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Evaluating Federal Websites:

Improving E-government for the People

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Introduction

E-government is a strategy for government to deliver services and information through technology to citizens, businesses, and to other governments. The portal Firstgov.gov[1] is a beginning effort for the federal government of the United States to put basic public services online such as tax forms and filing services, social security and unemployment benefits, and student grant applications.

E-government also extends to the state and local level. Pennsylvania, for example, is creating a portal that gives citizens instant access to government agency information and services, and Chicago is in the process of creating an online City Hall.[2] These E-services are a way for the government to better meet the needs of citizens, businesses and other government agencies and to respond in a more timely manner to user requests for information. Agency Web managers have seen Web page use increase steadily as people access more federal agency websites more often.

In his 2002 Presidential Memo on the Importance of E-government, President George W. Bush stated the administration's goal to make E-government more "citizen-centered, results-oriented and business-based" (White House, 2002). This business-modeled focus entails not only an increase in the number of services available online, but also an evaluation of current federal websites and services to better meet user needs. However, examining the quality of the services rendered online and evaluating agency websites is difficult. With 22,000 websites totaling more than 33 million web pages belonging to the federal government alone, the quantity of sites needing evaluation is daunting (Bednarz, 2002). In addition, evaluative methods are limited and funding for assessment of websites and services is not common (Robinson, 2002).

This chapter will address the need for evaluation of federal agency websites and what kinds of evaluation are especially useful for such an assessment. We will begin with a look at federal information policy that affects website development and will then give an overview of evaluation and website evaluation measures currently used for assessing the efficiency and effectiveness of online sites and services. Finally, we will discuss the importance of evaluation of federal agency websites and online services in furthering the goals of creating a fully inclusive E-democracy. A key theme of this chapter is the importance of ongoing evaluation of information technologies – such as federal websites – if such technology and applications are to meet user needs.

Federal Information Policy

Policy at any level directs the decisions and actions of organizations and individuals in those organizations. With federal policy, guidelines are set forth to structure the decision-making of governments and societies. As stated in the *Encyclopedia of Library and Information Science*,

> Society both affects and is affected by government information policies developed at the national and local level. Information policies in turn affect the degree to which people

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[1] *FirstGov: Your first click to the U.S. government*. Available: http://www.firstgov.gov
[2] *PA PowerPort*. Available: http://www.state.pa.us/; and *City of Chicago*. Available: http://www.cityofchicago.org/

have access to the expanding universe of traditional and electronic information. A nation's information policies provide a framework for how that country provides the information services and products. (McClure, 1999, p. 306)

Information policy, then, is the statement of a specific goal set by the federal government to regulate information-related activities—both in the government and in society. Policy statements can appear in legislation, guidelines, court decisions, presidential statements, agency circulars and other official statements.

Policy is essentially a socially agreeable way to solve problems. *Stakeholders*, the people affected by a social problem or *issue*, recognize that policies may be developed to deal with a particular social problem. Stakeholders often have conflicting value systems and have differing objectives in the resolution of an issue. Policy issues are usually the subject of ongoing debate and long-term discussion (McClure, 1999). Example issues related to E-government and online information resources and services that federal agencies need to consider include:

- Electronic records management;
- Information access;
- Intellectual property;
- Information security; and
- Information privacy.

Electronic records management policy instruments concern issues regarding the creation, maintenance, use, and disposal of federal records. Internet access policy instruments are concerned with ensuring the equitable access for U.S. citizens to electronic information contained on federal government websites. Intellectual property policy instruments include a wide variety of ownership rights in intangible products, such as copyrights, patents, trademarks, and trade secrets. Information security instruments concern risks to the ongoing operation of government computer systems, their integrity, and the protection of classified or confidential materials they contain. Information privacy instruments seek to protect personal information collected from agency website users.

The U.S. Office of Management and Budget

There is no single body of law that describes and coordinates federal information policy. Because of this decentralization, when multiple agency input is necessary for a complete solution but agency information cannot be shared because of discrepancies in data formatting or software compatibility, we have what are known as *stovepipe* information systems. This lack of coordination between agency information compatibility invariably gets in the way of efficient and effective E-government.

The Office of Management and Budget (OMB) reports directly to the President's office and is responsible for implementation and oversight of federal information policies. At the September 2002 Interagency Resources Management Conference (IRMCO), OMB official Mark Forman (2002), stated that the next step for the development of E-government would be "breakthrough performance," which is based on:

- A citizen-centered strategy;
- Concrete outcomes, measures, and statistics;
- Real time data collection;
- Cross-agency collaboration and partnerships;
- Simplifying services (three clicks to service); and
- Standardizing technology and eliminate stovepipe applications.

He also made clear that a goal of the administration is to effectively implement E-government in order to make the federal government "more responsive and cost-effective" (White House, 2002). This effort provides specific strategies and techniques to help agencies facilitate these goals and develop "breakthrough performance" in the delivery of E-government through federal websites.

Key Policies Affecting Federal Website Development and Management

Thus, it is through federal information policy that the legal and procedural framework in which government agencies make information and services available to the public is established. An information policy instrument "describes how information will be collected, managed, protected, accessed, disseminated, and used" (McClure, 1999, p. 307). Following is an introductory list of selected U.S. federal information policy instruments that affect the development and management of federal websites.

Electronic record management

- *Government Performance and Results Act of 1993*—Sets forth performance plans, goals, and measures for agency programs
- *Paperwork Reduction Act of 1995*—Makes federal agencies publicly accountable for reducing the burden of federal paperwork on the public
- *Electronic Freedom of Information Act of 1996*—Amends the Freedom of Information Act of 1967 to provide for public access to information in an electronic format
- *Government Paperwork Elimination Act of 1998*—Establishes that websites are to be interoperable and standardized across government

Information access

- *Section 508 of the Rehabilitation Act*—Sets forth that information technology that is acquired or produced by the federal government must be accessible to persons with disabilities
- *National Information Infrastructure (NII) Agenda for Action*—Marks government responsibility to make government information more easily and equitably accessible

Intellectual property

- *NII Copyright Protection Act of 1995*—Adapts copyright law to include digital and networked information
- *Digital Millennium Copyright Act of 1998*—Protects copyright in electronic media

Information security

- *Computer Security Act 1987*—Establishes standards and security guidelines for the protection of sensitive information in federal computer systems
- *Electronic Signatures in Global and National Commerce Act of 2000* (ESIGN)—Recognizes e-signatures as legal across the US

Information privacy

- *Privacy Act of 1974*—Establishes federal guidelines for the protection of personal information
- *Patriot Act of 2001*—Describes the rights of citizens to information privacy particularly with regard to criminal or financial records

This listing, though not comprehensive, offers a general sense of the range of existing federal policies relevant to the development, management, and evaluation of websites.

Federal information policy and agency website development occur in a dynamic environment. Stakeholder issues and technological changes affect information policy having rapid impact on established information policies and the creation of new ones. Federal agencies often must adjust their operations almost immediately. Policy tends to follow technology and practice. Sometimes the lag between policy and practice can be great, so that agencies must construct their own policies to rationalize practices before Congress enacts new laws.

Evaluation of federal websites and online services is the key to creating better regulations and to maintaining a high standard of E-government. The *Government Performance Results Act of 1993* mentioned above is one policy that focuses attention on the evaluation and accountability of federal agency information access and dissemination. Senator Lieberman's proposed *E-government Act of 2002* (S. 803) demonstrates ongoing attention to these federal electronic services. The Bush Administration has also signaled its support for these various E-government programs and assessments. The administration, in its 2002 budget, notes the importance of accountability and performance assessment of E-government initiatives – including federal websites.

Evaluation

Website evaluation is the use of research or investigative procedures to systematically determine the effectiveness of a web based information system on an ongoing basis. Evaluation plays a key role in organizational planning, monitoring website activities and services, and

modifying goals and objectives on an ongoing basis. This is "formative" evaluation. In contrast, "summative" evaluation determines the degree to which the website is meeting set goals and user needs. Figure 1 illustrates this dual role. On the left side of the diagram, information discovered as part of the evaluation process feeds back into goal setting and planning. Ongoing evaluation is a vital source of information for agencies' planning processes. For example, an evaluation of current website user satisfaction may reveal usability issues with the current page design or information architecture. Planners may choose to change or modify goals based upon newly discovered problems or the achievement of previously set goals.

Figure 1: Formative and Summative Evaluation
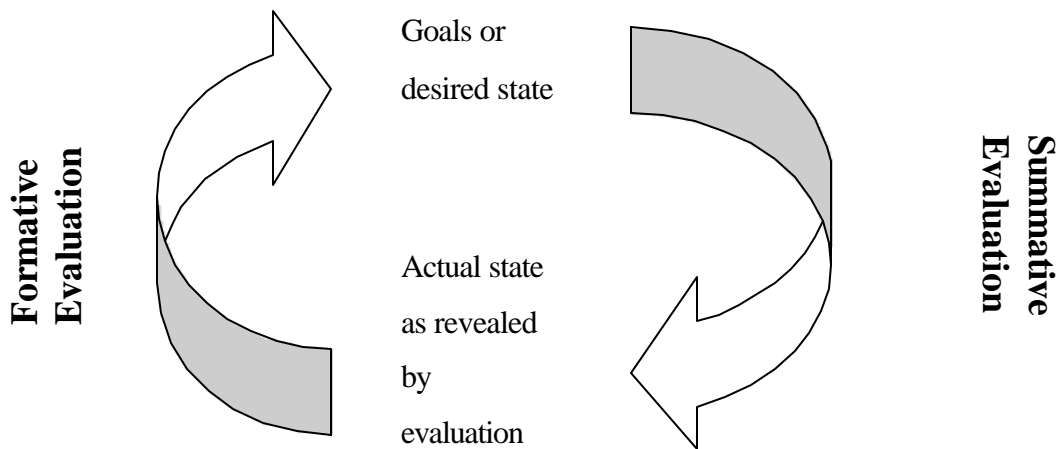
On the right side of the diagram, evaluation determines the degree to which the organization has met stated goals. Developing goals and objectives with no follow-up effort to determine how well those objectives were actually accomplished significantly reduces the overall value of both planning and the use of assessment techniques. Based on the previous evaluation, if the organization had created a goal to improve site usability, they would then use evaluation to determine the degree to which the site's usability had improved.

Both formative and summative evaluation efforts are important – although most organizations tend to concentrate on summative approaches. But for monitoring and ongoing improvement of services, formative evaluation (intended to improve, not prove) is essential.

Information Systems (IS) Evaluation

IS evaluation has become an increasingly important topic within the competitive U.S. business environment. Several factors have contributed to evaluation's growing importance. First, IS projects historically have had low success rates; some researchers have suggested they are as low as 30-40 percent (Willcocks & Margetts, 1994). Many organizations trying to restructure around E-commerce do not succeed, as success in E-business often has more to do

with relationships and organization than with IT. This increases pressure on managers to both justify their projects and show how their projects can and will succeed.

Second, vendors inundate mangers with dizzying hype surrounding new products and IT trends. Managers need evaluation tools to help them determine the actual usefulness of these products and trends for their organizations. Third, while organizations' budgets have generally increased allocations for IT, downsizing and streamlining demands require IT managers to show how increased IT spending is adding value to the organization. For examples of and resources about general IS evaluation guides see:

- The National Research Council report *More Than Screen Deep: Toward Every-Citizen Interfaces to the Nation's Information Infrastructure,* http://www.nap.edu/readingroom/books/screen
- *Performance-Based Management: Eight Steps to Developing and Using IT Measures Effectively* by the GSA Office of Governmentwide Policy, http://www.gsa.gov/attachments/GSA_PUBLICATIONS/extpub/pmfinal.doc

Readers should take note that the many resources developed for general IS evaluation can be adapted for use in website evaluation.

Web IS Evaluation

Since the mid 1990s, interest in website evaluation has surged. One result has been the publication of a range of web "do-it-yourself" books that include advice on both design and evaluation (for example see Nielsen, 2000; Jacobson, 1999). At the same time, researchers from the business, education and information science fields have sought to evaluate web sites based on many criteria including:

- Web metrics (Sterne, 2002);
- Interface design (Kopak & Cherry, 1998; Van House, Butler, Ogle & Schiff, 1996);
- Usability (Benbunan-Fich, 1999);
- Comparison to peer organizations - benchmarking (Johnson & Misic, 1999);
- Fit with theoretical models (e.g. marketing model: von Dran, Zhang & Small, 1999; motivational model: Zhang & von Dran, 2000);
- Web site strategy (Auger, 1997);
- Information quality (McMurdo, 1998); and
- Hypertext structure (Bauer & Scharl, 2000).

Web site evaluation has also become a popular topic within the trade press (e.g. Dugan, 2000). A significant amount of web evaluation emphasis focuses on log analysis techniques (Rubin, 2001) and use of specific log analysis software such as WebTrends and Webtracker.

Readers should keep in mind that information on general website evaluation is applicable to the federal web environment with certain key allowances made for design restraints imposed by regulation or statute.

Website Evaluation in Federal Agencies

Federal website evaluation has been ongoing since the inception of federal websites. One early landmark was the World Wide Web Federal Consortium publication of suggested guidelines for federal website development (draft 1996).[3] These guidelines have been periodically updated in recent years.[4] Many federal agencies conduct periodic evaluations to maintain and enhance the quality of their sites. There has also been a substantial and increasingly sophisticated academic evaluation research stream. Current Web evaluation research has looked at federal websites in terms of a variety of evaluation criteria including information content and ease of use (e.g. Eschenfelder et al., 1997; McClure & Wyman, 1997; Hert & Marchionini, 1997) and compliance with federal records guidelines (McClure & Sprehe, 1999).

Further, some studies have looked at specific aspects of websites. For instance, Hert (1998) evaluated website finding aids and Moen and McClure (1997) examined the government information locator service (GILS). Other evaluation efforts have taken a more holistic approach. For instance, Hert, Eschenfelder and McClure (1999) included techniques of usability, management, technical and policy analysis. Finally, these studies vary in methodologies, with some relying on mainly one method (e.g. log file analysis Redalen & Miller (2000) and Bertot et al. (1997)) while others have taken a multi-method approach (e.g. Hert, Escenfelder & McClure, 1999).

Many federal agencies are struggling with the development of website evaluation techniques, the development of statistics and performance measures, the integration of assessment into website planning and development, and the incorporation of user-based feedback that can assist them in evaluating the performance and impact of their websites (Hert, Eischenfelder & McClure, 1999; McClure, Sprehe & Eschenfelder, 2000; McClure et al., 2002). Anecdotal information and site usage statistics are often used as the basis for assessment – if assessment occurs at all.

Citizen input and feedback are also vital components of the delivery of meaningful E-government services; however, much more could be done to effectively and systematically collect and use this input and feedback if standardized tools and mechanisms were in place. Using criteria relevant to service enhancement, these tools could formally assess user data to improve services and to provide summaries to agencies to help them refine their public services.

Such evaluation tools are essential if federal agencies are to have measures and statistics to assist them in program development and planning of website services. They are also necessary in order to determine the degree to which web-based program plans are successfully integrated into overall agency goals, to enable agencies to comply with accountability requirements as outlined in the *Government Performance and Results Act* (and other federal mandates), to demonstrate the use and impact of particular services and resources provided via the website, and to respond to public needs for access, content, and services.

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[3] The original guidelines are available at http://www.dtic.mil/staff/cthomps/guidelines (last visited October 2002).
[4] Updated July 1999, available at: http://www.ojp.usdoj.gov/oa/fedWebguide/welcome.html (last visited October 2002).

Federal Website Evaluation Approaches

There are a number of approaches upon which website evaluation can be based (McClure & Bertot, 2001; Menascé & Almeida, 2002; Sterne, 2002). In addition, there have been a number of recent reports that offer "assessments" of federal websites – unfortunately, their methods are suspect or non-existent and offer a "report card" mentality of assessment (Stowers, 2002). To make federal websites and services more customer/citizen-centered, webmasters and agency chief information officers (CIOs) must realize that there is no "one size fits all" template for success in online service. The following is a selection of only a few of the myriad evaluative approaches available for holistic assessment of Web services.

Approaches for incorporating public comments and concerns about website content and access, or comparing the success of their efforts to other websites, are quite limited. Generally such approaches rely on a "comments" or "suggestions" icon strategically placed on various website pages. Bertot and McClure (1999) experimented with "pop up" questionnaires on selected pages with some success. Surveys, focus groups, and other types of usability assessment can also collect user input (Sterne, 2002). Difficulties with the various approaches for user input includes coordinating the data from the various sources, insuring that the responses are representative of the website user population, and obtaining adequate response rates.

Log analysis techniques provide a great deal of data about web user activity (Yonaitis, 2001). Current Web or E-metrics typically used for determining the success of a website include such log files as page impressions (the number of pages viewed), the number of visitors to a site, the length of time they spent on a particular page, and the number of screens downloaded or printed from a site (Nicholas, Huntington & Williams, 2002). However, the data captured by log files is more useful for determining the burden placed on the web server, the success of search engines in locating a site, or the way users navigate the web in general than they are evaluating the needs of users of the websites (Zawitz, 1998; Fieber, 1999; Nicholas, Huntington & Williams, 2001;Garofalakis, Kappos & Makris, 2002). Statistical measurements based on this logged data, such as the Velocity, Stickiness, and Personalization Index, better tailor website services to meet the dynamic and highly personalized needs of the individual user (Cutler & Sterne, 2000).

User satisfaction can be measured through a number of methods. Federal agencies have considered a wide range of approaches that address issues of evaluation of website user satisfaction and usage data. One proposed approach, Value Measuring Methodology (VMM) encourages the assessment of the value and usage of E-government websites and projects based on a multidimensional analysis of the cost/benefit, social, and political factors (Mechling & Booz Allen Hamilton, 2002). Another approach is using digital guides as a part of federal E-government websites and services (Hoenig, 2001). Commercial firms such as ForeSee Results also have well developed products.[5] No matter what approach or combination of approaches employed, there is a pressing need for creation of a practical and more holistic approach to determine user satisfaction and general usage of federal agency websites.

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[5] ForeSee Results available at http://www.forseeresults.com/ .

Technical assessment of the website in terms of hardware, software, and network connectivity is another crucial area that affects overall web performance. This key component affects the overall success of the website and the degree to which the technology infrastructure adequately supports the objectives, activities, and resource/services provisions from the website. Although there are a number of guides to direct assessment development in this area, recent work by Menascé and Almeida (2002) and Sterne (2002) provides a very useful summary and practical guide for technically-oriented measures and assessment techniques.

A management and policy perspective considers the manner in which the agency is organized to design, provide, administer, evaluate, and plan for the website. Previous work by Hert, Eischenfelder & McClure (1999) suggests that a range of managerial and organizational issues can affect the quality and usefulness of an agency website. A policy perspective is especially important in assessing federal websites given the range of privacy, security, access, records management, and accessibility issues that affect the successful operation of an agency website.

Federal information policy areas such as security, privacy, records management, and accessibility (among others) affect federal website development and implementation. As an example, Section 508 of the Rehabilitation Act establishes accessibility standards for federal government information technology to provide equal access to individuals with disabilities, whether they are federal government employees or citizens using federal government technologies (29 U.S.C.A. § 794d). Section 508 compels federal government agencies and vendors to comply with accessibility standards.[6] These guidelines are issued by the Architectural and Transportation Barriers Compliance board, commonly known as the Access Board, which "is the primary federal agency for creating accessibility standards, including the standards for Section 508" (Jaeger, 2002).

Evaluation tools in the areas outlined above are essential if federal agencies are to have measures and statistics to assist them in program development and planning of website services. They are also necessary to determine the degree to which web-based program plans are successfully integrated into overall agency and E-government goals, to enable agencies to comply with website accountability requirements, to demonstrate the use and impact of particular services and resources provided via the website, and to respond to public needs for access, content, and services.

Usability Assessment of Federal Government Websites

Some agencies maintain a range of statistics describing web services while others have undertaken only minimal or no data collection and analysis effort; some have devoted substantial resources to "one-stop shopping" for information; many have developed "frequently asked questions" to assist visitors to agency websites. Most agencies already use web log statistics and other software-based measures (i.e. E-metrics) to examine aspects of their websites' performance. But agencies still need a flexible approach that goes beyond web statistics such as transaction logs to offer a variety of techniques by which agencies can determine whether their

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[6] Standards for Section 508 of the Rehabilitation Act available at http://www.section508.gov.

websites are successfully achieving the information dissemination missions for which they are intended.

A compilation of the evaluative approaches mentioned above is found in holistic usability assessment. Usability is formally defined as "the effectiveness, efficiency, and satisfaction with which specified users can achieve specified goals in particular environments" (International Standards Organization, ISO DIS 9241-11). For practical purposes, however, a broader meaning for usability, including log analysis, policy analysis, website management and organization, and user satisfaction is typically employed. Observation, a well-known usability approach, is only one component of usability testing. Figure 2 offers a general overview for conducting usability assessments.

Usability experts stress the importance of system designers taking a holistic approach to user-centered design (Mayhew, 1999; Norman, 1988; Landauer, 1997). Most usability labs, however, are designed to support only formal, empirical methods of testing usability, most of which can be performed only after a given application is nearly complete (Nielsen, 1993). These post hoc assessments of usability will generally not be as successful at uncovering usability flaws as will assessments that use a variety of inspection methods (Nielsen & Mack, 1994). Thus, usability assessment of existing evaluation tools and methods during site visits and needs assessments, in the development of candidate evaluation tools, and in the production of the final evaluation tools.

The federal website Usability.gov, created and maintained by the National Cancer Institute, is a starting point for usability assessment, providing good usability resources, web design checklists and basic usability guidelines.[7] The key to usability is not only how well the website works, but also the degree to which the website meets user needs. We provide some detail on this approach to stress the importance of IS meeting user needs and engaging in an ongoing process to regularly determine if, in fact, users needs are being met. Developing information systems and services (such as websites) without such ongoing assessment techniques is likely to result in applications that are not used or are largely ineffective.

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[7] Usability.gov website available at http://www.usability.gov/.

Phase 1: Usability Assessment
The evaluator conducts a review of user needs and usability issues, such as error frequencies, user complaints, and other potential problem areas. In this phase, the evaluator creates an outline of the scope of the project, associated timelines and deliverables, costs, the users to be tested, and basic evaluation methods. This phase also includes the identification of representative tasks and users to assist in the usability evaluation.

Phase 2: Usability Evaluation
The use of both empirical and non-empirical methods is preferred and recommended.

Expert Analysis
- Heuristic Evaluations. Usability professionals evaluate the environment for compliance to standard design and usability heuristics.
- Cognitive Walkthroughs. Usability professionals test the environment using typical scenarios designed around expected user behavior.

Usability Metrics
- Interviews. Users reflect about their use of a site, and are questioned regarding their opinions, insights, and attitudes.
- Focus Groups. A small group of representative users are asked to discuss the usability of a particular website from the perspective of their own information needs.
- Log Analysis. Specialized software collects statistics about the users' interactions with a website, providing accurate data on the users' specific actions.
- User Feedback. Users provide feedback as they use a particular system, providing valuable data on user satisfaction, changing needs, and critical concerns.
- Questionnaires. User demographics, previous experience, attitude, and pre- and post-testing information are collected.

Representative User Testing
- Formal Empirical Observations. Individual users complete specific tasks and are observed as they interact wit the environment.
- The "Think-aloud" Approach. Individual users provide a running commentary on their thoughts as they perform particular tasks.
- Constructive Interactions. Pairs or small groups of users work on particular tasks while discussing the website's features and characteristics aloud.

Figure 2. Usability Assessment Processes

Improving Federal Websites and E-Government

There is abundant evidence that federal websites need to be improved in terms of usability in order to meet federal policy guidelines, such as accessibility requirements for individuals with disabilities, and to support E-government initiatives (Robinson, 2002). Helping agencies to understand and implement evaluation methods will make their websites and web-related services as useable and useful as possible, which furthers the government's goal of making web-based digital government available to all citizens. Ongoing evaluation can address these and related problems with federal websites and can facilitate the growth of federal E-government into a federal E-democracy. When agencies understand and implement evaluation methods that will make their websites and web-related services as useable and useful as possible, citizens can better use and access the digital government information services and resources those websites provide.

Interest in evaluation of web-based services continues to increase though few comprehensive approaches assess federal websites on an ongoing basis. As agencies continue to be encouraged to provide additional web based services with limited resources and as implementation of the *Government Performance and Results Act* presses forward, ongoing evaluation and use of performance measures are likely to take on increased importance.

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