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Author(s): W. Michele Simmons and Jeffrey T. Grabill

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W. Michele Simmons and Jeffrey T. Grabill

Toward a Civic Rhetoric for Technologically and Scientifically Complex Places: Invention, Performance, and Participation

The spaces in which public deliberation most often takes place are institutionally, technologically, and scientifically complex. In this article, we argue that in order to participate, citizens must be able to invent valued knowledge. This invention requires using complex information technologies to access, assemble, and analyze information in order to produce the professional and technical performances expected in contemporary civic forums. We argue for a civic rhetoric that expands to research the complicated nature of interface technologies, the inventional practices of citizens as they use these technologies, and the pedagogical approaches to encourage the type of collaborative and coordinated work these invention strategies require.

We are interested in how people can write to change communities. Indeed, it is commonplace to think that citizens often have very little say and almost no power to effect public policy, even when it affects their own neighborhood. Frank Fischer asserts that “[d]espite the contemporary emphasis on citizenship, democratic theorists largely remain distant from the level of citizen . . . such theorists mainly labor at the abstract level of nation-state and, in doing so, neglect the everyday aspects of deliberative politics, especially as

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they relate to ordinary people” (xi; see also Willard). This is largely true, yet as one of those political theorists correctly observes, ordinary people are often inhibited from participating in decisions that affect their lives because they lack the “technical expertise, authority . . . and status” needed to participate directly in decisions that affect their lives (Young *Justice* 56–57). Participation

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requires that citizens also have an understanding of complex issues in order to articulate their experiences and participate in public conversation and offer valuable contributions to any decision. But the requirements for ethical and effective public deliberation must confront a set of what Asen calls “indirect exclusions.”¹ Indirect exclusions “function tacitly through discursive norms and practices that prescribe particular ways of interacting in public forums” (Asen 345).

The significant body of literature on public deliberation and discourse ethics is one response to indirect exclusions. The literature outside of rhetoric and composition concerned with these issues focuses on why people have a right to participate (e.g., Young) or the ethical rules of that participation (e.g., Habermas; Benhabib). Inside the field, early discussions often focused on distinguishing among public, private, and technical discourse, the different requirements for deliberation in each, and ways in which technology limits knowledgeable public argument (Bitzer; Goodnight). Some scholars, such as Nancy Blyler, have wondered, given the technical and scientific nature of policy, whether the public can significantly contribute to policy decisions concerning community issues. For example, in her examination of how public participation in decision making is often “co-opted by science and technology” (131), Blyler asserts that “scientific and technological forces so manage discourse that full participation by citizens . . . are virtually precluded as possibilities” (128). Susan Wells also draws on Habermas’s theory of communicative action, but unlike Blyler believes that “even within the highly conventional and restricted boundaries of technical discourse . . . we can identify the relations of power that block that desire [of the ideal speech situation] and offer strategies for subverting that power, for betraying it into communicative action” (qtd in Blyler 127). Equally optimistic about rhetoric’s potential power in public participation, Craig Waddell believes that citizens can participate in science policy decisions when they adopt particular rhetorical strategies and when a social construction model of risk communication is used.²

Others have focused on the separation of public discourse and technical decision making that denies the public epistemological status—a problem that has long plagued public policy. Such separation creates a passive audience rather than a contributing public (Grabill and Simmons; Katz and Miller; Killingsworth and Palmer; Mirel; Stratman et al.). Beverly Sauer, for example, examines the power structures in scientific coal mining debates and documentation that control discourse and prevent nonexpert voices from being heard even when those voices offer sensible coal mine safety recommendations (“Sense and Sensibility”; *Rhetoric of Risk*).

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While important for the models and rules developed for conceptualizing a deliberative public sphere and promoting ethical communication, we are not convinced that this body of work helps us deal with forums in which indirect exclusions are built into the nature of the system and process. They don’t help us understand, in other words, how citizens might act in most public forums. They do not deal effectively with problems of knowledge—invention—or what Dahlgren calls the “relevant knowledge and competency” condition of civic culture:

People must have access to reliable reports, portrayals, analyses, discussions, debates, and so forth about current affairs . . . Accessibility has to do not just with technical and economic aspects but also with linguistic and cultural proximity. The sources of knowledge and the materials for the development of competencies must be comprehensible, cast in modes that communicate well with different collectivities . . . They also must have the ability to express their own ideas if they are to partake in the public sphere’s processes of opinion formation and/or engage in other political activities; communicative competencies are indispensable for a democratic citizenry. Education, in its many forms, will thus always retain its relevance. (337)

Our interest in how people can participate therefore assumes indirect exclusions as a norm and so also assumes significant asymmetries of power that require a rhetoric, one that begins with a robust theory of invention that enables one to work through various indirect exclusions.

In this article, we focus on invention and its relation to a type of “professional” performance because this relationship names the key problem facing “nonexpert” participants in public deliberations—a problem of knowledge and a problem of performance.³ Consider the fact that citizen participants at a

public meeting are often characterized (by government officials, industry representatives, and university researchers) as people who often know nothing and who rant emotionally about irrelevant issues.⁴ The fact is, however, that nonexpert citizens can be effective, but in order to be effective, they must have an art that is powerfully inventive and performative.

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These performances are enabled by inquiry practices that allow citizens to understand the particular institutional systems (rhetorical situations) in which they find themselves—to know how to ask questions that will uncover rules, procedures, protocols, and values. They must be able to invent valued knowledge, and so they must be able to use complex information technologies and know where to go to do their own science. And they must be able to produce the professional and technical performances expected in contemporary civic forums. These performances are always taking place and have epistemological value: meeting notes and agendas, flyers and newsletters, websites and iMovies, meetings and protests, letters and reports. It is obvious that a meaningful civic rhetoric that is effective in contemporary public spaces must help people write, speak, and compose new media effectively. They must perform persuasively. What may not be obvious is the nature of these performances. Our partial list above suggests the requirements that advanced information technologies be used, but it should also be clear that the genres and literacies look like the material taught in technical and professional writing classes, not the first-year writing class. And they are not the sorts of “great speeches” that are often analyzed in rhetoric scholarship. These performances are mundane documents, and indeed, “emotional” rants delivered while standing on folding chairs. Within the space of this article, then, we will situate our argument about the ways citizens develop knowledge within three examples of rhetorical activity. We will then present the contours of this new civic rhetoric and its implications for both research and teaching.

Inventing the Civic

In his short introduction to Janice Lauer’s recent book on invention (to which we are deeply and too invisibly in debt), Charles Bazerman writes that any theory of invention is meant to answer fundamental questions that “rest on even more fundamental philosophic questions about the nature of writing: What can we as individuals and communities know and claim? How do we know things and how might we share that knowledge with others? How can

we represent what we know and believe and how does representation realize or transform our beliefs and knowledge?" (xv). These are questions not exclusive to writers or teachers of writing. They are fundamental questions of epistemology that are germane to most, if not all, domains of life. Indeed, the issues that most communities face as they imagine who they are and what they might be require what rhetoricians have always understood to be acts of invention. As it always has been, rhetoric is how we come to know who we are.

What confounds the ability of most citizens to ask and answer the questions Bazerman posits is the tremendous technological, scientific, and institutional (bureaucratic) complexity that characterizes contemporary life. Most public spaces where deliberation takes place are either institutionally complex (i.e., procedurally dense) or technically and scientifically complex—or both. This complexity places an extraordinary burden on nonexperts ("citizens") to develop knowledge that might be persuasive in these settings. In most of these settings, each of us would fall into this "nonexpert" category. In what follows, we will use examples from our own work to show this complexity and also to illustrate some inventional practices necessary for these contexts.

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A Mundane Example of Writing

Nearly a decade ago now, Barbara Mirel wrote, "[a] major change is transforming the American workplace . . . [as] employees in every department can manage their own data and compose data reports for business purposes" ("Writing" 91). She goes on to describe the use and importance of data reports for business organizations, asserting that the basic purpose of data reporting is to "support a reader's interpretive needs and strategies for turning that data into information and knowledge" ("Writing" 92). What is important about Mirel's analysis is her understanding of the use of databases as a type of writing and as thoroughly rhetorical.⁵ The implications of this claim are significant. Mirel correctly notes that to understand writing in business organizations is to understand the relationships between problem solving, databases, and writing. Furthermore, she suggests that the more one studies the complexity of user interactions with databases for writing, the more the line blurs between the databases and the texts produced by using them. In other words, if both Mirel

and Sullivan are correct—that to be an effective user of a database requires a deep, rhetorical knowledge of how databases are written—then the writing scene in business organizations, the very tools and resources for invention, include the database itself.

While Mirel's claim might have been striking in 1996, it is certainly not a novel statement to make about business organizations—what we routinely call “knowledge organizations”—today. But what is also true for business organizations is just as true for community-based, neighborhood, cultural, and civic organizations today, and has been for some time now. Writing in communities entails the making and use of databases themselves, which is even more obviously true if one understands computer networks as databases, as this first example helps illustrate.

Many people in the United States live in communities where one can access web-based databases in order to collect data relevant to public decision-making processes. Such information technology-driven initiatives, sometimes called “data democratization,” are a common part of many economic development, planning, e-government, and activist programs. It is a significant example of a more widespread and commonplace view, driven by advances in information communication technologies (ICT), that the information served

by these technologies is, by itself, useful, and that people, by virtue of the fact that the information exists, make use of it in their day-to-day lives.⁶ In fact, the strongest statements about the power of information create an explicit connection between information and economic well-being, and in so doing, mirror the even longer-standing connections

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made between literacy and economic development (in literacy theory see, for example, Street; Graff; Goody). The short version of the literacy-development narrative is that a certain level of literacy in a given economy, country, or region corresponds to a certain level of economic development. More recent projects addressing the digital divide, such as the city of Atlanta's large-scale Community Technology Initiative, rest on the argument that shared knowledge and information forms a foundation for healthy communities. In these narratives, literacy and, now, information are an economic and social good.

There are a number of problems with these assumptions, of course. The most significant problem, in our view, is the invisibility of (the problem of) writing with computers. Consider the following interface from the birth records

database, one of many databases in a community informatics website in Lansing, Michigan (see Figure 1). A user accesses the birth records database two-to-three layers deep in the larger website. Once the user gets to this particular database, she is required to make complex technological and scientific choices, beginning with the meanings of terms, the choices of row or column variable as they pertain to this database and in terms of how they relate to each other, options regarding grouping tables, and choices to exclude missing variables. The online help is not helpful.⁷

If our user plays with her options, the database returns a long table (see Figure 2). If our user is like us, she is now completely lost. Devoid of context, what do the values mean? The layout and design is a problem. But more importantly, this data cannot be used; worse yet, it might be misused. What and how statistical indicators mean is complex, and it is easy to overgeneralize or misapply data to situations.

What we have just described is a common, real moment of rhetorical invention and the very type of complex writing situation that Mirel describes as commonplace in the business organization of the late 1990s (“Writing”). It is more clear, I suppose, why employees in a corporate organization might need databases to write. But why would anyone “in the community” need to use this database? Related to that question, why is it even publicly accessible? One

Capital Area Birth Data Query

The program will give you birth rates if it has the necessary data, otherwise it will give you percentages.

Row Variable Year	Column Variable None
Group tables by None	Select Counties Clinton <input type="checkbox"/> Eaton <input type="checkbox"/> Ingham <input type="checkbox"/> All <input type="checkbox"/>
Start Year 1995	End Year 2003
HELP Definitions Back to CACVoices	Exclude missing values <input checked="" type="checkbox"/>

Submit Query

Fig.1.

Year By Trimester Care Began				
Frequency Row % Column %	First	Second	Third	Row Totals
1995	5,152 90.51 11.07	488 8.57 13.94	52 0.91 6.82	5,692 11.20
1996	5,221 89.43 11.22	426 7.30 12.17	191 3.27 25.03	5,838 11.49
1997	5,397 92.54 11.59	387 6.64 11.05	48 0.82 6.29	5,832 11.48
1998	5,364 94.99 11.52	235 4.16 6.71	48 0.85 6.29	5,647 11.11
1999	5,158 94.50 11.08	254 4.65 7.26	46 0.84 6.03	5,458 10.74
2000	5,416 94.19 11.64	274 4.77 7.83	60 1.04 7.86	5,750 11.32
2001	4,993 88.72 10.73	534 9.49 15.25	101 1.79 13.24	5,628 11.08
2002	4,993 90.06 10.73	439 7.92 12.54	112 2.02 14.68	5,544 10.91
2003	4,853 89.51 10.43	464 8.56 13.25	105 1.94 13.76	5,422 10.67
Column Totals	46,547 91.61	3,501 6.89	763 1.50	50,811

Fig.2.

answer is that powerful tools such as a birth records database are available because they can be made available. ICTs enable it. Some organizations sponsor it out of a genuine desire to enable community capacity. Some sponsor such initiatives because they can become more efficient by “outsourcing” searching and interpretation to citizens themselves. Some organizations do it for both reasons. What is undeniably true is that powerful tools are available and people use them because they provide access to information that may be difficult to access in other ways. This is a good thing. If a community needs to make an argument for day care, better prenatal care, or services and spaces based on population growth, a database like this is essential. But community organizations do more than use databases. To be effective agents for change, they know they must generate data and make databases, activity we will show more clearly later in the article and that is just as common in our experience. Yet while computers and writing has been interested in helping students write with similar tools in schools and technical and professional writing has been concerned with the workplace, we have largely missed the migration of knowledge work into communities. In short, there is little guidance available that might help a neighborhood association, a group of students, an activist organization, or government employees trying to become more productive citizens.

Our point with this first example is simply to frame a problem space and to assert that any attempt to understand writing for community action and change must account for the practices embedded in this example; must understand the technologically mediated places where people invent new knowledge; and must understand that if citizens cannot access, assemble, and analyze the information they find, they will not be able to produce the necessary knowledge to participate in decision-making processes that affect their lives and communities.

Problems with Designing Complex Information: Midwest Citizen Group’s Searchable Database⁸

A growing number of citizen education and involvement sites are being developed both by citizen organizations and as a result of federal regulations. These sites often aim to provide citizens with information that will enable them to more actively participate in public decision-making processes. Michele is a

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member of the Midwest Citizen Group (MCG), a statewide citizen environmental organization devoted to addressing environmental issues that affect local communities across the state. As part of its outreach, the organization maintains a regularly updated website that reports on these environmental issues. One of MCG's primary campaigns involves a steel plant in Planttown, Ohio, that in a given year emits over eight million pounds of soot into the air—this according to the steel mill's own reports. The plant has violated the Clean Water Act over two hundred times between 1988 and 2001 (MCG Fact Sheet; U.S. Department of Justice Press Release, <http://www.usdoj.gov/opa/pr/2000/June/376enrd.htm>). Up to one million gallons of waste and toxics have been accidentally released into two nearby water sources, causing fish kills and contaminating a creek with high levels of PCBs. And millions of pounds of silver flakes, rust colored particles, and black particles have covered nearby properties for over twenty five years. Recent Toxic Release Inventory reports indicate that the steel mill emits a significant number of toxins that exceed Environmental Protection Agency (EPA) levels (MCG fact sheet). These emissions are thought to be accountable for a constant layer of black soot inside and outside residents' homes, increased respiratory problems in residents, and foul odors that permeate the community on a regular basis.

While MCG's goals include finding ways to convince the steel mill to acknowledge and attend to citizens' concerns about emissions, they are also tasked with making the public more aware of the steel mill's actions in an effort to encourage people who live in the area or are involved with the steel mill to become more informed and vocal advocates.⁹ According to the director of the citizen's group, when MCG volunteers began visiting residents of the town, they found that while most citizens say that they have had trouble with soot, particles, and smells for years and consequently, they believe, respiratory problems, few citizens write formal complaints because when they call the steel mill to complain, they are led to believe that no one else in the community is having similar problems. In this case, part of the problem is that citizens are either not aware of the extent of the problem, or they think that they are the only ones affected, or they do not know what counts as evidence in formal complaints.

As a result, MCG works to inform residents and unite interested communities to write letters to the steel mill's board of directors and CEOs, none of whom live in the area, explaining how the emissions from the steel mill have affected their lives. As a way to unite citizens by showing them that others in the community were experiencing similar problems and to provide the citi-

zens with the necessary technical and structural information to write effective compliant letters, MCG began developing a searchable database website to provide citizens with access to documents on the steel mill's polluting practices, with information on how to write a formal complaint letter, with examples of other complaints, and with information on the Right to Know Act.

The documents on these polluting practices—over sixteen boxes with about two thousand documents per box—include visual emissions rates, stack tests, annual inspections, and citizen complaints. While these documents are public record, they are not readily accessible. According to the director of MCG, in order to view these documents, interested parties must first make an appointment with the appropriate agency at least two weeks earlier. The agencies offices are open only Monday through Friday, 8:30–4:30 (when many residents are unavailable). Interested parties must pay for any copies of the documents and must know what they are looking for because most boxes, indeed most documents, are not marked or organized. Many documents have unintelligible headings of letters and numbers—permit numbers understood only by the agencies and the steel mill. Access to these documents is important because they offer insight into how the involved parties construct their knowledge and arguments about an issue and what counts as knowledge. Insight that can only come from structured ways of reading these documents (e.g., technical and scientific literacies that enable a rhetorical analysis). William J. Kinsella asserts that technical competency is an essential tool for successful citizen participation (92). He claims that because policymakers often view the public's participation as "uninformed," the public "must engage the prevailing discourse to transform it" and "must possess some basic level of technical knowledge to enter the conversation at all" (Kinsella 92). Kinsella quotes Laird to call for a technical literacy for citizens:

[I]t is not enough that participants simply acquire new facts. They must begin at some level, to be able to analyze the problem at hand. At the simplest level, this means understanding the different interpretations that one can draw from the facts and trying to think about ways to choose among those interpretations. At a more sophisticated level, it means beginning to learn how and when to challenge the validity of facts, where new data would be useful, and how the kinds of policy questions being asked influence the type of data they seek. (93: 353–54)

Having access to the type of documents MCG has collected is one way for the public to learn the jargon, concepts, and overall discourse of a particular policy issue and to begin to analyze that issue. The development of this website—the

creation of a database—serves as a key example of the inventional requirements and burdens placed on communities.¹⁰ First is the fact that a citizen environmental organization saw the need and developed the website. Second is the fact that any website created is a function of prior inquiry practices—searching for information, selection of information (interpretation), and ordering of information (analysis). Thus, merely creating this website demands significant intellectual effort.

While such a database holds much promise for enabling citizens to understand environmental issues that affect their community and for providing them with strategies for bringing about change, the resulting structure and design of the information is organized in a way that may not encourage citizens to investigate the kinds of multiple interpretations and analysis called for by Kinsella and Laird. For example, the current model organizes the documents by date, providing an interesting history of the steel mill’s practices but limiting other searching practices. Unless a citizen knows the date of a particular document, he or she may have trouble accessing important information in individual documents. Figure 3 illustrates this narrative structure.



Fig. 3

Thus despite the significant work necessary to create the website and the sincere hope that it will be useful for area citizens, there remain significant problems at the interface that are unavoidable. In this case, the interface becomes an obstacle to citizen involvement. This example suggests that if we hope to use websites to disseminate information to help citizens actively participate in the complex decisions that affect their lives, we must consider more than the traditional inquiry issues of finding, selecting, and ordering the information. A civic rhetoric would also address helping users understand complex information technologies, both in terms of creating and using them.

This example, however, also highlights the networked quality of civic space. It takes a number of people and institutions to do this work. Indeed, the rhetor here is MCG; the organization invents and performs.¹¹ In many respects, change is possible only through the coordinated work and writing of these multiple people and institutions. For the campaign to reduce pollutants from the steel mill, it took both MCG's ability to locate, assemble, and analyze the necessary data and the individual citizens' ability to analyze and combine that data with their own experiences living near the steel mill to create knowledge that was persuasive enough to bring about change. For example, when MGC went door to door in neighborhoods in and around Planttown to encourage residents to write letters about the effects of the steel mill's polluting practices, they provided fact sheets with specific information about the emissions into the creek and air and the potential consequences of repeated exposure to these emissions. According to MCG's website, nearly 25,000 citizens used this information to write letters and petitions to the steel mill's executives and board asking them to reduce the pollution from the mill. Nearly five thousand people wrote letters to Planttown's mayor asking him to build a fence around the creek contaminated with PCBs that is also near a school where young children play. Over three thousand citizens wrote to the CEO of the steel mill to build the fence around the creek. And over six thousand citizens wrote to ask the CEO to clean up the contaminated creek and stop further PCB contamination. Since that time, the steel mill has built a fence around the creek and made concrete progress toward reducing emissions. This change may be attributed in part to a new CEO for the steel mill who, unlike the last CEO,

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agreed to meet with area citizens to hear their concerns, but this change is also likely due to citizens who were able to be persuasive regarding the effects of the steel mill's polluting practices on their community.

Here again, however, we hope it is clear that the ability of citizens to participate in this fashion in contemporary civic forums requires work at the computer interface. Investigations at the level of the interface are important because the literacy practices necessary to use these websites and databases may be more complex than have been previously considered in interface design. Here, the complexity lies not only with the technical information, but also with how the interface—the electronic format and structure itself—affects the meaning of the information. Clearly, if citizens cannot access, assemble, and analyze the information they find, they will not be able to produce the necessary knowledge to participate in decision-making processes that affect their lives and communities. In this regard, the ways in which different modes and media practices add layers to, and complicate, the meaning of information becomes essential to the knowledge work of citizenship. Gunther Kress and Theo Van Leeuwen, for example, assert that the meaning of information is shaped as much by the design, production, and distribution as by the information itself (4). Of these modes and media, it is the distribution layer that we find most interesting for our work.

For Kress and Van Leeuwen, distribution involves developing the communication into a format that allows access to the information (87). As we understand it, this layer is the structure and interface design that helps users navigate the available information. Kress and Van Leeuwen warn that when we adapt print information to electronic formats we must be aware that we are adapting information to a medium that is both multimodal and interactive, and we must be careful to consider the ways in which users can access and interact with information in databases because this information “consists of fragments which have not been assembled for the user in the way they are in older media” (103). It is this complex process of assembling and layering information from different electronic formats and databases that can be difficult for users.

If this is true, how then can citizens read and make sense of the complex information, made more complex by multimedia databases? Kress and Van Leeuwen examine one possibility posed by a group of designers (Oren et al.) who believed users are not able to do their own “assembling” of information in databases but become overwhelmed “clicking aimlessly from screen to screen”

unable to learn from the information (103). As a result, these designers developed “user guides” to help users navigate through information in databases. Yet, they found that these guides “linearized” the database, preventing users from exploring on their own (104). Indeed, this guided format is reminiscent of the citizen action website that presented the information in a story format. Michele talked at length about the very structured format of the website with one of the directors at the MCG. The director’s rationale for the structure is twofold. First, she understands that many people check the site everyday for updates and this format is a convenient way to see the latest information easily. Second, she believes that MCG can sort through the mass amounts of information and pick out the most important information. However, this approach doesn’t necessarily encourage citizens to explore different questions and make their own connections and conclusions and may exclude seemingly less important information that might also provide an alternative perspective. For example, if the information on the website enabled invention—that is, if the information encouraged the citizens to explore different questions—they might decide to pursue a safety measure other than a fence for the contaminated creek.

A challenge we see to organizing civic websites is to balance helping citizens find information that is pertinent to their situation with allowing them to explore the material with multiple questions and consider multiple factors. Indeed, Barbara Mirel, in her discussion of interaction design for complex problem solving, maintains that one of the three principles of useful interaction is balancing user control with guidance in the software (*Interaction*). Mirel’s argument addresses designing useful software for the workplace, yet we see connections to designing useful civic websites. While some scholars in rhetoric and composition question extrapolating theory about the workplace to theory about civic situations (see Coogan), we believe in this case, the connection is warranted. This connection is in part because of the complex problems that both knowledge workers in a traditional workplace setting and citizens considering appropriate environmental decisions face: “uncertainty, incomplete and diverse sources of information, multiple logical and situational factors, and competing demands from multiple stakeholders” (*Interaction xxx*). For complex problems, she asserts, the design

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must accommodate multiple explorations. We believe the design of civic information must allow for multiple entry points, multiple types of questions, and multiple angles of investigation to allow citizens to invent usable knowledge from the available information. Providing a single narrative of information does not allow for these explorations. Without the ability to invent and produce usable knowledge from available information, full participation in civic issues becomes unlikely.

Doing Science

We draw next from an ongoing project of Jeff's for our third example. Jeff has been working for about two years on a risk communication project in the community of Harbor, a city that has as much industrial density as any area in North America.¹² In Harbor, there exists a short, man-made river channel that links various industrial operations with a lake. Periodically, this channel must be dredged for barge traffic. Given the industrial density in Harbor, over a prolonged period of time, the sediments in the channel are heavily polluted. Currently, these sediments flow into the lake, polluting that water body. Thus for navigational and environmental reasons, the channel must be dredged. Dredging these sediments, however, creates another set of problems, as the dredging operation threatens to resuspend contaminants in the water. Furthermore, the transportation of the sediments creates risks, as does the disposal and treatment of the sediments—currently planned to take place in an open confined disposal facility (essentially a landfill protected by clay walls). The project is planned for thirty years, so it is a project of some size. The confined disposal facility will remain open—that is, uncapped—for those thirty years, meaning that there is also a risk of air pollution due to blowing dust particles. To make matters more difficult, the confined disposal facility is located within a few hundred yards of two schools.

Currently, there are two federal agencies, one state agency, two local governments (with their various management and technical functions), four universities, and a number of community-based organizations (some fluid; some stable) involved in deliberations regarding the project. The project touches on issues of engineering (civil, chemical, and environmental), dredging technologies and operations, public health assessment, airborne contaminant research, geology, and a host of legal, procedural, and ethical issues. The citizen groups participating in the decision-making processes associated with this project

are at a considerable disadvantage, particularly given the fact that they do not have the resources to hire their own experts.

Despite the disadvantages, these citizen groups must act if they have any hope of directing the course of the deliberative process, and to engage effectively, they must create new knowledge about the issues at stake. How is this done? How can community organizations, composed largely of nonexperts, "do science?" There are, of course, a number of examples of citizen science projects and community-based research initiatives, and these examples are appropriate answers to the question of how a community does its own science (e.g., Fals-Borda and Rahman; Epstein; Sclove, Scammell, and Holland). Here we want to review how one local organization, Concerned Environmental Citizens (CEC), invents new knowledge.

CEC is a loose collection of individuals, some with college degrees, some with degrees in relevant scientific disciplines, but most without either. Attendance at organizational meetings typically results in twenty individuals, most of them women. Briefly, then, here is how that organization invents new knowledge:

1. At meetings, members are asked if they have knowledge or leads about the issue of concern.
2. Members read all relevant public documents about the issue of concern.
3. Members read widely in newspapers, magazines, and select scientific journals (e.g., *Nature*) for relevant articles.
4. Members write to experts cited in publications to ask follow-up questions or to ask these experts new questions based on the local situation.
5. Members report back at meetings about what has been discovered (and then return to searching and reading strategies).
6. Members write issue summaries for distribution to the wider community.

There is considerable complexity masked by this list, of course. But we can suggest some things about how this organization writes. The first issue is that the rhetor in this process is not an individual. In fact, to study rhetorical practice in contemporary public forums is to abandon the study of individual writers because a focus on individual writers obscures the most important and

complex rhetorical activity taking place. The inventional practices and communication activities that we observe in Harbor are fundamentally the acts of organizations. There are, obviously, individuals acting within these organizations, and indeed, there are varying levels of cooperation and collaboration. But this does not change the basic fact of distributed rhetorical activity and the necessity of understanding this distributed activity.

So what does this distributed activity look like? Figure 4 shows one representation of this distributed activity. Each box and corresponding letter represents an individual in the organization, their area of expertise, and the most visible interactions between them. Many of the interactions are visible in meetings, and the meeting is an important context for writing.

At meetings, there is a loose reporting procedure in which individuals report to the group on interesting and relevant information that they have read or found. This reporting then sometimes triggers discussion and some organizing and action items. But as the map also shows, certain individuals in the organization have their own specialties, and they tend to investigate and report on those issues both in CEC meetings and in public meetings. The interactions that take place in meetings are important on their face, but there is also a deeper layer of activity that is not visible in meetings.

Two members of this organization conducted a neighborhood epidemiological survey (a household survey). Others in the organization actively moni-

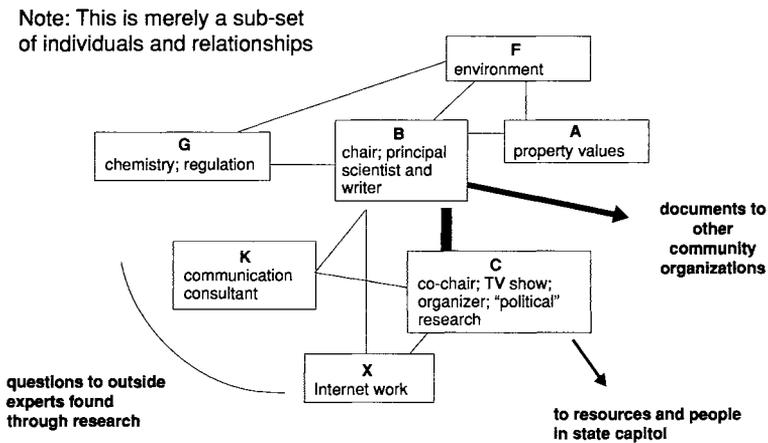


Fig.4.

tor matters such as sewage discharge. But much of the work concerns searching and reading, both online and in more traditional ways. When we first asked the woman represented here as “B” how she did her science, her answer then (and now) is that she reads. (Anonymous B) It is not quite that simple. B does not have regular Internet access nor does she often or easily use a computer. So her reading is largely newspaper, magazine, and journal based, although she manages to get her hands on a number of government and organizational reports not available in print at the local library. Other individuals in the organization do networked-based searching and reading, and somebody—perhaps a few somebodies—helps B with whatever computer-based work she needs done.

Another layer of this distributed work is how the organization reads. Some readers read abstracts and summaries. Others go immediately to footnotes, references, and data sets. In this way, the distributed reading practices of CEC mirror the distributed reading expertise within corporate organizations. The reading and sharing then triggers another layer of activity—tracking down outside expertise. As B told us once, “We couldn’t do anything with what we know,” so many individuals in this organization track down scientists or others they find through articles and news reports who they think can answer a question for them. (Anonymous B) They send questions, data sets, and documents. And from what we can tell, they get a high level of response to their inquiries. The organization is also capable of mining databases available over networks and databases that are geographically isolated in places like the state capitol. They also maintain their own databases, such as financial records related to the city of Harbor, which is notoriously corrupt.

As with any effective rhetorical practice, the activity described is connected to larger rhetorical situations and communication practices. CEC has a solid sense of the community and of their audience, and we have come to rely on them in both respects. They know where they fit within the larger community (their sense of place in the community has been confirmed to us by how others perceive CEC), they have a strong sense of who is a member of the community and who is not (this is, of course, an issue of some contention), and they seem to have developed a communication strategy designed to provide quality information to others in the community (which serves as an organizing function) and designed to confront the corps, EPA, and city at every opportunity. So, for example, they have developed and utilize a phone tree for communication; they distribute summaries and issue papers to individuals and other organizations, and we know that these documents are used by these

other organizations; and they are always present and vocal in public meetings. That is, they understand the effective delivery networks within the community and use them. They can create effective documents; they can organize; they have strong views of what makes for a good public meeting and what makes for a manipulative one. Some individuals can be very effective at public meetings. And the organization as a whole is extremely effective at doing and communicating science. They have been a major part of delaying the dredging project for many years; they have shaped the substance of the debate about the project in the community. We understand them to be successful and in many ways powerful in writing their way to community change.¹³

While we think this organization has developed effective invention strategies, and therefore established its ethos within this community, this example, too, raises more questions and problems than it answers. Foremost among them are questions related to the status of the inventional strategies and products produced by this organization. They certainly cannot leverage the expertise other stakeholders have at their disposal. Other questions center on the rhetorical performances that are part of their inventional practices—the speaking and writing. They are clearly effective communicating with some audiences, but which ones, exactly? And what about institutionalized audiences like government agencies or political audiences such as elected officials? How do they perform through various media at particular moments and places?

Implications for Research and Teaching

A number of issues clearly follow from our understanding of invention. Foremost among these issues are problems related to the usability and usefulness of computer interfaces, problems that are no longer the sole concern of technical communication—if they ever were—within the larger domain of rhetoric and writing. That is, some of the participants in this approach to invention are the people who design and write computer interfaces. Inquiry at and through the interface is unavoidable, and thus any theory of invention must concern itself with helping users orient themselves to complex information technology interfaces and help them find relevant information within them.¹⁴ In our Midwest Citizen Group example, the categories and organizational patterns the designers choose for their web-based information have a tremendous impact—in this case, a limiting impact—on the ways that citizens can access and use the information. And in Harbor, one of the reasons that only certain members of the organization conduct online research is that only certain members of the organization are able to do it. For others, access is a prob-

lem. Our point about technology design and use becomes more prescient given the development of recent new media interfaces, which complicate already complex technical information (see Manovich). Without the ability to invent and produce usable knowledge from available information, active participation in decision making about policy and other civic issues becomes almost impossible. Clearly, our notion of civic rhetoric must expand to accommodate not only the growing shift toward the screen and the visual, but also the complicated nature of interface technologies. To this end, a first step involves researching the literacy practices citizens need to use interfaces to access, assemble, and use information and discussing this as a form of civic discourse in our classes. Emphasizing the inventional practices of citizens as they attempt to invent new and persuasive performances reveals the rhetorical nature of interface technologies.

The networked quality of public spaces and the collaborative practices of invention, as we have shown, extend outside computer interfaces. Citizens in Harbor have done their own science, and their ability to produce information that some audiences find persuasive has delayed and changed the dredging project. They have developed sophisticated networks for accomplishing tasks related to research, community organizing, and communication. We learn from their example that computer networks and information technologies also enable inventional tactics not possible fifteen years ago. The ability of CEC to access and read newspapers from around North America, scientific journals in research libraries, and to communicate with experts around the world are certainly a function of information technologies (and another reason why any contemporary civic rhetoric must understand technology as fundamental).

Thus we see great promise in the work of the community organizations with whom we have worked, and we see in their efforts the outlines of what a civic rhetoric for technologically and scientifically complex places must look like. Frank Fischer's critique of contemporary political theory is relevant here. Such a rhetoric must concern itself with the day-to-day rhetorical practices of "everyday people," not exclusively with the concerns of The State. It must concern itself with understanding how people create civic cultures, how they define themselves within recognizable public spheres, not necessarily with the definitions of "civil society" or the validity of truth claims in deliberative discourse. Such a rhetoric, in other words, must be empirical. Here the teachers

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are communities, organizations, and individuals who engage in rhetorical practices, with varying degrees of success, in nearly every community. What inventional strategies are effective? Why? How do we know them to be effective? And can we draw from these a *techne* that can be taught to others?

We believe that one of the most important strategies for communities, organizations, and individuals participating in technically and scientifically complex places is the ability to recognize and formulate the right questions about any issue.

Like Laird and Kinsella, we believe that one of the most important strategies for communities, organizations, and individuals participating in technically and scientifically complex places is the ability to recognize and formulate the right questions about any issue. As Laird states, "analyzing a problem means being able to challenge the formulation of the

problem itself, that is, for people to decide for themselves what the most important questions are" (qtd. in Kinsella 93: 354). This sort of strategy is both inventional and performative.

In the same way that we must study ways in which citizens use complex interfaces to access and make sense of information, we must also study the writing citizens produce as a result. Seeking to understand these practices is part of the new civic rhetoric for which we are calling.

While the most immediate implications of this work for us concern ongoing research and capacity-building efforts, there are clear resonances between this work and the teaching of writing. The implications for professional and technical writing are significant, as that field's recent concern with public policy, civic issues, and service learning already attests. To the extent that what happens in the first-year writing class is genuinely connected to preparation for citizenship, then we think writing programs and pedagogical efforts could well learn from the rhetorical practices of those engaged in writing for community change. We have experienced this ourselves. In some domains of our day-to-day lives, we have some expertise, but in many more we are novices scrambling to catch up. As we think about more public issues related to our own lives, we are truly nonexperts like those in other community groups with whom we have worked. This is an unavoidable subject position for our students, too. They will necessarily be subject to decision-making processes that require the institutional, scientific, and technological expertise we have described here. How will they confront it? How will their education have prepared them to act as citizens?

As we think about teaching writing at our own institutions, we have been changed by our experiences working in communities. We know that teaching

writing with advanced information technologies is required. It is not an option. It is not a special topic. It is not something to be left to more technical disciplines. Indeed, it is too important to be left to traditional technical disciplines. As our evidence suggests, writing at and through complex computer interfaces is a required literacy for citizenship in the twenty-first century. This literacy has many components. We must do a much better job teaching database searching, including understanding how databases work. We must do a better job teaching the critical literacies necessary to deal with authority and credibility of sources, and we must engage issues related to quantitative literacy. We don't have to teach math or statistics as they are taught in those disciplines; we have to teach students how to make sense of public information from our own subject position as citizens and to be able to write using multiple forms of evidence. And we certainly need to provide some experience writing computer interfaces, reports, public presentations, multimedia compositions, and other, mundane documents meant to communicate important information to public audiences.

Additionally, what our evidence shows us is that invention and production are never a function of a single writer. Rhetorical practice in communities is coordinated if not collaborative. Organizations invent; collectives write. We have a pedagogical literature and set of practices that focus on collaborative writing, and so we should underline these pedagogies in our programs and work hard to become better teachers of collaborative writing. But we need to develop a more robust language and set of pedagogies for teaching coordinated writing, which describes a broad mix of practices that do not fit neatly into our division of "individual" assignments and "collaborative" assignments or even into a sequence of different writing assignments over the course of a semester. In both the MCG and Harbor cases, successes were a result of coordinated writing with others working toward a common goal. For example, it is unlikely that MCG alone could have persuaded the steel mill to reduce emissions or build a fence around a polluted stream only by making information about the consequences of the steel mill's polluting practices available. It is equally unlikely that the citizens alone would have been able to collect the necessary complex data and to organize such a large letter-writing campaign urging these changes in their community. Citizens may not consciously choose to coordinate their writing, but it is the default situation for this kind of work. Technically and scientifically complex work is, by necessity, coordinated or collaborative.

We also believe that rhetorical theory is useful as well, not just in terms of

connecting students to a long and meaningful history of people communicating to change communities but also to help students develop habits of mind that will enable them to recognize problems and design inquiry strategies to work toward solutions. In other words, our students, to be effective citizens, must become effective researchers. They must have the capacity to invent.

As we hope we have shown, the civic rhetoric that we have seen through our research is of a different sort than we are used to. This new rhetoric articulates technological and institutional infrastructures, scientific and rhetorical expertise, nonexpert ways of knowing and expression, and public decision-making processes. Rhetoric is no longer the terrain of the individual rhetor speaking or writing to “the public.” Although we realize that this subject position has not been the default for some time, the civic rhetoric we imagine *requires* collaboration of a breadth and depth perhaps not seen before or made visible to us in previous scholarship. The design of information technologies to enable effective use is not something that “everyday people” can do by themselves, nor is it possible for designers and scientists working on their own. As we have illustrated here, the inquiry practices of citizens require the collaboration of large numbers of people, tools, and infrastructures. No document is singly authored, no speech a solo performance, no organization outside a complex institutional infrastructure. In other words, given that all of the public decision-making processes that we have experienced and can imagine are framed by various institutional structures and mediated by “expert” technologies, epistemologies, and rhetorical practices, a robust civic rhetoric for such forums must enable both analytical and productive possibilities within such contexts. Rhetoric has always enabled the type of productivity we call for here, and indeed, as Janet Atwill has argued, the art’s purpose is to enable transgressive acts of the least powerful. The value of any contemporary art of rhetoric will be measured as it always has been—by how useful it (and we) can be for others.

Acknowledgments

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Notes

1. Direct exclusions are less interesting to us but obviously important. When a decision-making body or process is closed down to others as a function of naked

political power or when the explicit purpose of a process is only to inform citizens of decisions already made, then much of what we discuss here is irrelevant. Of course, in these situations, rhetoric is irrelevant as well.

2. Others question how useful these classical and social constructivist approaches are for improving public discourse about technology (Coogan; McGee). For example, Coogan argues that both the classical and constructivist approaches to technology often fail to account for the public interest. He remains skeptical of the rational deliberations among equals that classical approaches promise and of the constructivist use of workplace data as analogous with civic settings. Instead, Coogan argues for a materialist approach that studies the “coercive acts” of rhetoric as “ideological practices that enable stakeholders to cooperate or contend with one another” (302) and that dissolves the potential dichotomy between professional communication and public rhetoric (302). We find this work useful, particularly the move to dismantle the line between professional and public discourse.

3. We use the term *performance* along with *writing* and *composing* in this article because we are unsure what, precisely, to call what we see in communities and how to name what people can make with advanced information technologies. To be sure, an oral presentation at a public meeting is more clearly a performance, but how should we characterize a media piece that incorporates voice, video, and interactivity? Our pragmatic approach here is also meant to suggest a more theoretically informed notion of performance that might allow one to understand the productive work of citizens acting to change communities.

4. The characterization of citizens as “emotional” is commonplace in the risk assessment and communication literature (see Fischhoff, Watson, and Hope; Sandman; Slovic; Rowan). We have both witnessed and overheard characterizations of the kind we gloss here numerous times, and, frankly, have seen some pretty dismal performances by citizens (and equally dismal performances by “experts”).

5. As Mirel notes, the first study of this kind is Patricia Sullivan’s dissertation on the use of electronic search systems in libraries. Sullivan’s work was some of the earliest on electronic “card catalogs,” perhaps the first to connect databases and writing, and almost certainly the first work to understand databases and their use as rhetorical.

6. We will use the convention ICT in this article to refer to a broad range of information technologies that are used for “writing,” such as cell phones, PDAs, and iPods (“podcasting”) as well as computers and networks.

7. Our discussion here imagines a use scenario based on our own experiences. However, Jeff has conducted usability evaluations of this functionality as part of a two-year study not reported in this article. What Jeff found were significant usability problems; “failure” as measured by the metrics used in the evaluation. For

video of one such evaluation, please see <<http://www.wide.msu.edu/ccc/civic>>. The video is worth looking at, not precisely because of the usability problems but rather because of the remarkably smart way the user reasons her way through the interface. What is not imagined here, however, are the problems themselves. They are very real.

8. The names “MCG” and “Harbor” as well as the names of all individuals and organizations associated with both projects described in this article are pseudonyms. Michele’s contact with MCG is a function of her own outreach work. Her understanding of the MCG website was drawn from conversations with the director and her analysis of the site’s content as part of her work with the organization. We cite some of this content—specifically fact sheets—in this article as well. Of importance in terms of the content related to the MCG website is the fact that when Michele called to check on the status of the website materials while preparing this article for publication, she learned that—for the immediate future—the organization had decided to organize the information on the website primarily by date rather than by a database with multiple types of search queries. Data from the Harbor example is drawn from three years of empirical work in that community, which included a number of interviews, observations, and work with a range of public and organizational documents. A fuller elaboration of methodology can be found in Jeff’s forthcoming book, *Writing Community Change: Designing Technologies for Citizen Action*, particularly chapter three.

9. MCG is not working to shut down the steel mill, but rather to persuade the steel mill to develop a program to clean up the contamination on and off site and develop programs that bring the company into compliance with local, state, and federal environmental laws. First and foremost, MCG hopes the website will be an organizing tool for citizens—helping to unite them as affected neighbors and provide them with concrete evidence to include in complaint letters they write to the steel mill and their legislators. Additionally they believe that even members of the steel mill’s board of directors are not aware of some of the steel mill’s practices and may be shocked into advocating for different practices.

10. We see, then, two commonplaces of data democratization. One is illustrated by our first example—a government-created and maintained database. The second is the local information infrastructure created by a nongovernmental organization like a neighborhood association or statewide citizen organization. Each is common, and each requires different sorts of inventional acts.

11. At our current historical and political moment, with increased government secrecy and attacks on both freedom of information and fair use policies, the activity of an organization like MCG may be far more important than the political speech of a public figure. Gaining access to information necessary to make in-

formed decisions about issues that affect citizens is becoming more and more difficult. James Porter argues that a growing number of state and federal government policies are making it possible for federal agencies to “resist” many requests by citizens for documents that normally would fall under the Freedom of Information Act. Such policies are also calling for the removal of information previously accessible from websites, public archives, and libraries. Porter asserts that while some of these regulations may be necessary in the wake of post-9/11 concerns, many of the newly regulated documents would not pose a threat to national security. Pete Shuler argues that while government officials are supposed to serve only as the “custodians” for public records, it is rare that the request for such documents are filled in a timely manner, if at all. Shuler tracked 491 requests made by representatives from forty-two newspapers, the associated press, two radio stations, and two universities all in Ohio for information that fell within the definition of public record. He found that when the requests are filled, certain information may be blacked out. Other times, government employees required requesters to provide identification and a rationale for the need of the information, “both of which are impermissible.”

12. The risk communication project in Harbor is sponsored by an outreach group in civil and environmental engineering at Michigan State University called Technical Outreach Services to Communities (TOSC). TOSC is the outreach arm of our EPA region’s Hazardous Substances Research Center (HSRC). TOSC’s mission is to facilitate public involvement by providing independent technical expertise to communities. As a researcher engaged by this group, my work is coordinated with and by them and shaped by other project constraints as well. In addition, the work has been collaboratively conducted with my colleague Stuart Blythe, a faculty member at Indiana University-Purdue University, Fort Wayne.

13. To bring this back full circle to a focus on “doing science,” because of the nature of the organization as a loose group of people from within the community, the questions that they are asking and answering come from the community. For an organization like TOSC, this is mission critical because TOSC’s mandate is to help answer community questions, and for an outsiders like ourselves, the most difficult and fragile task was to figure out where and how to listen.

14. Our goal should be what Michael Gurstein calls “effective use,” or “the capacity and opportunity to successfully integrate [information communication technologies] into the accomplishment of self or collaboratively identified goals.” For Gurstein, effective use is a highly contextualized assessment of the extent to which information technologies are designed in such a way as to enable users to achieve their own immediate productive goals—inquiry, writing, video, whatever.

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W. Michele Simmons

W. Michele Simmons is an assistant professor in the English department at Miami University of Ohio. Her research interests include examining the ways in which citizens participate in environmental decision making. Her most current work focuses on how to understand and enable the literacy practices necessary to use civic websites.

Jeffrey T. Grabill

Jeffrey T. Grabill is an associate professor of rhetoric and professional writing and co-director of the Writing in Digital Environments (WIDE) Research Center at Michigan State University. His research focuses on how to communicate with diverse audiences with respect to technical and scientific issues. His current work focuses on how to understand and support the inventional work by/within communities.