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The Growing Support Crisis in Federal STI

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ABSTRACT

Federal agencies in the United States federal government that provide Scientific and Technical Information (STI) face a growing support crisis brought on by the Internet. As these organizations use the Internet to provide increased access to databases and automated resources they are finding more users from the general public are asking more questions. These organizations need to be prepared to support an increasingly diverse user group via the Internet. Projects of the National Library of Education (AskERIC and Virtual Reference Desk) are reviewed and used to raise and discuss issues in supporting STI applications in a government setting. Finally a set of recommendations is presented to help plan digital reference services in this context.

AUTHOR BIOGRAPHY

R. David Lankes, Ph.D., is director of the ERIC Clearinghouse on Information & Technology at Syracuse University. He is co-founder of AskERIC, the award-winning project that provides high-quality information to educators via the Internet, and is founder of the Virtual Reference desk project. He is also a faculty member for Syracuse University's School of Information Studies and he speaks and consults nationally on Internet issues in education and business. His work focuses on Internet information services and the increasing demands of users in the dynamic Internet environment.

INTRODUCTION

Federal Scientific and Technical Information (STI) providers such as the National Library of Medicine, National Library of Education, National Agricultural Library and the Defense Technical Information Center face new challenges as use of the Internet grows. Organizations that specialize in the production of databases and collections of materials (including images and texts) now find themselves in an unfamiliar support territory. Collections once meant for small specialized audiences are now being used by increasingly naïve and diverse audiences. Where once STI agencies could assume a level of sophistication and self-support by their intended audiences, they now find themselves overwhelmed with questions from the general public.

Only recently have STI agencies begun to realize the impacts of the Internet, which was originally seen as a cost effective dissemination alternative to print. Alternate formats, new media capabilities and new means of inter-agency linkages are now possible and their impacts increasingly understood. Evaluation of web sites and product design in a client/server environment are rapidly developing in sophistication and use. In addition agencies have realized larger audiences and claimed this increased user access as a sign of success in information dissemination. However, as shown in Figure 1, increased user access comes not only from reaching more of an agency's core audience, but crossing into new audiences and users. Now those accessing the product include:

- Core - users who are familiar with a specific STI product,
- Secondary - audiences with great knowledge of an agency's scope, but are unfamiliar with a given product
- Topical - those familiar with an agency's topic on a broad scale, and
- General - the general public with minimal understanding of the agency or it's products.

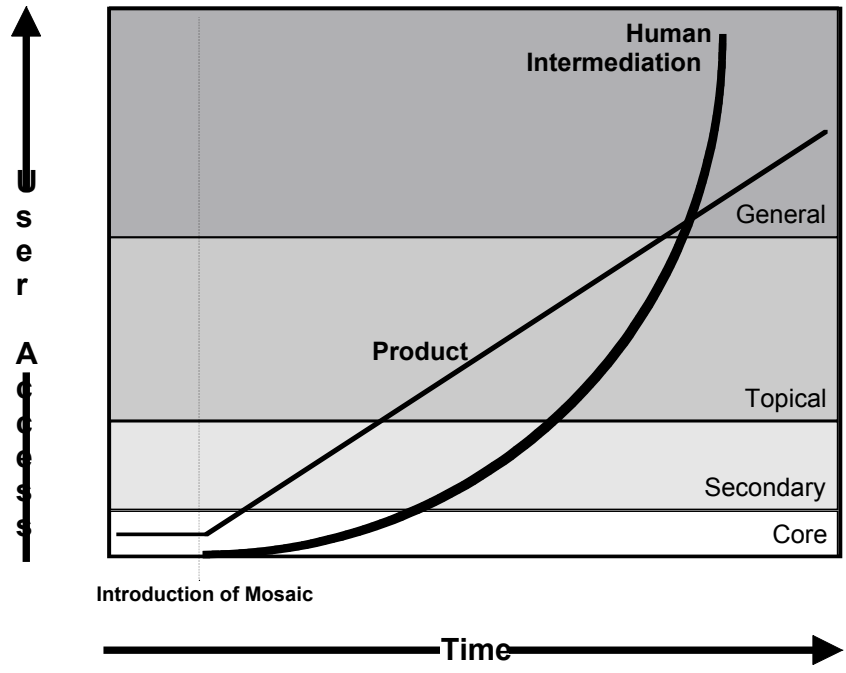

Figure 1: As user access of STI products increase, the support burden also increases

So while dissemination in terms of users accessing a product may be increasingly successful, the sophistication of that audience now varies widely.

The unintended consequences of this "Internet embrace" have affected traditionally low-funded, low-staffed help and support desks. As new audiences come to STI collections, the nature of the support interaction changes dramatically. New audiences have caught these agencies unaware, and the agencies must now scramble to understand new policy, budgetary and technological approaches – often inventing them as they go. The United States National Aeronautics and Space Administration (NASA) support personnel, used to interacting with rocket scientists, now face questions about alien life from school children. Further, with the inherent overlap of agency missions and topics, questions may be submitted to one agency that would be answered more appropriately by other information providers within the federal government.

There are several issues that further complicate the support question including:

- Policy - The issues of increased support are complicated by a diverse policy environment. For example, are web logs and user questions private, or should they be seen as part of the public record[1]? Is a federal agency responsible for archiving all user access data including e-mail questions and web logs? How can a government agency institute tiered levels of service while remaining true to its mission?
- Technology - Traditional help desk software to date has been telephony oriented and unable to deal with the increasing use of the Internet for user support. Help desk software to this point has been designed as closed systems. How can these services better interoperate in a network of support?
- Budget - How does an STI agency budget for an expanding support function when the number of users is unknown and the character of those users constantly changes? How do these agencies build cost and fee structures to allow them to interoperate on a greater scale?

This chapter examines these issues by first examining the state of user support in the CENDI (CENDI, 1999) STI agencies and looking for parallels in library based digital reference research. Digital reference is defined as the provision of human intermediation (often experts) in electronic networks such as the Internet. Finally, a case study from the National Library of Education (National Library of Education, 1997) will be used to clarify the current situation in customer support, and future research will be discussed.

CENDI Agencies

CENDI is an interagency working group that represents senior Scientific and Technical Information (STI) managers from nine programs in eight U.S. Federal Agencies (see Table 1). Its name is drawn from the federal agencies that compose the group. According to the organization's web site the mission of the organization is as follows:

"CENDI's mission is to help improve the productivity of Federal science and technology-based programs through the development and management of effective scientific and technical information support systems. In fulfilling its mission, CENDI member agencies play an important role in helping to strengthen U.S. competitiveness and address science- and technology-based national priorities" (Hodge, 1997, p. 1).

Table 1: CENDI Agencies and Contributing Units

Agency	Contributing Unit
Commerce	National Technical Information Service (NTIS)
Education	National Library of Education (NLE)
Energy	Office of Scientific and Technical Information (OSTI)
National Aeronautics and Space Administration	Scientific and Technical Information Program (NASA STI)
Agriculture	National Agricultural Library (NAL)
Department of Health and Human Services	National Library of Medicine (NLM)
Defense	Defense Technical Information Center (DTIC)
	National Air Intelligence Center (NAIC)
Interior	USGS/Biological Resources Division (USGS/BRD)

In 1997 CENDI released a report from a series of meetings regarding activities related to the impacts of the Internet on customer service and product development (Hodge, 1997). This report outlined current use of internal and public support help desks within these STI agencies.

The report concluded "agencies are finding a new user community for their products and services, but resources originally intended for the agencies' more traditional audiences are being stressed to provide services to the new communities" (Hodge, 1997, p. 1). Further "the increase in inquiries from non-

registered users and non-traditional customer groups leads to more questions that are out-of-scope for the particular agency. This leads to referrals to other agencies and organizations" (Hodge, 1997, p.7).

These issues of change in audience and the tools used to support those audiences are not unique to STI. In fact, libraries internationally are dealing with the impact of the Internet on customer support. In the following section, the author will explore the changes in library customer support through the reference function.

IMPACTS OF THE INTERNET ON REFERENCE SERVICES

The literature shows significant impacts on reference services prompted by greater access to the Internet and Internet tools. These impacts include new skills needed by information specialists and reference librarians (Bobp, Kratzert & Richey, 1993). The Internet is also expanding traditional library collections and improving location and access to reference resources (e.g., ready reference materials and pathfinders through World Wide Web sites, access to catalogs and electronic reference sources through telnet, etc.). Most significant to this chapter, the Internet affords reference services the ability to conduct entire reference transactions (from specifying users' needs to delivering information from the collection) via the Internet (Still & Campbell, 1993).

A great deal of literature has focused on augmenting traditional reference services with Internet resources and capabilities. This literature ranges from evaluation criteria for on-line reference sources (Balas, 1995) to discussions of technology used to locate and access Internet resources (examples include Feeney, 1993; Bobp, Katzert & Richey, 1993; Gainor & Foster, 1993; Arms, 1990; Branse, 1993; Machovec, 1993). In these discussions, the interface to the user remains the same, but the collection is expanded to include Internet resources. These new resources change the reference environment. Mardikian and Kesselman (1995, p. 22-3) presented five "rationales for changing reference:"

- Increasing access to resources beyond the library (networked resources including the Internet).
- Lack of geographic constraints for users ("users may no longer need to come to the library to obtain information").
- The need to differentiate services to different populations of users (i.e., inside an organization and outside an organization) in the face of shrinking budgets.
- Increases in complexity of information resources and the need for specialized knowledge.

- New options (primarily in staffing) for answering reference questions.

These rationales highlight the redefinition of librarians' roles within a traditional geographically defined library setting. However, the same issues are directly relevant to supplying scientific and technical information support in a government context. The Internet is shattering traditional boundaries for information centers, libraries and government agencies alike.

CHANGING ROLES OF REFERENCE LIBRARIANS

Reference librarians and customer support specialists face new responsibilities, training requirements, tasks, and role in response to the "increasingly automated [library] over the past three decades" (He & Knee, 1995 p.7). He and Knee presented the idea of an electronic services librarian. In regards to reference services, they stated, "It is important for electronic services librarians to be familiar with traditional as well as electronic reference sources. By learning traditional sources, they will be able to recognize which Internet resources may also be valuable" (p. 9). He and Knee called for librarians to update their skills in response to perceived changes to the reference environment. This need for updated skills is the same in the context of STI agencies and their staff.

The burden of learning and applying the application and evaluation skills of the Internet falls upon the information professional. In the case of a library, the reference librarian must master the new Internet tools for his or her users. The reference librarian acts as "a bridge which has technology at one end and the user at the other" (Callahan, 1991). Learning, however, is not limited to just applications and technology. It also applies to learning to deal with change. McClure et al. stated "library staff . . . must learn from their colleagues in the computing services how to become more comfortable with the type and rate of change that will accompany the networked environment" (McClure, Moen & Ryan, 1994). This notion of change and the need for technical proficiency is echoed throughout most of the literature concerning reference services and the Internet.

Accompanying the changes in reference librarians' skills are changes in the reference librarians' roles, particularly in regards to staffing. Oberg states "paraprofessionals can and do perform well at a reference

desk, freeing librarians to concentrate on higher-level tasks" (from Mardikian & Kesselman, 1995, p.21). Mardikian and Kesselman presented a three level staffing model to reflect the changing role of the reference librarian (see Table 2).

Table 2: Mardikian and Kesselman's Staffing Levels (From *Building and Maintaining Internet Information Services: K-12 Digital Reference Services*)

Level 1: Minimum Human Intervention
Self-guided building tours Automated telephone answering machines Better signage Better floor maps Library quick guides Step-by-step guides Computer-assisted instruction for self-service instruction Computerized information kiosks
Level 2: Library Interns/Trained Paraprofessional Staff
General library orientation and general bibliographic instruction Directional inquiries Ready reference searching Bibliographic verification on OCLC, RLIN, and the online catalog Assist with search strategy formulation Technical assistance with machine problems Basic informational services with referrals as needed
Level 3: Librarians, Subject Specialists
Individual research consultations Specialized reference services Office hours in departments Member of a research team with teaching faculty Liaison activities with departments Specialized instructional services Integrate information literacy into the curriculum Research and development efforts Mediated online searching Create CAI programs and expert systems for users Ongoing evaluation and needs assessment

Accompanying this shift in responsibilities for reference librarians (to higher-level tasks) is a call for greater collaboration with other types of professionals. Lewis (1995) believed the infusion of new tools for location and access into libraries means "a significant upgrading of skills of most librarians and will mean professionals who are not librarians will have to be offered positions along side of, or in place of, librarians." McClure, et al. (1994, p.67) listed partnering with computing services, faculty, and other "external organizations and companies" as critical success factors in building the virtual library. Indeed, STI services have already formed strong relationships with computing centers and technical organizations as discussed by McClure et al. (1994).

The changes for librarians just outlined also pertain to information professionals in STI agencies. Whether their title is librarian, customer service representative, or analyst these information professionals must expect to change their roles and skill sets in reaction to the increased use of the Internet for customer support.

Digital Libraries

The Internet is also used to provide better access to a library's collection. The Internet is used to organize materials for reference patrons (Jensen & Sih, 1995) and allow patrons access to reference sources such as online public access catalogs (He & Knee, 1995). This literature includes discussions of standards for information interchange (Moen, 1992). The literature seems to present a continuum for reference services and access in relation to the Internet. There has been a general belief that libraries and reference services are headed "towards a virtual future" (Strong, 1996). However, this future has not been widely explored.

Sutton's (1996) four-part typology of libraries anticipated the expansion of reference collections to include the Internet, as well as the use of the Internet to access an individual library's collection. This four-part typology created a continuum from a paper-based ("traditional") library to a fully "digital" library without walls (Sutton, 1996, p.129). It consists of:

- Traditional: "a specific place with a finite collection of tangible information bearing primary entities like books and journals . . . [denoted as] paper" (Sutton, 1996, p. 131).
- Automated: a mix of paper and digital reference resources and meta-information that "point to non-digital media" (Sutton, 1996, p. 135).
- Hybrid: typified by the use of both print and digital meta-information sources (increasingly digital) and the coexistence of both digital and paper primary resources. This type of library allows for the first time remote access to "some subset of the library's digital collection or to digital resources"(Sutton, 1996, p. 136).
- Digital: ". . . the library as a logical entity. It is the library without walls—the library does not collect tangible information bearing entities but instead provides mediated, geographically unconstrained access to distributed, networked digital information" (Sutton, 1996, p. 138).

From this typology, Internet information systems, specifically digital reference services, can be seen as "digital" libraries. Since such services transact all information delivery via the Internet, they are fully digital.

Sutton (1996) stated that in a digital library the primary task of the librarian is to provide "context" (Sutton refers to Saffo's [1994] concept of context). That is to say, the collection becomes so large (it could be considered to consist of the entire Internet) that patrons no longer desire the full range of information available on a given topic, but the "best" information. The librarian's role shifts from advocate to a collection to a filter for the user. Since the patron is no longer bound by geography (or technology), the user will select services based on how well they create a context useful to that user.

This would indicate that the role of STI customer service shifts from the simple provision of materials and/or technical assistance (software help for example) to one of context provision. The STI customer support specialist will need to provide high-level synthesis and be able to adapt scientific and technical information to a user's context. This also calls for STI agencies to tier service levels. Providing in-depth analysis for the entire public would be impossible. Perhaps these synthesis services should be reserved for core audiences (see Figure 1).

The shift in STI provision to a truly digital environment raises a number of legal, ethical and operational issues as discussed in the following section.

ISSUES IN DIGITAL STI PROVISION

Internet-based STI services and other digital reference services can vary in many aspects including number of staff, number of questions answered, technology used, and subject areas covered. However, they do experience many common issues. For instance, many services are familiar with the experience of starting what they had planned to be a small, controlled question-answer service for a specific population (possibly as an outgrowth of another Web resource or initiative) only to very quickly become overwhelmed by hundreds of questions from the general Internet public. In addition, many services struggle with legal issues regarding liability for information provided and confidentiality of user information posted on services' Web sites. Common issues are summarized on the following pages.

Legal and Ethical Issues

User Confidentiality. STI customer services that plan to make user correspondence public through a question-answer archive, etc., should consider how they will ensure confidentiality of any information that can be used to identify a user (e.g., name, e-mail address, postal address, phone number, etc.). This is especially important when dealing with students since educators and parents may discourage children from providing personal information that will be accessible to all Internet users worldwide. This concept is consistent with the American Library Association's Policy on Confidentiality of Library Records (American Library Association, 1986) and the American Library Association Code of Ethics, which states "We protect each library user's right to privacy and confidentiality with respect to information sought or received and resources consulted, borrowed, acquired or transmitted" (American Library Association, 1995 Online). STI customer services would benefit from adopting core policies and philosophies of established library associations.

Service Liability. Services rely on their information specialists to provide information based on expertise and knowledge. Services should make sure that users are aware of the limits on information provided. This is especially important for services whose expert information can be interpreted as professional advice (e.g., medical, legal, etc.) but is a valid concern for all types of digital reference services.

Operational Issues

Lack of Software. Currently, there is a lack of software available to assist Internet customer support services in managing the question-answer process. Some services have attempted to automate the question-answer process by developing original software packages (many based on PERL scripts). Other services manage the process using an e-mail program and a pencil and paper to record question routing activities. Traditional help desk software has been created with several assumptions that make applying them to Internet customer support difficult, namely:

- Telephony support – existing help desk software was developed around call centers and an assumption that customers would get support over the phone. Even as these organizations begin including Internet options they are being built around modern web technologies such as Java. Basic functions such as importing e-mail into these systems can be challenging.

- Finite question domains – many software packages assume support of a limited product and therefore a finite domain of answers. Synthesis functions and high-level open ended domains have a difficult time adapting to the limited tiers of software functions available. As an example, many default options assume that all customer support specialists are the same (not specialists in different areas).

- Scale – the current support options tend to be expensive and require large computing infrastructures. These systems are built around teams of 20 or more, and do not match well to teams of two or a set of part time support specialists (see cost and pricing models below).

- Cost and pricing models – pricing for help desk packages is based around a "per seat" licensing system. The more people involved in supporting users, the higher the cost. Further these packages carry high installation and maintenance costs.

- High customization – few (if any) help desk packages work off-the-shelf. Most require intensive customization and installation (especially for linking to the Internet and existing databases). This process of installation can be lengthy, expensive, and require additional staff to support the customized application.

These limitations are not insurmountable, and are being addressed by today's vendors. However, STI agencies are warned to spend a great deal of time at the beginning of a process shopping vendors and looking at the customer support services that will use the applications developed.

Marketing and Publicity. While some services openly embrace the opportunity to attract users, others are more hesitant for fear that they may receive more questions than they can handle. Different techniques for advertising a service include registering the service with a Web search engine, placing notices on other organizations' Web sites, and posting messages on related electronic discussion groups, etc.

Question-Answer Policy. Answering user questions is not always as straightforward as it may sound. Decisions must be made early on regarding the following questions: What types of questions will and will not be answered? What are the necessary components to include in a response? How will vague user queries be handled? What is the turnaround time for a response? Decisions on these issues will aid staff in conducting day-to-day tasks and will help services focus on intended goals.

Supplemental Resources. Most services offer some type of Web-based resource to supplement their question-answer service; in some cases, it is the service that supplements the pre-existing resources. The most popular types of resources are question-answer archives and collections of frequently asked questions, or FAQs. Other resources may include supplemental information about a popular topic and lists of links to

other resources. Services often encourage users to review the collections first before submitting an original question. Issues related to supplemental resources include type of user interface, number of question-answer sets included, frequency with which resources are updated, and staff member(s) responsible for resource maintenance.

This is only a short list of issues that STI services will encounter as they move their customer support to the Internet. Others include:

- Liability – what is the legal exposure of STI services in the scientific and technical fields including medicine?
- Cost recovery - can a government agency charge for customer support when it already charges for products being supported either through direct fees or taxes?
- Service tiers - can there be different levels of services for the core, secondary, topical and general audiences?
- Establishing a per unit cost for customer support - how can customer support be priced either for outsourcing or establishing base-line budgets?
- International Support – can a federal agency utilize taxpayer money to support international users? This is particularly problematic on the Internet where it is nearly impossible to establish the geographical origin of an inquiry?

The following sections examine some of these issues in a as addressed by one CENDI member, the National Library of Education (NLE). NLE is currently dealing with these issues through the AskERIC service which it offers to the general public.

AskERIC: A CASE STUDY IN FEDERAL STI DIGITAL REFERNCE

The United States federal government formed the Educational Resources Information Center (ERIC) in 1966. The government envisioned ERIC as a national information system designed to provide users with ready access to an extensive body of education-related literature. Today, National Library of Education within the U.S. Department of Education supports ERIC. One of ERIC's primary products is the ERIC database. This database is the world's largest source of education information. It contains over 800,000 abstracts of documents and journal articles on education research and practice (Abdal Haqq, 1995) and is available in approximately 3,000 locations worldwide as of January 1995 (Stonehill & Brandhorst, 1992). AskERIC went online as an Internet-based question answering service in November of 1992 (ERIC, 1992)

as a special project of the ERIC Clearinghouse on Information & Technology. The service had a dedicated staff of one with assistance from the ERIC Clearinghouse on Information & Technology and a doctoral student from Syracuse University's School of Information Studies. Within a year, the service had added automated services (FTP, Gopher, WAIS) and increased its staff by three.

As the number of incoming questions doubled, AskERIC's staff increased. When the automated services (primarily Gopher) grew beyond the existing time and effort of the doctoral student, a second coordinator level position was added. AskERIC then expanded from a pilot project of three states (Texas, New York and North Dakota) to the entire United States. The system needed to become available twenty-four hours a day, seven days a week. A Research and Development (R&D) team was created with separate resources for experimentation. The goal of R&D was to keep AskERIC current in the constantly changing Internet environment. Also created with the expansion was a separate set of resources for interfacing with state and regional networks originally known as the Virtual Communities group. AskERIC also increased its systems infrastructure with the help of Sun Microsystems. The increase in the technical infrastructure led to the creation of a systems component to AskERIC that operates as a SunSITE[3].

Currently AskERIC is in its seventh year of operation. It provides many types of Internet services (e.g., World Wide Web, e-mail, phone support). AskERIC is also one of a handful of global SunSITEs. The project has increased its staff and computing power by an order of magnitude. The project has gone from one person in a back room with a NeXT workstation, to over 30 staff around the country working on high-end workstations to meet the needs of educators around the country. Throughout that time, the growth has been user-directed: educators and other users have determined the types of services offered and the level of resources allocated.

AskERIC Today

Today AskERIC serves over 70,000 educators a week through its services. It constantly seeks out new partners from education, industry, and government to provide its clients with the best information. As shown in Table 3 AskERIC has five components:

Table 3: Functional Components of the AskERIC Service

AskERIC's Question/Answering Service (Q&A)	A set of trained information specialists around the country take educator's questions via e-mail and use a variety of networked and traditional resources (ERIC database, Internet sites, mailing lists, etc.) to answer these questions.
AskERIC's Virtual Library (AEVL)	A set of coordinated automated Internet information systems that provide documents on the process of education (including more than 900 lesson plans, subject oriented InfoGuides, and archives of educator discussion groups such as MIDDLE-L, LM_NET [(Eisenberg & Milbury, 1994], and EDTECH).
AskERIC's Partnerships (originally Virtual Communities)	AskERIC's outreach services to acquire resources for AskERIC's user services (Q&A and AEVL).
AskERIC Research and Development (R&D)	An effort to investigate the networking tools of today and tomorrow. This group also advocates the position of education in today's high-performance computing and networking effort.
AskERIC Systems (Systems)	Support group that maintains systems (hardware and software), purchases technology and acts as a technical liaison with technology partners such as Sun Microsystems and Personal Library Software.

AskERIC will continue to change in the future as educators' needs change and as the network matures. Already several AskERIC initiatives have begun incorporating challenges outlined in the National Information Infrastructure (Executive Office of the President, 1993).

The AskERIC Organization

All five of AskERIC's areas guide the management of AskERIC's Internet information services. Each area, however, does this in a different manner, and to a different degree. While AskERIC concentrates on user input, it must deal with other forces that seek to create policy. AskERIC *Research & Development*, for example, stresses new technology in vision setting activities. AskERIC *Partnerships* (see below) concentrate on exterior interests in policy setting.

User Services

AskERIC's user services provide the primary method of guiding AskERIC's Internet information services. Of AskERIC's five units, only two are directly accessible to end-users; the *Question Answering Service*

(McKee, 1995), and the *Virtual Library* (Morgan, 1994). These services (described above) represent the main user input, and therefore, the primary means of directing the organization. Figure 2 represents this input.

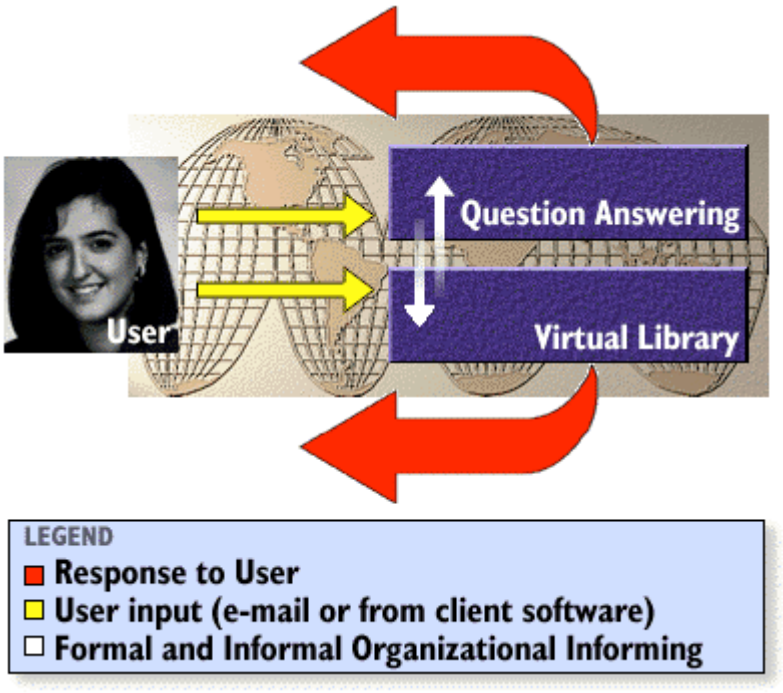

Figure 2 AskERIC's User Services: AskERIC uses e-mail to inform (formally and informally) and direct its primary services. The user receives feedback in the form of either an e-mail response or the requested file.

In the question answering service, user questions and comments are the major source of information. At the date of this writing the *Question/Answering Service* receives over 1,200 questions a week at peak periods. Trends in questions and comments represent users' situations and information needs. These trends are communicated to the rest of AskERIC particularly to the Virtual Library. An example of this communication is the development of the InfoGuides—pathfinders to Internet and ERIC resources on given topics. The topics are derived from incoming questions to the Q&A service.

The *Virtual Library*, to a great degree, represents repeated trends in *Question Answering Service*. The Virtual Library also "informs" the *Question Answering Service*. It does this by informing question answerers (Network Information Specialists) what resources are available in the AskERIC Virtual Library and how to access them. It also informs the larger AskERIC organization of "hot" areas on the automated

services. This is determined by often-accessed Web pages. Currently the AskERIC Virtual Library averages over 2 million hits per week.

In combination, then, the *Question/Answering Service* and *Virtual Library* represent not only the interfaces of AskERIC to the user community, but also the primary means or gathering data on what users want and how the service is satisfying those needs. This data forms the direction of the project. The user input forms the primary influence in building and maintaining AskERIC's Internet information services.

Technology Services (Research & Development and Systems/SunSITE)

AskERIC also considers technology in determining the strategy of the service. However, the technological input is considered secondary to user input. The *Research & Development* effort exists both within the AskERIC organization, and outside it. Not all of the researchers in *Research & Development* are employees of AskERIC. Many researchers are students from Syracuse University. One could view *Research & Development* either as a part of AskERIC, or as a separate research effort working on AskERIC material. Figure 3 below depicts this relationship.

Figure 3 AskERIC R&D's Relationship to Other AskERIC Components: The figure represents the use of Research and Development efforts to scan the Internet technology environment. Rather than setting direction, Research & Development informs other sections of AskERIC.

The main purpose of *Research & Development* is to look for future technologies that may be useful to AskERIC and K–12 educators. However, AskERIC does not implement these technologies until the user services (*Question/Answer Service* or the *Virtual Library*) feel there is broad enough acceptance from the end-user population. AskERIC could not use the World Wide Web, for example, until the user services felt there was enough access for their users. So while *Research & Development* does help to manage and direct the service, it is always constrained by the needs of the user services.

The *Systems* group of AskERIC serves a different technical purpose. Whereas *Research & Development* seeks innovation, *Systems* seeks stability. It is the responsibility of the *Systems* group to ensure all computing and network platforms are available to the other AskERIC components (except for *Research & Development* which is mostly self-supporting). *Systems* also overlaps in responsibility with the *Partnership* group (described below). Once a relationship is established with a technical organization (such as Sun Microsystems or Personal Library Software), *Systems* forms a relationship with a technical contact within the partnering organization. This relationship is used to support the technical infrastructure provided by the partner as well as solicit opportunities and feedback from this partner.

Partnerships

Another component of the project that contributes to AskERIC's ongoing activities is the *Partnerships* group. The *Partnerships* group is responsible for soliciting funds, resources, and projects from organizations external to AskERIC. Partnerships also acts as a liaison to external partner organizations (such as state networks, The Federal Department of Education and various organizations). The *Partnerships* team acts as a liaison between external organizations and AskERIC. This branch of AskERIC, however, does not determine policy or direction. The *Virtual Library* group assists and directs most efforts of the *Partnerships*. If the Library does not see a fit between the external organization and AskERIC, then contact is not continued.

The *Partnerships* team also works with the *Systems* group and the *Research & Development* group on a project by project basis. The technology services act as a sort of contractor to provide specifications and technical expertise to the project. These relationships can be seen in Figure 4.

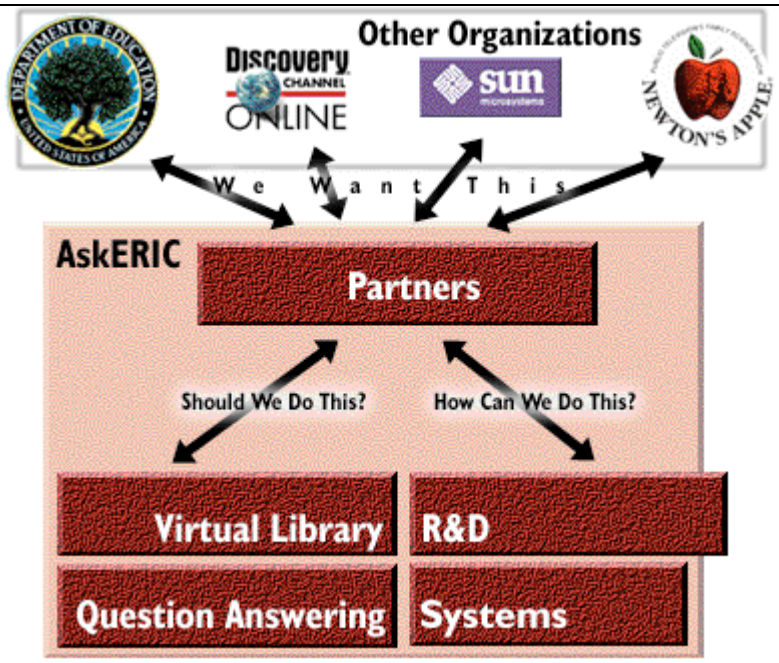

Figure 4 Relationship of AskERIC Partnerships Group to AskERIC and Other Organizations: The Partnerships area takes input, resources, and projects from outside of AskERIC and coordinates with internal AskERIC sections to determine the usefulness and feasibility of new projects, and new resources.

AskERIC Summary

AskERIC can serve as a case study for how STI agencies can provide user-centric services to a core constituency and the general public. It represents one way to learn from the shifting field of digital reference and one example of combining product (the ERIC database and the websites) with service. This blending of service and product is discussed by Davis and Meyer (1998) in their book "Blur." It is applied directly to federal information by Lippencott and Cheverie (1998) in "The 'Blur' of Federal Information Services: Implications for University Libraries."

However, AskERIC also must contend with increased demands on its customer service and the constant evolution of the Internet environment. AskERIC, through the contracts used to support it, has created a linear cost relationship with demand. The United States government pays per question answered, thereby creating a situation where the more questions asked, the more it costs the government. So as the

government succeeds in providing more users with better information, it creates a greater strain on its resources.

In response, this year the government made provisions to allow private funds to support the AskERIC project. Third party corporate and non-NLE sources can be used to augment NLE funds. This use of non-federal resources raises interesting questions. It will be interesting to watch as STI agencies diversify their funding of customer support. How will the government maintain a non-bias perspective in the face of corporate money? How will the agency retain identity amongst multiple sponsors?

In an attempt to find alternatives to sole-source government support of the education community, the NLE with the White House Office of Science & Technology Policy created the Virtual Reference Desk Project.

VIRTUAL REFERENCE DESK

The primary purpose of the Virtual Reference Desk (VRD) is to build a cooperative digital reference network for the United States' primary and secondary education community. Such a network would link students, teachers and parents to experts from multiple communities (e.g., federal agencies, libraries, professional organizations, and corporations). Such a network would allow services like AskERIC to off-load out of scope questions and benefit from a community of innovation.

Work of the first three years of the project have led to a series of tools that can be of use to digital reference services, including STI agencies. These tools include:

- Descriptions – exemplary digital reference services are studied and described. These descriptions provide a blueprint of services, and their workflows. A "meta-description" of digital reference services has been created to serve as an exemplar and basis of software tool development (Lankes, 1998).
- Planning methods – a planning system has been created based on theory, literature and experience. This methodology allows organizations to either plan for a new AskA service, or examine an existing service (Lankes and Kasowitz, 1998).
- Training programs – A series of self-guided training materials (Lankes and Kasowitz, 1998) and courses has been developed to train information professionals on how to build and maintain digital reference services in K-12, library and STI settings.
- Standards – the Virtual Reference Desk team is developing a metadata standard to allow questions to be exchanged from digital reference service to digital reference service. The Question Internet Profile (QuIP) outlines a basic XML application that can allow rich interoperation within a given digital reference community, and basic interoperation amongst all digital reference communities (Lankes 1998).

This method of creating an extended community of interest to provide a distributed network of support is an option that should be explored in other STI domains.

CONCLUSION AND RECOMMENDATIONS

The Internet is indeed a great development in the distribution and coordination of federal scientific and technical information. If indeed STI is "an essential ingredient of the innovation process – from education and research to product development and manufacturing" (United States Congress Office of Technology Assessment, 1990, p.1). and people are increasingly looking to the Internet for this information, then the way in which we support this information on the Internet is just as vital.

As the number of users accessing Internet STI sites grows, policy makers and managers must be aware that the populations they serve are also growing more diverse and needy. Simply building self-service interfaces for highly specialized, often highly educated staff no longer works. Today users at all levels must be involved and considered in the creation of tools and the building of support systems. In essence, increased Internet product access equals increased need for customer support.

Increased customer support on the Internet should also be tiered. As Mardikian & Kesselman (1995) pointed out an organization must know when to use human resources for customer support and when to automate. The expensive human resources should be used for high-level synthesis and the creation of tools for users. Web pages and on-line help can work well for simple factual answers and basic directions. All too often organizations (including libraries) switch these two tasks.

It is important for STI agencies to think of service and product as linked. A database with no support is of limited use. Further, in some cases, agencies need to think of service as a product. It is very conceivable that the resources supporting the population of a database may be matched or exceeded by the amount spent applying and supporting it with high-level analysis and synthesis. After all, with increasing sophistication

of web harvesters and search engines, the problem is not finding information, but rather finding too much information. The day will indeed come when users will pay more to filter out information than access it.

There is a need for continued software and standards development in federal STI support. Much work has been done in getting databases on the Internet, and metadata standards for data interchange, but little has been done to connect support agencies. Questions should regularly (and effortlessly) change hands amount STI providers to balance load (the number of questions) and scope (the topic of questions).

Finally, STI agencies should seek to create a community of support. Look outside traditional agency and contractor resources to provide expertise and synthesis. In the education community, volunteer and barter systems can be established to link experts to users. However, in other areas such as medicine or science, there may be need for transaction systems where monies are exchanged for expertise.

Federal STI agencies face a great challenge. As they succeed in organizing and distributing information, they may well be spelling their own doom. With increased awareness and access come increased support demands. The Internet presents both opportunities and headaches to customer support. The promise of 24 hour a day, 365 day-a-year support is a titillating (and real) opportunity, but many policy, economic and technological barriers remain. Agencies must first recognize the need to provide high-level human support on the Internet, then they must determine the level of support they can provide, and then they can take advantage of the distributed real-time resources they have available to them.

If agencies continue to believe that web pages and databases are sufficient to serve a general public, they will come to find a public confused and very unsupportive.

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ENDNOTES

[1] For example via the Freedom of Information Act in the United States.
[2] Patron is a library term synonymous with user or customer.
[3] SunSITEs are university-based projects that use donated equipment from Sun Microsystems.