, which are at present beyond the common person's imagination, will eventually be a possibility that should not be overlooked: 50 years ago the Net itself might have been considered a lunatic's fantasy.

Without the following research material none of the described ideas, models and proposals for legal, social and technological developments would have taken shape:

A. Books

R E Allen, *Socrates and Legal Obligation* (1980)

M A Boden (ed), *The Philosophy of Artificial Intelligence* (1990)

X Dai, *The Digital Revolution and Governance* (2000)

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S Hick, E F Halpin & E Hoskins (eds), *Human Rights and the Internet* (2000)

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G F Luger & W A Stubblefield, *Artificial Intelligence: Structures and Strategies for Complex Problem Solving* (1998)

N S Papantoniou, *General Principles of Civil Law* (1983)

A Rose (ed), *Human Behaviour and Social Processes: an Interactionist Approach* (1962)

W T Stace, *The Philosophy of Hegel: a Systematic Exposition* (1955)

W O Weyrauch, *Gypsy Law – Romani Legal Traditions and Culture* (2001)

N Wiener, *The human Use of Human Beings : Cybernetics and Society* (1950)

B. Articles

S Anil, "Cyperspace and the Law of Defamation: Developing a Workable Model" (2001) *Computer and Telecommunications Law Review 2001*

J Barlow, Roetzel & Andress "The Continuing Evolution of Internet Jurisdiction Law" (2003), @: <*www.tilj.com/content/litigationarticle01210301.htm*>

J Clift, "Jurisdiction: Building Confidence in a Borderless Medium – UNCITRAL and the Goal of Harmonization of Law" (1999), @: <*www.ilpf. org/events/jurisdiction/presentations/cliftpr.htm*>

promising potential for future interactive systems to construct their operational basis concretely towards human law, predicting and escaping the already encountered ambiguities on the "two-dimensional" Internet.

T Fotopoulos, "Systems Theory and Complexity: a Potential Tool for Radical Analysis or the Emerging Social Paradigm for the Internationalised Market Economy?" @: <*www.democracynature.org/dn/vol6/takis_complexity. htm*>

J Heflin, "Web Ontology Language (OWL): Use Cases and Requirements (W3C Working Draft)" (2003) @: <*www.w3.org/TR/webont-req/*>

M L Nickles & K F Lorentzen, "Construct.S – Building multiagent systems based on Luhmannian systems theory" (2001), @: <*http://wwwbrauer.informatik.tumuenchen.de/gruppen/kikog/projects/socionics/index.shtml?constructs. htm*>

Å Nilson, "Jurisdiction: Building Confidence in a Borderless Medium – Development of International Law Inside Closed Groups Projects in the Coming 2000's" (1999), @: <*www.ilpf.org/events/jurisdiction/presentations/nilsonpr.htm*>

J M Oberding & T Norderhaug, "A Separate Jurisdiction for Cyberspace" @: <*www.ascusc.org/jcmc/vol2/issue1/juris.html*>