AN EXPLORATION OF THE EMERGENCE, DEVELOPMENT, AND EVOLUTION OF REGULATORY CHARACTERISTICS OF INFORMATION SYSTEMS

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Abstract

What does it mean for code to be law? Is there an inherent characteristic in software that renders it a modality of regulation? How should technology-as-regulation be studied and what is the role of the developer as a regulator? These are some of the research questions we are trying to address in our study concerning the mode of development of peer-to-peer technologies and the evolution of their regulatory facets over time. The study considers whether peer-to-peer technologies have regulatory characteristics that accumulate over time as a result of the effort to deal with the complexity and uncertainty of the tasks they support. The process of development of these technologies reflects the involvement of different stakeholders, both humans and nonhumans, in the refinement and proliferation of the regulatory characteristics. In our study we follow the path of development of code-as-law and seek alternative methods, drawn from both the fields of regulatory theory and systems development, in order to study these emergent phenomena.

1 BACKGROUND

In May 1999, Shawn Fanning, an undergraduate student at Northeastern University, created an application called Napster. The idea behind Fanning's software was to enable end users to share the MP3 files stored in their computers, using a centralized indexing service to locate the files. Two years after its launch, Napster had experienced an exponential growth to reach an audience of over 50 million users. Napster's popularity resulted in a lengthy legal battle between the music industry and Fanning's newly founded company on issues of copyright infringement (Alderman 2001).

Perhaps unsurprisingly the court case contributed to the file-sharing software's notoriety and led to the establishment of "Napster" as a generic term for "peer-to-peer" networks. Fanning's file-sharing service, however, was neither the first peer-to-peer (P2P) technology used for file-sharing, nor was it a pure peer-to-peer application.

Regardless of the technological nature of Napster, it has been inextricably linked to the term peer-to-peer and this has led to the labeling of a whole family of technologies as anti-regulatory, anti-authority devices. The social and conceptual construction (MacKenzie and Wajcman 1999) of peer-to-peer technologies as anti-control mechanisms was a collective process facilitated in part by the media industry and the high profile legal action against peer-to-peer services that made them an icon for teenager users and thus triggered their proliferation, sophistication, and anti-authority status.

Most of the peer-to-peer services have been entangled in legal disputes with the media industries. Napster was sued in 1999 and a shortly thereafter Scour faced a very similar fate (Alderman 2001). Both companies had to suspend services (from July 2001 and December 2000, respectively). In the midst of a series of legal developments and extensive media hype, the Recording Industry Association of America (RIAA) and Motion Picture Association of America (MPAA) have also gone after a number of other peer-to-peer services based on the most advanced peer-to-peer technology available at the time: FastTrack. Morpheus, KaZaA, Xolox and Grokster have been the targets of the media industry both in the United States and in The Netherlands. Xolox was shut down in the process only to open some months later when the case against FastTrack in The Netherlands was resolved in favor of the technology company. Morpheus and KaZaA have survived to become two of the most widespread file-sharing applications. RIAA and MPAA have also expressed their intention to prosecute individual users and their legal teams have sent warning letters to Internet service providers asking for the names of particular users, the IP addresses of which have been identified as handling many media files. Indeed, the practices of the media industry are likely to become more aggressive in the future: certain U.S. senators have already proposed the creation of legal "safe havens" for media companies that want to hack into peer-to-peer networks or individual computers in order to protect their intellectual property.

However, by emphasizing the anti-centralization and anti-hierarchical attributes of P2P technologies, it is possible to adopt a rather one-sided view of the whole issue. While P2P technologies have characteristics that defy sources of external control, at the same time they are very much about "awareness of the self and the others" (Gong 2002); they are about sharing, interconnectivity, parallel processing, communication, and collaboration. Each of these goals can only be achieved through the use of rules governing the operations and relations between the nodes of P2P networks. That is, by their very nature, P2P networks are self-organizing and self-regulating: "Obviously much remains to be done before P2P establishes itself as a lasting force. System monitoring, remote peer control, usage metering, and accounting methods are just a few of the areas that need further research" (Gong 2002).

Thus the continued successful development of P2P networks will require the accommodation of more self-regulatory mechanisms. The technology that is the architect of freedom to share files becomes a technology that *enforces* self-regulation.

At a very elementary level these mechanisms are needed for the solution of nominally technological problems. Nevertheless, it is impossible to distinguish between the constraints of technological issues and the control of human behavior, especially when the latter occurs within the framework of these systems (Bloomfield and Vurdubakis 1994).

For instance, almost all of the second generation file-sharing systems allow the users to regulate the number of downloads and uploads that will take place in their part of the network. It is also often the case that the companies providing file-sharing software adopt the practice of bundling their applications with monitoring programs, known as spyware. This is software that transmits data concerning the behavior of the user to data warehouses which own the spyware. Often, users are not properly informed about the existence of the spyware application when installing the P2P software. As a consequence, a parallel industry has been developed in order to deal with such issues. There are spyware-removal programs, such as Ad-aware, or software that runs over popular file-sharing applications and blocks the spyware programs. Under the latter category we find applications such as Diet KaZaA and KaZaA lite.

Of equal importance for our study is an exploration of the organizational, social, technical, and legal infrastructure that supports the creation of both the peer-to-peer protocols and their "servents." We focus in particular on the Gnutella protocol and the LimeWire servent, but we do not ignore the greater picture. The modes of development and the constant toggling between open and closed source development have to be understood and analyzed in order to provide meaningful results concerning the nature of the regulatory characteristics of technical artefacts. The evolution of the artefact and the ecology in which it belongs is important but cannot be isolated from the process of its creation. In that sense, we attempt a transfer to the realms of systems development practices and research methods employed in regulatory theory, where mechanisms of creation and maintenance of a regulatory infrastructure are often studied in conjunction with its operation (Baldwin and Cave 1999; Baldwin et al. 1998).

The whole issue requires further research to identify and explicate the regulatory characteristics of P2P systems. At this point we just need to emphasize that external efforts to control technologies as disruptive as P2P systems are inherently flawed. At the

same time, the position that P2P systems are anti-regulatory or anti-control is too simplistic and crude to be accepted. They encapsulate regulatory characteristics that control both technology and human behavior. The point is not whether regulation exists but where its locus and content are.

2 THEORETICAL FOUNDATIONS: CODE AS REGULATION

The point of departure for our research is what is called "The New Chicago School" of thought (Lessig 1998). Developed by Lawrence Lessig in 1998, the New Chicago School is an attempt to extend earlier understanding regarding the sources of regulation. While the older school argued that norms and markets regulate better than law, Lessig argued that there was a fourth "modality of regulation," architecture. In the digital environment, he later argued, architecture meant code and the design of the code (Mansell and Silverstone 1996). Code, like law, is a modality; they can both regulate human action.

The focus of his work has been on the ways in which the architecture of the Internet regulates the behavior and legal environment surrounding the Internet (Lessig 1999, 2001) and has instigated a heated debate on the issue of new forms of regulation which has produced some interesting results, especially in the field of studies of regulation, legal jurisprudence, and particular fields of law such as intellectual property and privacy law.

However, the issue of the positioning and the precise role of computing systems as regulatory forms remains largely unexplored. The technological factor needs to be further analyzed and understood if we are to make any meaningful comments about regulation and technology (Hosein 2003). In this work, we wish to take Lessig's ideas further and apply them to specific technologies, namely the file-sharing systems that have arisen in the post-Napster era.

We use these systems to explore the way that code-as-regulation is created and evolves and in particular to address the following:

- Are there any mechanisms of transparency and accountability for how this new form of regulation is formed?
- How could the checks and balances that exist in other forms of regulation be used in the case of code-as-regulation?
- If such mechanisms do not currently exist, how is the balancing of rights of different stakeholders to be retained? This is a particular concern given the unintended effects that can arise when large scale infrastructures become embedded in daily practices (Hanseth and Braa 1998).

Our research is, therefore, positioned in the intersection of socio-technical studies, regulatory theory, and info-structure research.

Our first claim is that we cannot talk about *architecture* or *code* as single, monolithic entities. Instead, we need a more sophisticated understanding of what information infrastructures are (Ciborra 2002; Ciborra and Associates 2000). Therefore, we follow a layer analysis identifying different layers of technology on which the Gnutella Networks are positioned and other software elements (such as servents) that operate across the Gnutella network. Moreover, we approach technologies as being places within an *ecology* of other technologies, what we call *T-ecologies*. One important way to understand a particular form of technology is to understand the technologies that surround it and that give it meaning (Introna and Whitley 2000). For instance there is no point analyzing the evolution of regulatory characteristics in the Gnutella protocol without taking into consideration the process of its development; it is not possible to understand the interaction between the Gnutella network and the LimeWire servent if we do not study other protocols such as FastTrack, or without studying the infrastructure that supports the open-source development, or the CD-burning software that is available, or even the prices and availability of MP3 players such as iPod. Some of the technologies we refer to are network technologies, some are applications or mobile devices, but all of them constitute parts of the same T-ecology.

This observation brings us to our second claim: T-ecologies of regulation are not modalities of regulation but rather they develop regulatory characteristics over time.

3 RESEARCH DESIGN

In order to study these research questions, we are analyzing the design of the Gnutella network, and in particular the LimeWire application (LimeWire 2002). This application has particular regulatory characteristics built into it. For example, there are modules within the system that are written to stop "queries that are *bound* to match too many files," a filter that "tries to eliminate duplicate packets from *overzealous* users," a check to determine "whether or not this node has all of the *necessary characteristics*

for it to become a supernode if necessary" (all quotations from LimeWire Javadocs, emphasis added). By examining the UML diagrams, specification evolution and source code for the project (available, as the system is now Open Source [Gnutella News 2002]) we will determine the stage at which regulatory characteristics start to emerge.

- Is it at the stage of analysis as a conscious decision by the developers in order to achieve particular policy objectives (e.g., privacy or content filtering)?
- Is it at the stage of analysis as a conscious decision by the developers in order to achieve particular technological results (e.g., ease of use, avoid network break down)?
- Are they the result of technological limitations?
- Are they the result of system inertia (legacy system effects)?
- Are the regulatory characteristics found in the original documentation the same as the ones found in the source code? When does the emergence of regulatory characteristics occur: during the phase of analysis, design, or coding?
- How does the mode of development influence the way the regulatory characteristics are developed?
- More generally, are the regulatory characteristics developed or emergent?

It is intended that the preliminary results of the study will be presented at the conference.

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