Information Technology and Regulatory Policy:
New Directions for Digital Government Research

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Abstract

Information technology holds the potential for improving the process by which government makes regulatory decisions affecting vital aspects of society and the economy. This article charts new directions for research on the application of information technology to regulatory policymaking. Drawing on the deliberations from two recent workshops organized by Harvard University's Regulatory Policy Program, the article highlights avenues for expanding the objectives of digital government research as well as contributing knowledge to decisionmakers who seek to improve the responsiveness, efficiency, and manageability of regulatory policymaking. Effective innovations in applying information technology to regulatory policy will need to take into account both the capabilities of new information technologies as well as the institutional design of the federal regulatory process. By integrating perspectives from both the information and social sciences, digital government research can help shape the future of information technology and the making of regulatory policy.

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Making laws is one of the most significant things that governments do. While Congress usually may be viewed as the source of lawmaking, in fact regulatory agencies like the U.S. Department of Agriculture, Environmental Protection Agency, Federal Aviation Administration, or Nuclear Regulatory Commission create more than ten times as many laws each year as Congress does. Regulatory agencies follow a process called rulemaking to create binding legal rules that affect virtually every vital aspect of society, including the quality of drinking water, the operation of airlines, the distribution of electricity, and the design of automobiles, among many other significant matters (Kerwin, 2003). Each year, regulatory agencies adopt thousands of rules that collectively deliver enormous benefits to society but that also impose quite substantial costs on the economy as well (Office of Management and Budget, 2002).

Given the high stakes associated with rulemaking, efforts to help improve the ability of agencies to manage the rulemaking process as well as increase public participation in the process deserve careful consideration. E-rulemaking is one such effort. E-rulemaking, or the use of information technology in the development and implementation of regulations, promises to help streamline and improve regulatory management as well as help inform citizens about governmental decision making and involve them more meaningfully in the rulemaking process. Agencies confront extensive demands for information collection and analysis in making rules, so technologies that help agency staff retrieve and analyze vast quantities of information promise important benefits. Moreover, by taking advantage of advances in digital technologies, agencies might also be able to increase the public's access to and involvement in rulemaking. For example, in recent years, agencies have constructed websites containing rulemaking documents and have allowed the public to submit electronic comments on proposed

rules, thus making it easier for members of the public to learn about and participate in the rulemaking process.

Those who work on regulatory issues increasingly recognize the potential benefits from new applications of information technology in the rulemaking process. For example, the Bush Administration has made e-rulemaking a major part of its government-wide e-government initiative. Furthermore, the E-Government Act of 2002 directs regulatory agencies in the coming years to deploy technology to enhance public participation in government decisionmaking. Serious research on information technology and regulatory policy is beginning to emerge, but the growing interest among policymakers makes more evident the value of forging a long-term research agenda on e-rulemaking.

To develop and advance such a research agenda, the Regulatory Policy Program at the John F. Kennedy School of Government recently convened two workshops, one in Washington, D.C. and another at Harvard University. Organized in cooperation with the National Science Foundation's Digital Government Research Program, these workshops brought together academic experts from computer sciences, law, and public management, along with key public officials involved in managing federal regulation, to forge a forward-looking research agenda on information technology and regulatory policy.

In this article, I present several key directions for future research that emerged from the workshop discussions. At the outset, I provide an overview of the rulemaking process and explain potential applications of information technology to this process. I then discuss a series of research questions that can guide interdisciplinary research on e-rulemaking. Research from across the social and information sciences will be needed to answer the core questions that lie ahead about the role of information technology in making regulatory policy.

THE RULEMAKING PROCESS

To adopt a new rule, a government agency begins by informing the public of its intentions with a notice of proposed rulemaking (NPRM) in the *Federal Register*, a daily government publication that contains regulatory notices and other announcements from the executive branch. In addition to giving the language of the proposed

rule, the NPRM will typically provide a discussion of the agency's reasons for proposing a new rule as well as describe any underlying data and analysis. The NPRM may also present alternative options the agency is considering and invite the public to offer comments on these alternatives.

The NPRM specifies a time period for public comment on the proposed rule and will provide an address where public comments can be sent. Agencies frequently allow a period of one to three months during which comments can be submitted. While the most obscure rules may only elicit the submission of a few comments, the most controversial rules can prompt hundreds of thousands of public comments. The number of comments submitted for most rules falls somewhere in between. In addition to allowing the public to submit comments, agencies also sometimes hold public hearings or meetings to solicit oral comments on their proposed rules.

After reviewing all the comments received, an agency makes revisions to the proposed rule and publishes its final rule in the *Federal Register*. In the main body of the *Federal Register* announcement – a section referred to as the *preamble* – the agency provides a written justification for the rule in its final form and an explanation of the policy choices it represents. Preambles for the most significant rules can take up many more pages in the *Federal Register* than the rules themselves, occasionally even taking up a hundred pages or more for a single new rule.

In the process of creating rules, agencies often conduct economic analyses and have them reviewed by the Office of Management and Budget (OMB). In addition, agencies sometimes conduct analyses of impacts on state and local governments, small businesses, and the environment. Overall, rulemaking is an information intensive process that involves many professionals within an agency, as well as a variety of actors outside the agency, such as the OMB, Congress, the courts, interest groups, and the media.

The rulemaking process is intended to be transparent and accessible to those outside the government. After issuing a proposed rule, agency officials are expected to keep records of conversations they have with representatives from outside interest groups. They also keep copies of studies and all other documents associated with a rulemaking on file in agency dockets, which are open to the public under the Freedom of Information Act. Agency

dockets have traditionally consisted of paper copies stored in file cabinets at each agency's headquarters. While formally accessible, in practice regulatory dockets have long been cumbersome for those outside Washington, D.C. Until the recent development of web access, agencies' proposed and final rules themselves were relatively inaccessible to the general public, with access limited to hard copies of the *Federal Register* available mainly by visiting selected public libraries.

THE POTENTIAL OF E-RULEMAKING

Advances in information technologies promise new ways for government agencies to manage the information demands of rulemaking and improve public access to and involvement in the rulemaking process. For example, the *Federal Register* is now fully accessible via the Internet. Moreover, a handful of agencies have begun to make their regulatory dockets available on-line (Brandon & Carlitz, 2003).

In an effort to expand information technology capabilities across the entire federal government, the Bush Administration launched an e-rulemaking project as part of its overall e-government initiative. A key goal for the Administration's e-rulemaking project is to make it easier for the public to access information about government regulations and participate in the rulemaking process. The first stage of this project led to the creation of Regulations.Gov, a portal enabling users to search all proposed rules that are open for public comment (Skrzycki, 2003). In future stages, the Administration plans to create a comprehensive on-line docket that will enable the public to access all documents related to every new regulation across the government.

These projects, while noteworthy, only scratch the surface of the potential ways that information technology might be applied to rulemaking. Advances in information technology make it possible to retrieve, categorize, extract, and analyze information in ways that may help dramatically improve government rulemaking. Many other possibilities exist for applying information technologies in new ways to government rulemaking. Some of the possible innovations in rulemaking practice that could be developed include:

- *Improved data mining capabilities*. Although many agencies keep compliance or incident data, the staff who write rules

can find it difficult to make use of this information. Data mining technologies could enable rule writers to learn from the various sources of data already collected by their agencies.

- *Conflict identification tools*. Information technology could help rule drafters identify conflicts in rules, to ensure consistency both within and across rules.

- *Plain language tools*. To help make rules clearer, automatic "plain English" translators could be used to aid agency staff in drafting rules. Such tools might help improve regulatory compliance since rules that are easier for the regulated community to understand probably stand a better chance of being followed, all other things being equal.

- *Integrating rules with other laws*. Information technology could link all the traces of a rule's history, both back to the underlying statute as well as to past or related rules, facilitating improved understanding of legal requirements.

- *Customizable, automatic alerts*. Interested users could sign up for email alerts of rules added to an agency's regulatory agenda and receive them long before an agency issues a notice of proposed rulemaking in the *Federal Register*.

- *Online regulatory deliberations*. Digital technology can facilitate communication with interested members of the public across the country, something which might be especially valuable for rules that affect diffuse portions of the public or small businesses. Technology could even be used to facilitate interactive deliberations about new rules (Beierle, 2003; Coglianese, 2003).

- *Sharing data and models online*. Using something akin to a SimCity® game, regulatory agencies could provide the public with digital access to simulation software that shows the tradeoffs implicit in a regulatory decision (Belton, 2000).

- *"TurboTax®" rules*. Information technology could lead to a reconceptualization of the form in which rules are promulgated, transforming rules from text to software packages akin to the popular TurboTax® or other commercially available compliance software.

RESEARCH DIRECTIONS IN E-RULEMAKING

Advances in information technology raise many possibilities for changes in rulemaking practice. Research can help inform decisions about these alternatives as well as advance the digital government research agenda more generally. Digital government research on rulemaking is only beginning to emerge, but in the future it can be expected to fall within four main areas: (1) information technology, (2) agency management of rulemaking, (3) public involvement in the rulemaking process, and (4) regulatory compliance. This section highlights these areas by presenting a series of key research questions for each. Future progress on many of these questions will be enhanced through coordinated research efforts that involve perspectives from both the social and information sciences.

Information Technology. Advances in e-rulemaking will depend on adapting existing technologies to the rulemaking process as well as on developing new technologies. In particular, advances are likely to be most valuable in areas such as modeling, natural language processing, and human-computer interface. Some specific research questions directed at developing new IT applications for rulemaking include:

- How can general simulation and modeling packages – such as ones designed to assist with economic analysis – be constructed so they are useful to different regulatory agencies or for a variety of regulatory issues?
- How can software be designed to perform automated checking of rule documents for internal and external consistency?
- Can IT tools be designed to perform automated cross-indexing and linking to related rules, docket records, and other relevant documents?
- How can rulemaking systems be designed to be clear and easy-to-use for a variety of users, from agency specialists to ordinary citizens? What structures and system designs will best facilitate clear and effective communication of the complex policy and procedural issues that characterize rulemaking?

- How can agencies structure technologies for public input that will encourage more members of the public to participate more meaningfully in the rulemaking process? What technologies can best support interactive dialogue between the public and agency staff?
- How can IT tools be designed to help agency staff process and analyze commentary and dialogue from the public? Can systems be designed to categorize and summarize public comments and generate responses to them?

Agency management of rulemaking. Information technology can help in overcoming certain management challenges associated with rulemaking, but it may also create new management challenges of its own. The application of new information technologies to the rulemaking process generates a series of research questions for the field of public management.

- What effects do information technologies have on agencies' ability to gather more or better information required for writing rules? Does it enable rule-writers to conduct analyses or perform functions more quickly or with improved quality?
- What degree of flexibility is needed in IT systems that support rulemaking? Will structured systems help streamline the production process for new rules or will it create more work to adapt structured systems to meet contingencies related to each rule?
- How do agency staff members perceive the benefits and costs of information technologies in the rulemaking process?
- How does information technology affect the decision making within regulatory agencies? Does it change the relative influence that various professional staffs have inside an agency? For example, could lawyers lose influence over technical staff if IT systems made it easier for non-lawyers to draft rules?
- What kinds of changes, if any, does e-rulemaking bring to the relationships between regulatory agencies and other governmental actors, such as staff in Congress or the OMB?

- What aspects of the organizational culture within agencies are relevant to e-rulemaking? How can agencies make the organizational changes that might be needed in order to secure the full benefits of e-rulemaking?

Public involvement with rulemaking. E-rulemaking will affect more than the internal management of regulatory agencies, but also the interaction between agencies and the public. Research on how information technology affects public participation in rulemaking will contribute to the theory and empirical study of democratic politics (Shulman, Schlosberg, Zavestoski & Courard-Hauri, 2003). Some of the more important questions for research include:

- Does public awareness of the rulemaking process increase after the introduction of new IT tools? Do these effects vary across different segments of the public?
- Does IT increase the number of comments submitted on proposed rules? Does it affect who comments? Does it change the nature of the discourse?
- How does the public respond to different types of communication and deliberative technologies used by agencies? How do different means of obtaining public input – email, videoconferencing, chatroom – perform according to various metrics?
- What does greater access of information do to media coverage? Does IT change the role for other information brokers (e.g., lawyers, trade associations) in the rulemaking process?
- Do comments have a different impact on agency decision making when agencies uses information retrieval software to analyze comments than when they use staff or consultants to analyze them?
- How do people feel after participating via different technological means? Do they feel differently about email than a written comment, or about a videoconference than an in-person hearing?
- Does e-rulemaking affect the public's sense of legitimacy of regulations? Does it reduce or reshape conflict?

Regulatory compliance. A final set of research questions concern the role of information technology in promoting regulatory compliance (Kerrigan, Heenan, Wang, Law, & Wiederhold, 2003). Research can be directed toward finding ways for information technology to promote regulatory compliance as well as determining what impacts information technologies have on the behavior of government enforcement staff and regulated firms. Some of the pertinent research questions include:

- How well can compliance assistance systems process users' descriptions of their situations and then identify all the relevant rules for users? Can effective systems be designed to help firms identify their own compliance and non-compliance with rules? (Lau, Law & Wiederhold, 2003).
- What are the most effective ways to communicate regulatory requirements in compliance assistance software? How can systems best display or explain compliance to users, especially with respect to regulatory issues that fall within so-called "gray areas?"
- What role can information technology play in improving evaluations of regulations? Can remote sensing technologies, for example, be used to link changes in underlying conditions with regulatory changes?
- How can systems be designed to process data on regulatory compliance in ways that will prove helpful for agency staff when revising old rules or creating new ones?

INTEGRATING SOCIAL AND INFORMATION SCIENCES

In order to tap more of technology's potential in rulemaking, research will be needed from across the social and information sciences. With coordinated input from different disciplines, researchers will be able to help develop more effective uses of technology and better assess the impact that IT-based tools have on agency rulemaking.

Research from the social and information sciences can contribute in different but complementary ways. Social science research, for example, will be needed to understand better the organizational and individual behavior that characterizes the rulemaking process. Further social science research can provide a

basis for understanding ways that the rulemaking process might be improved through new applications of information technology. It can also provide baseline data needed to identify changes that information technology makes in the rulemaking process.

Research from the information sciences will be crucial for improving the use of technology in the rulemaking process (Hovy, 2003). Research directed toward issues such as natural language processing will be particularly helpful (Katz, Hurwitz, Lin & Uzuner, 2003). Information sciences research can still benefit from social science perspectives on the underlying organizational and decisionmaking processes that underlie regulatory policy. By identifying the causes of problems in the rulemaking process, for example, social science research can enable information scientists to design systems that can address these causes and better meet users' needs.

In addition, institutional research will be valuable for identifying the organizational constraints under which new technologies must operate (Fountain, 2001). Information systems that do not fit well the institutional needs or practices of agency officials will prove to be ineffective, no matter how technologically innovative they may be (Lubbers, 2002). Successful e-rulemaking efforts will therefore need to integrate both technological and institutional analysis, taking organizational needs and constraints explicitly into account in designing information systems.

CONCLUSION

Through rulemaking, government agencies make laws that affect every major aspect of economic and social life in the United States. E-rulemaking, or the use of information technology in the rulemaking process, is therefore an important area for future digital government research. Researchers working across disciplines can help design information systems that better meet the institutional routines and requirements of the rulemaking process. They can also evaluate the impacts of information technology on regulatory outcomes and behaviors. The effective use of information technology promises to advance important goals, such as improving regulatory decisions, enhancing democratic legitimacy, decreasing administrative burdens, and increasing regulatory compliance. Careful research will be needed in order to assess whether, and how

well, specific applications of technology improve the rulemaking process. Through coordinated efforts, researchers can advance both the practice of e-rulemaking and our understanding of the rulemaking process itself.

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