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Regulatory Patterns of the Internet Development: Expanding the Role of Private Stakeholders through Mediatized "Self-regulation"

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Abstract: *This article studies the Internet from an evolutionary point of view, based on historic analysis, to confirm institutional change predictions suggested by Utterback's innovation development theory. It explores the appearance of rules and the consolidation of public and private initiatives that could enhance the capacity of the private sector to co-regulate in the digital sphere, which is especially relevant to the field of electronic commerce-related transactions. This institutional review distinguishes between two distinct layers of the Internet. Also, formal and informal regulatory patterns are identified in their evolutionary stages, revealing the prevailing models: unregulated, self-regulated, co-regulated, or regulated. These conceptual associations aim to provide a framework scheme to further study specific topics in the fields of Internet governance, digital economy, and the information society. This primer should also induce interdisciplinary research, for better understanding on how rules influence digital innovation and behaviour, in practice. Implicit in this account is that most of the credit for the efficient development of these technologies, in their two layers, during their first stages, might be attributed to the availability of collective, collaborating, or independent self-regulatory capacity. The most immediate observations show a growing tendency towards over-prescriptive regulatory systems, promoted to control its use and content; incompatible with the needs and interests of the majority of stakeholders. A concluding claim is that the Internet and telecommunication technologies in general, considered as enabling mediums, would benefit from dynamic and mixed regulatory solutions, according to and depending on whether their object is their infrastructure or the surface layer of its applications.*

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1. Introduction

Governance of the Internet is a term with specific content that expands the function of the states from merely governing to managing. It also involves the participation and empowerment of other private actors and parties that turned from mere users to contributors as well as managers of legitimate regulatory models. Research in this field fits well within the Internet governance context, or the study of governing and administering the networks. Literature on the patterns and classifications of Internet regulatory models abounds, but instrumental to the present discussion are mostly materials that highlight the roles of stakeholders in the creation of rules. Stakeholders can be grouped into categories such as: Public and private, Governmental and non-governmental, Non-profit (NGOs and the general public), Technical, Businesses, Academic, etc. according to the interest they represent. These are merely conceptual divisions that are not intended to ignore the extraordinary cooperation that, deliberately or not, has taken place between traditional power structures and other organizations, to respond to the demands of what has been metaphorically called "The Information Society."[1] All categories used in this work have been chosen or created for concrete applications and do not pretend to be comprehensive. They aim to contextualize the opportunities that can still be found, to promote favourable, novel and dynamic institutions for social order, and to revitalize trade and promote the globalization of commerce innovatively. Later, follow-up papers can propose concrete strategic electronic business management models that effectively incorporate digital dispute prevention and management techniques applications.

The study of Internet governance, in theory and practice, constitutes a multidisciplinary challenge, and thus it should produce valuable insights *if* a combination of various methodologies can be applied. Its main object, the networks (and related digital telecommunications technologies), should be appraised from at least two perspectives: One technical/operative consisting of its design, engineering, administration and management of protocols; in other

[1] A number of definitions of the 'information society' metaphor are discussed in detail by Webster, 2006. On the 'network society', see Castells 1996, 1997 and 1998.

words, its material, structural dimension. And the other, in the public view, of its usage, interfaces, and content (allowing users to process data/information).[2]

Different sciences have grounded theory on what is at stake in each of these layers. To add to this complexity, the Internet's evolutionary path also affects in diverse ways society, economies, traditional organizations and regulatory systems. For a complete institutional review, therefore, not only formal regulations should be taken into account but also informal rules manifested on identity, community structures, cultural and social phenomena, etc. A departing but systematic way to approach analysis is proposed in Table 1 (see p. 100).

Common concerns on the Internet structure of social, economic, and legal relevance are extensively discussed by Lessig (1999; 2006), Wu (Wu & Goldsmith, 2006) and Zittrain (2009). Content-related matters expand further, with a focus on subjects such as digital rights, innovation management, information management, electronic commerce, trade and social networking, interaction design, etc. The number of overarching issues resulting from the Internet expansion increases with the process of digitalization of everyone's identity and life, reshaping the public and private notion of governance. Current discussions pretend to formulate innovative constitutional principles of global acceptability that could balance the admitted need for neutral networking with a proper level of definition/protection of digital rights; institutional outreach is typically pushed by the expansion and diffusion of most technologies.

Establishing a difference between technical standards and normative formulas of conduct affecting the stakeholders of the networks is convenient also for methodological reasons. Discipline-centred scholarly literature has seldom risked with distanced, all-encompassing and principled analysis in regards to phenomena of these characteristics. The following pages propose a mixed assessment to overcome these limits. It is difficult to argue against the Internet being relevant to all sciences after it has shaken all known social arrangements and forced the reformulation of the most essential values of society in a very short period of time. The emergence of the Internet, coupled with coinciding digital computing and communication technologies advancements marked the

[2] The National Science Foundation (NSF) funded research suggests an approach based on what have been called "the layers of digital service architecture" where two more are added composing a four-tiered generic model with the surface level divided into two: Content (the actual data) and Services (how it is presented) and the infrastructure into another two: Network (transmission structures) and Device (machinery and applications, such as a smart phone and its Operation System (OS), see Yoo et al., 2010. For simplicity and to include technologies preceding digitalization, the two perspectives proposed in this article should suffice.

beginning of a so-called 'techno-economic paradigm' that did not remain long in the engineering level of an invention. It demonstrated capacity to create wealth at a global scale and assist human development, which facilitated its subsequent, rapid, global diffusion. These unset conditions continue to generate radical changes waiting to be steered on a direction beneficial to most (Perez, 2004).

With the telecommunication technologies the world entered the information age. They are innovation products from the second half of the past century. The compatibility and convenience of legal and economic principles applicable to the management of the networks can be examined best, analyzing records of the Internet's historical development. This work is entirely based on theoretical sources, using qualitative empirical and historical research methodologies. Insights on regulations are included in as much as needed, to propose an understanding of the impact and effect of norms on technical, social, economic and political phenomena and vice versa. The discussion rests on an account of selected chronological events that allowed grouping the Internet development in at least three phases to identify the patterns, models and institutional change that began four decades ago. This retrospective is useful to support the validity of innovation theories and forecast how policies and regulations could better match the next stage; preparing institutions for a new techno-economic paradigm.

According to Carlota Perez, it is the mismatch between the fast pace of technology development and the slow moving changes in social and economic structures what causes predictable periods of crisis, a discontinuation of the perceived prosperity that innovation can produce. In the politics during transitions thus, is where governance models for adequate innovation management should be implemented. This article argues in support of this position that institutional change needs control, but emphasizes on that the role of private actor through their self- and co-regulatory capacity can be more efficient, and therefore should be incentivized (Perez (2004).

For the purposes of this article, the first, non-commercial period begins with the deployment of the technology and the design of the first transmission control protocols, or enablers of computer interconnectivity, called Transmission Control Programming and Internet Protocol (TCP/IP), (e.g. Cerf & Kahn, 1974; 2005; Postel, 1981). The second starts with its commercialization when in the 1990s the networks were turned over to private sector operators. The Internet grew in its scale, capacity and functionality, becoming the emblematic sign of the information society. By the third, very fast moving stage it turned into the public host of all sorts of human interaction. The networks became a fundamental component of private and public (e-government) exchange, subject to unprecedented exposure and vulnerability. People's lives are digitally

recorded, to the extent mediated by its platforms. In the past couple of years it has become evident that mobile technologies and broader digitalization are to grow further as well as the diversification of their connectivity source, from the wireless networking to other related telecommunication possibilities.[3]

In sum, this primer begins with a revised timeline of the Internet technologies development, noting on observable stages of institutional shift, and their coincidence with the prevailing regulatory pattern. The next section reveals the applicability of Utterback's innovation theory, and how it could be linked to an analysis suggesting the convenience—or not—of normative constraints. It continues by identifying some formal and informal institutional expressions associated with each Internet layer to proceed with a discussion attending only its surface of content and usage, including a brief reference to regulatory constraints in connection with electronic commerce. It ends with a reflection on the possibilities for e-business organizations to increase their self-regulatory competences and apply them to the prevention and administration of disputes. The underlying claim is that these features can initially be the result of strategic management moves—to create a comparative advantage—but, being the match between electronic commerce and conflict management practices favourable enough, they have the potential to institutionalize online dispute resolution (ODR) schemes.

2. Annotated timeline of Internet development

Internet is a technology, a system of interconnected networks transmitting data and based on protocols that identify hosting addresses, enabling operations.[4] This is a simple denotative description of one of its dimensions, often referred to as *the code*; its architecture; a medium, enhancer of communication processes and connectivity that links its clusters globally. To service users, and connect people, it also requires devices and platforms such as computers in support of operating systems, and software to process and provide the data in the

[3] The Internet of Things (IoT) is forming an integrated system of interconnected everyday objects hyper-enabled to become active parts of people's environments. The virtual and the analogous world begin to converge this way. Although rooted on the same tangible design and infrastructures, this field evolves independently with the support of nano-electronics, sensors, cloud computing, and specific software. People and organizations adopt it gradually; its impact extends from the known and conceptualized so far, turning this into a new important field for research that this paper can only afford to mention. See more under Interconnectivity beyond commerce; Google and social media "rule", below.

[4] The Internet Protocol Suite is commonly referred to as TCP/IP after the first networking protocols: the Transmission Control Protocol (TCP) and the Internet Protocol (IP). To orientate in the technical specifications of the Internet structures, see IETF, n.d.

form of communications and applications. Thus, connotations on a second differentiated dimension describe it as the layer of usability, *interfaces and application software* (not the system software that integrates the capacities of the devise in use like word-processing software, or games). The last is the more visible of the two, where the digital economy thrives through the social networks, and on electronic transactions. The user's increasing familiarity with platforms, software, functionality and designs, almost renders essential features of the Internet architecture secondary. Even more so, with the progress of more innovative solutions like mobile technologies and nanotechnology assisting the transformation of objects required for a digital living experience and the "Internet of everything," attention to the most superficial aspects of these processes is not likely to shift; the mobile phone is an essential device for social interaction, storage, access, and distribution of content, a medium for services, businesses, leisure and even conflict resolution (Poblet, 2011; Katsh & Rainey, 2011). Also, the number of ordinary appliances turning into smart objects that communicate with people and each other is on the rise. This is possible due to incremental wave of innovation initiated by the Internet (Vermesan *et al.*, 2011).[5]

Historical records on its evolution are documented in a diversity of timeline schemes, for example by Robert H. Zakon (2003–2011), Rustad (2009; 2011), Leiner *et al.* (2009), Mowery & Simcoe (2002), and others, as well as by institutions such as Cybertelecom, the European Organization for Nuclear Research (CERN) and the National Science Foundation (NSF). Most chronological accounts report selectively and propose assessments according to the disciplinary approach inducing analysis. Therefore, to avoid commonalities and oversimplification on the one hand, and to cover systematically as many aspects as possible to support this paper's claims, an integrating, updated and more pertinent analysis is proposed. The result should be expandable on different grounds, and serve as a preamble for further writings.

3. The early non-commercial networks

The world of integrated communication and information developed because the vision of computers as calculating machines was radically altered by a publication in **1960** by J.C.R. Licklider. His *Man-Computer Symbiosis* focused on how humans interacted with computers, on the basis of which, the term "Netizen" was later coined. Licklider's vision of interactive computers evolved into one for interactive

[5] More on the IoT, smart interconnected products, and connectivity for anything, see ITU, 2005 and EC, 2009.

computers and computer networks. Connections were established between the late 1960s and the 1980s by experts in computing, librarians, scientists, and engineers only, using the Advanced Research Projects Agency Network (ARPANET). This was the first practical network to implement TCP/IP (key to its former and present infrastructure), and the forerunner of the global Internet as we know it.

Emailing was an adaptation created in **1972** that linked a name with a computer address with the symbol @, using remote access protocols. The Internet "material layer" took off during the 1970s, adopted by the United States Defence Department in **1980**, and became "universally" available by **1983**. In the meantime, newsgroups were formed on the side; Usenet also linked systems worldwide, a decade earlier than the appearance of a World Wide Web. Even though not a part of the Internet, it had organizational significance creating a community based on networks, as well as Listserv, developed in **1981**, to operate for the BITNET Network (Grier & Campbell, 2000).[6] In **1975**, according to the Microsoft Historical Records Online, Bill Gates and Paul Allen founded their Corporation (Microsoft, n.d.). In **1982**, the United States Postal Service (USPS) attempts at a public service introducing E-COM. Electronic messages could be printed at a post office, for hard copy delivery, but following significant losses, the service was discontinued within three years. International Business Machines (IBM) introduced the IBM Personal Computer (IBM PC), and Intel, the multinational semiconductor chip maker corporation well known for its "Intel inside" marketing campaign of the 1990s, released the 286 processor. ARPANET adopted TCP/IP as protocol suite for ARPANET also in 1982, but converted to use TCP/IP the following year. EUnet (the European UNIX Network) was created by the European UNIX Users Group (EUUG) to provide email and USENET services. Most countries in Europe were in hold of a telecommunications monopoly, by which all other provisions of such services was not only disfavoured, but also illegal.[7] The original connections were established between the Netherlands, Denmark, Sweden, and the UK (Griset &

[6] BITNET networked the academic community, similar to Usenet. Connecting 450 universities and more than 3,000 computers, by the beginning of the 1990s, BITNET was the most widely used research communications network in the world for email, file transferring and real time messaging.

[7] See Eurostat, n.d.. European telecommunications have been traditionally considered public services. Until recently, they have been in charge of monopoly providers. During the early 1980s, the wave of liberalization of this market began, although basic services were still reserved to these traditional monopolies, because of inaccessibility problems and lack of diffusion of their technologies. With the innovation process marching towards maturity (See next section, below), by 1998, the services were finally liberalized in the European Union resulting in a progressive drop in prices that further pushed the expansion and use of the services and growth of the sector.

Schafer, 2011). In **1983**, the solution for the proliferation of resources locations, hosts and networks was designed by Jon Postel, Paul Mockapetris and Craig Partridge to support the addressing space; it was called the Domain Name System (DNS): .edu, .gov, .com, .mil, .org, .net, etc.[8]

In **1986**, the NSF went online with the NSFNET, connecting supercomputing centres, which was the first large scale effort of interconnection building the backbone of the system. A dominant design was forming, and an important institutionalization effort began shaping, reflected on the existence of a formal structure with responsibilities and commitment that responds to the emergence of virtual communities and interests. Generous public funding in the United States supported the research of computer networks during this period. Enactments such as the Electronic Communication Privacy Act (ECPA) made no references to the Internet, but informed the public for better understanding of these emerging systems. This outreaching action is a landmark in the history of Internet. It anticipated the growth it was to experience *if* from the academic and military use, networking and applications, could be extended to other areas, through platforms and with interfaces more friendly and functional, designed to be used by any person. Another significant *formal* institutional development of the time was the incorporation and implementation act in the United States, in **1989**, of the Berne Convention for the Protection of Literary and Artistic Works, signed more than a century earlier. This is an indication on the networks beginning to raise questions about fundamental notions of the property law scheme valid at the time, evidencing the first signs of the on-going tensions caused by the mismatch between the analogue world rules and the new realities of social change as discussed for instance by Boyle (1997; 2006), and Jensen (2003); known as the "law lag".

ARPANET was terminated in **1990** when the first "search engine", ARCHIE, was launched. This was a catalogue-like indexing system software that archived file transfer protocol sites. Other similar resources started to appear around the same time. The launching of the World Wide Web took place in **1991** and is attributed to Tim Berners-Lee and colleagues at CERN. The NSF assumed control of the civilian Internet, permitting private and commercial access to the NSFNET "backbone". These two events, not surprisingly, coincided with the rise in popularity of personal computers. The NSF centres developed software solutions for navigating comfortably through information contained

[8] The specifications were published by the Internet Engineering Task Force (IETF) available online at: http://tools.ietf.org/html/rfc882, http://tools.ietf.org/html/rfc1034, and http://tools.ietf.org/html/rfc1035.

in the networks and servers. [9] Some browsers were available at the time, such as ViolaWWW, MidasWWW, and Cello, [10] but none was ever so successful as Mosaic, the predecessor of Netscape Navigator and Mozilla Firefox. This client for a multiplicity of early protocols offered the first interactive, graphical experience to the users. Its design attributes contributed to its success. After its release, Mosaic facilitated digital commercial developments including Microsoft's Internet Explorer that was made available in **1995**. The friendly appearance and transparent functionality achieved with Mosaic was followed by other developers, and continues being a concern of contemporary browsers, who still compete on those grounds to become the preferred choice of most users.

4. The privatization and commercialization of the Internet

The notion of an unregulated cyberspace was common during the 1990s, only true to the extent of the inapplicability of traditional, uninformed and parochial standards to a new technology. The Internet offered unprecedented opportunities to all, but, strictly speaking, it has always been affected by normative and organizational arrangements. Rules are not only those associated to vigorous state action or noticeable policy; valid general legal categories have always been applicable to the telecommunication sector. Socio-normative models also emerge with any kind of human organization (including the existence of private ordering, contract based, also backed up by national legal systems). The role of governments in the development of technologies and research indicates its indirect regulatory involvement as well. Programmers, nevertheless, could freely work on innovative codes and content and different economic sectors could plan to conduct professional and commercial activities almost unrestricted by specific constraints. For the public, the Internet meant better, faster communication and access to otherwise unreachable valuable sources of information/data. The registration of domain names increased, despite the costs imposed by the NSF from the year 1995. While in 1992 only 50 websites existed worldwide, in 1993 (when CERN promised that WWW technology will be freely available) 150 were in record, and in 1994 the number increased to 3,000, among which were the White House Website, Yahoo, the Amazon bookstore, and Pizza Hut.

[9] Web servers are computers that stored files in HyperText Markup Language (HTML) at this time, but nowadays in any kind of formats. They "load up" webpages to web browsers when a valid request for access is placed, by users, from a computer or any other platform. The transfers are made via Hypertext Transfer Protocols of HTTPs. The browser is built on programming language; software.

[10] For CERN WWW timeline see CERN, 2001.

In 1995, the number of sites had almost tripled and at the end of the decade more than a quarter of companies with ten or more employees had Internet presence (Rustad & Daftary, 2001). Online gambling became possible in 1995; in **1996**, Xanga, the first blogging service was launched (Cybertelecom, n.d.). This diffusion and expansion of the technology in its basic structural level, and the development of related uses and application software, did not happen inadvertently to governments around the world. The Internet has been forcing the reshaping of substantive laws in practically all fields, the first and foremost shaken of all institutions being the right to property (Brousseau, 2004). This global, borderless phenomenon, the most important platform hosting digital products, with embedded information of unexploited value has been the object of one of the most complex and continued discussions of the times (e.g., Leaffer, 1995; Samuelson, 1990; May, 2000; Pechman, 1998; Reichman, 1995; Maskus, 2000).

The last decade of the 20th century staged a debate between two seemingly irreconcilable positions. To conform to political economic theories, legal systems capture the ideological choices of states translating them into consistent rules. With property rights allocation, states determine how social agents transact and to some extent influence their microeconomic economic performance. At the international level, however, a degree of harmonization and compatibility of the different legal systems is needed to assure satisfactory results. Put in these very simple terms, this explains the first position: mainstream legal policy developments that support international standards and mixed regulatory patterns. The digital economy can generate wealth, and economic growth, but the effort to globalize institutions is problematic. Left to legislative powers alone, the struggle to legitimize property rules, values and principles within an acceptable institutional framework of international relevance will continue to face widespread resistance. Without denying the convenience of a coherent approach to economic progress worldwide, opponents blame this trend, for lacking the insights, capacity and regulatory tools to set global innovation policy and systems, compatible with the nature and needs of the information society. An international body was established in **1995** to preside these processes: the World Trade Organization (WTO). In the same period the World Intellectual Property Organization Copyright Treaty was signed. This international agreement constitutes the institutional response to the revolutionary applications enabled by the advent of digital technologies and the switch from information scarcity to information plenitude.[11] The Internet effect

[11] The enactment of an increased protection responded to requests of some states and the creative industries to protect their intellectual property system and patrimony, from the perceived threats that originated in information technology advancements. On this, consult the booklet prepared by the European Digital Rights (EDRI, 2013).

caused concerns and was admitted to create special conditions affecting deeply rooted structures, bringing about a change in social, technical and economic models. Rustad and D'Angelo report that the commercialization of the Internet created the most serious legal dilemmas in the field of trademarks, copyrights and online contracting, which was apparent in the increase of registered legal disputes. Courts also began to discuss the jurisdictional problems standing out from Internet related transactions (Rustad & D'Angelo, 2011).

In the United States, privacy and security issues were raised and laws enacted to protect children from dangers generated online.[12] In the late 1990s, cybercrime rates caused alarm, but they logically followed the criminalization of conducts that were not expressly prohibited earlier, for instance, cybersquatting.[13] In **1998** the Internet Protocol Version 6 (IPv6) Standard was completed, at the request of the IETF, to deal with the foreseen congestion of the IPv4.[14] When in 1998, the NSF role in the Internet diminished, more than 2 million domain names were registered. The United States Department of Commerce's National Telecommunications and Information Administration decided to conclude an agreement with the Internet Corporation for Assigned Numbers and Names (ICANN), a non-profit corporation for the oversight domain name registrations. In **1999**, Internet telephony became available with the service Voice over IP (VoIP). This period is marked by the consolidation of the telecommunications and software industry as economic sectors in their own right, in fact surpassing in growth all others (McGarty, 2000). Technology diversification also took place, in the last years of the past century, which facilitated e-commerce, e-auctions, the emergence of Online Banking, MP3 formats, net-cell phones, thin computing (Kanter, 1998),[15] embedded computers (Lee, 2000),[16] etc.

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12 Cybertelecom, see *supra* note 13.

13 Cybersquatting consists on the registration of domain names (an alphanumeric designation) that coincide with well-known brands or trademarks, with the purpose of selling them to rightful holders of their intellectual property rights. Cybercrime has different forms: it may target the networks, as the worms and hacks do, or any other object in as long as facilitated by this technology. Some crimes do not attack infrastructure and, yet, occur exclusively over the Internet such as computer fraud (password traffic is a good example), and SPAM.

14 On IPv6, consult Google IPv6, n.d. Other highlights of the first ten years of the Internet available at Internet2, n.d.

15 Thin computing started to simplify the complexity of computer systems, while still delivering to the user the functionality needed on their equipment. It aims to lower costs associated with maintenance.

16 Embedded computer is the adaptation of microprocessors to various other devices, for instance a video camera or any other consumer electronics. They are not standalone computers, but parts of a network.

5. Interconnectivity beyond commerce; Google and social media "rule"

Licklider and Taylor understood that there could be remarkable social dynamics beyond hardware and software, and wrote about the effects that dispersed but interconnected computing would have on people well in advance of its occurrence.[17] They predicted that influential communities could form and would agglutinate around common interests, regardless of their location (Licklider & Taylor, 1968). This early realization of the challenges of recent times was manifest in their question: "Will 'to be on-line' be a privilege, or a right?"

Their vision was confirmed during this period, with the primary telecommunication technology established and sufficiently diffused at an acceptable level of expansion and market penetration, so it validates its design (that should also be produced optimally). Even taking into account the uneven growth of the Internet, creating the so-called digital divide, the innovative process sets and is "diffused" in innovation theory terms. The Internet *code* is mature. The priority now is to build a grid structure connecting people, machines, and data into large-scale resource-sharing and collaboration architecture; a systemic construction. This requires guarantees of a secure, efficient and reliable technology, given the difficulties posed by the vulnerability of social interactions/transactions when being mediated by devices, and made available in the networks. Grid computing is more than an engineering project; it has sociological and organizational implications that intensify the need for more committed research on institutional development. It is described as an integration of technologies resembling a railroad system design, with its own vitality and relevance to every discipline; almost a developmental imperative (Berman & Hey, 2003). More academic attention to the interaction between human and computers is paid at the request of scholars interested in socio-technical design. Meeting social requirements is as important as complying with technical standards. Even though computing began at the engineering level, it has grown towards becoming an information

[17] Joseph Carl Robnett Licklider, one of the most popular figures in computer science, published his ground-breaking work on the cooperation between men and computers in 1960. He foresaw the implications of this interaction/association, and its beginnings from assisting human intellect, discharging it from the burdens of routine and time consuming tasks. Robert William Taylor shared this vision and in 1969 inaugurated the development of Licklider's proposed computer network, the ARPAnet or the predecessor of the Internet.

vessel (its software), to later incorporate a cultural dimension; naturally as it happens in the analogous world (Hjarvard, 2008). Each evolutive level of the system builds on the previous; this way social computing rests on the basis of personal computing, which depends on software that implements hardware functions and so on (Whitworth & Sylla, 2012; Whitworth & Ahmad, 2013). Notable during this period is the popularity of valuable studies on the dialectics of the virtual communities (Canavillas, 2011; Ellison, 2007; Fuchs, 2007; Croon & Jakobsson, 2002; Damasio, Henriques & Costa, 2012), though a slow decline is seen when analyzing search results in reputable scholarly databases.

The emerging grid/ecosystem coincides with a notable increase of cooperative community efforts, projects, initiatives among which peer-to-peer practices are common; in the year **2000** Napster takes the stage. Most developments concentrate on software and applications, or the surface and the platforms delivering the experience for users, but the capacity of the basic design is also a fundamental concern, so the IPV6 is finally implemented. In the 21st century, the software industry became an economic sector surpassing all others. It is documented that the U.S. software and information industries "grew more than three times faster than the overall U.S. economy in 2005" (10.8%, compared with 3.2% of the U.S. Gross Domestic Product (GDP); SIIA, 2008). This pattern was noticed in Europe but by comparison the effect was not so remarkable before the present Digital Agenda for Europe 2010–2020, issued by the European Commission (Anttiroiko, 2001; Hervás Soriano & Mulatero, 2010). Innovation is the most systematic in this field of mediatization as well as on those concerning intellectual property laws (creations and inventions) and human rights (digital rights, such as privacy and freedom of speech).

The mediatization of human activities is observable though initiatives on social networks. Our increasing dependency on telecommunication devices and functions, including basic forms of human interaction, is eased by wireless devices. Even the most personal processes are established digitally, with computers and other telecommunication devices mediating activities and relationships. This, considered by most of us an irreversible path, intensifies the interest of many disciplines on the effect that these technologies have had on human behaviour, even on whether and how these patterns would also require regulatory consideration.[18] In **2001**, the dot.com bubble bursts (DeLong &

[18] Kaptelinin and Nardi have discussed in detail the theoretical foundations and applicability of Aleksei Leontiev's activity theory reviving the interest in his work. Their publications have become text references for conceptualizing the formation of new communities when "learning in the making", or "forming by acting".

Magin, 2006) [19] and the same year the European Council adopts an international cybercrime treaty, addressing, for the first time at that level, criminal offenses that are committed on the Internet (Weber, 2003). Wikipedia goes online and Google is launched in **2002** (its corporate information history see Google, n.d.).

In **2003**, the first phase of the World Summit of the Internet Society (WSIS) began in Geneva. A Declaration of Principles was adopted, and a Working Group on Internet Governance (WGIG) was formed to continue developing initiatives. Their plan of action on specific fields included a line on ICT applications, among these, e-commerce (ICU, n.d.). This is how the interest in Internet governance issues speeded, with an institutional response endorsed by United Nations; the second phase of the WSIS took place in **2005,** and the Internet Governance Forum (IGF) was created (see IGF, n.d.). In **2004**, Web mashups began integrating services from across different webpages aggregating businesses, and data.[20] Cloud computing models appeared in **2006**, consisting of storage services and virtual servers reachable on demand. So early into this capacity, the cloud was used as an application suite, mainly for utility, comfort and non-essential needs. This service-oriented architecture was most welcome, because it delivered a single application to innumerable customers using the same or unified technology. Cloud computing spares customers the cost of expensive software licensing, most notably offering alternatives to desktop applications; such is the case, for example of Zoho.com. For perspective on the size that the Internet reached during this stage, while Google's original index in 1998 had 26 million pages, in the year 2000 it had reached a billion, and in **2008**, a trillion.[21] An emerging technology in **2009** was geolocation. As the word indicates, it is about detection, also called geotagging, it associates a digital resource or platform (a mobile phone, for example) with a geographical location, and the delivery of information, produced in terms of latitude and longitude coordinates. Mobile technologies evolved rapidly and advanced into the next step forward, diversifying the source of connectivity from the wireless networking to other related telecommunication possibilities,

[19] The dot-com bubble popped with the stock market losses on the cost of Internet domains, and the tech industry caused a mild economic recession. Despite an abundance of funding capital poured into start-ups, they failed to be profitable when expected. A bubble inflates prices through investment and speculation; as mentioned earlier in the paper, Internet domain registrations soared between 1995 and 2001. The companies who registered were referred to as "dot-coms".

[20] These applications mix technology in a user friendly manner, so its business applicability proved enormous. A prototypical example would be an embedded dictionary, translator, or enabled payment options. Its appeal conforms to the image of an Internet of Services.

[21] According to Worldwidewebsize, 2013, the Indexed Web contained at least 13.69 billion pages by Thursday, 07 March 2013.

initiating the movement towards IoT.[22] Based on the smart machine concept, and full interconnectivity, IoT realizes the increasingly complex applicability of telecommunications. Everyday objects understand and react to their environment, programmed to satisfy a wide range of people's needs, and assigned an IP address. IoT relies on sensors that collect data and can be installed on any artefact, linked through wired and wireless channels, that are networked, and apply analytical methods to process information, or activate functions (closing gates, refuelling a vehicle, signalling when an appliance requires fixing, heating a greenhouse, etc.) Millions of objects will populate the networks, communicating through the virtual social connections we establish.

The International Telecommunication Union (ITU) records data indicators about the information society. They predicted that in 2011, the global population was to be outnumbered by networked devices and that by 2020, the ratio will be of six platforms to one person (additional statistics and aggregates are available at the ITU statistics pages).

Just like observed in the aftermath of the printing press revolution, the Internet, together with the digitalization and massive proliferation of information, encouraged the formation of new cross-cultural bonds at all levels, a process unaffected even by access or availability disparities resulting in a digital divide (Norris, 2003; Gurstein, 2003; Van Dijk & Hacker, 2003). The remarkable capacity of technology to unify communities and generate social and economic value is of foremost importance. Human organizations naturally *self*-develop informal institutions. Uses, practices, and traditions form in a continuum towards the co- formulation of formal regulatory systems. Alternatively, communities demand formal regulatory activity from established political and governmental authorities with legislative capacity. Or these last decide on intervention and controls to extend their traditional regulatory mandates to the emerging environments. In any case, institutional change takes place. This is a common understanding of how society organizes, based on cultural studies, sociology theory and managerial/organizational research. The alternative presented is openly reported by media and manifest in the shape of political activism, lobbying and other forms of participation. The nformation and telecommunication technologies (ICT) add efficiency to these dynamics. States are more responsive than ever to their constituency's needs and expectations evidencing the affectability of governmental policy-making. Applied theory on complex adaptive systems and economic geography illustrates these points (Berkes, 2006; Spencer & Dale, 2011; Ottaway & Hamzawy, 2011).

[22] See *supra* note 6.

6. Innovation cycles on network technology and institutional development

The preceding account selected representative events that could be connected to the assessment that follows, which is restrictively applied to the integrative conceptualization effort put forward in this text. It should be revealing enough, on the one hand, to confirm, in connection with documented institutional developments, Abernathy and Utterback's model.[23] And on the other, to draw conclusions on the active involvement private *and competent* stakeholders could benefit the most from, when participating in the digital economy developments. This practical framework is worthy of attention because it draws from empirical research, theoretical understanding and expertise. The term institution is used here beyond its legal significance. While within the legal science institutions are either functional structures (organic view) or recognized phenomena subject to policy (i.e. the family, marriage, in general any source of legal categories), political and economic sciences adopt an expanding sociological approach.[24] Institutions, if to use the classification by DiMaggio and Powell on organization theory, are settled rules of conduct within organizations that may have coercive, mimetic and normative origin (DiMaggio & Powell, 1983).

Institutions are formal, coinciding with the legal definition, when they are issued by authorities, according to pre-established procedures explicit on the laws, and hence, binding. These would include the laws in *latu sensu* and public policies (Joamets & Solarte-Vasquez, 2004). They are informal when belonging to other regulatory systems: culture, traditions, practices, convenience, ethics, morals, standards and such. This work claims that classifying their scope of influence is also needed for their accurate assessment. In this light, the "global" can be instead replaced by three more manageable layers of differing institutional intensity: international, regional (*and supranational*) and national (Table 1).

[23] This paper assumes that intellectual perspectives on innovation from the organizational theory and neoclassical economics continue offering accurate explanations on the dynamics of technological change, applicable to the information technologies. Institutionalism, for instance, provides a strong support for the sociological understanding of the role that differentiated institutions play in innovation processes.

[24] The word sense of institution that is most encompassing is the sociological one. The legal science meaning is unduly restrictive and diminishes the importance of other regulatory systems of relevance such as ethics, social practices, etc. Institutions are incorporated into the managerial and economic analysis to facilitate cross-disciplinary dialog and cooperation. They include all types of social rules and patterns that ultimately affect conduct and organizational arrangements. They can be constraining or inspiring, but always changing. Their identification and study therefore seem to be the key to understand human development.

Table 1. Summary table for institutional analysis[25]

Historical evolution stage	*Innovation cycle phase*
International and Global Institutions	Formal: Laws and public institutional policies Informal: Other regulatory manifestations
Regional and Supranational Institutions	Formal: Laws and public institutional policies Informal: Other regulatory manifestations
National and Domestic Institutions	Formal: Laws and public institutional policies Informal: Other regulatory manifestations

This analysis uses these additional conceptual frames for institutional specification:
– *Technical*: Constraints of engineering nature, requiring only technical solutions.
– *Social*: Stakeholders' (people and organizations, with interest in the situation at hand, and to whom any change can enhance, maintain or keep that interest or stake) responses and positions on the technological advancement, seeking to pull, push, slow, or invigorate the process. Within this, a managerial frame could be added, to explore what sort of organizational construct a company can use to better match innovation and technical evolution.[26]
– *Legal*: Rights and duties affecting the development or implementation of technologies; regulatory limitations, conditions or opportunities that originate or have an impact on inventions and innovations. The legal is one of the categories that mostly determine the course of action for any business, because legal standards, regulations and policy (in its development —*the due process*), are binding.
– *Environmental*: The tangible and intangible surroundings and their impact. This refers to the coverage or the infrastructure diffusion degree, in the case of ICT, the penetration levels of hardware and software, for example. Abernathy and Utterback's model was different to early similar theoretical proposals (Eveleens, 2010; Chang & Chang, 2009) because they explained innovation as a process, carefully attending to its transitions and dynamics, assuming that products and technologies are not subject to fixed influences.[27] They were leaders in achieving to explain the interaction between products and institutional factors linked to their development, organizational management structures, and the external competitive environment interdependently

[25] This and other tables are original, proposed for this paper and based on the theory referenced throughout.

[26] Learning institutions, resource-based, dynamic capabilities, path dependency and evolutionary theories seem, according to their theoretical support, the most compatible with current innovation management developments.

[27] Static models of innovation management theory are the Incremental–Radical dichotomy by Schumpeter and the Henderson–Clark model.

considered (Utterback & Abernathy, 1975). Most importantly for the purposes of this review, in their model the innovation cycle development system also goes through three phases, each with different impact on companies, the market and on the capabilities and resources required to sustain the innovation process. In the progressive incorporation of a new technology the transformation of institutions is one of these evolutionary signs.

In the *first phase*, highly skilled people explore and experiment. Product transformation or radical innovations are possible, undisturbed by regulatory frameworks, standards or procedural demands. Technological and market uncertainties prevail, the manufacturing process based on trial and error relies on expert labour force that utilizes general purpose equipment. No process is settled, due to permanent adjustments that seek to improve products; efficiency is not a concern. Many small firms might coincide in developing similar projects, but there is no real advantage for them in competition, because everyone could benefit and reduce transaction costs on the basis of collaborating instead. Advantages could only be achieved by associating or differentiating entirely, with an increase in transaction costs (and risks without assurance of success in later stages). It is more likely that nobody has a clear idea of the potential applications and reach of their creation, or what would be the response of the markets. Additional and derivative technologies (specialized materials, for example) are not developed, so suppliers are not direct players, lacking any bargaining power. Most limitations come from old (*institutions*) technologies and habits themselves. This is called the *fluid stage*, so flexible that opportunities exist to everyone interested, and outcomes vary significantly. There is room for everyone to participate. This is especially true if no commercial interest or financial concerns are involved, such as the case of the networks in their early years. They received public support and were developed for academic and security purposes. For a group to be successful in such volatile environments it cannot focus on independent efforts and conform to progressing alone. Cohesion and collaboration could in fact determine success as the common effort pushes progress further, more rapidly. Organizational strategic theories also suggest that if a product (*innovation*) possesses commercial value, companies would seek to establish a dominant design and outmanoeuvre real or potential competitors, assuring agreements with distributors and invest on marketing to affect customer perceptions and prepare its deployment. Alternatively, companies can purposefully institutionalize a dominant design or process, by waiting for the dominant design to appear in the sector, and imitate. This mimetic isomorphism, using the terminology proposed by DiMaggio and Powell, legitimate in business strategy, diffuses innovation, sets standards and

assures a cut of profits for followers in derivative fields (distributions channels, supplier contracts, complementary and derivative technologies, value added services (maintenance) and others). Gains do not need to be secured on the dominant technology.

In terms of regulatory patterns, the fluid stage is largely unregulated by coercive institutions, relying mostly on the private or quasi-private ordering or the property-contract model.[28] The social/personal competences mostly beneficial for success are entrepreneurship and collaboration/teamwork. Because the situation is novel, participants must be adaptable. Gathering and processing information is fundamental for achieving a disruptive, innovative outcome. Groups devoted to the development of solutions at this stage enjoy great independence from formal institutions. They perceive a freedom to do, create, combine and produce. Sometimes state policy on innovation promotes/helps (research and development) in indirect ways through funding, public campaigns, etc.

The *second stage* in the innovation process explained by the authors is called *transitional*. When the creators of the products or technologies begin learning what applications are possible and how customers could react to them, they test the market. Standards for manufacturing and maintenance are proposed. Labour needs not to continue being so skilled and meticulous, when processes are rationalized, then some specialized engineering steps are routinized. Tools adapt for process efficiency and in the case of industrial manufacturing, mass production patterns start appearing. People are replaced with machinery operated by fewer workers with no expertise apart from that on their tasks. Innovation needs to be diffused and spreads; market demands unequivocally signal the entry into this phase.[29] Companies and institutional organization management stiffs and rationalizes routines, which will help to lead to the appearance of a dominant design.[30] "The dominant design product has features that competitors

[28] In a private or quasi-private ordering, a supreme authority is required to back up the agreements that people subscribe, but the governance, control or management of relationships is on people. This is to say that no rights can be created in the absence of a legal system. This notion is popular in regard to the cyberspace as claimed also by Dunne, 1994.

[29] An example from other industry could illustrate how a sector considers its externalities: although technology enables industries to produce practically indestructible car tyres, the best manufactured are of much lower quality and duration. Behavioural economics studies have long established that proximate concerns influence consumers much more significantly than distanced ones, and people are price conscious. Cost consciousness is more spread than safety consciousness.

[30] A stereotypical example in the telecommunication sector is Microsoft, which established Windows as the "dominant design" of operating systems. Its previous dominant position with the MS-DOS probably helped.

and innovators must adhere to if they hope to command significant market share following" (Utterback, 1996).

Table 2. Summary table on the fluid phase

Fluid Phase	
Potential	Product changes and radical innovation
Product specification	Variety, differentiated and converging both, customized
Competition	Minimal on the exact same product if at all. Different working groups join efforts, associate and collaborate
Process	Flexible, unsettled, inefficient, unregulated, self-regulated or co-regulated
Competences required	Expertise/engineering, entrepreneurship and collaboration for organic and flexible organizations
The fluid phase ends when the ideal product is found or invented. Consolidation of a workable design	

During this shift, engineering and creation yields to management, adding other components to teams that already operate with more certainty, according to the convergence of convenient practices and patterns. Marketing efforts increase, assigning importance to aesthetics, whereas the innovation capacity heavily decreases. To incorporate radical innovation is costly and difficult for all, innovators, entrepreneurs and potential competitors. At this point competition shapes, with the struggle for a market share on similar products and their derivatives, as it is the case with Internet based software and applications. When organizations are structured and positioned and the "ideal" product specified in all its features (not only functional, but also aesthetic), innovations enter the *third*, *specification stage*. It could be argued that in the case of the Internet, this phase is not as recent as it might appear; experts claim that its base technology was already well established by 1985; supporting the needs of a specific community and beginning to be broadly used for daily communications (then, the utility of electronic mediums and interconnectivity was recognized). The fast developments that take place on ICT and its derivatives in some of their layers complicate any attempt to pinpoint a set of "most relevant" transitional events. The very ICT and its influence on society's progress is the reason why the innovation process pace continues speeding up, and some of the features explained by this model may seem to overlap. Institutional response, nevertheless takes place; informally by necessity and formally by request, convenience, and with delay.

Table 3. Summary table on the transitional phase

Transitional Phase	
Potential	Secondary Innovation and incremental improvements to create a dominant design
Product specification	Base/dominant design or base standard is established
Competition	Increasing during the search for the standard but convergence possibilities still exist. The market offers enough room for similar industries/manufacturers and organizations to participate
Process	Standardized and efficient. More institutionalized, and less uncertain. Co-regulation increases
Competences required	Shift to skilled administration and strategic management. Engineering needed on core disciplines related to product and processes (industrial engineering).
The Transitional phase ends with the complete consolidation of the dominant design and the development of a whole industry supporting its diffussion and sustainability.	

By the *third phase*, a *rigid stage*, the potential for radical innovation of the same product is diminished to the minimum due to excessive constraints and standards, its production, management, maintenance and use. The focus of the sector/industry is on extending the span of time when gains are still possible before the cycle ends, be it because the market is exhausted (expansion/diffusion is complete), or a monopoly or oligopoly is formed (intellectual property protection leaves little if any room for competition making it illegal or too costly to keep up with it). However, innovation and product development is available in other fields such as applications and services: business strategies, organizational management styles, distribution, marketing and contract management. The dominant design remains the same but a number of customizations can take place, albeit adjective, serving the sustainability of the sector. For example, a computer unit changes its shape, colour and weight, packaging and name, plus it is no longer sold together with a monitor, but it continues being a computing unit. In the field of software applications the example could be an aggregator of content served by web feeds. Google Reader was launched in 2005 and will be retired from the market in July 2013, but the concept/design remains available (OPML format for exporting RSS subscriptions and feed groups) with few specifications. Competition is intense, based on performance, costs and services associated with the dominant design;

there is certainty to *a degree* in terms of rules, standards, and processes. In addition, manufacturing/producing is made efficient.

This stage is also called *specification*, where specialized equipment fully replaces the need for very skilled labour. The market gets divided and moves towards an oligopoly, as mentioned above, because companies are more sophisticated and can strategically secure certain advantages through different assets and resources, such as partnerships, associations, acquisitions, mergers, and legislative support. Such resources could be differentiated as comparative advantages that strengthen the position of leading companies, making the entry to newcomers in what relates to the original innovation very difficult, if possible at all. Here is where the institutional response to the development of ITC differs from that common to other type of artefacts and products of the analogous world. The generative capacity of the information and telecommunication technologies is unlimited in its surface layer. Hence, the appeal of the digital economy and the reason why the structural layer, a platform for application support is better served by the neutrality principle. The term *neutrality* applied to the Internet implies a blend of economic, legal, technical, political, social and economic meanings. Net neutrality is a simple non-discrimination rule of egalitarian ideology applicable to the networks (Wu, 2006). Lessig (2001) alluded to the neutrality of the platforms where all bits "are created equal", one may add. Neutrality requires the interoperability of its structure and keeping the Internet open to content, (information and applications) promoting principles of open innovation rather than monopolistic control, to unlock the vast potential of its technologies. The opposite would mean, for example, that Internet service providers could favour some kinds of data/sources over some others. However, neutrality is not Internet freedom, which really means access and use of the contents at will, in the shape or with applications and devices people want. Both notions are linked but could be in contradiction. That the Internet should be free from government intervention is critical to achieve a real Internet freedom, at least in the libertarian view, akin to the nature of the Internet from its origins. Once states are involved, they intervene, formally (according to rules), affecting providers and users with constraints. As a result, central to the idea of Internet freedom has been the concept of deregulation or low intensity state control. Claims for any sort of cyber-regulation necessarily invoke governmental action, harming the neutrality of the net.

When the Internet base technology is diffused enough, organization theories and institutional changes can be identified and applied to the management of both of its layers. It is accurate to conclude that computing has evolved to a higher system category where its design and interactivity also matter. These factors

(design, aesthetics, transparency, and ubiquity, among others) represent concern changes from the mere technical the socio-technical design.

Table 4. Summary table on the rigid/specification phase

Rigid/Specification Phase	
Potential	Incremental and derivative innovations on processes and institutions, or sustaining technologies. The potential for radical innovation *in other fields* (rulemaking, managing, distributing, etc.) remains available
Product specification	Unchanged (or differences are trivial). The product is no longer an innovation but a commodity
Competition	High among positioned market stakeholders. New ideas threaten the productive life of the dominant design
Process	Formal, stable, strategic, protected, institutionalized both: formally and informally
Competences required	Management, marketing, public relations, multidisciplinary. Extending the life of a product is the priority. Rewards for the reduction of manufacturing costs (economy of scale)
Completed the institutionalization, structural and regulatory. The type of organization needed is: organized, bureaucratic, hierarchical, and mechanistic. Outside standards are set and paid attention to (laws on safety, for example)	

Products are in the hands of many, so interest is created around their availability and compatibility with a number of other objects and applications. The state and institutions are expected to protect, unambiguously, the rights originated in successful innovation processes. In the information society, the resources at stake are essential from any angle they could be observed. Data is collected and information is formed to create knowledge. This knowledge, in turn, produces more data and promotes more information exchange. Knowledge is the most important resource of the present techno-economic paradigm, and the Internet is the recognized catalyser of social processes that involve transactions over information; where the value is embedded not only in the data itself but its accessibility, reliability, and originality. The networks are the stage of the digital economy and will continue being so to the extent of their ubiquity. It is therefore not only a matter of maturity of a technology, but its decisive role in society, the one that demands regulatory consideration. In this rigid stage, according

to the model, institutions are set. Few principles of general acceptance exist on Internet governance; on the digital economy the regulatory repertoire also increases. In the case of virtual businesses, for example trade could not survive without institutional guarantees, remedies, etc.

7. Additional discussion

According to innovation theory, the most immediate regulatory implications of the maturity of any technology show tendencies towards over-prescriptive and rigid categories. It is confirmed in the context of the Internet, although one could to say that due to its size and global nature, congestion is not easily perceived. Rules are still promoted by some groups to control the use of the Internet and its content; especially preoccupied over the protection of digital rights, cybersecurity and intellectual property protection. Excessive regulation of the Internet and its layers would be incompatible with the needs and interests of the majority of stakeholders participating in this economic phase, its complexity and global scale.

Telecommunication technologies, if considered instrumental, could benefit from flexible, and mixed regulatory models adaptable to the characteristics of their object: infrastructure or applications. Multi-stakeholders of the Internet and related technologies are all of us. Users or netizens, emerging communities, organizations and governments, are growingly committed to find ways to introduce the benefits of predictable rules of conduct to the networks, without altering their infrastructure or wishing to sacrifice their flexibility. The role that institutions have played in its creation and development, and later in support of private orderings resulting from emerging relationships and communities is undeniable. It was a state and its government who sponsored the Internet and telecommunication technologies throughout its fluid stage.

It is, too, a legal system, the one that enforces private contracts and issued public policies promoting the digital economy. Organizations that affect the Internet are, besides governments, international agencies, professional associations, educational institutions, corporations, profit and non-profit, virtual communities, organized interests and independent groups. Consequently, in consideration to the polycentric nature of the telecommunication technologies in their current state of development, a maximalist approach to self-regulation could not offer assurances of effectiveness to any of its stakeholders either. This understanding of self-regulation would imply that all elements of its regulatory system—initiative, origin, formation, adjudication and enforcement—are self-

generated, involving no concerted actions with other establishments or powers. In contemporary legal systems this is acceptable only when official normative content is excluded from a certain order, such as the moral sphere, because it engages no other than one subject.

Regulating the Internet and its related and derivative technologies pose an extraordinary challenge measured by the gap between their stakeholders' aspirations and the capacity of governments and traditional institutions to act responsively, timely and proportionally. The technology is complex and multi-faceted, so to propose optimal regulation cannot be a matter of choosing between state action and self-regulatory methodologies alone. Legal systems of influence consider both to be necessary and/or complementary.

This article adds to the volume of literature explaining the importance and implications that technology development has, specifically within a most recent debate about governance and the regulatory patterns of the Internet. It integrates at least three disciplines, and shows the compatibility of independent reflections on similar concerns, based on adapted classifications. It insists on demystifying the conception of an unregulated or self-regulated Internet as well as a realistic view with consideration for neutrality, multi-stakeholderism and the actual capacity that institutions have to assist or deter development.[31] Instead of insisting on a principle of unregulated cyberspace, it shows interest for emerging principles admitting that the Internet is built upon free networking, and decentralization, openness, egalitarian design, universality and *regulatory* cooperation. People participate of the Internet experience voluntarily; life cannot be supported in the cyberspace so far, no matter how close the networks are getting to our intimate selves and how deeply it has transformed human structures. With reviewed expectations on the functions we assign to governments and organizations, stakeholders can focus on developing their own potential participating in the digital economy development as independent agents of their own interests. Accuracy on the limitations that institutions face can also help people and groups to be more self-reliant, constructive and responsible in regard to interactions and transactions that are mediated by technological platforms and applications. Businesses still have the opportunity to develop ("self"-regulate) private conflict management models, technology based, and incorporated into e-commerce practices as a comparative advantage within the digital economy. The Internet's private nature with a "self"-

[31] This is a notion on the cyberspace that has almost vanished from scholarly levels, see Lessig, 2006 and Mueller, 1999. Misconceptions remain among the population that strongly believe it possible, recognizing no value even in moderate normative support. On the other extreme are activists of vigorous enforcement who expect statutory institutionalization of every technology, see Radin & Wagner, 1999 and Drezner, 2004.

regulatory motor has fuelled its expansion and settlement. A bottom-up regulatory origin allows flexible possibilities, like when rules are created between individuals in their exercise of their freedom to contract. The opposite would mean top-down rigid regulations, such as laws, far removed from the transactions that people experience while immersed in the flow of institutional transitions resulting from the new technologic paradigm. People's interaction, expectations, perceptions of reality and value systems contrast with those existing before the network society was established. New social constructs must be coupled with long-standing harmonized principles that prevail in the international and supranational systems. State regulation is seldom as effective as are the social institutions that support and inspire it, but when in coincidence, laws become more legitimate. If the basic rules of conduct are legitimate, plenty could be spared in compliance measures. In times of very fast developments, the state, constrained by its own doctrines,[32] lacks dynamic capabilities that private actors can always rely upon. Predictability is a legal virtue that implies durability, resilience, and conservative application, not a social or technical rule.

Regarding the Internet layers, the code has experienced a high level of institutionalization, intrinsically through standards for interconnectivity and sustainability, mostly determined by engineering requirements; and extrinsically because formal and informal rules have been proposed for its maintenance and support, in three fundamental fields: Internet governance, digital rights (including intellectual property), and cybersecurity. The Internet Engineering Task Force (IETF) develops voluntary technical standards of wide acceptance (IAB, 1996), but the Internet system has always counted with an authority that assigned identifiers, such as the current ICANN that coordinates and oversights the IP address space and the DNS. In contrast, the field of software applications is largely available for further development. Also digital rights and cybersecurity issues are discussed in reference to this layer, together with cybercrime and electronic commerce legislative developments.[33] The subject matter of trade migrates from hard copies to digital, clustered information. Lawn mowers, pots and artwork are still being produced but many of them will become smart machines. Besides, the primary place where commercial exchange is expected to take place is the networks; hence, the importance of developing an adequate institutional environment for e-trade.

[32] That is, the rule of law and its implications: predictability, certainty, equality, procedural justice, etc.

[33] Additionally, the Internet Society (ISOC), integrating regional and local chapters, work to assure the development of ICT and Internet governance in the best interest of society. The ISOC offers financial support to standard setting bodies like the IETF, the Internet Architecture Board (IAB), the Internet Engineering Steering Group (IESG), and the Internet Research Task Force (IRTF). See ISOC, n.d.

Supranational regulatory developments for electronic commerce applications of importance include the EU Digital Agenda and within the European action plan for e-commerce (Mak & Nemeth, 2012; Kshetri, 2001).

An appealing field of application of dynamic and flexible, co-regulatory regulations for the Internet, compatible with public policies and e-commerce is dispute resolution. The first standards for development of national government policy with global influence were published in 1999 and contained in the OECD's Guidelines for Consumer Protection in the Context of Electronic Commerce. They state that implementing ADR methods in IT is a needed strategy. Digital technologies make possible the arrangement of decentralized processes for the administration and settlement of disputes, based on self-presented claims, but enforceable via traditional procedures. So, digital technologies combined with formal institutional coordination could solve some weaknesses of self-regulations, while implementing smart, efficient and well-designed interactive solutions. Del Duca, Rule and Loebl (2011), Cole and Underhill (2010) and Hodges, Benöhr and Creutzfeldt-Banda (2012) explore business to consumer affairs and the ODR schemes of most relevance, such as the EBay system. A co-regulatory approach would empower stakeholders, enabling them to adapt regulatory schemes to their needs and preferences. Support institutions, in the meantime, can maintain the consistency of the different schemes created by private norms and ensure their enforceability. States have always backed up electronic transactions effectuated online; this is why doctrine and legislative development in countries where electronic commerce is regulated has emphasized on updates of contract law statutes. Additional consumer legislation, legal acts and standards of practice are also topical as electronic commerce is no longer dealt with marginally, adjective to contract law and business administration. However, dispute resolution competences studies progress in a disconnected manner. ICTs provide a unique opportunity to integrate those fields.

Self and co-regulatory capacities could extend into many areas, but this paper intends to attend to the conceptualization of opportunities appearing during periods of uncertainty and transition, when the environment is not yet saturated with norms. In the field of e-commerce, it is worth to explore the possible self-regulatory and decentralized social rules that would help its development and capacities. Organizations with virtual operations could find in the enhancement of self-regulatory competences a resource valuable and unique to profit from, a comparative advantage. Embedded ADR mechanisms are options that may restore independence and flexibility to the bottom levels, where the power it implies will be effectively used to maximize the legitimate self-interest of all parties. This increased autonomy and efficiency would eventually contribute

to the development of customary rules or the institutionalization of the best of those practices for the benefit of digital commerce and trade. The less intrusive and centralized the way, the more suitable it is to the ICT technology where change takes place so rapidly.

8. Conclusions

Neutrality (*open networks*) and multi-stakeholderism are institutional manifestations of wide acceptance; the main principles of the information society. Their specification and application require a co-regulatory effort. Some rules compatible with the Internet are, and will continue being the reflection of traditional institutions or at least their analogous thresholds. Others will necessarily break through the" constraints" of state legal systems, in innovative ways, legitimized by their efficiency. Scholars are still preoccupied with searching the appropriate "level" of regulatory compromise that the stakeholders of the information society should adopt in regard to its most important technology. This on-going search for secure, predictable structures, even while incorporating observations about self-regulatory mechanisms, has yet to elevate theories of preventive law, proactive law and dispute resolution to their deserving rank. ADR theory is the main source inspiration for the preventive and proactive law practice. They recommend early engagement of actors, wider participation of parties, extensive and innovative legal competence, and a commitment to the prevention of legal disputes and adversariness. They also endorse integrative uses of legal and managerial resources, combined with what has been called a therapeutic lawyering style that can create value in relationships often neglected by other mechanisms. The preceding pages suggest these connections, admitting that this attempt is just a small part of a complex context that requires no disabling of any of its components. This vision, if shared, could assist a "better" future for a balanced digital experience where the regulatory functions are shared by private and public institutions. The reconciliation between governments and other powerful stakeholders is continuously taking place. This is a process of increasing self-determination that is being observed, rather than controlled, for a better understanding of its natural evolutionary path.

In a more detailed institutional review context, specific references should be made on the emergence and transformation of commerce transactions from simple exchanges into complex strategies that could incorporate well known organizational theories and the use of dispute resolution models. This paper should have set the

conceptual background on the regulatory patterns and the evolutionary cycles of the Internet and other telecommunications technologies. It was proposed from an historical perspective, in preparation to explore the thread on e-commerce, ADR and ODR later, with further and more concrete analysis. A follow-up paper could focus on how mediatized transactions and disputes are managed in practice, and their impact on e-commerce. This would consolidate proposals to better support and promote the economic performance of digital businesses and other private stakeholders online. With the expected number of cross-border exchanges only on the increase, the use of ODR could become critical. Information technology (software and smart systems), Internet communication (web and interaction design) and regulatory expertise are necessary to devise transformative human processes assisted by technology. The disciplines concerned with institutional development can be responsive to socio-technological challenges, and use the information age advantages to spread the word on more constructive and integrating professional practices.

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