

**Leading the Future of the Public Sector: The Third Transatlantic Dialogue**  
**University of Delaware, Newark, Delaware, USA**

**May 31–June 2, 2007**

**Workshop 5: Leadership and the New Public Management**

# **Active and Passive Leadership in Virtual Collaboration Networks**

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**ABSTRACT:** The tasks of leadership in large, multi-divisional organizations have always been complex, but new computer-mediated technologies for communication and information sharing offer promise to improve internal coordination and collaboration. Organization-wide platforms such as intranets and portals as well as personalized communication channels such as email, blogs and wikis are touted as making important contributions to managing and self-organizing. But what are the roles for leaders in initiating these new technologies and maintaining or adapting them over time? How do leader roles in creating platform technologies differ from those for personalized channel communications? By comparing results of interviews in 2002 and 2007 at the U.S. Environmental Protection Agency we see the evolution of computer-based communication and information sharing technologies and the differences in effective leadership roles and styles over time and across technologies.

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<sup>1</sup> Professor Regan is currently serving as a Program Director in the Science and Society Program at the National Science Foundation (NSF) and the research for this paper was supported during her time at the NSF. The views expressed in this paper are those of the authors and not those of the National Science Foundation.

## Introduction

Over the past decade we have seen an upsurge of computer-mediated tools for communication, collaboration and information sharing in organizations in every sector. Intranets, now a feature of virtually all large organizations, make it possible to disseminate an array of important information such as agency news, services, libraries of procedures and regulations, and widely used data sets. Email and common word processing platforms make it possible to communicate and share documents asynchronously, an asset in large multidivisional and geographically dispersed organizations. More recently, other communication platforms such as Instant Messaging and chatrooms have appeared in organizations to foster often informal information sharing and communication. Monitored and unmonitored chatrooms, for example, offer a site for organization members to share ideas, register complaints, and solve problems, and their advent was greeted with high expectations in the public sector (Mahler and Regan, 2002). Blogging, a more recent internet feature, may be supported by intranet platforms or practiced by stealth as a way to discuss obstacles, explore problem interpretations and generate virtual “Communities of Practice (Snyder, Wenger and Briggs, 2003-4). Joint-authoring technologies such as wikis may be formally or informally instituted to encourage collaborative work, especially in organizations devoted to knowledge work (McAfee, 2006). These tools too show great promise for allowing members of widely distributed organizations to work together on documents and projects.

In this paper, we explore two related aspects of the emergence and use of these tools in one federal agency. First we examine the evolution of computer-mediated tools for communication, collaboration and information sharing over a roughly 10 year period, with particular attention at two data points 2002 and 2007. Here we are interested in determining which technologies are being used, for what purposes, and with what success. More specifically we are focused on the use of computer-mediated tools for collaboration within the organization. Second, and of more interest for this workshop, we analyze the implications of these changes on leadership. We do not know much about the implication of these new technologies on leadership in organizations. These new technologies certainly raise issues about the organization and direction of work. If the technologies facilitate decentralized networks and self-designing work groups, how are the roles of organization leaders and managers affected? What role do leaders play in creating and extending these new technologies and how are the skills of successful leadership challenged and altered? How does effective leadership in this environment differ from what we see in more hierarchical traditional settings? Research in private sector organizations suggests that leaders in these new technology settings must resist the temptation to silence dissent and act instead as coaches and reporters. Do leaders in the public sector foster self-organizing? Or do they become monitors and evaluators? Under what conditions? These are some of the issues we seek to address. What does successful leadership look like in these organizations and how does it change as the technologies mature?

The federal agency we examine is the Environmental Protection Agency (EPA) which we have selected for several reasons. It is a large, multi-divisional and dispersed governmental organization where face-to-face communication is difficult and costly. In particular, in synthesized and still stove-piped organizations such as EPA, the newest forms of computer

mediated chat and authoring may help overcome cultural, geographic, and intergovernmental differences by providing a common and neutral space for communicating and sharing information. Also, because of an earlier study, we also have an opportunity with the EPA case to compare the development of these computer-mediated communication technologies and the leadership changes that accompany them at two points in time, 2002 and 2007.

### **The Problem of Intra-organization Coordination and Collaboration**

The integration and coordination of work in an organization is a core purpose of management, but this task is made difficult in any organization by the diffuse imperatives of its environment and the internal goals and technologies that mark the organization's divisions, departments and offices. Much of what we think of as leadership is devoted to efforts to solve these problems. Coordination imposes costs on the cooperating units as each reconfigures routines, task descriptions and resource distributions to accommodate the procedures and needs of other offices. For example, data sharing, an apparently simple and efficient operation, typically requires agencies to change or add to data collection routines and may require them to undertake costly updates of incompatible or legacy data storage and analysis systems.

Much of the current thinking about these issues looks to decentralized and often information and lateral coordination rather than to a hierarchical and more traditional role for leaders. Trust and social cohesion are often identified as factors that affect the likelihood of collaboration. Pardoe, Gil-Garcia and Burke (2007), examining agreements to cope with West Nile Virus and with criminal justice investigations, found that trust was critical to fostering collaborative action. Trust depended heavily on the actions of network leaders in negotiating agreements on governance structures, and in exhibiting respect and understanding of the needs of other collaboration partners for flexibility in dealing with their own constituents. Reagans and McEvily (2003) found that transfer of knowledge and information sharing is fostered by social cohesion within organizations and by the size and diversity of the linkages for information sharing. Cohesion affects the motivation and willingness of organization members to invest the time and effort needed to share information. The structure of the network of actors and offices and the inclusion of diverse knowledge pools was found to increase the complexity of the knowledge transfer. However, working against this tendency, the absorptive capacity of the organization, or the degree to which the information to be shared is based on common knowledge or assumptions, also eases communication and willingness to share information.

Several articles emphasize the importance of self-organizing in forging workable collaboration linkages. Snyder, Wenger and Briggs (2003-2004) argue that hierarchical centralized management tools are inadequate for problem solving and intelligence sharing characteristics of agencies such as DHS. Dealing with that complex organizational setting requires opportunities for collaborative learning provided by the forums known as "communities of practice." These communities are networks that feature "peer-to-peer collaborative activities to build member skills and steward the knowledge assets of organizations and society" (17). Snyder et al offer a number of examples of such communities across organizational and intergovernmental lines. For example, they describe the SafeCities initiative that brought together managers from federal

agencies, mayor's offices, law enforcement agencies, citizens courts, schools and religious leaders using teleconferences, listservs, and face-to-face meetings. This approach defines networks by their flexibility and constant adaptation to results and changing conditions in order to generate knowledge about how to accomplish organizational purposes.

For the synthesized and still stove-piped agencies in which we are interested, however, trust, cohesion and common knowledge backgrounds are typically absent. In these, coordination problems are magnified by the great differences in history, mission, culture, legislation and resource base that characterize the divisions and offices within them. Differences in working program assumptions, disciplinary based knowledge, and the distrust and competition often seen in multi-divisional organizations all work against collaboration and sharing. Whatever their origins, the problem of achieving internal integration and task coordination is daunting and has implications for the capacity of the organization to collaborate in ways that reflect the best intelligence of their workforce. It may, in fact, make more sense to treat coordination and collaboration in these organizations conceptually as an inter-organizational rather than intra-organizational undertaking. The data we have collected would seem to confirm this as most virtual collaboration networks exist at the program or bureau level and work across units at that level.

Viewed from this perspective, a number of insights from inter-agency and network relations shed light on the coordination problems in these multi-divisional organizations. Chisholm, examining coordination in multi-modal transit agencies, found the most reliable and effective coordination efforts were managed laterally, based on mutually beneficial advantage from exchange of factors and assistance rather than through a hierarchical or umbrella structure. Bardach, (1998) in his analysis of comparative case-study analysis of success in collaborative policy implementation, found that non-hierarchical management solutions featuring flexibility and discretion, understanding and trust among participants, and recognition of the possibilities of economic exchange were important in achieving success. The ability of a leader to create a consensus by articulating a vision, rallying motivation behind it, and identifying a clear path to achieving goals was essential. In contrast, however, Milward and Provan, (1995) found that the most effective network structure for providing effective and coordinated client outcomes was a monopoly provider, vertically integrated and hierarchically structured.

### **Contributions of Computer Mediated Communication and Information Sharing**

We next consider 1) how computer-mediated communication and information sharing tools can ease the creation of useful lateral linkages in the difficult multi-divisional settings we see in agencies such as EPA, and 2) what roles there are for leaders in creating, developing and encouraging the evolution of these virtual associations. Several recent studies suggest that the creation of virtual organizational networks may allow like-minded members working on similar problems to find each other and work together. This may offer a way to overcome the geographic and disciplinary fragmentation and lack of cohesion characteristic of some of the large, complex governmental organizations we are interested in. Dawes and Prefontaine (2003) conducted research on collaborative projects supported by advanced IT including geographic information data-sharing, e-filing for taxes, and public-private partnerships to launch jobs

portals. They found that successful collaborative projects were characterized by trial and error experimentation, feedback, and learning. The results of these interactions were seen to directly affect the levels of trust and the level of success in the projects. But behind these organizational processes, the availability, adaptability and affordability of information technology resources and choices had consistently important effects on the participants and the results.

Fedorowicz, Gogan and Williams (2006) offer lessons from research on a set of e-government collaborations and recognize the impediments created by incompatible information systems and mixed motives for cooperation. The issues that were overcome to achieve collaboration are instructive for large, complex organizations such as EPA. Problems of resource competition, unified leadership, motivation, and legacy systems were encountered and usually overcome in these successful cases. Based on their analysis of five cases, they report some of the lessons learned about creating and maintaining these collaborative initiatives. First, gaining a critical mass of supporters and participants was a lengthy process, requiring political skill and negotiation to overcome the constraints and differing priorities of participants. Accomplishing these things in large, multi-organizational networks required not just one but many effective “Champions.” (23) Second, administrative challenges included accommodating differences in readiness of participants to make the changes needed to achieve collaborative work or information sharing and recognizing the need to make the project financially attractive to participants so that the value of collaboration for the organization is seen to exceed costs. Finally, technical factors affected the success of the collaborations. Fedorowicz, Gogan and Williams found that in such information based collaborations, agreements to permit the originators of information to share their data rather than cede possession to a central authority avoided problems of ownership and control as well as increasing the accuracy and timeliness of the data. Legacy data systems and incompatible formats limited the effectiveness of collaboration efforts, and efforts to create new data standards were effective when organizations were allowed full participation.

McAfee considers the tools that members can use to share not just data, but to create and share ideas and project writing and results. He argues that while emails generate information overload, other new technologies such as blogs and joint authoring tools such as wikis are well suited to the demands of collaborative knowledge work. He distinguishes between technologies that offer platforms to access existing information and channels like email and IM, that offer a place to write and share ideas but are not available to all who potentially may be engaged in the issues in other part of the organization. In addition, he reports that many in information intensive organizations feel overwhelmed by the volume of email traffic. Intranets, Internets and information portals are platforms that reach all who may be interested but do not allow creative personalized messages. The capacity to author proposals and to observe the exchange of ideas online is, however, a significant advance offered by newer blogs and web-authoring tools. Blogs are online conversations in which the posted comments are cumulative and can be observed by all who enter the site. On wikis, authors can work jointly on a document and can revise each other’s work. . McAfee argues, “When authoring tools are deployed and used within a company, the intranet platform shifts from being the creation of a few to being the constantly updated, interlinked work of many. Evidence from Wikipedia shows that group authorship can lead to convergent, high-quality content.” (2006, 24).

There is also some experience with these technologies in the public sector. In Chicago, blogs have been used to communicate directly with citizens complaining about transit cutbacks and wikis have found a place in communicating with citizens for disaster response. In both cases, communication with citizens was direct, with uth the intervention of the press or government webmasters. They offer advantages over e-mail efforts as well. “E-mails have to be sent, forwarded and continually passed along to the right people and e-mail addresses have to be known. Wikis, on the other hand, mobilize and bring together a "mini-governance structure" so people can reach agreement and work together.” (Perlman, 2006)

But these tools also change leader roles. Management decisions to adopt and support the technologies and even to act as exemplars in using the technologies were essential in getting staff to explore them as well. In the case McAfee reports, early successful use was also linked to management’s initial decision to support only one Wiki application and server so that users would be able to communicate across divisions. Yet designers also were passive in specifying how the new ITCs were to be used. He notes, “the technologists of Enterprise 2.0 are trying hard not to impose on users any preconceived notions about how work should proceed or how output should be categorized or structured. Instead, they’re building tools that let these aspects of knowledge work emerge.” (p 25). In addition, because the technologies are used and controlled by users, criticism and complaints are to be expected, and may trigger overt or covert management pressure or reprisals. If the value of the technologies for lateral collaboration is to be realized, however, then managers must make judgments about when to exhibit self-restraint and when or if to intervene.

Thus the role that leaders play in initiating these new technologies and supporting virtual collaboration is complex and may change over time. Initially, financial and architectural decisions are in management’s hand, but later, the role of management changes to a more passive one. “If they fail at either of these roles — if they’re too light at first or too heavy later on — their company is liable to wind up with only a few online newsletters and whiteboards, used for prosaic purposes.” (McAfee, 28) In the early iterations of computer-mediated collaboration, the highest levels of management need to provide focus and financial support, and to integrate the collaborative space into the mission of the agency. But over time, the higher management levels need to step back and let the network actors take over. March offers analogous advice when he defends the “technology of foolishness” and suggests that Garbage Can decision making can lead us to explore options that would never come up if we limit ourselves to considering only widely accepted or carefully researched alternatives.

If we compare the leadership roles in the earlier, more centralized computer-mediated technological projects, such as portals and intranets, with leadership roles in projects involving decentralized technologies, such as blogs and wikis, we can hypothesize a range of roles for leaders. We believe that the roles of leaders will vary along two dimensions. The first involves the type of technology project; drawing from McAfee, we distinguish between platform technologies, involving more centralized development, and channel technologies, involving more decentralized development. The second dimension concerns whether the leader is acting during the initial development of the technology project or during the maturation. We expect four

leader roles and styles to emerge: champion, supportive, participative, and delegative. These are explicated in Table I below.

**Table I**  
**Hypothesized Leader Roles and Styles**

<b>Type of Technology</b>		
<b>Stage of development</b>	Platform Technologies	Channel Technologies
Initial Effort	<ul style="list-style-type: none"> <li>- Generate vision or environment conducive to development of ideas</li> <li>- Support with resources and policy</li> <li>- Foster use and provide incentives</li> </ul> <p style="text-align: center;"><b>Champion Style</b></p>	<ul style="list-style-type: none"> <li>-Enable innovations to occur -</li> <li>Invest with resources</li> <li>-Model desired uses of technology</li> <li>- Ignore creative but potentially controversial uses</li> <li>- Foster trust</li> </ul> <p style="text-align: center;"><b>Supportive style</b></p>
Mature Technologies	<ul style="list-style-type: none"> <li>- Adapt, learn, reform</li> <li>- Legitimate</li> <li>- Invest in the next generation</li> </ul> <p style="text-align: center;"><b>Learning Style</b></p>	<ul style="list-style-type: none"> <li>- Stand back</li> <li>- Provide environment and incentives for experimenting</li> <li>- Light-handed monitoring</li> </ul> <p style="text-align: center;"><b>Delegative Style</b></p>

**Methods**

For purposes of this paper, we draw upon our prior work, conducted during 2001-2002 (Mahler and Regan 2002 and Mahler and Regan 2003), and current interviews in 2007 (Mahler and Regan 2007) to investigate the evolution of computer-mediated tools in EPA. This work allows us to compare EPA activities in these two time periods, focusing both on which technologies are being used, for what purposes, and with what success and also on what role leadership has played in the development of these technologies. In effect, this gives us a longitudinal case study of EPA.

During both time periods, our research proceeded in three steps:

- First, we began with an analysis of the agency website to ascertain what e-government activities were currently occurring with the agency, what electronic information sharing activities could be gleaned from a review of available online activities, and who appeared to be the key people involved in these activities. We began our searches with the chief information office in each agency but in both cases quickly branched out into other areas of the agency.
- Second we searched GAO reports to identify online collaborative activities that the GAO had mentioned in its review of each agency's activities.
- Finally, we conducted a number of quite detailed interviews with EPA personnel involved in the development, support, and use of online collaborative tools. These included staff in IT positions, in general management, in public affairs, and in programs. At the end of each interview we asked to whom else in the agency we should speak.

In our first set of interviews, the focus was very much on the development and use of the EPA Intranet. In the second set of interviews, we posed questions about: current use of computer mediated communication and information sharing technologies; examples of centralized, data-sharing platforms; forms of decentralized, informal, and lateral communication and joint-authoring tools; use levels and patterns for each; and evidence that these technologies are contributing in concrete ways to efforts to coordinate and integrate work in large, multi-divisional governmental organizations. In both set of interviews, issues of leadership and management were major areas of discussion.

## **Results**

We have been able to compare the management's views on the uses of these technologies in EPA at two points in time, in 2002 and in 2007. The results are sobering and indicate the incremental character of technology adoption and use. On the other hand we do see a steady trajectory of applications as technologies are simplified. We also see interesting similarities and contrasts in management tactics and roles between the public and private sectors. Finally, we can identify interesting developments in managerial expectations and tactics for spreading the use of collaborative technologies.

### *2002 Findings*

In 2002, the prime emphasis on the use of communication and data sharing technologies within EPA was on the agency's new intranet and the collaborative tools it supported. The idea behind the Intranet, called EPA@Work, was to put information that is important to EPA employees at their fingertips: "multiple sources of information to help EPA employees effectively do their jobs are just a click away." (Mahler and Regan, 2002). The first EPA Intranet resulted from the realization that other agencies were doing Intranets and that there would be value from an EPA Intranet. A team of three, operating from the Office of Information Resources and Management but with support from the top of the agency, developed the prototypes of the Intranet and its

initial agency-wide deployment in January 1998. The members of the team all had some computer and technical background but were basically interested in information applications. In developing applications, team members interviewed managers of various programs to identify areas where the Intranet might offer new opportunities. The Intranet did not have a separate budget; instead funding came from the Internet budget.

In 2002, about 70 percent of the [EPA@Work](#) was designed to enhance access to facilities including activities such as cleaning, copying, and parking. One function that employees consistently found valuable and that was regularly used was the “EPA locator” by which staff could find contact information for other employees and contractors. This function was prominent on all iterations of [EPA@Work](#). Another function that was popular involved forms and information on travel. Forms could be downloaded and printed, but could not yet be completed and submitted online.

The 2002 EPA Intranet also offered the capability of creating online work groups, chat rooms, and collaboration through its license for Lotus Notes and Lotus Notes Mail. It was hoped that these technologies would spur real cooperative projects and problem solving. Members might join a chat room to comment or even just to complain, but over time solutions and projects might emerge. However, these more interactive functions were not yet being used widely in the agency because of training requirements, firewalls, and the expense. We found that the EPA used formal group collaboration software that required some training, and although this seems like a small impediment, participants seemed to be reluctant to confront this hurdle to explore what was only a potentially useful collaborative opportunity. We found staff were disinclined to use even labor saving work applications if the software is unfamiliar and required an investment in training (Mahler and Regan, 2002). The Intranet team had demonstrated the People Soft Portal, which they hoped would allow customization and more collaboration and flexibility. There was an expectation that this might constitute the next iteration of [EPA@Work](#).

### *Discussion of 2002 Findings*

Four findings from our 2002 research help uncover the evolution of leader roles in the early stages of computer-mediated collaboration. First, the early development of the agency’s Intranet were not directed by technical staff, but rather were led by administrative staff and program managers. This ensured that decisions were made based on what employees were likely to have wanted and the functions that were important to the agency as a whole. If decisions are driven by what is technically possible or innovative, then employees will need to readjust their work habits to suit the new technology. To be utilized and functional to the agency and staff, our EPA informants indicated, the Intranet technology should accommodate the needs and conventions of the employees and organization. Moreover, if the technology drives Intranet development that development will be constrained by what is technically possible and easy at that time. If management and staff needs drive development, new technical features may be created. Managers can challenge technical people to find appropriate solutions that may not be available with current technologies.

Second, we found that upper management support for and interest in the agency's Intranet is especially critical in the initial planning for and launching of the Intranet. Without such interest and support, an agency-wide Intranet would not have developed. In 2002 we found that management, though supportive in principle, was slow to actively encourage employees to use the Intranet. Nor did management act to limit availability of information only to the Intranet. After three years of having an EPA Intranet, many employees were still not aware that there was an EPA headquarters Intranet. The Intranet team had worked with an Advisory Council and had the support at the branch level but we concluded would have benefited from earlier support higher up in the EPA.

Third, we found that marketing of the Intranet to employees was critical throughout all the early stages of development and deployment. At various points, Intranet Weeks were held when the Intranet team did a "dog and pony" show to illustrate the benefits and capabilities of the Intranet. Although attendance tended to be low at such events, the Intranet team found these to be an important way of publicizing the Intranet. The EPA Intranet team believed that it was important to expand the Intranet as the technology became available to do more on it. The team tended to develop its own software and not be constrained by what was available "off the shelf." Money was a constraint and affected what the team was able to develop; for example, portal technologies were too expensive.

The issue of trust and modeling of the use of the interactive online tools was also important to early adoption. Resistance to the use of collaborative functions appeared to be based on the unwillingness of staff to undertake the training needed to use these relatively cumbersome online tools, but there were also concerns about privacy and the possibility of reprisals for unauthorized content. Even the promise, not as it turns out fulfilled, that at least some chat rooms would be unmonitored, appeared to assuage these fears.

Fourth, the EPA agency-wide Intranet co-existed with other Intranets at the division, program and regional or field office level. Management saw this as creating a need for an organization-wide internal, closed website for the organization as a whole. It was also evidence of the infrastructure available for the development of networks at lower levels within the EPA and for places where leadership for online applications could emerge at those levels. In 2002, it appeared that most of the online work within the EPA occurred in the smaller units, and those Intranets were more valuable to staff on a day-to-day basis.

### *2007 Findings*

In 2007, we see the emergence of what McAfee calls both channels and platforms for computer mediated communication and collaboration. We first consider the development of channels.

Channels for individual communication include first email, and our interviewees agree that most computer mediated communication, collaboration and information sharing occurs via email. Everyone in the agency is familiar and comfortable using email, understands its limitations, and can easily access it from their offices or remotely. Email provides the simplest means of staying in touch with colleagues on quick details associated with collaboration, organizing workflow,

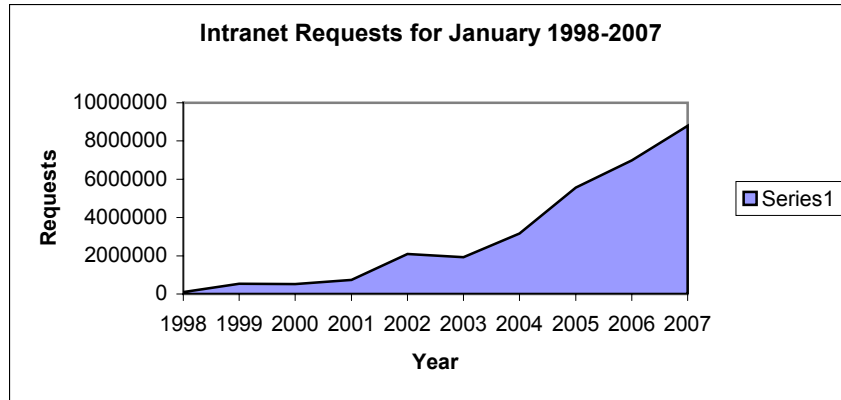
and remaining up-to-date with communications, approvals, and document updates. However, managers also report being inundated with email. Additionally, our interviewees noted that while listservs were also being used for some collaboration, email was easier, quicker, and more targeted. It was observed that one of the problems with listservs was that one could be barraged with the number of responses and that not all were likely to be relevant or important. Overload is apparently a universal problem.

Our agency informants also believed that upwards of about a quarter of agency personnel were using instant messaging (IM'ing) as a way to quickly communicate; however they believed that this was being used to replace phone calls or as a sidebar to a voice conference call rather than as a collaborative tool.

Agency staff are all adept at attaching documents to emails and most are accustomed to using co-authoring functions, such as track changes in Microsoft Word. Older, commercial joint authoring software, such as Lotus Notes, is available to EPA staff, but not often used because it is viewed as excessively awkward and needing training. However, email attachments have their own limitations, one primary one being that huge documents are difficult to download and take up space in email transmission and storage systems. There are also document management systems that are designed to address these problems and facilitate online collaboration. For example, shared drives permit a number of people to access documents and to edit or update those documents. However, individuals need to be on the same server to access the documents which complicates collaboration with officials in regional offices. In addition, remote access to these servers is difficult.

The EPA-wide Intranet was a platform originally designed with a chat-room feature, to serve as an open-collaborative space where individuals across the organizations with common concerns could identify each other and work on solutions (Mahler and Regan, 2002). Much was hoped for from this feature when it was launched, but in general administrators have been somewhat disappointed in the response. One of our interviewees noted that the intranet site has become "static" but costly. It should be noted however, that despite the concerns of designers, the number of requests and the number of sites linked through the intranet have risen rapidly since 2003. (See Figure I below)

**Figure I**  
**EPA Intranet Requests**



The Intranet site provides access to Lotus Notes and Quick Place, a meeting function. Like Lotus Notes, however, Quick-Place is seen to be overly complex and not user-friendly and consequently is not much used. Instead, a popular interactive technology with capacity for joint authoring is the commercial application, “Go-to-Meeting.com.” This application is not supported by the agency intranet, but several of the offices we visited were subscribing to the user-friendly technology. It reportedly does not require nearly as much training as the supported virtual meeting application. One user reported keeping the application open all day to carry on complex conversations with colleagues near and far and to share files for discussion.

In terms of other recent computer mediated communication and information sharing innovations, our headquarters informants have not seen the use of blogs. They believed that staff would be hesitant to use them, and they themselves were not convinced that the technology would actually be useful for collaboration. Blogs would more likely be used for comments by individuals on issues of common concern. Another respondent characterized blogs as “open journals.” Similarly, they were not aware of the use of chatrooms for collaboration but thought they were being used instead for answering direct questions.

Most did, however, believe that in a decentralized agency such as EPA there were likely to be wiki applications. They could see value in them as a tool for online collaboration, although they did not believe that their use had been fully explored yet within the agency. In our visits to EPA, we did indeed see evidence that wikis were being used by some workgroups, especially among those working on data and internet applications. One EPA staff member, a sophisticated user of online applications, characterized wikis as a searchable repository of comments, drafts, and papers, like a “communal closet.” And like a closet, when the contents grow, organizing material becomes difficult and takes on the complexity of other large information platforms.

There is an Oracle wiki program that is available from the EPA Intranet; however, it is not simple to either use or to install. It appears that some are using other easier and more flexible wiki-type applications that are not supported by the agency. Such “rogue sites” allow for experimentation with different programs and groups of people. These trial wiki applications are revealing valuable insights into the optimal size for a wiki, the best way to organize the material on wikis, and the best way to manage the evolution of a wiki. But because the agency supported

applications are seen as cumbersome, informal personal trials with alternative kinds of software are emerging quietly and informally.

We were interested in determining the degree of management support and modeling of use for these applications. What support there is for blogs and wikis seems to be coming from mid-level managers in the Office of Environmental Information. But we did not hear reports of strong upper-level institutional support for either of these kinds of channels now. Funding for these initiatives is scarce, and EPA managers are not seeking out new projects, but rather trying to consolidate progress with the existing portal project and the new Environmental Science Connector. One manager who had been using joint authoring tools like wikis with a work group reported that there were few in the agency who were interested in these tools. His efforts to model their use with subordinates have had only mixed results. Collaboration is not easily gained regardless of the ease of communicating complex information. “We are lowering the barriers to good communication, but that does not mean good communication will result,” noted this manager. The issue appears less to be one of trust or concern for official disapproval than the learning curve for the new applications and inertia about using new technologies. For example, despite the relative popularity of the Go-to-Meeting software, it is only used by a few score agency members.

EPA has also created, and continues to experiment with, online platforms for disseminating data and agency information. Directly or indirectly, however, they also provide opportunities and resources for collaboration among working groups. Several platforms are in various stages of development, use, or decline. The EPA Intranet has a link on its homepage to “Realtime Collaboration.” One iteration of an online collaboration space was part of an effort to design a shared or common environmental data repository termed “Enterprise Portal.” This space was championed by a former Chief Information Officer who could see the potential of and need for such an online space, but creators were less clear about specifically how to make it valuable to potential users. As a result, anything that could conceivably be beneficial was put up on the Enterprise Portal, rendering it less useful than might have been the case if it had been more targeted. In additions, because of system architecture it requires high levels of expertise to add or update the online information, adding to the expense and difficulty of maintaining the site. One of the features on the Enterprise Portal was a space that was used by the Office of Air and Radiation and the Research Office to provide for easier collaboration on the permit process. In designing this space, users were asked about what data sets they looked at everyday and designers then tried to populate the portal with the information that was used most frequently. However, access to data became a problem as there was no single sign-on and different security protocols complicated collaboration. Additionally, the idea behind the Enterprise Portal was primarily to make the individual’s job easier rather than to facilitate real collaborative work As a result, the Enterprise Portal turned into a static tool rather than a collaborative space.

A second generation of this project from which much is now expected is the Environmental Science Connector. This platform is an example of an effort to overcome long-embedded incompatibilities in the data of some of the divisions within the agency to create a platform that features “deep integration” of data along with several collaborative tools. The Environmental Science Connector has a universal tool bar with links to instant messaging, instant meeting,

Lotus Notes, blogs and wikis. This is used as a shared “workbench” where people can work on documents, discuss priorities, solve problems, and designate who will do what next. The Connector also offers an “instant meetings” function which allows agency staff to go immediately to a shared space for a meeting; this is generally done so that they can look at a document simultaneously and share control of the cursor. The connector has some advantages over the Enterprise Portal that may make it more successful. First, the Connector has a more defined audience, and so designers have a better idea of what kinds of information will be useful. For example, it provides information for the Office of Research and Development, with about 3000 members, and its Environmental Information Management System, which posts research updates in specific areas with links to the public access internet. Currently there are 6 or 8 scientist groups reporting peer reviews on the Connector. Thus it can be customized to provide access to shared documents to a specific community of practitioners, such the Geospacial team. In addition, the administrative processes are standardized for the groups using the Connector, and it uses a single budget system making it easier to fund and manage.

The manager of this project is making a low-key launch of the new platform, demonstrating it to user groups at Headquarters and in the regional offices. As of February 2007 this was still in the pilot stage, with the formal launch this spring. Different work groups are invited to sign on to try out the space. Site designers are evaluating how people use that site and what was needed to store and share documents on which staff were collaborating. The project is a product of Office of Environmental Information, a liaison office established to foster collaboration across the agency and to help resolve issues of data ownership and responsibility for the approval of data use. The new data sharing function is the result of a great deal of investigation by Office of Environmental Information to determine needs and uses of data across the offices of the agency which has traditionally been characterized as fragmented and stove-piped especially with regard to data systems. When complete the system should allow search for data on toxic substances across media such as air, water, or food.

### *Discussion of 2007 Findings*

Four findings from our 2007 research are relevant to the discussion of leadership in the early and later stages of computer-mediated collaboration.

First, as is true in most areas of e-government, leadership support for major new initiatives is critical to their success. To spur the major investments in complex information sharing platforms requires an agency champion to support the budgetary investments needed and to model their use so that they become accepted, legitimated, and institutionalized. Even when the new initiatives are championed in this way, however, the path to acceptance is long. Of the technologies adopted when we first interviewed in the agency five year ago, such as the intranet, several are just now getting heavy use even as the agency is moving on to more advanced platforms.

Second, the more interesting and advanced online collaborations that we identified are occurring in relatively small groups that initiated the online activities on their own in order to more efficiently and effectively conduct their work. These were very much bottom up activities that

were begun at the initiation of one or two individuals who are technologically savvy and very comfortable in the online environment. Much of the real innovation in computer mediated communication and collaboration begins very informally with individuals who are at ease with the technologies and take the lead in initiating similar uses in the workplace. In addition, much of the collaboration at this point was occurring within technical teams and offices rather than across divisions. And it may well be the case that online collaboration occurs more easily in such a small unit because the necessary trust, common leadership, shared expertise and intellectual concerns is most often found there. Further, if the sub-units of a large department are relatively autonomous in their work, then online collaboration need not extend outside the existing stovepipe. This is not to denigrate the value that online collaboration can bring to a small unit.

Third, we found it interesting that the support of top management to create the software and hardware resources for these experiments with collaboration did not seem to be as important in channel technologies as it was for the platform technologies. In many cases the programs for collaboration via channel technologies that are provided by the agency were not used because of the lack of user-friendliness, their inflexibility, or their steep learning curve. The likelihood staff will use these technologies, especially the new channel technologies, is also very dependent upon the ease of use. Cumbersome technologies with significant training requirements and elaborate log-on and password requirements are less likely to be used. In addition, top agency leadership appear uninterested for the most part in these channel technologies, leaving some discretion for lower levels of management and program staff to experiment with their own applications and uses. The role of top leadership is different in the major platform projects such as the Enterprise Portal, however. Here the effort to purchase and fund the platform design and overcome the inter-divisional differences can apparently only come from a central authority.

Finally, we see that online collaboration, with both channels and platforms, is more likely to be used under circumstances where there exist trust among the participants, shared leadership, and common expertise and intellectual concerns, and a similar worldview or data expectations. The Environmental Science Connector illustrates this pattern. Trust was an important issue in the channel technologies, earlier with concerns about reprisals for content in chat rooms and more recently with regard to the creation of informal, unauthorized sites for collaborative work. Room to experimentation appears to be important for the development of informal collaboration technologies, but this may be a product either of a purposeful policy or of “benign neglect.”

## **Conclusions**

In comparing EPA’s development and deployment of computer-mediated collaborative tools in 2002 and 2007, we find some support for our expectations about leader roles in virtual collaboration networks. In dealing with platform technologies upper level leader support and more formal bases of authority for budgets and new program requirements are critical to the initial effort. The EPA Intranet would not have been developed without support from the top; an agency-wide intranet is inconceivable without such support. This type of leadership is necessary but, as we saw, not sufficient. Leadership alone will not insure that the Intranet will be used. Hence, we see the value of marketing and in effect selling it to potential users, but also the importance of a platform design that is focused on a specific community of users. So the

leadership characterization of “champion” does indeed capture the style and orientation that is required, but other elements are important as well.

In platform technologies at a more mature stage, in this case 2007, we found that top-down development of the Intranet had loosened and middle-managers were playing a larger role. Indeed the top level seems to be rethinking the value of agency-wide portal or gateway technologies which are expensive, require unnecessary standardization and sophisticated programming, and entail large staffs to manage them and impose heavy training requirements on all staff. At this stage a more open, exploratory leadership role is critical and the adaptive posture of “learning” seems appropriate. “Simple” rather than “complex” is an asset both from a management and from a user perspective. We see this with the current pilot development of the Environmental Science Connector which requires top-level support, of course, but envisions a more targeted information sharing platform for defined audiences. In this model, mid-level information technology managers take on more of the role of champion for designing and supporting the system.

For channel technologies during the initial effort, the key leadership role seems to be to enable but ignore. It appears from our cases that channel technologies do not develop top-down and that top-down resources for such collaboration generally were not conceived and designed in ways that are actually useful. Almost all of the collaborative tools on the EPA Intranet have been ineffective and agency staff who are interested have mostly experimented in developing their own. In our discussions with these actors, we saw the importance of personal interactions, styles and skills, adaptability and flexibility, as well as commitment to a shared vision. These are characteristics of what Schneider (2002) terms the “stakeholder model of organizational leadership,” and what Gibbons (1992) identifies as the important contingencies for leadership.

Although it is difficult to talk about “mature” channel technologies, we do believe that if upper-level management tried to impose standards or restrictions on the use of blogs, wikis, and other collaborative experiments, the result would be to retard the development of their potentially enormous benefits. A “delegative” or passive leadership role that permits discretion will be more conducive to the evolution of mature technologies. Turning a blind eye on unauthorized experiments with legitimate if unconventional means and ends seems by default to be taking place in our case. Such a role is somewhat at odds with more traditional management notions especially as these uses in some agencies may entail some information security risks.

In effect, we find here, as has been found before (O’Toole, 1997, and Eglene, Dawes and Schneider 2007) that networks and bureaucracy continue to coexist and interact. What our research helps to reveal is some of the points at which changes in the mode of interaction between bureaucracy and network occur. A particularly interesting point for further investigation is that of the initial effort of channel technologies where both traditional bureaucratic leadership roles and the newer network leadership roles both are critical. Interestingly, the two appear to work in parallel rather than interactively.

Our examination of the evolution of virtual collaboration in the EPA also illustrates the role that computer-mediated tools play in creating and possibly sustaining the development of networks in

the agency. The networks we saw most frequently were project-based, where there was a task or series of related tasks, that needed to be conducted or a particular problem that needed to be solved. (Smith-Doerr and Powell, 2005) In these cases, sharing of information was key to the project – and computer-mediated tools were seen as a means to efficiently and effectively share the workload. The management of organizations in which major work is conducted through such virtual collaborations such as blogs and wikis does have implications for leader roles. “Wiki technology has been shown to enable greater collaboration by freeing up groups from hierarchical and formal communication channels.” (Antonopoulos, 2006) As groups are freed from the hierarchical and formal control, the importance of network leadership skills will become more important. Traditional hierarchical leadership will become more passive, and contingency or stakeholder leadership will become more active.

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