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Topic (i): The impact of Internet on the statistical production and dissemination process

**SUPPORTING ELECTRONIC GOVERNMENT**

Submitted by U.S. Department of Commerce<sup>1</sup>

**I. INTRODUCTION**

1. We know technology advances continue to change our environment. In the United States, information technology industries have been responsible for more than one-quarter of recent real economic growth. We have experienced the irreversible phenomenon of the globalization of markets and their growing closeness through information technology. Computer power in PCs and storage capacity continue to increase, both occurring without an increase in cost. Telecommunications costs are decreasing, and the biggest change of all is the explosive use and capacity of the Internet.

2. The growth of the Internet has been phenomenal. At the end of 1997 there were approximately 100 million Internet users worldwide. This included 11 countries with over one million Internet users, which is expected to grow to 38 countries in the year 2000. Estimates are that the total number of worldwide Internet users will grow to 707 million by 2001. Just from January 1997 to July 1997 almost 3.4 million additional hosts have been added. WWW

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<sup>1</sup> Prepared by Alan C. Lorish, Jr..

hosts continue to increase at a pace of approximately 256% annually. The most wired countries in the world (in order) are Canada, United States, Australia, France, Britain, Germany and Japan.

3. The Internet's primary advantage to all users is the speed of access to information and services from both the private and public sector. It also provides a fast medium for data and service providers to implement changes with minimal delay in communications. The Internet has been good for small businesses. Not only has it increased competition but it has leveled the playing field between large and small size companies. Viewing a company from its WEB site can provide a degree of perceived equality as one cannot see the size, complexity or scale of operation of the firm. Consumers have benefitted as well. It is estimated that approximately \$13 billion will be spent in online retailing in 1998, with that market growing by estimated 200% annually.

Approximately 16 million people use online retailing in 1998, with projections to grow to 60 million online by the year 2002.

4. However, it is important to recognize that the Internet is an information technology tool that can be used along with numerous other tools to support the business processes of industry or the delivery of government services. It is not a panacea, and continues to have growing pains. However, impressive current Internet usage statistics are, put in perspective, only about one percent of the world's population is online today and those who are seemingly belong to a technologic and socioeconomic elite. At this point in its evolution the medium is a niche itself. For example, despite the current online retail sales numbers mentioned above the Internet still accounts for only one percent of all retail sales.

## **II. U.S. GOVERNMENT AND THE INTERNET**

5. In the U.S. the number of installed office and home computers continues to grow. The U.S. will grow to over 164 million computer in use by year end 2000. However, we must continue to recognize that not all Americans have the option of electronic access to government. Many Americans live in urban or remote rural areas where distance, location, or poverty reduces access to services available from existing service delivery mechanisms. Thus, the continued development and expansion of the National Information Infrastructure (NII), an ever expanding range of equipment including computers, switches, cable, wire, satellites, optical fiber transmission lines, microwave nets, and much more, has continued to receive political attention.<sup>4</sup> An ambitious goal is to enable universal access to the NII over the next decade. Certainly, the ability to share data and information broadly via the Internet is a key component of the re-engineering of the delivery of government services or more popularly known in the US as the National Partnership for Reinventing Government. As such, an increased emphasis has been placed on proactive information distribution by all Federal agencies.

6. In July 1996 the U.S. Congress passed The Information Technology Management Reform Act of July 1996 (Clinger Cohen Act of 1996) which created U.S. Chief Information Officer positions throughout the Federal government and

codified the Government Information Technology Services Board (GITSB). GITSB was formulated to identify and promote the development of innovative technologies and systems that facilitate the implementation of an electronic government. Eighteen Champions were nominated from across government and asked to prepare a report on their respective areas of improving the Federal Government's ability to serve the people using the latest Information Technology. The Champions authored a report called "Access America - Reengineering Through Information Technology" which was released in February 1997. In addition GITSB has a WEB site at [www.gits.gov](http://www.gits.gov), that further discusses its initiatives and accomplishments. This report sponsored by the Vice President and National Partnership for Reinventing Government provided an action plan to move toward an electronic government over the next several years.

7. For the U.S. government, electronic services to the public are continuously improving. Electronic access is becoming simplified as several government wide entry points have been created on the Internet. The White House's home page links users to Congress and federal agencies. Almost all Federal agencies have Internet Home pages and countless numbers of government services continue to be automated for electronic access by the public. Key US economic statistics are now available on several agency web sites. For example the Bureau of Economic Analysis now has U.S. National Income and Product Accounts, U.S. regional statistics, methodology papers, and the complete Survey of Current Business on-line.

8. While most of the Internet advances pertaining to government services are showing the payoff in thinking about and delivering government services in brand new ways, much work remains to be accomplished. A significant number of government services remain delivered in the same old ways, primarily manual and paper based.

9. There are numerous critical issues to be dealt with related to the Internet and the delivery of government services. For example, to what extent should governments provide free information rather than providing it on a cost recovery basis? Who should be responsible for disseminating government information on the Internet? Are there too many WEB sites, should, or could they be consolidated? Certainly the issue of maintaining adequate security/privacy is paramount regarding data storage processes and public releases. Will government wide or even agency wide standards and guidelines ever prevail in the Internet arena? The explosion of WEB sites has largely been the result of the "ease of use technology" coupled with no standards or best practices being followed. Challenges remain in the area of data being disseminated and updated in a timely, meaningful, and accurate manner. Also in numerous U.S. agencies data are often locked up in stove piped systems - not in electronic formats easily made for WEB access.

10. Finally, a most critical item and one which I would like to focus on is the shortage of IT skilled workers. In order for the government to fully harness the power of the Internet, implement an electronic government and bring the recommendations of Access America Report to fruition, agencies will

need to have access to a workforce with the skills required to design, deploy, and maintain advanced Internet applications. This includes but is not limited to the ability to secure authenticated transactions; "one-stop" searching of multiple agency databases; Internet-based groupware to support virtual agencies; directories of government employees; applications based on emerging object technologies; selective dissemination of information; and design of WEB-based applications for easy navigation and access by persons with disabilities.

### III. SKILL SHORTAGE

11. According to Bureau of Labor Statistics (BLS) the Information Technology industry employs approximately two million people in the US. BLS projections indicate that between 1994 and 2005 the United States will require more than one million new IT workers (computer scientists and engineers, system analysts, and computer programmers to fill approximately 820,000 newly created jobs and to replace approximately 227,000 workers leaving these fields as a result of retirement, change of professions, or other reasons. Worldwide there are an estimated 600,00 unfilled jobs in the IT industry.

12. In 1996, the Information Technology Association of America (ITAA), a nonprofit trade association of more than 11,000 information technology companies conducted a survey to determine whether the reports of shortages in information technology personnel were correct, and if so, to determine how severe was the shortage. Questionnaires were sent to a randomly selected sample of two thousand large and mid size IT and non-IT companies throughout the United States. Results of the survey indicated that there are about 190,000 unfilled information technology jobs in the United States today. This was reported to be a conservative estimate as the survey did not include the IT worker needs for small companies, nonprofit organizations, or federal, state, and local governmental agencies.

13. ITAA's survey also pointed out the dramatic effects this shortage of skilled personnel can have such as limiting growth and increasing IT support costs. Ultimately we can also expect a slower growth in the IT industry and its innovation. An inability to fill positions prevents companies from growing at their optimum level, thus slowing down innovation and growth in the U.S. economy.

14. More disturbing is that a traditional avenue for filling staff shortages through universities and colleges appears not to be working in the technology arena. The number of computer science graduates fell 43% between 1986 and 1994. A major problem is the negative public image of the IT industry among students. Fewer people come out of a university wanting to be a software engineer. Also, that there appears to be a lack of a consensus in academia and industry on the composition of the curriculum needed for a computer science degree. There also appears little demand by the industry for software personnel certification.

15. Certainly these shortages are felt in the public sector. However, there

were no reliable estimates of the number of existing federal personnel who may already possess the levels of knowledge and experience necessary to design and deploy high-end Internet/Intranet applications. Among personnel who have been identified as having at least significant Internet design experience, the federal government had no measures of relative strengths and weaknesses. Federal agencies have no established, industry-recognized competency standards, and no broadly accepted analyst certification programs, to turn to for guidance in seeking to train existing staff, to recruit new staff, or to evaluate the merits of private sector contractors.

16. Accordingly, each agency has developed its own approach to issues of Internet training, recruiting, and contracting, each hoping that its individual efforts will lead to sound on-line applications that meet their own needs and those of an expanding and increasingly demanding clientele. The challenge faced was first in taking an accurate stock of the best of federal Internet dissemination initiatives to date, and then using those lessons to build a common protocol that will ultimately assure all federal agencies of timely access to the most productive Internet skill sets, the most effective site design procedures, and the most efficient on-line deployment means available.

#### **IV. GITSB SURVEY**

17. In order to assess the current skill base and to determine in what skill categories shortfalls might exist GITSB created a Survey of Internet/Intranet Skills that was mailed to 32 Chief Information Officers throughout the U.S. government. The results of the survey would hopefully provide a more complete understanding of the directions that need to be taken in the future to address possible Internet skills needs. The following briefly highlights the findings of the survey as responded to by the CIOs and concludes with the next steps approved by the GITSB at a May 7, 1998, meeting.

18. Skill shortages were identified in all seven of the critical Internet applications areas defined in the survey (distributed processing, specialized tasks, application client, data input, database query, document distribution and web page authoring). When agencies were asked to identify their most severe needs over the near future, all the basic skills needed to maintain an adequate Internet site - writing HTML pages, creating forms in HTML, linking forms to a database and administering Unix and/or Windows NT servers, were identified.

19. In the areas of Internet security training it seems all 'bells, whistles and red lights' went off. Anywhere security training was mentioned, the perceived need seemed great. The subgroup viewed this to be partially caused by the fact that no one seems to know what is "safe and secure" so respondents felt they could never get enough security related staff or training. Access control knowledge was the highest rated security need.

- Twenty-six percent of the CIO's responded that they had an immediate urgent need for staff knowledgeable in Internet security issues.
- Sixty-seven percent responded that they would need these skills in the need future.

20. In the areas of Internet standards the majority of agencies responded that "no Internet standards" were in place to help control their development efforts. When asked how staff were trained or obtained their skills related to performing these functions the response was a 'mixed bag'. "Self taught" and "on-the-job" led the list but there were numerous other categories in proximity to these two (e.g., hired with skills, government training). Clearly there was no lead method in employees obtaining the skills that are needed.

21. The two application categories with the largest current installed base as reported via the survey are web page authoring and document distribution. These two categories utilize basic web skills and could include older static page technologies. Also since these types of applications are older, more sophisticated tool sets have been developed ( most current releases of desktop word processors will generate a document formatted in HTML)

22. The Web browser becomes a much more powerful tool when connected with large databases and a server as an interactive data mining pipeline. Data Input and Database Query require the addition of more complex technologies, whose tool sets are not as advanced. It is also possible to say that when these technologies are added to a web site a different group of people is required for support (professional computer series). Also, the problem of organizing diverse data sets to be able to be accessed via data base systems becomes a critical consideration.

- Twenty-two percent of respondents said that there was an immediate, urgent need for personnel skilled in linking a web browser to back end databases.
- Sixty-two percent of respondents said that they would need these skills by the end of calendar year 1998.

23. Another area of the survey dealt with agency use of contractors vs. in house staff for providing the support needed to develop and maintain an Intranet site. The use of contractors vs. in-house staff by agencies was almost evenly split, with a slight majority of agencies reporting the latter. The single biggest reason reported as to why agencies use contractors was due to a "lack of adequate in-house staffing." This seems very reasonable given considerable federal government downsizing that has occurred over the last few years and the robust economy that has business competing with government for precious IT resources. The second and third biggest reasons reported for using contractors is "lack of training for existing staff" and "growing complexity of technology." These two are certainly interrelated. Training is a traditional target for organizations faced with declining budgets and, with the rapid pace of technical advancements in the last decade, maintaining a

skilled IT staff even with adequate training budgets has been difficult for most organizations.

## V. POST SURVEY ANALYSIS

24. The data collected in the survey continues to be analyzed. There are some serious options being discussed and considered relative to the survey results. Given the limited resources that exist across government and the number of agency Internet sites that require support, should we seek consolidation of U.S. agency WEB sites in order to leverage the scarce support resources. Does every agency and their sub-elements (Bureaus) need to support their own site and/or should public access points be consolidated? Other options discussed included "outsourcing", and creating "government go teams for Internet". The most notable recommendation and the one endorsed by GITSB was the creation of a "Webmaster Certification Program." This was to include seeking the use of private sector training/learning professionals for the establishment of a learning curriculum for employees to learn all aspects of IT support related to maintaining an agency Internet/Intranet site. GITSB also approved the movement toward 'standards' and 'best practices' for Web development work as part of this effort.

25. The first step in creating a Webmaster Certification Program is seeking the assistance of private sector training/learning professionals, industry associations such as Computer Technology Industry Association (COMPTIA) and professional groups such as the Federal World Wide Web Consortium for the establishment of a learning curriculum for employees to learn all aspects of IT support related to maintaining an agency Internet/Intranet site.

26. A Webmaster Certification program is just one component in developing a workforce where every employee is using technology to deliver the highest quality of service, and every manager includes information technology as part of every business function. In attempting to ensure that the government has access to personnel with the appropriate Information Technology knowledge and skills, the U.S. Chief Information Officer Council plans to issue a solicitation to colleges and universities to establish a curriculum geared to the education requirements of high level information technology executives and managers in the federal government. The core subject areas are IT investment strategies, capital planning, resource management, the Clinger Cohen Act, business process re engineering, IT architectures and cost justifications. Once an approved curriculum is established GITSB is recommending that the Webmaster Certification program be included in the curriculum of the CIO University Program.

## VI. CONCLUSION

27. Already the Internet has had enormous impact on the dissemination of government data. As the twentieth century comes to a close, an increasing number of citizens have Internet access at home or work, and telecommunications companies continue to make the investments in

infrastructure that will enable higher-speed Internet access. All this suggests that the opportunities and payoff for creative government use of the Internet will expand dramatically in the months and years ahead. Governments have many opportunities to use the Internet more effectively, but seeing these goals vs. achieving them is challenged by the skilled worker shortage. Our ability to find or develop the skilled people we need will determine how successful the information technology revolution continues into the 21st century. Establishing certification programs such as the Webmaster program discussed in this paper are good starts but not nearly enough. Organizations need to continue to become more creative in seeking solutions. Distance learning and on-line computer based training module are options to facilitate IT training outside the classroom environment. The retraining of displaced or non-IT skilled workers in the IT area is also one alternate that merits further consideration. In addition, strategies for public organizations to retain their current IT staff needs to be explored. Public and private sector organizations must continue to form partnerships and collaborate on these issues, collectively the problems can be adequately addressed so that IT advances continue to benefit our service delivery and ultimately our society.

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#### **REFERENCES**

"America's New Deficit: The Shortage of Information Technology Workers", U.S. Department of Commerce, Office of Technology Policy, Fall 1997.

"Help Wanted: The IT Workforce Gap at the Dawn of a New Technology", Information Technology Association of America, Arlington Virginia, 1997.

"Internet Industry Almanac", Computer Industry Almanac Inc., Buffalo Grove, Illinois, September 1998.

Matrix Information and Directory Services, June 1998

"National Information Infrastructure: Myths, Metaphors and Realities", Yogesh Malhotra, WWW document, URL <http://www.brint.com/papers/nii/>.

"Short Supply", Edward Cone, Information Week, November 3, 1996, pp. 44-60.

"Tech-Skills Shortage Threatens Europe", Andrew Craig, TechWeb, WWW document, URL <http://www.techweb.com/wire/story/TWB19980310S0005>, March 10, 1998.

The Washington Post, November 20, 1998.

"Web Usage Trends '98", International Data Corporation, Framington, Mass., March 1998.