The Recursive Regulatory Model

An emerging concept in legal scholarship is that the design of communication technologies is a public policy concern. Legal scholars, most notably Lessig, argue that fundamental societal concerns such as privacy, accessibility, freedom of speech, and intellectual property protection are now intertwined with the hardware and software of communication technologies (1999). This has led Braman to argue a foremost issue for communication law and policy is to address how these technologies affect societal concerns (2003).

Theoretical work within communications has not addressed how communication technology regulates or affects fundamental societal concerns. For example, privacy is affected by numerous technologies including cookies and Radio Frequency Identification tags. However, scholars and policymakers lack the analytical tools for addressing these public policy issues. This lack of theoretical guidance is worrisome, because there are growing calls for proactively designing technologies to regulate as an alternative or in conjunction with the law. For example, digital rights management technologies are supplanting the rights established by copyright law on how people can access and use content (Litman, 2001).

This article develops a theoretical model for how technology regulates. Its aim is to provide useful analytical insights into the relationship between society and technology to address these policy issues. The term technology is used as a short hand for the hardware and software of communication technology. The term regulate refers to how technologies influence and affect our online experiences. The Recursive Regulatory Model (RRM) is inspired by Orlikowski's structuration model of technology (1992) from organizational communication. RRM also uses insights from Actor-Network Theory for examining the relationship between technology and individuals. The result is a systematic way for analyzing how technology regulates, how it develops, and how society can alter technology to comport with existing norms.

The first part of the article reviews communication theory, which suggests that the structuration provides a useful way of understanding the relationship between society and technology. The article next provides a short background on RRM, and then focuses on the three main relationships within RRM. They are how technology develops, how technology affects individuals, and how society can intervene and alter how technology regulates. The final part of the article discusses the implications of RRM for communications law and policy.

Theoretical Approaches for Studying the Role of Communication Technology

While the role of communication technology has recently gained prominence within internet policy, this issue has long been recognized by communication scholars. This section does not review this history, but instead focuses on developing our theoretical understanding of communication technology. This section begins by considering the conventional approaches in communication to understanding communication technology. It notes the limitations of the conventional approaches, which tend towards either social or technological determinism, and suggests the need to look towards other theoretical frameworks. This section ends by examining two different theoretical perspectives, structuration theory and Actor-Network Theory.

Jackson's review on the meaning of communication technology begins by noting a central dichotomy in communication research (1996). This is the "technology-centered" versus "social-centered" perspective on research. A technology-centered approach argues that technology is largely the responsible for change. In contrast, a social-centered approach argues that the technology is one of many complex variables, and that changes occur as these variables interact. Jackson argues that this dichotomy has little to contribute to building of a new communication theory. Instead, what Jackson suggests are new integrative theories that recognize that "technology is captured neither by a description of material elements nor by an account of how it is perceived by others" (1996, p.248).

One integrative theory is structuration, which is a social theory that has moved beyond the traditional dichotomy in sociology between structure and agency. Traditionally, sociologists have argued that individuals are either determined by social structures, e.g, race, class, or gender, or that these social structures only exist in the minds of people, thus granting people immense agency. Giddens tried to overcome these two opposing schools in his structuration theory. Giddens argues that structure consists of the rules and resources that are created through the actions of individuals through practices and routines (1984). A duality emerges as structure constrains action, but simultaneously, action serves to maintain and modify structure.

Scholars in organizational communication use this theoretical approach to examine how individuals are affected by technology (Orlikowski, 1992; Poole & DeSanctis, 2004). The advantage to structuration is that it moves beyond technological determinism and social constructivism. Following Giddens, they argue that an individual's actions are neither determined by technology, nor are they capable of constructing technology as they see fit. There is a duality of structure, so that technology is both a product and a result of individual action. We develop technology, but technology also affects our activities. This recursive relationship recognizes that while individuals design technologies to enable new actions, these technologies also constrain our action. This is often summarized as technologies constrain/enable action.

The limitations of structuration are that it is a theory of social organization that explains change in a social system over time (Jones, 1999). As a result, it does not allow us to examine the relationship between people and technology beyond the recognition that technology both enables and constrains us. Parsons acknowledges these limitations in his case study on cable television (1989). While structuration allowed him better insight into dynamics of cable television, it was not capable of addressing how power and values are embedded or found in the use of technology. As a result, structuration is not capable of unpacking exactly how technology

regulates us, and how we regulate technology. This leads Monteiro and Hanseth to argue that structuration simply does not provide a fine grained analysis of the interaction between individuals and technology (1995). While Orlikowski and Iacono conclude that scholars need to better theorize the information technology artifact and move beyond the simple constrain/enable distinction (2001).

What it is missing from structuration is concepts that allow the interrogation of the relationship between individuals and technology. These concepts can be found within Actor Network Theory (ANT) from technology studies. ANT another integrative theory that is concerned with the interactions between technology and individuals (Law, 1992). It contains a wealth of concepts for understanding the relationship between technology and individuals, such as actors, networks, the process of inscription, and reconfiguration. The addition of these concepts allows for the development of a model that provides an understanding of how technology regulates.

Recursive Regulatory Model

The elements of Recursive Regulatory Model (RRM) consist of institutions, individuals, and technology. Institutions are intermediate social actors with origins in social rules and interactions. The concept of technology is defined as material artifacts, such as the hardware and software of communication technologies. As we discuss later, this narrow definition is useful, because it allows us to frame the role of technology as an interaction between individuals and technology, while also considering how technology can be socially constructed. The narrow definition also allows RRM to be generalizable and useful for examining how technology affects a variety of societal concerns, such as the privacy, freedom of speech, accessibility, or intellectual property protection.

As Figure 1 shows, RRM recognizes a recursive relationship between society and technology. This is analyzed in three separate stages. The developing technology stage argues that institutions are central to understanding how technology is produced. The technology regulating and reconfiguring technology stage considers how technology constrains and facilitates certain types of actions by inscribing norms and values into technology. It further recognizes that individuals have agency in deciding whether to use technology, that individuals may use technology in unanticipated ways, and that individuals can modify technology depending on its durability. The last stage concerns how individuals can act individually or collectively to influence the development of technology. This may include actions such as consumer pressure through the market or government regulation.
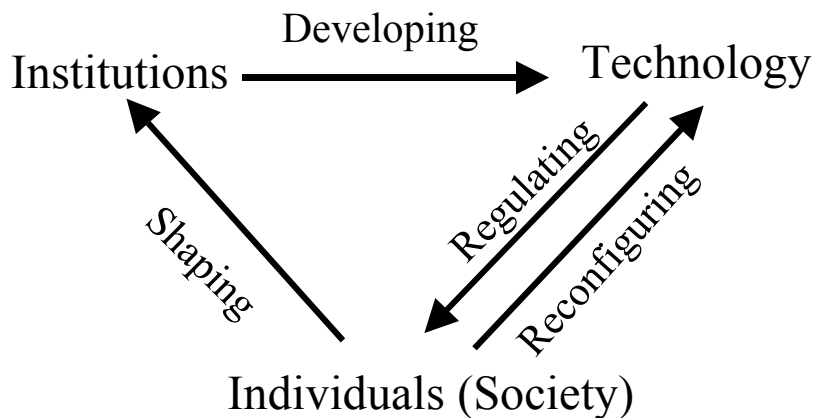

Figure 1. The Recursive Regulatory Model

The directionality of the arrows emphasizes how technology regulates. The model is tightly tailored to this issue, and does not address all the relationships between institutions, individuals, and technology. For example, an arrow could have been drawn from technology to institutions. After all, new communication technologies have significant implications for a variety of institutions including government (Fountain, 2001) and firms (Shapiro & Varian, 1999). But our model takes a regulatory perspective and is concerned with how technology

affects our experiences and choices. As a result, these other relationships are omitted to keep RRM as simple as possible.

The model separates two activities, the development and use of the technology. Much of the literature on technology generally or on communication technologies separates these two activities. The model focuses on institutions as the source of communication technologies, while examining the use of technologies at an individual level. This does not mean individuals cannot be institutionally situated, for example, prohibiting the use of file sharing software at the workplace. Similarly, the distinction between users and institutions in the development process is not definite and its blurring can be seen in user-driven innovation (Boczkowski, 1999; Lievrouw, 2002; von Hippel, 2001). However, RRM argues that while individuals can influence the development process, institutions such as firms or the open source movement mediate these influences.

Developing technology

The first stage of RRM highlights the central role of institutions in the development of technology. Institutions are defined as intermediate social actors with origins in social rules and interactions. This definition is compatible with work within sociology on new institutionalism theory (Powell & DiMaggio, 1991) or work within economics on the role of institutions (North, 1990). As a result, developers are suspended within a web of values, norms, procedures, laws, beliefs, and taken-for-granted assumptions in an institutional setting (Barley & Tolbert, 1997).

The idea that institutions play a central role in the development of technology is implicit in much of the scholarly work on communication technologies. For example, scholars have focused on the role of firms and government in influencing the development of technology (Edwards, 1996; Mansell, 1993; Savage, 1989). More recent work has begun examining

increasingly influential institutions such as universities, consortia, and the open source movement (Cargill, 1989; Feller & Fitzgerald, 2002; Shah & Kesan, 2003a).

Institutions play a central role, because they mediate how values are inscribed into technology. During the development of technology, institutions favor certain values over other and inscribe them into technology. The inscription process refers to how beliefs, tastes, competences, motives, aspirations, values, biases, and political prejudices are embodied by the artifact (Akrich, 1992). This occurs because developers build into technology certain "interpretive schemes (rules reflecting knowledge of the work being automated), certain facilities (resources to accomplish that work), and certain norms (rules that define the execution of the work)" (Orlikowski, 1992, 410). This notion of inscribed values connects to work by philosophers of technology (Feenberg, 1991; Winner, 1980), as well as, scholars who have identified values in communication technologies (Flanagan, Farinola, & Metzger, 2000; Friedman, 1997; Introna & Nissenbaum, 2000).

To understand the inscription process it is necessary to examine the development processes within each institution. After all, institutions have their own norms and processes for developing technology. These norms affect an institution's membership, motivations, and susceptibility to external influences. The net result is that the development process affects the final attributes of technology. As a result, institutions will systematically emphasize certain attributes or values of technology. For example, institutions could favor certain technical values, such as open standards or low defect code. Institutions may also systematically differ on more socially oriented values, such as appropriate level of intellectual property protection or privacy protection for technology. This suggests that by understanding the development process, it may be possible to predict certain tendencies in the final attributes of technology.

Technology regulating

The ability of technology to mediate activity allows technology to constrain or facilitate certain types of actions. In short, technology can regulate. The technology of a fountain pen, mechanical pencil, and word processor simultaneously facilitate and constrain certain actions when it comes to composing, editing, and saving our writings. The manner in which these technologies operate differently is the result of the inscription process embedding certain norms into the technology. As a result, technology can affect society in a variety of ways including our cognition, culture, socio-structure, and laws.

The emphasis on technology should not be considered as technological determinism. First, individuals have agency. They can choose not to use technology. Second, technology does not only limit behavior, but allows enables new actions. Consider the ability to send messages over long distances via the telegraph or send pictures via a computer. This is often summarized as how technology can both constrain and enable.

To understand how technology regulates, it is necessary to fully examine how technology operates. This involves a technical understanding of technology. Only by examining the rules inscribed in the design of technology is it possible to understand how it regulates. To examine an inscription, Monteiro and Hanseth suggest analyzing "which anticipations of use are envisioned", "how are they inscribed", and "how powerful are the inscriptions, that is, how much effort does it take to oppose an inscription" (1995). These steps allow for the analysis and assessment of inscriptions in technology.

This part of the model focuses on how technology affects our actions. The idea that technology influences us is not new within communications. Scholars within media ecology (Innis, 1951; McLuhan, 1964; Meyrowitz, 1994), computer-mediated communication (Daft & Lengel, 1984; Haythornthwaite, Wellman, & Garton, 1998), organizational communication

(Orlikowski, 1992), and cultural studies (Kolko, 2000; Nakamura, 2000) have all recognized the ability of technology to regulate actions. RRM recognizes their work, and therefore argues that to understand how technology regulates, it is necessary to examine the inscriptions placed in technology. However, there is a recursive element here. While technology affects individuals, they too can affect technology by reconfiguring technology. As a result, one cannot understand how technology regulates without studying its interaction with individuals.

Reconfiguring Technology

Individuals also play a crucial rule in how technology regulates, because they have agency. They can decide whether to use a technology, how to use a technology, and whether to try to modify the technology. After all, individuals do not always use the technology as intended by developers. The history of communication technologies is full of examples of unanticipated uses, such as the personal use of the telephone by women (Fischer, 1992). This occurs because even though developers have inscribed the technology, it doesn't mean the technology will be used in that manner. Orikowski synthesizes past research in recognizing that "through error (misperception, lack of understanding, slippage) or intent (sabotage, inertia, innovation), users often ignore, alter, or work around the inscribed technological properties" (Orlikowski, 2000, 409).

Individuals can also reconfigure the material properties of the technology. This process involves individuals adding or modifying a technology and therefore shaping it to fit their requirements and interests. This can be as simple as turning on the v-chip feature or the closed captioning feature in televisions. Nowadays, users of personal computers are expected to continually reconfigure their computers by installing new updates for software. Technologies vary on their degree of reconfigurability. In some cases, the ability to reconfigure a technology may be the result of users pushing developers to change the design of a technology. For example,

the recent incorporation of security management tools in Windows XP came in response to pressure from users.

The ability of an individual to reconfigure a technology depends upon its durability. This concept is important, because technologies are neither totally malleable nor fixed. Scholars within ANT have argued that technologies can be made more durable in two ways. First, technologies become more durable when switching or changing technologies requires a consideration of investments made in hardware, software, and individuals. This concept is discussed in the economic literature as switching costs (Shapiro & Varian, 1999). Thus, the durability of a technology increases as its switching costs increase. The second concept, path dependence, is also discussed in the economic literature. Here technologies become durable from a lock-in effect that arises from "random" historical events (Arthur, 1989; David, 1985). In this way a technology, such as the QWERTY keyboard layout, becomes durable and irreversible because of events during its development.

This concept of reconfiguring technology has not been addressed. Most work stems from the economic literature, which attempts to understand innovation of technology, and not how technology affects societal concerns. Work within Human Computer Interaction (HCI) has touched upon how individuals customize technology. For example, research has shown that experienced users are more likely to reconfigure technology (Page, Johnsgard, Albert, & Allen, 1996). However, this research provides little guidance in understanding how people can reconfigure technology that affects them in everyday life. For example, how are people reconfiguring their computers over security concerns? RRM urges scholars to consider how individuals reconfigure technology, because it is integral in understanding how technology regulates.

One approach for thinking about how technology regulates is the work on the governance characteristics of code (Shah & Kesan, 2003b). Some of the characteristics include defaults, transparency, and standards. These governance characteristics may be manipulated to vary how technology regulates individuals. They could also be used in conjunction with traditional regulatory methods such as law and social norms. For example, Digital Rights Management schemes are partially built upon the idea that the technology can protect intellectual property rights in conjunction with the law.

Shaping technology

People can also react and influence the development of the technology. This process is widely recognized by a number of disciplines including communications, social movements, and regulation. Examples of these influences within communications include movements by citizens over radio broadcasting policy, the public support for the v-chip legislation, or calls for regulating telemarketing or spam.

One way influence can be manifested is by pressuring developers to change the material characteristics of the technology. This could be accomplished through the market or government regulation. For example, television manufacturers have responded to consumer desires for larger televisions by producing larger televisions. In contrast, the government had to intervene with regulation to force television manufacturers to incorporate digital television tuners ("Balanced Budget Act," 1997).

Another manifestation of influences could influence developers by changing their incentives. This could involve the use of market pressure by consumers, public interest advocacy, governmental fiscal policy, or governmental regulation. For example, government has a number of fiscal tools to shape technology including funding research and development, using its procurement power, technology transfer, and funding education and training. Examples of

regulatory approaches government can use include prohibitions on technology, using standards or market incentives, modifying liability, requiring disclosure, and modification of intellectual property rights.

In a more general sense, institutions can change over time. After all, institutions are not static but dynamic entities that are affected by changes in norms, law, and other incentives. An example of the shifts within the institutional settings of the information technology industry is the movement over the last thirty years from an emphasis on standard developing organizations to consortia (a legally constructed institution). On the face, this move has occurred because the processes developed to ensure all interested parties have a voice has slowed down the development of standards. As a result, consortia, which limit the actors involved in the development process, have emerged as the preferred method for developing information technology standards rapidly.

Discussion

This article provides a systematic way for thinking about how technology regulates. RRM considers how technology develops, how people use technology, and how society can influence the development of technology. This section discusses the implications of these three relationships and how RRM advances our theoretical understanding of how technology regulates. The section ends by suggesting that RRM is useful, not only to analyze technologies such as cookies, but also to provide recommendations for emerging technologies.

First, RRM highlights the role of institutions in the development of technology. This focus on institutions is implicit in much of the literature on the development of communication technologies, but has not been brought to the forefront. The implication of RRM is that policymakers should focus on the institutional norms and rules by which technology is developed, rather than trying to influence individual programmers.

Second, RRM recognizes that technology affects individuals and that individuals can affect technology. This concept stems from structuration theory, which allows for a more nuanced understanding of technology by moving beyond simple deterministic relations. The idea that technologies can be reconfigured to comport with an individual's values is significant. The implication for policy could be a move away from regulating certain technologies to instead ensuring technologies are reconfigurable.

Third, RRM emphasizes the role society and individuals can play in influencing the development of technology to meet a variety of societal concerns, such as privacy, security, and competition. While this concept is important in structuration theory, it has not been explored from a public policy perspective. The implication is to examine the varied ways that society can influence technological development. This part of RRM also recognizes the role of non-market forces on technology. While there is considerable rhetoric that government must keep its hands off the internet, the reality is that government has, is, and will be heavily involved in shaping the development of code. For example, consider recent legislation on unsolicited e-mail and regulations requiring cell phone number portability ("Controlling the Assault of Non-Solicited Pornography and Marketing Act of 2003," 2004; "Telephone Number Portability," 2003).

RRM is inspired by structuration theory and is an integrative communication theory. However, it moves beyond structuration by better analyzing how technology regulates and how technology can be reconfigured. Structuration is a theory of social organization, and is not suited to analyzing how values are embedded into technologies or the implications of certain social and technical attributes of technology, such as defaults. In contrast, RRM is capable of analyzing technical features of communication technologies. RRM also uses concepts from ANT to analyze the relationship between individuals and technology. These concepts allow for a more complex understanding of this relationship. However, ANT is not a model, but a descriptive

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approach for examining technology. In sum, RRM attempts to overcome the problems with both structuration and ANT.

RRM can also be used proactively to ensure technologies comport with societal goals. For example, the use of Radio Frequency Identification (RFID) technologies on consumer products is generating concerns over privacy. An RRM analysis would recommend enrolling various institutions outside of firms to develop more privacy sensitive versions of RFID technology. RRM would suggest an emphasis on the reconfigurability of RFID technology to minimize privacy concerns. Finally, RRM would suggest a role for public interest groups and government in influencing the development of RFID technologies, because the market has not been successful in addressing privacy issues with RFID. These proposals illustrate how RRM can be forward looking. In sum, RRM is a model capable of assessing technologies as well as showing how technology can be used proactively as a regulator.

Conclusion

This article provides a theoretical model for how communication technology can influence society. The model considers the role of institutions in the development of technology, how technology regulates individuals while also recognizing that individuals can reconfigure technology, and finally how society can intervene and influence the development of technology. This model is inspired by structuration theory and its ability to move beyond technological determinism and social constructivism. The model also relies on concepts from Actor Network Theory to analyze how technology regulates individuals. In sum, RRM provides scholars and policymakers with a framework for analyzing how information technologies affect fundamental society concerns.

RRM analyzes how technology regulates at multiple levels. RRM shows how institutions can systematically favor and embed certain values in technology. However, RRM also points out

that individuals and society have agency. Individuals can reconfigure a technology and society can act in a myriad number of ways to influence how technology develops. For scholars, RRM highlights the importance of both institutions in the development stage and individuals in the use of a technology.

RRM is a process-based theory that highlights key aspects and relationships for how technology regulates. RRM urges scholar to consider the larger historical and socio-economic conditions under which technologies are developed and used. Simply put, RRM does not argue for strictly causal relationships. RRM stresses the recursive nature of our relationship with technology.

RRM is a technology agnostic theory, which is useful for analyzing a variety of issues, such as privacy, security, free speech, and accessibility. RRM's approach requires the examination of the norms, values, and assumptions embedded in technologies. Only by understanding those embedded values is it possible to understand how technology regulates. The promise of RRM is that once these embedded values are recognized along with the systematic institutional favoring of certain values, it then becomes possible to develop strategies for influencing the development of technology to comport with societal concerns.

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