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CITIZEN PARTICIPATION IN RULEMAKING: PAST, PRESENT, AND FUTURE

CARY COGLIANESE†

ABSTRACT

Administrative law scholars and governmental reformers argue that advances in information technology will greatly expand public participation in regulatory policymaking. They claim that e-rulemaking, or the application of new technology to administrative rulemaking, promises to transform a previously insulated process into one in which ordinary citizens regularly provide input. With the federal government having implemented several e-rulemaking initiatives in recent years, we can now begin to assess whether such a transformation is in the works—or even on the horizon. This paper compares empirical observations on citizen participation in the past, before e-rulemaking, with more recent data on citizen participation after the introduction of various types of technological innovations. Contrary to prevailing predictions, empirical research shows that e-rulemaking makes little difference: citizen input remains typically sparse, notwithstanding the relative ease with which individuals can now learn about and comment on regulatory proposals. These findings indicate that the more significant barriers to citizen participation are cognitive and motivational. Even with e-rulemaking, it takes a high level of technical sophistication to understand and comment on regulatory proceedings. Moreover, even though information technology lowers the absolute cost of submitting comments to regulatory agencies, it also dramatically decreases the costs of a wide variety of entertainment and commercial activities that

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are much more appealing to most citizens. Given persistent opportunity costs and other barriers to citizen participation, even future e-rulemaking efforts appear unlikely to lead to a participatory revolution, but instead can be expected generally to deliver much the same level of citizen involvement in the regulatory process.

E-rulemaking seems to be the next “best thing” capturing the attention of administrative law scholars. For a time, negotiated rulemaking had been the reigning “best thing,” promising to cure the ills thought to afflict a time-consuming and conflict-ridden regulatory process. But even after Congress passed a statute encouraging the use of negotiated rulemaking and a number of agencies tried to use the procedure, interest generally faded as empirical research showed that formal negotiation of rules makes little difference, or certainly fails to accomplish anything like what proponents had promised.

1. The seminal article advocating the use of negotiated rulemaking is Philip J. Harter, Negotiating Regulations: A Cure for Malaise, 71 GEO. L.J. 1 (1982).
3. For case discussions of specific negotiated rulemakings, see, for example, Charles C. Caldart & Nicholas A. Ashford, Negotiation as a Means of Developing and Implementing Environmental and Occupational Health and Safety Policy, 23 HARV. ENVTL. L. REV. 141, 149 (1999) (analyzing and assessing the potential of negotiation in the formulation and implementation of environmental and health and safety policy); Henry H. Perritt, Jr., Negotiated Rulemaking Before Federal Agencies: Evaluation of Recommendations by the Administrative Conference of the United States, 74 GEO. L.J. 1625, 1627–29 (1986) (reviewing negotiations over rules at the Occupational Safety and Health Administration, the Federal Aviation Administration, and the Environmental Protection Agency).

Experience with other regulatory reforms has exhibited a similar pattern of initial high hopes followed by a failure to deliver on reformers’ expectations.\(^5\)

Is e-rulemaking headed down the same path? At the very least, it is starting out in much the same place. Reformers promise great things from the application of new information technology to the regulatory process—chief among them being the ability to expand public participation in rulemaking. Prior to the advent of modern information technology, unelected regulatory officials made significant policy decisions through a process largely insulated from the general public.\(^6\) Information technology is now supposed to make it easier for ordinary citizens to learn about, participate in, and influence governmental decisionmaking about new regulations.\(^7\)

The Clinton administration first trumpeted e-rulemaking as a means of enhancing citizen participation,\(^8\) and the Bush

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5. See, e.g., Cary Coglianese, Is Consensus an Appropriate Basis for Regulatory Policy?, in ENVIRONMENTAL CONTRACTS: COMPARATIVE APPROACHES TO REGULATORY INNOVATION IN THE UNITED STATES AND EUROPE 93, 93–94 (Eric Orts & Kurt Deketelaere eds., 2001) [hereinafter Coglianese, Consensus].


administration has picked up the tune with still greater gusto. Making e-rulemaking one of its governmental reform priorities, the Bush administration moved swiftly to implement a one-stop Web portal, Regulations.gov, that allows citizens to comment more easily on any proposed rule issued by any federal agency. The Bush administration has also created an online docket system intended eventually to house all rulemaking records across the entire federal government. Commenting on the launch of Regulations.gov in 2003, the director of the Office of Management and Budget (OMB) said, “[E-rulemaking] will democratize an often closed process and enable every interested citizen to participate in shaping the rules which affect us all.” With similar optimism, the managers implementing the administration’s e-rulemaking initiative have declared the project to


11. For commentary on the new federal docket management system (FDMS), including recommendations of ways to enhance access to information for research, see Cary Coglianese et al., Unifying Rulemaking Information: Recommendations for the New Federal Docket Management System, 57 ADMIN. L. REV. 621, 622 (2005). The Bush administration’s program to create a government-wide docket system has met with bumps along the way, including funding conflicts with congressional appropriators. See Cindy Skrzycki, Funds for E-Docket Filed Under ‘No,’ WASH. POST, Jan. 10, 2006, at D1 (reporting that the House Appropriations subcommittee refused to allow the Office of Management and Budget (OMB) to require agency contributions for the development of the FDMS until the OMB submitted a detailed funding plan). The administration, however, continues to promise that the “FDMS will ultimately replace the 20 existing individual agency electronic regulatory systems and over 150 paper-based docket systems.” EXECUTIVE OFFICE OF THE PRESIDENT, OFFICE OF MGMT. & BUDGET, REPORT TO CONGRESS ON THE BENEFITS OF THE PRESIDENT’S E-GOVERNMENT INITIATIVES 3 (2006), available at http://www.whitehouse.gov/omb/inforeg/e-gov/e-gov_benefits_report_2006.pdf [hereinafter E-GOVERNMENT BENEFITS].

be “a groundbreaking achievement on the road toward citizen-centered government.”

Administrative law scholars similarly predict grand effects from e-rulemaking. One of the earliest administrative law articles on e-rulemaking claims that the Internet will “change[] everything,” helping to ensure that “[c]itizens can . . . play a more central role in the development of new agency policies and rules.” Another legal scholar suggests that the federal e-rulemaking initiative holds the potential to “enlarge significantly a genuine public sphere in which individual citizens participate directly to help . . . make government decisions.”

In this vein, a


15. Peter M. Shane, Turning GOLD into EPG: Lessons from Low-Tech Democratic Experimentalism for Electronic Rulemaking and Other Ventures in Cyberdemocracy, 1 US 147, 148 (2005), available at http://www.is-journal.org/V01I01/I-S-%20V01-101-P147,%20Shane.pdf; see also Coglianese, supra note 6, at 373 (reporting on an e-rulemaking workshop at which “[m]any participants were convinced that [information technology] would lead to a dramatic increase in the number of comments submitted on agency rules”); Lobel, supra note 7, at 440 (“The new portals for notice and comment help make the public comment process more interactive and deliberative. This . . . increases public participation and democratic legitimacy.”) (footnote omitted).

number of authors claim that e-rulemaking portends a fundamental transformation, even a revolution, in the regulatory process.17

Is a revolution really in the works? To assess e-rulemaking’s impact and its potential, I begin this Article by reviewing what researchers have discovered about citizen participation in rulemaking in the past, before the introduction of e-rulemaking. Then I consider the empirical research on whether and how citizen participation has changed since the introduction of e-rulemaking.18 Fortunately, an interdisciplinary network of researchers has been producing a rapidly expanding body of research that speaks directly to the question of e-rulemaking’s impact.19 After examining what the research community

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18. In this Article, I use “e-rulemaking” broadly to mean the use of the Internet and digital technologies in soliciting public input about rulemaking. The introduction of e-rulemaking is marked by the increased adoption by federal agencies of the option to submit rulemaking comments by e-mail in the late 1990s.

19. In 2002, the National Science Foundation (NSF) asked me to convene a series of workshops aiming, among other things, to build a network of scholars interested in e-rulemaking from across the fields of the information sciences, social sciences, and law. The NSF
has learned about the impact of current e-rulemaking efforts, I finally
come to consider how citizen participation might possibly expand in the future
with new applications of information technology and whether e-
rulemaking might eventually create a true revolution in public
participation in the regulatory process.

Will e-rulemaking actually increase thoughtful citizen
participation in regulatory policymaking? The answer appears to be,
after a careful consideration of the available evidence, decidedly
“no.” Based on the experience to date with several different types of
e-rulemaking projects, no signs of a revolution appear on the horizon.

I. PAST

Back in the “old days,” which really were not that long ago,
anyone submitting public comments to a regulatory agency needed to
read the Federal Register to learn if an agency had issued a proposed
rule and then had to send in comments by mailing a letter before the
close of the comment period. Regulations.gov did not exist, and the
Federal Register was not even available online, so it was not easy for
most people to learn that an agency had proposed a rule that might
be of interest to them. Some public libraries across the country
acted as carriers of the Federal Register, but by the time many libraries received
each issue, catalogued it, and placed it on the library shelves, the
public comment periods for the proposed rules in that issue were well
underway, if not lapsed altogether. Of course, if interested parties
could hire a Washington lawyer or lobbying firm to monitor an
agency’s activities, or if they belonged to a trade association or other
organized interest group, they would be in a much better position to
know when a new rule was in the works. On occasion, the public
might happen to learn of a proposed rule in a media report, but

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20. Coglianese, supra note 6, at 362–63.
coverage of a new regulation was (and still is) relatively rare. Even when the media do cover a rule, seldom do their reports provide enough detail to enable a citizen to know how to submit a public comment.

Not surprisingly, most rulemakings did not elicit many comments. For example, in 1989, the U.S. Environmental Protection Agency (EPA) issued a total of seventy-two hazardous waste rules under the Resource Conservation and Recovery Act (RCRA), nine of which the agency considered significant enough to list in its semiannual regulatory agenda. For these significant rules, the agency received an average of twenty-five comments per rule, whereas the other, less significant rules averaged only six comments per rule. Researchers have found similar comment levels in studies of other rules and other agencies. Political scientist Marissa Golden examined comments submitted on eleven randomly selected regulations proposed between 1992 and 1994 by the EPA, the National Highway Traffic Safety Administration (NHTSA), and the Department of Housing and Urban Development (HUD). The number of comments submitted on these rules ranged from one to 268, with a median of twelve comments submitted per rule. In another study, political scientist William West examined comments on forty-two rules completed by fourteen different agencies in 1996. The number of comments ranged from zero to 2,250, with the median rule garnering only thirty-three comments.


23. Id.


25. Id. at 252.


27. Id. at 79.
Few of these comments ever came from ordinary citizens. A study of all the significant EPA hazardous waste rules from 1989 to 1991 found that industry filed nearly 60 percent of all the comments submitted in these proceedings, whereas individual citizens submitted only about 6 percent. Only about 40 percent of the rulemaking proceedings received at least one comment from an individual citizen, whereas 96 percent of them contained at least one comment from a business firm and 80 percent had at least one comment from a trade association. Of those comments submitted by citizens, most were only the briefest of letters. Often they were handwritten notes; sometimes they expressed flippant, derogatory remarks toward the agency; and sometimes they were obviously cribbed from a grassroots group’s form letter. Business submissions were consistently longer and more sophisticated, at times running into the hundreds of pages.

Other studies have found a similar paucity of participation by ordinary citizens in agency rulemakings. For example, in ten out of the eleven rules in Professor Golden’s study, not a single ordinary citizen filed a comment. The one exception, in which citizens submitted 9 percent of the comments, was a HUD rule on housing for

29. Coglianese, supra note 22.
30. For a similar observation, see Wesley A. Magat et al., Rules in the Making: A Statistical Analysis of Regulatory Agency Behavior 39 n.17 (1986), which recounts a rulemaking in which “the Utility Water Act Group submitted four bound volumes of comments totaling more than 500 pages on the powerplant industry rules.” Id.
31. See Jeffrey M. Berry, The Interest Group Society 134 (3d ed. 1997) (“Many of those who write to agencies are representatives of interest groups since the technical jargon in regulations makes them incomprehensible to anyone not expert on the subject.”); Magat et al., supra note 30, at 39 (“Most of the comments came from individual firms and trade associations.”); Jason Webb Yackee & Susan Webb Yackee, A Bias Towards Business? Assessing Interest Group Influence on the U.S. Bureaucracy, 68 J. Pol. 128, 135 (2006) (“[B]usiness interests typically submit the majority of comments to a given rule.”). As political scientist E.E. Schattschneider observed nearly fifty years ago, the policymaking process is dominated by organized interests, and even among organized groups there are many more corporations and trade associations involved in policymaking than groups representing individual citizens. E.E. Schattschneider, The Semisovereign People: A Realist’s View of Democracy in America (1960). Mancur Olson’s theoretical development of collective action showed the difficulties that ordinary citizens face in mobilizing to pursue common interests in the policy process. Mancur Olson Jr., The Logic of Collective Action: Public Goods and the Theory of Groups 2 (1965); see also James Q. Wilson, Political Organizations (1973) (elaborating on the implications of collective action problems for interest group politics).
the elderly and disabled.\textsuperscript{33} In the three HUD rulemakings that Golden studied, governmental entities tended to dominate among the commentators, contributing 75 percent of all the comments submitted.\textsuperscript{34} Businesses dominated at the EPA and NHTSA, filing 77 percent of all comments.\textsuperscript{35} On the basis of data like these, it is difficult to argue with Golden’s conclusion that “at least in the regulatory arena, there is a striking absence of citizen representation.”\textsuperscript{36}

II. PRESENT

In an article published in 2005, administrative law scholar Mariano-Florentino Cuéllar suggests that patterns of participation may have started to change.\textsuperscript{37} On the basis of his examination of comments in three rulemaking proceedings, he concludes that, “contrary to conventional wisdom, comments from the lay public make up the vast majority of total comments about some regulations.”\textsuperscript{38} Professor Cuéllar is certainly correct that some rules—like those in his study—do garner a large proportion of comments

\begin{itemize}
\item \textsuperscript{33} Id. at 255.
\item \textsuperscript{34} Id.
\item \textsuperscript{35} Id. at 253–54. Golden did not find, however, that many of the same businesses participated across the different rulemakings, even for those issued by the same agency. See id. at 257 (“[E]ach [rulemaking] results in a strikingly different set of participants.”); see also Coglianese, supra note 22, at 51 (noting that “[b]y far, most groups and individuals participated infrequently” and that “[o]f the 1,607 participants examined, 87 percent participated in only one [rule]”).
\item \textsuperscript{36} Golden, supra note 24, at 255. Woody Stanley, an official with the Department of Transportation, has suggested that at least some of the NHTSA rules in Golden’s study may have in fact garnered citizen comments that were not included in the public docket because most of them were form letters and postcards that provided the agency with no relevant information. E-mail from Woody Stanley, Office of Legislative and Government Affairs, Federal Highway Administration, to Cary Coglianese, Associate Professor of Public Policy and Chair of the Regulatory Policy Program, John F. Kennedy School of Government, Harvard University, (Mar. 16, 2006 13:03 EST).
\item \textsuperscript{37} Mariano-Florentino Cuéllar, Rethinking Regulatory Democracy, 57 ADMIN. L. REV. 411 (2005).
\item \textsuperscript{38} Id. at 414. The first of these rules was proposed by the Treasury Department in 2002 to address law enforcement use of private data kept by financial institutions. It garnered a total of 172 comments, 124 (72 percent) of which individual citizens submitted. Id. at 442–43. The second rule, proposed and finalized in 2003 by the Federal Elections Commission, governed the financing of political campaigns and party conventions. Id. at 447. About fifteen law firms, political organizations, and legislators submitted comments on the proposed rule, whereas about 1,100 individual citizens submitted comments. Id. at 448–49. The third rule was proposed by the Nuclear Regulatory Commission (NRC) in 2001 to change the procedures for licensing nuclear power plants. Id. at 456. The NRC received over 1,400 comments, 98 percent of which came from individual citizens. Id.
\end{itemize}
from ordinary citizens. Yet that has always been the case. An especially salient rulemaking would, from time to time, become the subject of a grassroots mass mail campaign, with a large volume of form letter submissions targeted at an agency. This appears to be what happened in the three rules in Cuéllar’s study. As with other highly salient rules in the past, most of the comments in two of his rulemakings were “simple form letters,” and citizen comments in the other rulemaking were, in Cuéllar’s words, “tremendously unsophisticated.”

The fact that all three rules in Professor Cuéllar’s study were proposed within the last five years—after e-mail communication had become commonplace—does at least raise the question of whether the Internet might be leading to a general increase in citizen commentary. The agencies in Cuéllar’s study, after all, accepted e-mail comments on the specific rules he studied. About 98 percent of

39. See Fred Emery & Andrew Emery, A Modest Proposal: Improve E-Rulemaking by Improving Comments, 31 ADMIN. & REG. L. NEWS 8, 8 (Fall 2005) (“Many agencies were besieged by comments long before the coining of the phrase e-rulemaking.”); Ioana Munteanu & J. Woody Stanley, Participation in E-Rulemaking: Evidence from an Agency Electronic Docket 20–21 (Nov. 1, 2004) (unpublished manuscript, on file with the author) (“[T]he DOT received a large volume of comments by mail, including post cards and form letters, for... controversial rulemakings prior to the introduction of the [electronic docket management system].”); see also David C. Nixon et al., With Friends Like These: Rule-Making Comment Submissions to the Securities and Exchange Commission, 12 J. PUB. ADMIN. RES. & THEORY 59, 64 (2002) (reporting that the twenty-one final rules the Securities and Exchange Commission promulgated in 1998 elicited over six thousand comments, with “the vast majority of those comments... submitted [by individual investors] in reference to two particular rules”). Although the U.S. Department of Agriculture allowed email submission of comments on its proposed organics food labeling rule in the late 1990s, the vast majority of the more than a quarter million comments came in as postcards, paper letters, or faxes—not e-mails. Stuart W. Shulman, Democracy and E-Rulemaking: Comparing Traditional vs. Electronic Comment from a Discursive Democratic Framework C-7 (unpublished manuscript, Jan. 27, 2003); Stuart W. Shulman, An Experiment in Digital Government at the United States National Organics Program, 20 AGRIC. & HUM. VALUES 253, 255 (2003).

40. Cuéllar, supra note 37, at 449, 457.

41. Id. at 443. The lack of sophistication to citizen comments is relevant because, based on standard principles of administrative law, comments are supposed to provide the agency with information relevant to making rational policy decisions, not serve as a measure of public opinion. In contrast with legislators, agency officials are neither supposed to nor generally do use comments to count preferences. Professor Cuéllar’s observations about the sophistication of the comments in the rules he studied are based on an index of ordinal rankings of each comment on five qualities, such as the extent to which the comment addressed the underlying statute or the extent to which it contained well-developed background information. Id.

42. E-mail from Mariano-Florentino Cuéllar, Associate Professor of Law and Deane F. Johnson Faculty Scholar, Stanford Law School, to Cary Coglianese, Associate Professor of
the comments submitted on one rulemaking and about 80 percent on another came in electronically.\textsuperscript{43}

Other recent rulemakings have reportedly generated large numbers of citizen comments. Over the past few years, revisions to the Federal Communications Commission’s (FCC) rules on the concentration of media ownership,\textsuperscript{44} an EPA rulemaking on mercury emissions,\textsuperscript{45} and the U.S. Forest Service’s rulemaking imposing bans on road construction in wilderness areas\textsuperscript{46} have each drawn hundreds of thousands of comments, most of them submitted electronically. If rules like these, that garner tens or even hundreds of thousands of comments, have become more than just a rare event, then perhaps this is because of e-mail communication and other e-rulemaking efforts such as the creation of Regulations.gov.

The evidence so far suggests that Regulations.gov has not had any substantial impact on public participation in rulemaking. In September 2003, the Government Accountability Office (GAO) reported that, at most, a couple hundred comments came in through Regulations.gov during its first five months of operation.\textsuperscript{47} According to the GAO report, only about eight of the 300,000 total comments submitted to the EPA during this same period, and twenty-one of the 18,000 total comments submitted to the Department of Transportation (DOT), came in through the Regulations.gov portal.\textsuperscript{48}

\textsuperscript{43} See id. (noting that 98 percent of the comments on the FEC rule and 80 percent on the Treasury rule were submitted electronically). Professor Cuéllar notes that the percentage of comments submitted electronically to the NRC was “somewhat lower.” Id.


\textsuperscript{45} David Schlosberg et al., ‘To Submit a Form or Not to Submit a Form, That Is the (Real) Question’: Deliberation and Mass Participation in U.S. Regulatory Rulemaking 11 (May 5, 2005) (unpublished paper, on file with the \textit{Duke Law Journal}).


\textsuperscript{48} Id. at 23–24; Herz, supra note 10, at 147.
By October 2004, however, an EPA official reported that Regulations.gov had channeled 9,800 comments to various federal regulatory agencies. Although 9,800 comments is clearly a more substantial response, it is not immediately obvious how to interpret this number. Considering that the federal government proposed about 4,900 rules during this same period, total comments submitted through Regulations.gov amounted to an average of only about two comments per rule. Moreover, it is indiscernible how many of the comments submitted through Regulations.gov would have reached agencies through other channels anyway. On the other hand, it is also possible that Regulations.gov led more users to find out about rules open for comment and then to e-mail comments directly to the agencies, rather than submitting comments through Regulations.gov’s Web interface. More study is needed to determine Regulations.gov’s impact over the long term; however, the early returns suggest that this impact has not been anything dramatic.

Even if Regulations.gov has not increased the level of citizen comments, has the simple ability of citizens to use e-mail contributed to an increase in public participation in rulemaking? According to one report, comments filed on DOT rulemakings “soared when electronic submission became routine.” In 1998, the first full year the DOT placed its regulatory dockets on the Internet, the department reportedly promulgated 137 rules that garnered a total of 4,341 comments. Two years later, in 2000, the DOT reportedly received

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51. Based on a recent study I conducted, it does appear that Regulations.gov makes it somewhat easier for users to find materials on proposed regulations available on regulatory agencies’ Web sites. Cary Coglianese, How Accessible are Online Regulatory Dockets?, Presentation to the American Bar Association Section on Administrative Law & Regulatory Practice 10–11, 13 (Oct. 21, 2004), available at http://www.ksg.harvard.edu/cbg/rpp/erulemaking/papers_reports/Coglianese%20ABA%20Presentation.pdf. Whether any increased accessibility provided by Regulations.gov also leads to an increase in the number of comments submitted directly to agencies has not been examined.


62,944 comments across 99 rules.\textsuperscript{54} On average, this is nearly a twentyfold increase in the number of comments per rule.

Despite this dramatic increase, one needs to know more to conclude that information technology \textit{caused} this increase. Rulemakings were not randomly assigned to an “e-mail group” and a “non–e-mail group,” so it is possible that DOT’s rulemakings in 2000 were simply more controversial or otherwise more “comment-prone” than the rules it promulgated in 1998.\textsuperscript{55} After all, regardless of the availability of e-mail, rules that are highly salient or that affect an easily activated professional group will be more likely to generate a larger quantity of public comments. Of course, such rules also tend to be relatively rare, and for some agencies they might not even be issued every year. This means that the existence of even one or two of these outlier rulemakings in a single year could easily account for a dramatic increase in total or average participation compared with any other specific year.\textsuperscript{56}

Several recent studies confirm that most proposed rules still continue to generate relatively few comments, even after the introduction of e-mail submissions. Government analysts Ioana Munteanu and J. Woody Stanley recently studied comments filed in seventeen randomly selected DOT rulemakings, finding that 83 percent of the total comments came from just a single proceeding, a rule that affected the mandatory retirement age for commercial airline pilots.\textsuperscript{57} Munteanu and Stanley find that “most DOT rulemaking dockets established after [the introduction of DOT’s online system in] 1998 continued to receive only a few submissions during the notice-and-comment period.”\textsuperscript{58} Professor John de Figueiredo, in a study published in this symposium issue, analyzes comments and other filings in FCC proceedings since 1992 and finds

\textsuperscript{54} Id.; see also Skrzycki, supra note 52, at E1 (“In 1997, the [DOT] got 3,102 public comments on 155 rules; in 2000, there were 62,944 public comments on 119 rules.”).

\textsuperscript{55} For background on research designs that permit valid causal inferences, see Coglianese, supra note 5, at 1116–18. In addition to controlling for the degree of controversy or significance of rules, one would want to control for any differences in the length of the comment period, for presumably rules with longer comment periods will garner more comments.

\textsuperscript{56} When a small number of extreme outliers exist in a sample, the median is usually the better measure of central tendency than the mean or average, as averages can vary markedly, especially if there is an extreme outlier. \textit{See} Coglianese, Assessing Advocacy, supra note 4, at 413 (discussing the properties of averages and their sensitivity to outlying data).

\textsuperscript{57} Munteanu & Stanley, supra note 39, at 14.

\textsuperscript{58} Id. at 20.
that “in 99 percent of dockets, the e-filing option does not seem to cause an increase in individual or interest group participation.” That said, the FCC’s rulemaking on the concentration in ownership of media outlets did receive a dramatic spike in comments amounting to “over twenty times the average number of . . . comments the FCC had ever received in any single month.”

In an especially informative study, political scientists Steven Balla and Benjamin Daniels have conducted research specifically designed to test whether e-rulemaking has caused an increase in public comments. Their sample consists of over four hundred and fifty DOT rules, roughly half issued between 1995 and 1997 (before the introduction of the DOT’s online rulemaking system). The other half consists of rules promulgated afterwards, between 2001 and 2003. By explicitly comparing comments before and after the establishment of DOT’s online system, Balla and Daniels’ analysis better overcomes the vagaries of small samples and the comparison of just two single years. They find, perhaps surprisingly, that the levels and patterns of commenting were basically the same across both sets of rules. The median rulemaking in the 2001–03 period had almost the same number of comments as the median rulemaking during 1995–97 (thirteen versus twelve, respectively). The averages were different (628 during 2001–03 versus 162 during 1995–97), but only because of two outlier rulemakings in the 2001–03 period. These outliers, as

59. de Figueiredo, supra note 44, at 987.
60. Id. at 980.
62. Id. at 11. Balla and Daniels relied principally on the Federal Register preambles for data on the number of comments filed. Id. at 7.
63. Id. at 10.
64. Id. at 17 (table 2). The two outlier rules each garnered more than 50,000 comments, whereas the largest number of comments in any single rulemaking in the earlier period was only about 14,000. Id. at 10–11. Without these two outlier rules in the sample, the average number of comments within the later time period would drop from 628 to 64, well below the 162 average for the pre-electronic period. E-mail from Steven J. Balla, Associate Professor of Political Science, Public Policy and Public Administration, and International Affairs, George Washington University, to Cary Coglianese, Associate Professor of Public Policy and Chair of the Regulatory Policy Program, John F. Kennedy School of Government, Harvard University, (May 4, 2006 16:13 EST) (on file with author). Even dropping the two rules having the most comments in the earlier period—one with about 14,000 comments, the other with about 5,000—the average number of comments in the earlier period (about 85) is still greater than the average in the later period sans outliers. Id.
Balla and Daniels correctly note, “characterize rulemaking as it is practiced only on the rarest of occasions.”

Balla and Daniels did not analyze the number of comments filed by individual citizens. However, the results of two other studies shed some light on citizen participation after agencies allowed e-mail submissions. In a study of nine of the most active DOT rulemakings in late 1999 and early 2000, researcher Thomas Beierle reports that in seven of these rules very few individuals filed comments. Almost all the comments in these seven rulemakings came from “the ‘usual suspects’ of law firms, industry, trade associations, and consulting firms.” Munteanu and Stanley report that the rules in their study that garnered the largest citizen input were, as would be expected, those that received the highest amount of overall comments. Given that such highly salient rules tend to be rare, rules that garner a high level of citizen input presumably also remain rare.

At present, then, neither agencies’ acceptance of comments by e-mail nor the development of the Regulations.gov portal have led to any dramatic changes in the general level or quality of public participation in the rulemaking process. Most rules still garner relatively few overall comments and even fewer comments from individual citizens. As in the past, the occasional rulemaking does continue to attract a large number of citizen comments, but most of these comments remain quite unsophisticated, if not duplicative.

65. Steven J. Balla & Benjamin Daniels, Information Technology and Public Commenting on Agency Regulations 12 (Apr. 7, 2005) (unpublished paper presented at the Midwest Political Science Association, on file with the Duke Law Journal). Even for these two outliers, the overwhelming majority of the comments appear to have been submitted by means other than e-mail. Balla & Daniels, supra note 61, at 13.


67. Beierle, Discussing the Rules, supra note 66, at 11.

68. See Munteanu & Stanley, supra note 39, at 26 (“[I]ndividuals were also the predominant type of commenter to most of the dockets with high public response.”).

69. See Cuéllar, supra note 37, at 443, 449, 457 (commenting on the lack of sophistication exhibited by most comments filed by individuals); J. Woody Stanley & Christopher Weare, The Effects of Internet Use on Political Participation: Evidence from an Agency Online Discussion
According to one recent study of about 500,000 comments submitted on an especially controversial EPA rule, less than 1 percent of these comments reportedly had anything original to say.  

III. FUTURE

Maybe more revolutionary change will come in the future. In the wake of early reports about the low number of comment submissions through Regulations.gov, the director of the Bush administration's eRulemaking Initiative drew an analogy to online tax filings. He predicted that citizen use of Regulations.gov will increase over time, noting that the Internal Revenue Service (IRS) had remarkably few users of its online filing system in its first several years of operation, even though the system now brings in 65 percent of all tax filings each year. 

Perhaps use of Regulations.gov will increase with time, but the analogy to online tax filings is clearly inapt. Citizens already were filing taxes before the introduction of the IRS's online system, and they continue to have a strong reason to do so (given that filing is mandatory). The IRS's e-filing system simply makes it easier for tax filers to do something they would otherwise do. In addition, many people rely on tax preparers to assist them with their taxes, so the shift to online filing reflects, in part, the choices of these professionals rather than a complete groundswell from citizens themselves. None of these considerations apply to Regulations.gov, which only promises to

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70. See Schlosberg et al., supra note 45, at 11, 35 n.35 (noting that the EPA's major regulation aimed at addressing mercury levels in the air received only about 4,500 original comments out of over 490,000 submitted); see also U.S. Envtl. Prot. Agency, Controlling Power Plant Emissions: Public Comments, http://www.epa.gov/mercury/control_emissions/comment.htm (last visited Jan. 20, 2006) (reporting that “[t]here were approximately 4,500 unique comments submitted” on the mercury rulemaking).

71. Gail Repsher Emery, Government Defends E-Rulemaking, WASH. TECH., Mar. 22, 2004, at 16 (quoting Oscar Morales, Director of the eRulemaking Initiative, as observing that “[n]ot many folks participated in the first couple of years [of online tax filing], so I’m not really surprised to see our numbers are low. Use will increase over time.”).

help those citizens who take it upon themselves to express their opinion on a proposed regulation. No one should expect Regulations.gov’s usage to increase at anything near the rate of usage for the IRS’s system.

Of course, even if Regulations.gov fails to generate a dramatic change in public participation, it is possible that the government will begin using altogether new online tools. For example, some scholars have urged agencies to establish interactive, online regulatory dialogues that would involve the public through chat rooms or discussion boards. Existing software already allows citizens to interact online with each other and with government officials, as well as to focus their comments on topics defined by the agencies or the users. Professor Peter Shane has suggested that agencies should establish a series of “deliberative groups around the country with access to software for conducting online deliberations” and then invite these groups, among other things, “to develop deliberative recommendations concerning issues on the agency’s agenda.” Although Shane indicates that agencies are unlikely to implement his suggestions fully, in fact a few agencies have taken steps to use

73. See Stuart Minor Benjamin, Evaluating E-Rulemaking: Public Participation and Political Institutions, 55 DUKE L.J. 893, 899–901 (2006) (discussing the applicability of online collaboration and peer rating tools, such as those found at Wikipedia.org and Amazon.com, to e-rulemaking).

74. See, e.g., Cuéllar, supra note 37, at 491–92 (contemplating that agencies would use “sophisticated online surveys” to help them get a sense of public opinion); Lobel, supra note 7, at 440 (“[D]igital technology can further be used to create deliberative forums. Government agencies could create panels of citizens, like traditional juries, that would advise about rulemaking.”); Beth Simone Noveck, The Future of Citizen Participation in the Electronic State, 1 IS 1, 20–21 (2005), available at http://www.is-journal.org/V01I01/I-S,%20V01-I01-P001,%20Noveck.pdf (“[M]oving rulemaking into cyberspace presents an opportunity to experiment with . . . new methods of dialogue and decision-making . . . that may now be practicable with information technology.”); see also Coglianese, supra note 6, at 370 (reporting innovative ideas that arose at a scholarly workshop, including proposals for digital deliberations and online hearings); A. Michael Froomkin, Technologies for Democracy, in DEMOCRACY ONLINE: THE PROSPECTS FOR POLITICAL RENEWAL THROUGH THE INTERNET, supra note 19, at 3, 9 (discussing alternative technologies for facilitating citizen participation in policymaking).

75. See Noveck, Electronic Revolution, supra note 16, at 502–04 (describing the usefulness of Unchat, H2O Rotisserie, and software developed by AmericaSpeaks, as well as urging the development of other software that could potentially be used for deliberation over rulemaking).

76. Shane, supra note 15, at 159. For a similar, non-electronic proposal for deliberation over rulemaking, see David Fontana, Reforming the Administrative Procedure Act: Democracy Index Rulemaking, 74 FORDHAM L. REV. 81 (2005).

77. Shane, supra note 15, at 159–60.
online dialogues, at least in limited circumstances. Their experience offers a glimpse of what the future might hold if agencies go further down the path urged by proponents of online dialogues.

In 2001, the EPA established a ten-day national online public dialogue on potential revisions to its longstanding internal policy document on public involvement in rulemaking, permitting, and other regulatory processes. To help EPA officials determine what kind of revisions to make, the agency used the Internet to try to engage the public in the revision process. For each day of the dialogue session, the EPA posted a new thread on the dialogue Web site and assigned several participants to serve as discussion leaders. In a review of the dialogue, researcher Thomas Beierle declared it to be a “highly successful” experiment.

Although the EPA’s experiment showed that a regulatory agency could set up and use an online dialogue system to generate discussion among people from around the country, it is harder to say whether the dialogue session resulted in much, if any, improvement to the normal comment process. The level of participation was rather modest, certainly relative to the number of people affected by the EPA’s policies. About 1,200 people signed up to get access to the dialogue, 39 percent of whom turned out to be government officials. Of those who signed up, 320 participated by posting at least one message. Over the ten-day period, participants contributed a total of

78. See infra notes 79–97 and accompanying text.
81. BEIERLE, EVALUATION OF THE NATIONAL DIALOGUE, supra note 80, at 11. Beierle did temper his assessment somewhat, noting that “[t]o say that the Dialogue was a success is not to say that there is no room for improvement.” Id. at 51.
82. Id. at 21. This is not to suggest that there is anything wrong with government officials participating in such a dialogue, but rather simply to note that not all participants were truly from the “public.” Even fewer were individual citizens. Among the nongovernmental participants, a significant portion came from industry and educational institutions. Out of the 320 active participants, “[r]oughly 18% were affiliated with an environmental or community group or identified themselves as individual citizens.” Id.
83. Overall, about sixty percent of the 320 participants contributed only one or two messages during the entire dialogue, “many of which were introductions posted during the first
about 1,200 messages to the site—although a third of these messages came from those who had been specifically recruited to keep the dialogue going. Only about eighty messages a day came from users participating on their own initiative, relatively few of whom were ordinary citizens.

A year before the EPA ran its online dialogue, the DOT’s Federal Motor Carrier Safety Administration (FMCSA) created an interactive discussion about the development of an agency strategic plan. From August 2000 through May 2001, the FMCSA allowed members of the public to submit comments via both a Web-based discussion forum and its traditional, official docket. Neither venue garnered an enormous number of comments, but the discussion forum did see greater use: 451 messages appeared in the forum, compared with 102 comments submitted to the docket. Of course, participants in the online forum tended to submit more than just a single message. The 116 identifiable participants in the discussion forum contributed 339 messages (the remaining messages were submitted anonymously), compared with 100 individuals and organizations submitting 102 comments to the docket. There were virtually no overlaps in the participants between the two venues,

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84. Id. at 23–29.
85. Although it is difficult to know how to gauge this level of participation, eighty messages a day for ten days hardly seems like a lot. In one recent year, Congress received an estimated ninety-four million e-mail messages. Communicating with Capitol Hill: How Technology Is Changing Information Processes in Congressional Offices, INSIDER’S BULL. (Cong. Mgmt. Found., Wash., D.C.), Nov. 2003, at 1, available at http://capitoladvantage.com/capwiz/pdf/InsidersBulletin1.pdf. Closer to home, the EPA received an average of about two thousand formal comments a day on proposed regulations in the first five months of 2003. See U.S. GENERAL ACCOUNTING OFFICE, supra note 47, at 23–24 (identifying the “more than 300,000 comments received through the agency’s own e-rulemaking Web site and traditional methods”). On the other hand, as Tom Beierle has noted, eighty comments a day for ten days could be more than might be received at a typical public meeting. E-mail from Tom Beierle, Ross & Associates Environmental Consulting, Ltd., to Cary Coglianese, Associate Professor of Public Policy and Chair of the Regulatory Policy Program, John F. Kennedy School of Government, Harvard University, (Mar. 17, 2006 11:26 EST) (on file with author).
86. Stanley & Weare, supra note 69, at 511. The Web site containing the discussion forum also included a link for submitting an online comment to the docket. Id. at 510.
87. Id. at 511.
88. Id.
89. Id. at 513. Stanley and Weare reported that only six individuals both participated in the discussion forum and submitted comments in the docket, and in five of these cases “the
by establishing the discussion forum the FMCSA plausibly increased the level of public involvement in its planning process. One cannot be confident, though, how large any such increase might have been. Because the same FMCSA Web site contained links both to the discussion forum and the online docket submission form, participants could simply select one versus the other. Had the FMCSA provided only the docket option, it seems likely that at least some visitors who selected the forum would have submitted a comment to the docket instead.\footnote{Stanley, Weare, and Musso claim that “[m]any of these individuals would not ordinarily participate in FMCSA-sponsored policy-making discussions.” J. Woody Stanley et al., Participation, Deliberative Democracy, and the Internet: Lessons from a National Forum on Commercial Vehicle Safety, in DEMOCRACY ONLINE: THE PROSPECTS FOR POLITICAL RENEWAL THROUGH THE INTERNET, supra note 19, at 167, 176. Although this seems true enough if the comparison is to FMCSA rulemakings in general, it is not clear whether it applies in these specific proceedings, because the link to submit comments was located on the same Web page as the link to the online discussion. Even if the discussion forum had not been available, presumably some number of drivers motivated enough to find that Web page would have clicked the box to send in a comment, however terse it might have been.}

The types of participants who selected the FMCSA’s discussion forum did vary from those who selected the docket. Traditional docket comments tended to be filed by the usual suspects, such as government officials (37 percent), trade associations (27 percent), and businesses (14 percent).\footnote{Id. at 512.} In contrast, the bulk of the comments in the Web discussion forum came from either commercial truck drivers (20 percent) or other individuals (including anonymous posters) (57 percent).

In addition, most of the docket participants tended to be repeat players with the agency (85 percent), whereas very few participants in the discussion forum could be considered as such (4 percent).\footnote{Id. at 514–15. Of course, that there were differences does not mean that the existence of the discussion board caused them. It is not possible to be sure that these issues would not have been otherwise raised in the docket, had that been the only participation option available.} Along with these differences in participants came differences in the types of issues they raised in the two venues.\footnote{Id. at 513–14. The dominant participation in the docket by repeat players, and presumably by better-financed industry groups, could have been due to the fact that they were more familiar with the normal comment process. It may also have been that these players understood that “the Web-based discussion did not have the same legal authority as submissions to the official docket.” Id. at 511.} For example, issues of regulatory enforcement arose more frequently in
the discussion forum, but the docket comments gave more attention to issues related to safety research and analysis. 95

If these results at the FMCSA provide any indication of what might lie ahead, the adoption of new tools might well generate participation from a small number of citizens who would otherwise not participate in the normal commenting process, and by extension might bring somewhat different issues or insights to the attention of agency officials. 96 Even if online discussion forums are used more frequently, however, it does not seem likely that they will bring about a major transformation in citizen participation in rulemaking. The scale of public involvement in these digital dialogues has been quite modest, and the quality or sophistication of the contributions made by most citizen participants is also unlikely to increase a great deal, even with more widespread application of these new tools. 97

CONCLUSION

Even after introducing various forms of e-rulemaking, regulatory agencies continue to garner only the most modest, if not trivial, level of involvement by ordinary citizens. 98 Information technology may lower the cost of finding out about proposed rules and communicating with regulatory officials, but the reduction of these barriers alone is insufficient to induce a substantial fraction of the citizenry to contribute substantive comments on agencies’ proposed rules. Even with more sustained efforts to create user-friendly tools or new efforts to use the Internet to educate citizens about regulation, there will remain substantial motivational, cognitive, and

95. Id. at 514.
96. See supra notes 91–95 and accompanying text; see also Cuéllar, supra note 37, at 472–73 (arguing that citizen participants can tend to emphasize subtly different issues than policy insiders).
98. See Cary Coglianese, The Internet and Citizen Participation in Rulemaking, 1 I/S 33, 52–54 (2005), available at http://www.is-journal.org/V01I01/1-S,%20V01-I01-P033,%20Coglianese.pdf (“[E]ven after both Regulations.gov and the new government-wide docketing system are fully on-line, the core obstacles that keep citizens from participating in rulemaking will still remain.”).
informational barriers to citizen participation, making continuity rather than change the expected result, at least for most rulemakings.  

The chief barriers to citizen participation in rulemakings are not technological ones. Participating in a rulemaking requires, at a minimum, understanding that regulatory agencies make important decisions affecting citizens’ interests, as well as knowing about specific agencies and the new rules they propose. Yet regulatory agencies receive little attention in civics education at nearly every level, and the media generally neglect regulatory policymaking. As a result, the average citizen, who already shows declining involvement in politics, simply does not know a great deal about regulatory agencies or the policy issues underlying specific rulemakings. Indeed, it is almost a given that most citizens will not possess a good understanding of regulatory policy issues. If Congress delegates rulemaking authority at least partly because certain issues are so complex or technical that they require agency expertise, then the policy issues in rulemakings will tend systematically to be ones that are harder, rather than easier, for citizens to understand.

Even locating regulatory information on the Internet requires a degree of sophistication. In the fall of 2004, about two dozen students at Harvard’s Kennedy School of Government participated in a study to see how easy it would be for reasonably knowledgeable citizens to find information about rules proposed by federal agencies. I gave

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99. Continuity may not be such a bad thing. As history demonstrates, revolutions do not always turn out for the best. With respect to rulemaking, a real revolution in public participation might have only generated new problems for the regulatory process. Id. at 55–57 (discussing potential drawbacks to increased public participation in the regulatory process).


101. See supra note 21 and accompanying text.


103. For further discussion of this study, see Cary Coglianese, Weak Democracy, Strong Information: The Role for Information Technology in the Rulemaking Process, in FROM
these students information about four rules proposed by the DOT and the EPA and asked them to find a specific numbered document in the docket for each rulemaking, thereby simulating the challenge a typical user might face who wanted to find out more about a proposed rule. Surprisingly, even these graduate students, who were interested in regulation and adept at using the Internet, had a difficult time locating the right dockets within the time allotted. On average, the Kennedy School students could find only half of the dockets they were instructed to locate.

Motivational barriers are also intertwined with knowledge-based barriers. If relatively few citizens know about rulemakings or know how the policy issues addressed in these proceedings can affect their lives, this will constrain their motivation to get involved in the rulemaking process. But even when citizens do know about an upcoming rulemaking and how it might affect their interests, choosing to participate requires that they overcome the well-known problem of collective action. The Internet notwithstanding, it will remain costly for a citizen to take the time to learn about a rulemaking proceeding and submit a comment, at least one with any meaningful substance. The costs of participation should not be thought of in absolute terms, but rather as opportunity costs. Even though the Internet can decrease the cost of submitting a comment to a regulatory agency, it also dramatically decreases the costs of communicating with friends, tracking sports results, keeping up with celebrity gossip, or playing video games. For most people, the entertainment, business, and recreational opportunities made possible by the Internet will be more appealing than the opportunity to send in a comment on a proposed federal regulation. Moreover, even citizens concerned about regulatory policy could reasonably decide not to participate because

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104. Id.
105. Id.
106. Id.
107. See supra note 31 and accompanying text. Political scientist James Q. Wilson argues that the problem of collective action shapes the political environment of regulatory agencies, and that the distribution of the costs and benefits of regulatory policies explains patterns of public involvement in the regulatory process. James Q. Wilson, The Politics of Regulation, in THE POLITICS OF REGULATION (James Q. Wilson ed., 1982). If these motivational factors are what matter most, then the political patterns Wilson calls attention to will likely persist, even in the wake of e-rulemaking.
their one comment would be unlikely to make much of a difference—and in many cases, they can simply free ride on the comments submitted by organized interest groups.

It is hard to imagine how information technology could ever overcome the deep motivational, cognitive, and knowledge-based chasms that stand in the way of citizen participation in the regulatory process. The results to date from various applications of e-rulemaking suggest that these non-technological barriers are real and that probably the most that can be expected from e-rulemaking in the future will be incremental changes to the levels and quality of public participation in rulemaking.

One of these incremental changes could be marginally increased participation among groups or individuals who are already highly motivated and reasonably sophisticated. Participation by members of professional groups affected by proposed rules may increase, such as

108. The extant political science literature suggests that comments do not generally lead agencies to make changes in their proposed rules, which supports an assumption that a single citizen’s comment is not likely to make much of a difference. Golden, supra note 24, at 262; West, supra note 26, at 71; see Nixon et al., supra note 39 at 64 n.3 (observing that, for SEC Release 33-7513, the rules never cite an individual’s comments, although 88 percent of comment letters were sent by individuals). If it is true that most of the influence occurs at the proposal stage, as many interest group representatives seem to believe, then the entire effort to use information technology to provide public input on proposed rules may be more symbolic than real. See Cornelius M. Kerwin, Rulemaking: How Government Agencies Write Law and Make Policy 79–80 (3d ed. 2003) (describing how the important action in rulemaking generally takes place before a rule is proposed); Scott R. Furlong, Interest Group Influence on Rulemaking, 29 ADMIN. & SOC. 325, 335 (1997) (reporting results from an interest group survey showing that informal contacts prior to rule proposal are viewed as one of the most effective means of influencing agencies).

109. Similar conclusions find support in the more general literature on information technology and political participation. See, e.g., Bruce Bimber, Information and Political Engagement in America: The Search for Effects of Information Technology at the Individual Level, 54 POL. RES. Q. 53 (2001) (failing to find that the Internet contributed to any widespread increase in political engagement); Alice Robbin et al., ICTs and Political Life, 38 ANN. REV. INFO. SCI. & TECH. 410, 461–64 (2002) (failing to find support for more than “small and incremental” changes in political participation based on a review of empirical studies of the effects of information communication technology); Dietram A. Scheufele & Matthew C. Nisbet, Being a Citizen Online: New Opportunities and Dead Ends, 7 PRESS/POL. 55, 69 (2002) (finding “that—at this stage of its development—the role of the Internet in promoting active and informed citizenship is minimal”). But see Lori M. Weber et al., Who Participates and Why? An Analysis of Citizens on the Internet and the Mass Public, 21 SOC. SCI. COMP. REV. 26, 38 (2003) (reporting survey findings that suggest “there may be something about Internet participation that mobilizes citizens into political life,” but noting that “it may also be possible that those engaged in politics are more likely to use the Internet”).
with pilots or flight attendants participating in FAA proceedings.\textsuperscript{110} A second incremental change may be an amplification of the comment “bounce” long observed with an especially salient or controversial rulemaking. Instead of seeing occasional rules receive hundreds or thousands of comments as in the past, exceptionally salient rules may more consistently receive tens of thousands or hundreds of thousands of comments.\textsuperscript{111} The rare, outlier rule will likely lie somewhere farther out on the extreme.

For all other agency rules, it appears the future will be little different from the past and present. Rather than a revolution in citizen participation, the end result from even ambitious attempts at e-rulemaking seems likely to turn out much less interesting than the high hopes many now seem to harbor.\textsuperscript{112} As we enter what many have called the information age, decisionmakers should take empirical research information—not just hopeful thinking—into consideration. A more evidence-based assessment of e-rulemaking’s prospects can help policy makers and designers of administrative procedures make better, more realistic decisions about whether and how to use information technology in the regulatory process, or whether and how to change rulemaking procedures in light of new technologies.

\textsuperscript{110} The large number of commercial drivers who submitted electronic comments to the FMCSA is another example. See Stanley & Weare, supra note 69, at 512, 517 (showing tables of the percentage and numbers of comments submitted by different groups, including commercial drivers). From the standpoint of egalitarianism, perhaps scholars and policymakers should be concerned if individual professionals—rather than a representative cross section of all individual citizens—start to make up most of the participants in certain rulemakings. At least such a possible outcome raises concerns similar to those animating discussion about the so-called digital divide, or the disparities that exist across different socioeconomic groups in their access to the Internet.

\textsuperscript{111} This prediction seems to be borne out to some degree by the Balla and Daniels results. See supra notes 61–65 and accompanying text.

\textsuperscript{112} See supra notes 8–17 and accompanying text; see also Robbin et al., supra note 109, at 461 (noting that much of the early literature on information technology and politics has been “normative, prescriptive, aspirational, stereotypical, and hyperbolic”).