A COMPREHENSIVE INVENTORY OF TECHNOLOGY

AND COMPUTER SKILLS FOR ACADEMIC

REFERENCE LIBRARIANS

By

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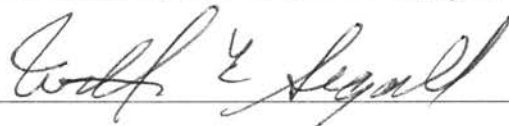the requirements for
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INTRODUCTION

Background

The popular press and scholarly literature remind us on a daily basis of the pervasive changes brought about in recent years by technology. This is certainly the case in academic libraries. Library automation systems, since their introduction in the late 1960s and early 1970s, have dramatically changed the way in which libraries manage their operations. Perhaps more importantly, technology has fundamentally changed the ways in which libraries provide access to materials and information for their users. While these changes have generally been welcomed by librarians, in many cases little formal education or training has been provided to ensure that librarians are able to use the available technologies to their greatest advantage.

Reference librarians working in academic libraries are faced with an ever-increasing number of electronic resources, many with unique interfaces and technical requirements. Navigating these changes, let alone assisting library users who have widely varying levels of

computer skills, is indeed a challenge. (Creth 1990; Peters 1990; Smith 1992)

Recent studies indicate that the mean age of academic reference librarians is higher than the mean age of the general working public and rising (Association of Research Libraries 1994; Wilder 1995). The ARL Annual Salary Survey 1998-99 (Association of Research Libraries 1999) found the mean years of experience among its member librarians to be 17.3 years. This would suggest that a large portion of the group received little or no formal education to prepare them for this changing environment.

Furthermore, academic libraries are often faced with financial challenges requiring that professional library staff positions be restructured, necessitating the revision of position descriptions and job requirements. The financial challenges also dictate that available funding for training be carefully targeted and expended in the most effective manner possible.

Statement of the Problem

Academic reference librarians play a critical role in assisting undergraduates, graduate students, and faculty in the research process. It is increasingly important that these librarians possess the technical skills that will

allow them to perform their jobs efficiently and effectively. This study will develop a comprehensive inventory of the technology and computer skills required of these librarians in today's academic library environment.

Purpose of the Study

The purpose of the study is to develop an inventory of the computer and related technology skills required of reference librarians in an academic library environment. The intent is to develop a comprehensive list, comprised of all computer and related technology skills that may be applicable, with the understanding that not all will apply to every reference librarian in every academic library.

Research Questions

Using the Delphi method, this study asked "What are the technology and computer skills required of reference librarians in academic libraries?" These skills may be subsumed under the headings of operating systems, hardware basics and troubleshooting, and software basics and troubleshooting. Respondents were asked to list the skills they believed to be required. The list of skills generated by the respondents was analyzed and sorted.

Thereafter, it will be redistributed to the same group in subsequent rounds to develop a consensus model of required skills.

Significance of the Study

The study provides academic library administrators with a comprehensive inventory of computer and related technology skills which may to useful in assessing training needs and in describing required and desired qualifications when updating job descriptions. In addition, the inventory may be beneficial to faculty and administrators in schools of library and information studies when curriculum revisions are undertaken.

Definition of Terms

Ability - "refers to the intangible qualities or characteristics that are necessary for performance and are often referred to under the rubric of 'motivation' or 'attitude.' Abilities needed by library staff include flexibility, cooperation, service attitude, and leadership" (Creth 1986a, 3).

Academic Libraries - "Academic libraries support the development of the colleges and universities of which they are a part. These libraries, integral parts of the

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institutions they serve, design their collections and services to meet the instructional and research programs of their parent institutions. The program of the academic library varies by type of institution; the library services offered in a doctoral-granting university will differ from the services developed to support the offering of a two-year college. . .

The basic assumption governing the growth and development of all academic libraries is that the library plays a significant role in the instructional and scholarly life of the college or university. This assumption is one that some seek to validate by demonstrating the value of the collections to the researchers on campus, while others focus on the benefits derived from the delivery of reference service to the campus community by liberally educated librarians who are involved in educational matters" (Wedgeworth 1993a, 5).

Digital Library - A library collection comprised of any combination or variations of 1) machine-readable data files; 2) online and CD-ROM databases; 3) computer devices on which the information is stored; 4) computerized library networks and systems (Saffady 1995, 223-224).

Knowledge – "refers to the information that is needed to perform a set of activities efficiently and effectively. Examples are knowledge of reference tools, cataloging practices, collection development, automated circulation systems, call numbers, management topics, and many more" (Creth 1986a, 3).

Reference and Information Services – "Reference and information services exist in libraries because the many means of access to information in library collections are complex and are not intuitively self-evident. . . To mediate between library users' information needs and the information resources of the library, libraries offer reference and information services. . .

The purpose of reference service is to help a library's clientele use its collections and external resources effectively to meet their information needs. The distinguishing features of reference service are a staff designated to provide the service; a collection of reference works accessible to the public in an area set aside for the provision of the service; adequate guides to the library's resources (such as a classification scheme, a catalogue, and indexes); and a high degree of interaction

between the staff and the clientele" (Wedgeworth 1993b, 703).

Skill – "refers to the techniques, the approaches, and the styles of translating knowledge into action or practice. For instance, librarians need the skill to conduct a reference interview, to interpret cataloging rules in relation to the intellectual content of the material, and to evaluate staff performance" (Creth 1986a, 3).

Technostress – "a modern disease of adaptation caused by an inability to cope with new technologies in a healthy manner" (Brod 1984, 16).

Assumptions

The participants will be selected to insure representation of viewpoints of experts and practicing academic reference librarians. Experts will be identified and selected based on their publication records, as well as their stature as presenters at national library conferences. These experts may, in fact, be practicing academic reference librarians. They may, however, also represent academic library administrators, library school faculty, or academic systems or technology librarians.

Given the above stated selection process, it is assumed that experts and practicing reference librarians

will be sufficiently knowledgeable about state of the art technology and able to assess the needs for functioning librarians.

Limitations

The study will not attempt to identify content or conceptual knowledge related to academic reference librarianship. That would include but not be limited to subject and source knowledge, search strategy formulation and skills, as well as communication skills. Furthermore, the study will not seek to describe skills that might be uniquely required by school (K-12), public, or special librarians.

CHAPTER II

REVIEW OF THE LITERATURE

As stated in Chapter I, the popular press and
scholarly literature remind us on a daily basis of the
pervasive changes brought about in recent years by
technology. The history of automated systems in libraries
is a relatively brief one, with early implementation
occurring in the late 1960s and early 1970s. In this
relatively brief time frame, however, library automation
systems have dramatically changed the way in which
libraries manage their operations. Many of these early
efforts in library automation focused on the management of
internal processes and functions. However, the application
of technology quickly spread to information delivery and
has fundamentally changed the ways in which libraries
provide access to materials and information for their users
(Borgman 1997, 215).

History of Library Automation

The history of library automation is well documented
in monographic and journal literature, and has been the

topic of numerous scholarly works. A review of this massive body of literature is beyond the scope of this study, but to understand the technological environment in which libraries operate today, it is useful to take a brief look at the history of automation in libraries. Two papers, published more than twenty years apart, provide adequate and interesting perspectives on the automation of libraries.

Allen B. Veaner (1974, 1993) of Stanford University conducted a study as part of a Council on Library Resources Fellowship entitled "Institutional Political and Fiscal Factors in the Development of Library Automation, 1967-71." The paper was originally published in 1974 in the Journal of Library Automation, and reprinted in 1993 in Information Technology and Libraries. References to Veaner's paper will cite the 1993 publication.

A 1997 Library Quarterly article by Christine L. Borgman provides a succinct overview of library automation history in the United States and Britain. Dr. Borgman is Professor and Chair of the Department of Library and Information Science at the University of California-Los Angeles.

Borgman frames her review of the history of library automation in four stages. The stages Borgman identifies are: 1) Efficiency of internal operations; 2) Access to local library resources; 3) Access to resources outside the library; and 4) Interoperability between information systems and the development of a Global Information Infrastructure. Each of these phases has been incremental; new goals developed throughout each stage, but goals in the earlier phases remain (218).

Borgman states that Stage One, with emphasis on efficiency of internal operations, began in the 1960s. While a few libraries had begun experimental use of computers earlier, the 1960s brought a convergence of factors that fostered the development of automated systems. These factors included a general expansion in higher education, which provided increased funding for libraries (218-19).

Veaner (1993) provides detailed information on the sources of funding:

> President Johnson's administration had launched
> enormous programs in support of education. The
> Library Services and Construction Act was soon to
> channel millions of dollars into library plant
> expansion and perhaps more significantly, the
> Higher Education Act of 1965 was to sponsor
> research, which until then had only the support
> of limited funds from the Council on Library

Resources, Inc. and the National Science Foundation (NSF) (54).

This period also saw a marked increase in the rate of publication. Libraries realized that the challenges of acquiring and processing materials exceeded the limits of labor-intensive manual systems (Borgman 1997, 219).

Veaner (1993) suggests that libraries entered into the software development process with the hope of catching up in an area where they were falling hopelessly behind. Academic libraries were also subject to increasing demands from the academic community, particularly those in disciplines where computers were already widely in use. He states:

> Libraries had come to be felt by some as strongholds of conservatism and expensive luxuries; librarians were faulted for not "putting the card catalog onto magnetic tape," for not implementing automated circulation systems, or otherwise failing to take advantage of new and powerful data-processing techniques (54).

According to Borgman (1997) the early library automation projects focused on core library operations, including circulation, acquisitions, and cataloging (219). Automation provided efficiencies through improved workflow within the library, and also provided means for sharing data between libraries. Borgman reports that most of these

early efforts were locally developed applications that relied on batch processing of records. These efforts resulted in improved services, getting books to shelves more quickly, and simplifying circulation operations (Ibid.).

These locally developed systems paved the way for the development of shared cataloging systems, most notably OCLC (originally the Ohio College Library Center, now the Online Computer Library Center). These shared systems required standards for exchange of bibliographic data, which came in the form of Machine-Readable Cataloging (MARC), a project of the Library of Congress. Other countries began developing their own MARC formats, and in the late 1970s the International Federation of Library Associations developed Universal MARC (UNIMARC), which paved the way for international cooperation and data exchange (219-22).

According to Borgman, with MARC format in place, the necessary elements were in place for Stage Two in library automation in the mid to late 1970s (221-22). While Stage One had focused on back-office functions and efficiencies, Stage Two built on computerized processing functions and brought integrated online systems to library users. These integrated systems allowed libraries to create a record at

the time an item was ordered, with modifications to the

original record as the item moved through the acquisition,

accounting, and cataloging processes. This same record

ultimately provided library patrons online access to the

item's bibliographic data through an Online Public Access

Catalog (OPAC).

Another key factor in the movement toward automation

in libraries was the emergence of a library automation

marketplace, with systems designed and marketed by

commercial vendors. Borgman states:

> The period from the late 1970s to early
> 1980s was marked by rapid growth in the number of
> libraries automating their operations. One of
> the most significant reasons for achieving
> critical mass at this point was the emerging
> market for automated library systems. Until that
> period, libraries wanting to automate had few
> alternatives to funding their own development
> costs. The textbooks of the early 1970s
> explained how to design and develop library
> systems, while 1980 marked the first text on how
> to select from the commercial systems available
> (222).

These commercial systems initially relied on

proprietary software, hardware, and, in some cases, even

operating systems. As the industry matured, librarians

pressured vendors to move toward open standards, and

commonly used client/server architectures (223).

OPACs represented the first visible evidence of library automation to the public. From initial on-site availability in a few libraries in the mid-1970s, OPACs reached critical mass in the 1980s, as they became available via local area networks, dial-up modem, and eventually via the Internet and World Wide Web. Borgman explains the benefits brought about by the development of OPACs:

> Online catalogs brought significant qualitative improvements in access to library resources. Even though the content and structure of the records was little changed from card catalogs, online catalogs provided new searching capabilities such as key word access, Boolean logic, and limits by date and type of material. By combining circulation, acquisitions, and cataloging data, integrated systems changed the nature of the catalog from a record of materials owned to a database indicating what is owned, available, and on order.
>
> Universities and other organizations with multiple libraries could treat all their holdings as one database, searchable from any terminal. Prior to online catalogs, only the central campus (city, government, corporate, and so on) library was likely to have a union card catalog; each branch library had a card catalog of its own holdings. With online catalogs, all catalogs could be union catalogs, allowing simpler and more comprehensive access to the full array of library resources. Conversely, online union catalogs can be viewed as local catalog by filtering only local records to the user interface of the system. Thus, online catalogs marked a shift in focus from individual local collections to the convergence of multiple collections and from access in the library
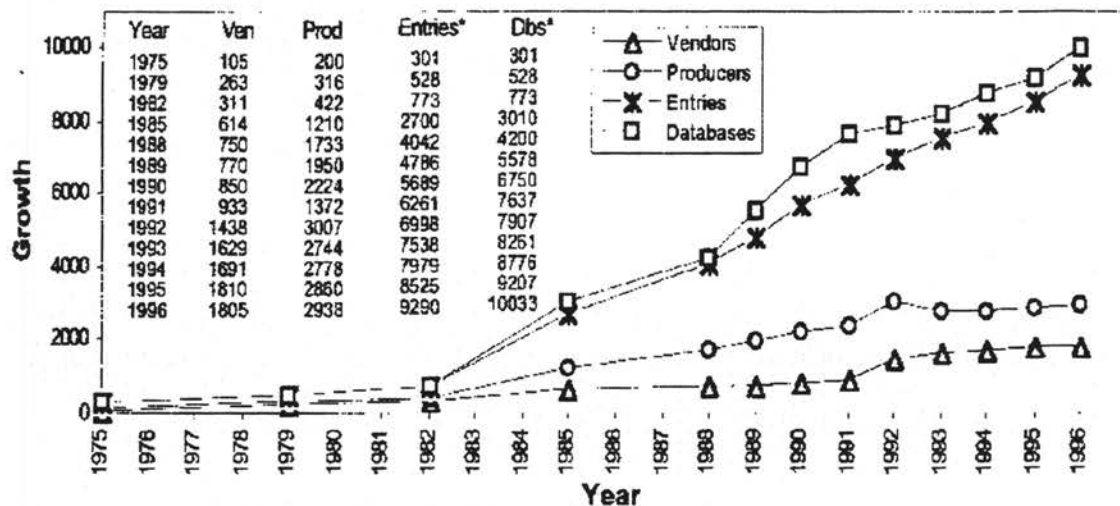
building to remote access, removing geographic constraints (223-24).

Once basic library operations were automated, and OPACs were in place, libraries were poised to move into what Borgman identifies as Stage Three, which focuses on provision of access to resources outside the library (225). The funding bonanza of the 1960s had passed, and by the 1980s libraries were faced with decreasing acquisitions budgets, while the rate of publication, and availability of information resources soared.

In light of these economic realities, coupled with the availability of technology, academic libraries have shifted their emphasis from ownership of massive collections to providing access to information. Academic libraries today can augment their own physical collections through Interlibrary Lending and document delivery services, and through access to a variety of computerized bibliographic and full-text resources. The development of protocols for exchange of bibliographic information has enabled libraries to deliver access to information resources to the library patrons' desktops (225-28). The phenomenal growth in the number of available databases is illustrated in Figure 1 (Nolan 1998, xxi).

While there is still much work to be done in the development of a truly common interface, it is now possible for library patrons to access not only the library's OPAC, but also a variety of Web-delivered bibliographic and full-text databases, CD-ROM databases, and document delivery services from the desktops.

Year	Ven	Prod	Entries*	Dbs*
1975	105	200	301	301
1979	263	316	528	528
1982	311	422	773	773
1985	614	1210	2700	3010
1988	750	1733	4042	4200
1989	770	1950	4786	5578
1990	850	2224	5689	6750
1991	933	1372	6261	7637
1992	1438	3007	6998	7907
1993	1629	2744	7538	8261
1994	1691	2778	7979	8776
1995	1810	2860	8525	9207
1996	1805	2938	9290	10033

*Note: Database and entries that are provided in more than one medium are counted only once.

Figure 1. Growth of Online Services

These are the challenges that will need to be addressed as libraries progress into Borgman's Stage Four. While MARC format and standards like Z39.50 and Hyper Text Markup Language (HTML) have enabled libraries to more easily exchange information, the World Wide Web poses additional challenges in providing common interfaces and standardizing file formats. Borgman states, "New

competition in the marketplace between client software packages is leading to a divergence in standards, with each offering customized features" (230). As libraries provide access to an increasing amount of full-text content, these issues become more complex.

Veaner (1993) concludes his article with predictions of future developments in library automation and some cautionary statements. Although his statements were made twenty-five years ago, similar statements are often heard today, particularly if one substitutes *Internet* or *World Wide Web* for *computer*. He states:

> The computer is actually the library's life insurance and blood plasma. A failure to respond to the challenge of the computer could be fatal, for it is increasingly apparent that patrons growing up in the computer era will not patiently interact with library systems geared to nineteenth-century methods. Nothing in the educational system exists to force people to use a given resource; people use the resources that are effective, responsive, and economical. If the computer is a better performer than the library, patrons will go to the computer. This will particularly be the case as computer services become broader in coverage, simpler to use, and unit prices continue to decline. Despite the serious and irritating problems associated with learning to use the computer, librarians must continue aggressively to support computer applications; indeed, library leaders can impart no more important message than this to their community leaders (64).

When we consider that all the changes described in the preceding paragraphs have occurred in a time span of approximately three decades, it is clear that academic libraries and librarians continue to work in a rapidly changing environment. The next three sections will review literature pertinent to the training of librarians in light of this changing environment.

Demographics of Academic Librarians

In 1995 Stanley J. Wilder published a work entitled The Age Demographics of Academic Librarians: A Profession Apart. Wilder's work is based on data collected from the 1990 and 1994 Annual Salary Surveys, conducted by the Association of Research Libraries (ARL). The ARL surveys collected data from their 119 member libraries. Wilder's analysis excluded 11 ARL member libraries that are not part of a university.

Based on his studies of ARL data, Wilder concludes that librarians in general, and ARL librarians in particular, are older than members of comparable professions, and that the average age is increasing at a more rapid rate than in other comparable professions (viii, 14-15). Wilder attributes this rapid and anomalous rise to the predominance of the cohort of librarians hired in the

1960s, who were in the 40 - 54 year old age bracket at the time of his study. Wilder notes that this group has disproportionate influence on the average age, because the rate of growth in the profession has decreased since 1971. He also points out that members of this group have been hired at a higher than expected rate over the past 25 years simply because they have comprised a larger portion of the general population (57). Wilder also states that, based on the data available in 1994, "ARL libraries had more librarians who began their careers in 1967 than began in any year from 1990 forward" (viii).

The ARL Annual Salary Survey 1998-1999 reports that the average years of experience among academic librarians by institution ranged from a high of 22.2 years to a low of 10.2 years, resulting in an average of 17.3 years (Association of Research Libraries 1999).

Based on Wilder's (1995) findings and the average years of experience reported in the ARL salary survey, one may surmise that a large portion of academic librarians completed their formal education prior to the introduction of technology in libraries. This fact has had, and continues to have, an effect on the ability of these librarians to assimilate and adapt to new technologies. It

also poses a continuing challenge to libraries in the area of training.

Jeannette Woodward, Assistant Director of the Wayne State University Undergraduate Library, published a paper in 1997 describing a "growing resentment toward aging professionals with limited computer skills who were no longer seen as carrying their weight" (32). This concern was voiced by a colleague of Woodward's and she was somewhat startled to learn that he was referring to librarians in their forties and fifties. Woodward states that

> Most middle-aged librarians are, of course, not so openly hostile to computers. They have struggled valiantly with each new program and probably know more about the subject than many members of the general public. Although they have tried to be good team players, they have acquired only the basic skills necessary to carry out the routine duties in their job descriptions (Ibid.).

Woodward states that librarians who completed library school in last few years bring with them knowledge of "networking, systems, database design, electronic reference sources, and experience with dozens of software applications" (33). She continues, "Between these graduates and 20-year veterans with nothing but a Windows

workshop and years of hands-on OCLC experience, there exists a vast chasm" (Ibid.).

Concern is expressed regarding the expenditure of meager training funds, which Woodward states are most often allocated to new librarians. The rationale for this allocation of funds is often based on the assumption that new librarians have more years ahead of them to use the knowledge and skills they gain from training. Woodward points out the fallacy of this approach, however, by pointing out that younger librarians are much more likely to remain in positions for a short time, while older librarians are likely to remain in their positions until retirement. She believes that the impression that older librarians do not want to learn new technologies is generally not true, stating that their seeming reluctance most often results from lack of opportunities to acquire new skills. Woodward also believes that the need for technical skills increases along with the degree of responsibility in a given position. She suggests that this knowledge must include theoretical knowledge of technology, not just the hands-on skills needed to do one's job. To make informed decisions about technology applications,

librarians must have an "insider's grasp on technology" (34).

Woodward urges libraries to evaluate and revise position descriptions to include specific computer competencies, as well as required theoretical knowledge. In closing she states that providing adequate training that targets these requirements will ensure that libraries benefit from the loyalty, dedication, years of experience, and leadership of their older librarians (Ibid.).

Writing in a 1998 column in Library Journal, Anne Woodsworth asks how librarians who are working with degrees more than five years old can both obtain and sustain technological competence (62). While some are able to "hack their way to it," she states that a better plan must be devised (Ibid.). Without a comprehensive training strategy, Woodsworth questions the ability of librarians to "master concepts that underpin IT [information technology] . . . cope with future IT revolutions or use it intelligently to fulfill their missions" (Ibid.).

Need for Training

The topics of training, professional development, continuing education, and staff development are frequently addressed in the literature of academic librarianship.

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This literature review will focus primarily on the literature that specifically addresses training in the areas of information and computer technology.

One of the most frequently cited authors on the subject of academic librarians and training, Sheila D. Creth, has been the University Librarian at the University of Iowa Libraries since 1987. Ms. Creth has made significant contributions to the professional literature, having written on the effect of information technology on libraries and the role of library professionals, creating partnerships between library and computing professionals, and a variety of personnel and organizational issues. She is a frequent speaker at library and computing conferences. Ms. Creth received the 1999 Library Information Technology Association/Gaylord national award for innovation in the application of information technology (Creth 1999).

In the Preface to Effective On-the-job Training, Creth (1986a) states ". . . I have come to believe that improved job training is an unrealized source for library effectiveness" (v). Based on her observations and experience, she describes a scenario in which newly hired library personnel often begin their jobs with a great deal of enthusiasm, but become disillusioned or apathetic within

a few months. She attributes this change to lack of training (Ibid.), and states that the health of the organization is directly impacted by poor training (2).

Creth cautions that the expansion of technology in libraries may lead to pressure to cut library staff. To enable staff to cope with more diverse and demanding job activities, Creth believes that attention to training is critical. Further, she emphasizes the fact that the technologies will continue to change at a rapid pace, requiring a staff that is sufficiently trained to readily adapt to the changing technological environment. She concludes her introductory remarks with these statements:

> The only factor in library organizations that may remain constant is change itself. . . The future of libraries relies on the quality, dedication, energy, and intelligence of the library staff. Training plays a central role in ensuring that staff are prepared (Ibid.).

Recognizing and accepting the fact that library organizations are in a state of constant change must be reflected in training. While maintaining commitment and respect for current practices, training is necessary to allow individuals to adopt new practices when change is required. Creth illustrates this point with a scenario involving a reference librarian,

The primary focus of training would be to ensure that the librarian has a commitment to the value of reference service, the ability to provide instruction in current services and activities, and the flexibility to respond to changes in the future. Unless training addresses this range of needs, the reference librarians will be wedded to the idea that reference service can be provided only at the reference desk using traditional tools, and he or she would potentially lack the flexibility to rethink reference service in the context of new technologies or changing user needs (6).

Creth discusses this duality of role further in the context of parallel systems, stating that

On the one hand, the library will change dramatically but also remain the same. Collections in printed form will continue to be important along with electronic publications and software; individual assistance to users in the use of printed indexes and online databases will continue and co-exist with new and yet unknown services. So traditional library activities, with all of the attendant knowledge and skills required of librarians, will exist alongside the emerging activities requiring new knowledge and skills. In addition, as technologies change, university libraries will upgrade a system and in doing so have to run two systems in parallel, maintaining operations on the old while implementing the new. These situations will make considerable demands on staff and require a vast range of knowledge as well as a high degree of flexibility (8-9).

In an article published in the same year, Creth states that academic librarians, as members of the educational community, must value education for themselves, as well as those they serve. Given the pace of technological change,

she believes that librarians must cultivate new roles and attitudes if they wish to retain control and the ability to shape their futures. She once again emphasizes the critical role of training in this context (Creth 1986b, 657).

One of Creth's most forceful statements on the importance of training comes from a chapter in a volume entitled Education for Professional Librarians. She states that

> Without a planned program of training and development, chaos tends to result as change is continually introduced. This in turn can lead to inadequate services, poor staff morale and high turnover, and eventually a diminished view of the library by faculty, students and administrators (Creth 1986c, 18-19).

Darlene E. Weingand (1986), in her chapter in Education for Professional Librarians, raises the concern of "occupational obsolescence." She states that

> Based on observable changes in the information professions, this author estimates that the shelf life of the preservice MLS now stands at approximately five years, and the rate of societal change continually challenges that estimate. Occupational obsolescence is now a very real concern in all lines of work, but it is particularly critical in the information professions, for it is information and its modes of access which are accelerating at the fastest rate (223).

The proceedings of a conference held at the University of Wisconsin in 1989, The Future of Academic Libraries, include a paper presented by Creth. She once again emphasizes the theme that training is directly related to quality of service, and that the demands for service increase with users' expectations of automated systems. She links the transforming nature of technology directly to the ability of librarians to effectively implement and use the technology. Creth states that

> If we keep in mind that the power of technology to transform the university library and information services on the campus will be exploited by people, then training should rise to the top of the list as a priority. Technology is a tool; it is people who bring imagination and understanding to bear on the information and the social setting in which information must be sought (59).

Susan Jurow (1992) also characterized training as a critical element in the effective use of information technology. She emphasizes the need for understanding of the larger environment in which technology exists. That understanding enables librarians to make intelligent decisions about appropriate uses of technology. She identifies librarians as facilitators or bottlenecks to the effective use of technology (13).

The Summer 1990 issue of Library Administration and Management (LAMA) was a theme issue focusing on training and staff development. In her contribution to the publication, Creth (1990) reaffirms the need for training, noting that the need is becoming evermore critical. She states that as fundamental changes occur in the methods by which information and services are provided, user expectations increase, and both of these factors place new learning requirements on staff (131). Referring to the traditional library role of preservation, Creth states that

> We need to take an environmentalist or preservationist approach to the people resources in the library. Otherwise, we run the risk that library staff may, like collections, become embrittled and unusable. Lacking knowledge and skills, they may become inflexible and unresponsive in planning for and adapting to the future (132).

In their article in the Summer 1990 issue of LAMA, Ronald Leach and Maureen Sullivan posit that academic libraries were traditionally comprised of three primary components: collections, staff, and facilities. They state that a fourth component has been added, with that new component being technology. They continue that it is a well-trained staff that gives academic libraries a competitive edge in developing programs of excellence in this new environment. To achieve this ideal, they stress

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the need for academic libraries to commit the necessary time, effort, and financial resources to ensure that staff training needs are met (138).

"Train and Retrain" is the title of Tom Peters' article in the Summer 1990 issue of LAMA. Peters brings an outsider's view to the issue, as a management consultant and author working outside academia. His article points out the disparity between organizational expenditures on hardware versus the concurrent funds allocated toward training. He contends that even though most organizations and institutions are likely to proclaim that their workforce is their greatest asset, the organizational commitment to training belies this view. He states that training is not only necessary to enhance workforce skills, but in today's environment it is an absolute requirement to guard against a decline of the prevailing skill level. Peters cites a number of corporate examples where training has played a documented and strategic advantage in the business world. He concludes by mapping out elements of a successful training program and initial steps that organizations might take to redesign and upgrade their training. His admonishment and advice is simply stated: "Train everyone - lavishly" (127).

Speaking at the 9th International Seminar on the Research Libraries - Yesterday, Today, and Tomorrow held in Kanazawa, Japan, Warren J. Haas (1991) addresses the changing role and mission of education programs for librarians. He reiterates the inseparable nature of professional preparation and the functions and services of research libraries, and comments on the changes that technology requires from library education programs:

> The dramatic transformation of libraries during the past two or three decades and the prospect of what lies ahead underscores the expanding role of librarians and demonstrates the wide range of knowledge and capabilities that are now required. . . .It is essential that the roles of librarians and the purpose and content of their professional education be clarified, assessed, and made fully responsive to the needs of the new era (111-112).

Duncan Smith (1992) takes a somewhat different view of the changes required of library education programs. He states that, "The profession does not need new librarians as much as it needs renewed librarians. The repositioning of the library profession can only be achieved through the continuing education and development of existing staff" (53).

Justification of funding for training is difficult, particularly as academic libraries have faced static or even shrinking budgets. Kathleen Low stresses the

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potential costs of *not* providing adequate training. In a
1991 article she stated that

> The cost of not providing training, however, far
> outweighs the actual training costs. Without
> training, existing hardware and software may be
> underutilized, countless staff hours may be
> devoted to cleaning up errors caused by lack of
> proper training, staff may become unproductive,
> or they may feel uneasy and under stress due to
> lack of sufficient training, leading the library
> to a high turnover rate. These are just a few of
> the greater expenses facing libraries if they do
> not devote some financial resources to training
> and development (279-280).

Training is identified as a critical element to enable
change in academic libraries, according to Susan Lee
(1993). She opens her article with this statement:

> Today's research libraries face changes occurring
> at rates exceeding the scope of natural
> assimilation processes, and lack sufficiently
> comprehensive methods for adjusting and adapting
> to the turbulence. . . While technological change
> has been continuing exponentially for the last
> two hundred years, it has now reached a level of
> pervasiveness and frequency unique to our times.
> (129).

Lee views training as an empowering process. As
librarians learn to do things differently, they produce
different results, which ultimately lead to organizational
renewal and increased effectiveness. (Lee, 1993, 138)

More recently, in a 1995 publication, Creth stresses
the need for training again. Here she states, "It is
essential that library professionals continuously acquire

new knowledge and skill [sic] to ensure that they remain a vital part of information services of the future" (90). She notes that, while the need for acquisition of knowledge and skills has always existed, technology has accelerated the pace at which these new skills must be acquired. This requires a rethinking of the approach to teaching and learning, "to ensure that ongoing, timely, and high quality learning is a high priority" (91). Two new elements appear in this paper that were not present in Creth's earlier writings. First, she states that library professionals must be sufficiently adept in new technologies to make intelligent decisions about relinquishing certain familiar and traditional activities in favor of the new. Second, she states that these choices must be

> . . . centered around an assessment of user needs rather than librarian's (sic) perception of user needs or the needs of librarians. An essential premise in changing expectations for work and working relationships is for library professionals to assume that assignments and responsibilities, along with knowledge and skills, will continually alter and change (91-92).

Tom Wilding (1995) authored a chapter in Academic Libraries: Their Rationale and Role in American Higher Education. He discusses the rate of change in academic libraries, stating that "Library staff have seen several

generations of library automation, and the half-life of a

library system continues to grow shorter and shorter. . .

New models of service are emerging and are being replaced

before they can be fully implemented by even newer models"

(71). In light of this rapid and constant change, Wilding

emphasizes the need for training programs to be updated as

conscientiously as the hardware and software. He reminds

us, however, that academic libraries will continue in a

"bimodal existence" and states that

> For the foreseeable future, libraries will
> include the very large printed collections that
> have been traditional (and these will continue to
> grow). At the same time, libraries will be
> acquiring access to ever more numerous electronic
> resources. Libraries will continue to be
> physical places where users come to study the
> history of the past and explore the world of
> print. At the same time, libraries will be
> gateways to a vast store of information through
> electronic networks. Librarians and other
> library staff members will need to maintain
> superior skills in both of these worlds, and this
> will present new training needs (87).

Carol Tenopir, Professor in the School of Information

Sciences at the University of Tennessee, Knoxville, and

Ralf Neufang conducted two surveys in the last decade to

track the incorporation of electronic reference tools in

ARL libraries (Tenopir and Neufang 1992a, 1992b, 1995;

Tenopir and Ennis 1998a). A third survey was undertaken by

Tenopir and Lisa Ennis (1998a, 1998b, Tenopir 1998). While

these surveys have focused primarily on the resources, the latest survey elicited comments from reference librarians about their perspective on the changing environment. One respondent states,

> "I believe that technologies are allowing us to do more, but they are also driving us to do more. Many traditional tasks remain while new demands are made on time. Many staff members feel as though the goal posts are moving. Overall, new technologies advance our abilities to provide information, but the more, the better, the quicker and the easier it gets, the more demand is created. We are plagued by our own successes" (Tenopir 1998, 39).

Adding to the view that reference librarians' roles are changing, another respondent adds,

> "Reference is less a skill as it has become a trade. The reference librarian more and more is technical support rather than a resource." There are "overwhelming numbers of new (digital) tools and interfaces to master for staff: this forces us to allocate significant time for training, puts the emphasis (too often) on the medium rather than the content, and widens the gap between subject specialists and desk service specialists" (40).

Concurrently with Tenopir's survey, Lisa Ennis surveyed the same population and sought responses to questions that dealt with technostress among academic reference librarians. Comments elicited in these two surveys are quoted in Ennis' (1998) thesis and in two articles that Tenopir and Ennis (1998a, 1998b) co-authored.

As reported in their second article, one respondent states that

> "We are required to know a lot about how data files are organized and to have knowledge of technical matters such as, what patrons need to do to access library resources from their homes and offices" (88).

Describing stress factors encountered by reference librarians, another respondent states that

> "The rapid proliferation and changing nature of electronic resources is creating an enormous amount of stress for reference librarians and a crisis for professional and staff development. Librarians are really struggling to keep up with developments and stay ahead of users in knowledge of resources and the skills to use them" (Ibid.).

The Association of Research Libraries' Office of Management Services publishes a series entitled Systems and Procedures Exchange Center (SPEC) Kits. The SPEC Kits cover a broad range of library topics, and generally present results of surveys conducted among the ARL libraries. Over the past twenty-five years, several of the SPEC Kits have focused on staff training and development (Association of Research Libraries 1975, 1978, 1979, 1981, 1982, 1984; Messas 1997; Wilding 1984). The applicability of these surveys to this study is limited. The SPEC surveys are distributed to ARL libraries through a SPEC liaison, designated by each institution. The survey

results, therefore, reflect the perspective of a single administrator within each institution. Further, the surveys have historically covered all areas of staff development and training. The latest survey by Messas (1997) included this statement in the cover letter that accompanied the survey:

> Since 1981 when the last ARL SPEC Survey was conducted on this topic, there have been dramatic changes in libraries which affect staff development. The tremendous growth in electronic resources made possible through telecommunications and other emerging technologies, budgetary crises in libraries demanding downsizing, outsourcing, restructuring and reorganization, quality initiatives, and the implementation and maintenance of integrated library systems have all placed an unprecedented burden on library staff.

> This SPEC survey is designed to determine how ARL libraries are utilizing staff development programs to enable staff to maximize their potential and effectiveness in this new environment (3).

Respondents to Messas' survey included information on such diverse training programs as: customer service, communication skills, CPR, sexual harassment, copyright issues, ergonomics, disaster recovery, and support for research, scholarship, and publication. Respondents also provided useful documentation about programs that specifically addressed technology.

The future of librarianship in context of the emerging digital library world has been a topic of frequent discussion. Lisa Dallape Matson and David J. Bonski address this question in a 1997 article in Online. They suggest that librarians and technologists must work together and evolve a new profession. With adequate training and skills, they envision librarians as the organizers of "knowledge into systems and structures that facilitate the productive use of information and knowledge resources" (92). Without training efforts, they believe that librarians will be increasingly viewed as anachronistic, slow, and expensive, and that they will miss a key opportunity to assure their future.

Brian L. Hawkins and Patricia Battin (1998) echo these sentiments. They emphasize the need for librarians to "define and demonstrate how information resources are integrated into the institutional mission" (264). Historically, the roles and relationship of librarians and technology specialists were defined by the resources at their disposal. As more choices and options have become available, the interests and activities of these two professional groups have intersected. Both groups are faced with "discontinuous change" (268). Hawkins and

Battin urge librarians to focus on professional

development, and to analyze the skills that are needed.

Their chapter concludes with this statement:

> The provision of information resources—through a
> print, electronic, or technical infrastructure—
> combined with the power of digital technology
> must enhance, not define, our educational
> mission. The professional obligation of
> information resource professionals is nothing
> less than to participate in the definition of the
> 21st-century institution of higher education
> (270).

An article by Rebecca Jones describes a presentation

by Richard Hulser, IBM Digital Library Consultant, at the

1997 Computers in Libraries Conference. Jones observes

that Hulser began his presentation in a business suit, but

as his presentation progressed, he gradually replaced his

normal attire with a *Star Trek* uniform. She summarizes his

message as follows:

> "Resistance is futile," Hulser reminded the
> audience. The times and the technologies demand
> changes. We, as librarians, can either choose
> our new "uniforms," replacing our suit jackets or
> traditional roles of our own free will, or have
> "uniforms" or roles chosen for us. Let's face
> it, the latter may not be as comfortable for us
> as making the choice ourselves (32).

Gary Pitkin (1997) points out that the state of

constant change that results from technology can be a

source of technostress for librarians. He states that

"Library workers worry that they are not keeping up with

the changes in their jobs and that the time they must take to learn new ways will be evaluated negatively by their supervisors" (59). He expresses concern that technostress can result in low staff morale, and that service to library patrons will suffer as a result.

Increasingly, academic reference librarians' job descriptions include bibliographic or library instruction; i.e. providing training to students and faculty in the use of library systems and resources. Alan Krissoff and Lee Konrad pose this question in a 1998 article:

> How do we go about providing better patron training when we ourselves are being overwhelmed by change? One solution lies in information agencies making a formal commitment to staff computer and technology training. We, as instructors and trainers, must develop the confidence and computer competencies necessary to make intelligent decisions about what our patrons need to know and about effective strategies for teaching those skills. . . By putting ourselves first in the electronic information age, we stand a much better chance of continuing to provide the levels of service to which we, as a profession, have historically aspired (28).

In a similar vein, Eric Lease Morgan (1998) asks: "In today's world, why would anybody trust a librarian, whose profession is about information and knowledge, who hadn't mastered a computer?" (39). He goes on to list general technology competencies that he views as critical in today's environment.

Dan Marmion (1998), Editor of <u>Information Technology</u> <u>and Libraries</u> and Assistant Dean of Library Technology at Western Michigan University, believes that one of the greatest challenges facing libraries is better preparing library staff to use technology. He emphasizes the need for academic library administrators to make concrete commitments to training and the need for academic libraries to place more emphasis on requisite computer skills when writing position descriptions. Marmion's article also includes a brief listing of skills that he feels are critical.

Joyce Latham (2000) frames her discussion of information technology skills in a very practical light. She states "The more you know about your standard installations, the more control you have over it yourself — and the better your service to the customer will be" (42). She goes on to say that librarians who demonstrate an interest and willingness to learn are more likely to develop positive working relationships with technical support personnel. She concludes her comments with this statement:

> We no longer have to climb shaky wooden ladders
> to retrieve images of information. Instead, we
> have to climb ladders of technical literacy that
> stand not only between us and our current

capabilities but between us and the viability of our profession (Ibid.).

Technology Training in Academic Libraries: Case Studies and Identification of Needs

There are numerous case studies and articles that outline technology training programs. Many of these articles stress the need to conduct needs assessments prior to design and implementation, and many discuss the difficulty of identifying those needs. Callahan and Watson (1995) provide a review of many of those studies. The following summaries are a sample of articles available, and much of the information was useful in establishing categories and parameters for this study.

Two articles describe the staff training program offered at the Penrose Library, University of Denver (Clark 1996, Grealey, et al, 1996). The topics in their program included:

    DOS basics
    Navigating Windows
    LAN Basics (login/logout, mapping drives,
    printing, and file management)
    Productivity Software (Word, Excel, Powerpoint,
    Desktop Publishing, Graphics)
    Email and Internet Tools (FTP)

The FUNdamental Skills program at Virginia Tech developed as a result of the recognized need to "design a comprehensive training program which would ensure a more

uniform knowledge base for all employees of the University

Libraries" (Hansbrough 1996, 9). The program included:

        Basic Mac (Macintosh Operating System)
        Basic Windows (Windows Operating System)
        Eudora (E-mail)
        Computer Troubleshooting
        VTLS (Library database)
        Microsoft Word (Word Processing)
        Internet
        Excel/Access (Spreadsheet/Database) (10)

Penn State University Libraries mounted a mandatory

program called Automated Skills Training (AST). The goal

of AST was "not to teach specific skills or software

packages but rather to eliminate anxiety and provide a

level of comfort around technology" (Clark and Kalin 1996,

32). The authors stress that training must be timed to

coincide with staff having access to the requisite

technology, and that ample time must be allotted after the

training session(s) to allow participants to implement and

practice what they have learned (Ibid.).

Noting that job advertisements can also provide useful

information on skills that are perceived as needed by

employers, Anne Woodsworth (1997) reported having found

these:

        Familiarity with presentation software and
        technology relative to web-based instruction. . .
        HTML and aspects of web page management. . .
        Experience with SGML, HTML, and other web
        standards. . . Technical knowledge of DOS,

Windows, networked environments, and the
Internet. . . (46).

Woodsworth (1997) describes the results of a recent
focus group that she led, where group members "affirmed
that technological competencies are the most critical ones
for all librarians, even if they obtained their
professional credentials as recently as the early 1990s"
(46). Key competencies that were identified include:
"knowing what the Internet is and is not; evaluating and
using hardware, software, and networks; and understanding
basic computer and information science concepts" (Ibid.).

As shown below, Marmion (1998) provides a list of
competencies that he feels are important, based on his
interaction with, and technical support provided to,
librarians:

       Operating Systems
       -Configuring the desktop
       -Formatting floppy disks
       -Copy and Paste data between applications
       -Copy and/or move files

       Hardware Troubleshooting
       -Ability to check connections and cabling
       -Knowing when to reboot

       Software
       -Learn what you use, and learn it thoroughly (217)

The Electronic Information Program (EIP) at the
College Library, University of Wisconsin-Madison,

approached their training as a four-part process. The

competencies germane to this study included the following

competencies:

    Core Competency #1:
    The Operating Systems
    -Working knowledge of the platform on which their
        computers sit
    -Understanding of the interface and desktop
        environment
    -Ability to format floppy disks
    -Ability to create and manage files
    -Thorough understanding of how to gain access to
        the various networks available from a given
        platform

    Core Competency #2:
    Hardware Basics and Troubleshooting
    -Ability to recognize and troubleshoot problems
        with printers, disk drives, cable
        connections and understand appropriate
        action in a given situation

    Core Competency #3:
    Software Basics and Troubleshooting
    -Dealing with software crashes
    -Cutting and pasting
    -Setting application preferences
    -Changing display formats
    -Preparing or selecting data for output to
        printers, floppy disks, or e-mail accounts
        (Krissoff and Konrad, 1998, 31-32)

An even more detailed checklist of competencies for

Software Basics and Troubleshooting was provided by

Krissoff and Konrad (30) and is presented in Figure 2.

INSTRUCTIONAL OUTLINE AND CHECKLIST FOR COMPUTER COMPETENCY #3:
SOFTWARE BASICS AND TROUBLESHOOTING

✔ Checklist of Competencies

A) INTERFACE FUNCTIONS
- ❏ Understanding and setting preferences
- ❏ Familiarizing yourself with application menus
  - Opening/creating new file
  - Cutting and pasting
  - Customizing views or display options
  - Other functions
- ❏ Printing files or search results
- ❏ Downloading files or search results
- ❏ E-mailing files or search results
- ❏ Quitting the program or database

B) FILE FORMATS
- ❏ Proprietary file formats
  - MS Word, WordPerfect, Excel, etc.
  - Saving output to ASCII format
  - Creating ASCII files from word processors or other applications
- ❏ Internet file formats
  - Recognizing/Importing/Exporting
    - HTML
    - PDF
    - ASCII (.txt)
    - Graphics (.gif, .jpg)
    - Compressed files (.zip, .tar, .exe)

C) NETSCAPE FUNDAMENTALS
- ❏ Using common browser functions
  - Back, Forward, Open location, Open local, File, Print, Save, Bookmark
  - Opening/closing a second browser window
- ❏ Launching software/databases with Netscape
- ❏ Setting browser preferences
  - Configuring user/server address for e-mail

D) NETSCAPE HELPER APPLICATIONS
- ❏ Downloading helper applications
  - Adobe Acrobat
  - Decompression/archive utilities
- ❏ Configuring helper applications for Netscape
  - Self-configuring vs. user-configured
- ❏ Associating applications with file formats
  - .pdf/Adobe Acrobat
  - .txt/Text Editor
  - .jpeg/.gif/JPEG Viewer

Figure 2. Software Basics and Troubleshooting

The majority of the articles cited above focus on the
needs of all library staff, including paraprofessionals and
librarians from the technical, as well as public service
areas. In addition, many of these articles describe
programs that were designed to meet a very particular need
at that point in time; i.e. the installation of a new
automated library system, or the deployment of new
productivity software for all library staff. While these
articles provide information that was useful in the
construction of the initial question for this study, none

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provide a comprehensive inventory of technology and computer skills for academic reference librarians.

The Delphi Method

This study used Delphi as its research method. Use of the Delphi Method assistd in the formation of a consensus inventory model of technology and computer skills for academic reference librarians.

The Delphi Method was developed at the Rand Corporation in the early 1950s as a means of forming reliable consensus among a group of experts. It attempts to achieve this consensus through a series of questionnaires, interspersed with controlled opinion feedback. The method eliminates the direct confrontation that often occurs among respondents in other group consensus methods, such as round-table discussions. Delphi is more conducive to expression of individual thought and aids in the gradual formation of a consensus opinion (Dalkey and Helmer 1963).

The composition of the panel of respondents in a Delphi study has evolved as the method has been used in various disciplines and settings. Although Dalkey and Helmer (1963) initially described the desired population as a "group of experts" (458), a later study stated that similar results could be achieved using a group composed of individuals with

varying knowledge and expertise (Brown, Cochran, and Dalkey 1969). Reilly (1970) described an ideal panel of respondents as "uniform to the extent of being in the same field, the respondents are normally chosen to represent the varying perspectives of managers, researchers, analysts, planners, educators, and any others to whom the questions have some special meaning" (254).

Initially used at Rand to forecast technological and military developments, Delphi has been adopted and utilized in a wide variety of disciplines and settings. Delbecq, Van de Ven, and Gustafson (1975) demonstrated the suitability of Delphi in a study that sought to determine future roles within a profession. Gentry (1994) identified Delphi as a potential method to be used in needs analysis in instructional development. He cautions that a Delphi study is likely to produce "mainly judgments of need, not objective evidence of need" (17). He further states, that when used properly, Delphi has a "high probability of generating valid needs for either educational or training systems" (Ibid.).

Delphi has been used in the field of Library and Information Science, perhaps most notably in A Study of the Needs for Research in Library and Information Science

Education (Borko 1970). The study had three stated

objectives:

> 1) To describe and summarize the content of existing programs being offered in librarianship and information science. . .
> 2) To identify problems and needs in library and information science education, and to indicate the data and the research that would be required to resolve these problems. . . and
> 3) To coordinate the various research suggestions and list them in an order of priority (2-3).

Borko describes the selection process of respondents as

"a highly selected sample composed of people who had a stake

in library education and who were competent to evaluate the

probable effectiveness of proposed research" (271). Rather

than experts, Borko characterizes the respondents as

"competent and interested individuals in the areas under

investigation" (Ibid.).

Delbecq, Van de Ven, and Gustafson (1975) enumerate

three conditions that they deem critical for a successful

Delphi study: "1) adequate time; 2) participant skill in

written communication; and 3) high participant motivation"

(84). They provide a detailed timetable, in which they

conclude that 45 days is the absolute, and perhaps highly

optimistic, minimum that a three-round Delphi study would

require (87). Selection of the panel of respondents must

take into account the second and third characteristics

listed above. Participant motivation is critical, and it is imperative that panelists understand the commitment they are making from the start.

The size of the panel in a Delphi study is highly variable, depending on the nature of the study and the type of information it seeks to elicit. If a study seeks to improve group understanding or generate group support, a large panel may be desirable for motivational, as much as informational, purposes. However, within a homogeneous group, few new ideas are generated when the size of the respondent panel exceeds thirty (Delbecq, Van de Ven, and Gustafson 1975). Dalkey and Helmer (1963) reported using a panel of seven.

After identifying the participants for a study, Delphi studies proceed by asking participants to complete an initial questionnaire that consists of an initial question or just a few questions that are generally broad and open-ended. This is considered "Questionnaire #1." The initial responses to Questionnaire #1 are analyzed and sorted. They are then returned to the respondents as Questionnaire #2. In this round, respondents are asked to rank items according to importance or rate them using a Likert-type scale. They are also given the opportunity to modify or clarify items.

Although each respondent sees all responses, the anonymity of each respondent is preserved. Responses to Questionnaire #2 are analyzed to determine if there is an emerging consensus among the respondents. Subsequent rounds are conducted for those items that lacked consensus, until the researcher is satisfied that it is unlikely consensus will be reached. Respondents may be furnished with their responses from the previous round as each new questionnaire is distributed. Following analysis of the final questionnaire, a final report is prepared that summarizes the goals, process, and results (Delbecq, Van de Ven, and Gustafson 1975, Dalkey and Helmer 1963, Reilly 1970).

Gentry (1994) describes research findings presented by Sweigert and Schabacker at a meeting of the American Educational Research Association (AERA) in 1974. As reported by Gentry, a minimum of two rounds is required to achieve consensus, with the greatest consensus emerging after round two. In addition, providing participants with their responses from the previous round might hinder the convergence of opinion (19).

Summary of Relevant Findings

Reference librarians working in academic libraries today are faced with rapid and continuous technological innovation and change. Although the history of automation in libraries is a relatively short one, in the past three decades the pace of change has accelerated, and continues to do so at an ever-increasing rate. It is therefore imperative that academic reference librarians receive training on an ongoing basis to update and renew their technology and computer skills. Without training, their ability to perform their jobs efficiently and effectively will be severely compromised, resulting in poor morale, job turnover, and public perception of libraries as outmoded and anachronistic. Additionally, librarians' ability to make wise decisions about future acquisitions of hardware, software, and electronic information products will be negatively impacted.

Although there are published case studies of training programs at various libraries, there is currently no extant inventory of technology and computer skills that focuses strictly on the needs of academic reference librarians. Most of the published case studies focus on the needs of all library staff, including paraprofessionals and librarians

from the technical, as well as public service areas. In addition, many of these published case studies describe programs that were designed to meet a very particular need at that point in time; i.e. the installation of a new automated library system, or the deployment of new productivity software for all library staff.

The Delphi Method provides an appropriate tool for developing a consensus inventory of technology and computer skills for academic reference librarians. In its nearly fifty year history, the Delphi Method has proved an effective method of eliciting input, prioritizing those items, and arriving at a consensus.

CHAPTER III

METHODOLOGY

Introduction

This chapter will describe the research methodology and research design. The development of the questionnaires and selection of the respondents will be described within the research design. Data collection procedures and data analysis will also be described.

Research Methodology

This study used the Delphi Method to form a consensus inventory model of technology and computer skills for academic reference librarians. The intent was to develop a comprehensive list, comprised of all computer and related technology skills that may be applicable, with the understanding that not all will apply to every reference librarian in every academic library. As outlined in Chapter II, Delphi has proved an effective method of eliciting input, prioritizing those items, and arriving at consensus among a group of respondents.

Research Design

The initial round of the Delphi study began with the open-ended question of "What are the technology and computer skills required of reference librarians in academic libraries?" These skills were subsumed under the headings of operating systems, hardware basics and troubleshooting, and software basics and troubleshooting. Additional sub-headings to aid respondents in organizing and categorizing their responses were selected from literature cited in Chapter II, including Clark (1996), Grealey, et al (1996), Hansbrough (1996), Clark and Kalin (1996), Woodsworth (1997), Krissoff and Konrad (1998), and Marmion (1998). The initial questionnaire was reviewed by a group of four academic reference librarians to insure that the questionnaire and instructions were clear, and would elicit a reasonable degree of specificity of responses. The questionnaire and instructions for Round #2 were also reviewed by this group prior to distribution to the study participants. None of the members of the review group participated in the study.

Once the responses to Questionnaire #1 were received, the responses were analyzed and sorted, and returned to the respondents for Round #2. Further detail on the procedures

can be found below in the Data Collection and Data Analysis sections of this chapter.

Participants were selected to insure representation of viewpoints of experts and practicing academic reference librarians. Experts were identified and selected based on their publication records, as well as their stature as presenters at national library conferences. These experts represented library school faculty, academic library administrators, academic systems or technology librarians, and academic library technology trainers. Practicing academic reference librarians were identified and selected from the officers and members of the board of directors of a state chapter of the Association of College and Research Libraries.

Based on the criteria described in the previous paragraph, 24 individuals were selected and contacted via email. The study was explained, and each potential participant was asked if he or she would be willing to participate. Of those contacted, 14 agreed to participate. Each of these individuals completed a Consent Form, and furnished the researcher with a current biography documenting their stature in the profession. This initial number of participants provided an ample number of

respondents according to research by Delbecq, Van de Ven, and Gustafson (1975) and Dalkey and Helmer (1963). A copy of the initial contact letter and the consent form may be found in Appendix B and Appendix C, respectively.

Data Collection

Questionnaires were distributed to participants via email attachments whenever possible. Each questionnaire was distributed in a spreadsheet format and respondents recorded their responses in the electronic document provided. Each respondent returned the document to the researcher via email.

Participants were asked to respond to the question "What are the technology and computer skills required of reference librarians in academic libraries?" They were asked to consider all of the duties for which academic reference librarians may be responsible. These duties might include bibliographic instruction, services to remote users (including technical support), and serving as a Webmaster or Web Editor. The instructions stated that the intent was to create a comprehensive list, with the understanding that not all of the skills listed may be required of all academic reference librarians.

As described earlier, the researcher provided a number of headings and sub-headings to assist the respondents in organizing their statements. It was clearly stated that these headings and sub-headings were not meant to dictate the responses, but were provided purely as an organizational tool. The headings and sub-headings provided in the first round were:

Hardware Basics and Troubleshooting
Operating System Basics
   DOS
   Unix/Linux
   MacOS
   Windows
Local Area Network Basics
   Login/logout
   Mapping drives
   Network printing
   File management
Productivity Software
   Word processing skills
   Spreadsheet skills
   Presentation software skills
   Desktop publishing skills
Graphics
Webpage Languages and Tools
   HTML
   XML
   SGML
   JAVA
   Web Authoring Tools
Email and Internet Tools
   Email

```
        FTP
        Web Addressing Conventions
        IP Authentication
        Utility & uses of proxy servers
   Search Concepts and Techniques
        Relational database construction
        Indexing
        Relevancy ranking
```

Respondents were asked to provide brief descriptive statements beginning with verbs whenever possible, describing each skill in a separate statement. A copy of the Round #1 questionnaire, is provided in Appendix D.

All responses from Round #1 were analyzed and sorted. Multiple statements that described the same skill were revised and combined into one uniformly worded statement. The condensed list of statements was used to create Questionnaire #2 (Appendix E). Additional detail on the data analysis is provided in the following section and in Chapter IV. In Round #2 respondents were asked to indicate the degree of importance of each item using this Likert-type scale:

```
    5 = Critically Important
    4 = Very Important
    3 = Important
    2 = Not Very Important
    1 = Not Needed at All.
```

Given Gentry's (1994) observation that providing participants with their responses from previous rounds might hinder the convergence of opinion, this study did not identify a given participant's responses from Round #1 when the Round #2 questionnaire was distributed. In addition, Gentry reported that the greatest consensus emerges after Round #2 (19). Therefore, and given the degree of apparent consensus reported in Chapter IV, a third round was not undertaken.

Data Analysis

The responses from Questionnaire #1 were analyzed and sorted. Multiple statements that described the same skill were revised and combined into one uniformly worded statement. In addition, when a given response was entered under multiple categories it was placed under the single category where it appeared most often. A detailed analysis of the data gathered in Round #1 and details on the formulation of Questionnaire #2 are outlined in Chapter IV.

Responses to the Round #2 questionnaire were analyzed using standard descriptive statistics such as frequency, mean, and chi square goodness of fit. A detailed analysis of the data gathered from Questionnaire #2 is provided in Chapter IV.

CHAPTER IV

ANALYSIS OF DATA

Introduction

This study was designed to develop a comprehensive
inventory of the technology and computer skills required of
reference librarians in today's academic library
environment. This study was conducted using the Delphi
Method, and consisted of two rounds. The first round began
with the open-ended question "What are the technology and
computer skills required of reference librarians in
academic libraries?" A number of headings and sub-headings
were provided as an organizational aid. The responses
elicited in the first round formed the basis for the Round
#2 questionnaire, in which participants were asked to use a
Likert-type scale to indicate the level of importance of
each skill. This chapter contains a description of the
data collected in the first round, the formulation of the
questionnaire for Round #2, and the analysis of data
collected in the second round.

Round #1 Data

Responses to the first round's open-ended question were returned to the researcher in a spreadsheet file by 12 of the 14 respondents. Two respondents encountered difficulties with the email attachment, and requested that the researcher send a printed copy, which the respondents completed manually. Once received by the researcher, these two sets of manual responses were entered into spreadsheet files. While maintaining responses in the categories that had been provided, and the additional categories provided by respondents, the responses in the 14 individual spreadsheet files were merged into a single file.

The 14 respondents provided a total of 848 skill statements and numerous other comments in response to Round #1's open-ended question. Some of the comments were specific to a particular skill statement, and were provided by the respondents to add clarification. Other comments were of a more general nature, relating to one or more of the categories provided.

Comments from Round #1

As described earlier, some of the respondents included comments in their responses in Round #1. Comments that were included to simply provide clarification of a

particular statement will not be included here, but those of a more general nature will be summarized.

Under the heading of Hardware Basics, one respondent stated that student technical assistants handle most of the day-to-day hardware troubleshooting. The respondent added that it is still important for reference librarians to have the basic skills and knowledge to handle these tasks in the absence of other personnel, even though they are not considered to be professional-level responsibilities. Another stated

> I think as reference librarians we should be able to handle the basics, but I'm not a techie -- I don't have am MIS. I don't want to know how to program the workstations.

One respondent added "Not sexy, but probably skills one needs."

The Operating Systems Basics heading, and its subheadings, generated a number of comments. Three respondents commented that DOS skills are needed infrequently in today's environment. Regarding Unix/Linux skills, three respondents commented that these are skills required of Systems Librarians, not Reference librarians. However, one respondent, stated that

> I would provide a basic course in Unix/Linux, but I would aim it at the issues of security and access. Librarians must have a perspective on

Three comments under the MacOS sub-heading aimed to minimize the need for skills in this area, particularly in situations when the platform is not supported by the institution. One respondent had "never heard of" MacOS. However, one respondent stated

The profession should not abandon Mac users, just because the majority of institutions invest in PC environments. These skills would be especially helpful when assisting remote users over the phone, or when assisting students in computer labs (with Macs) housed in libraries.

Under the Windows sub-heading, two respondents stressed the importance of Windows navigation and troubleshooting skills in the context of assisting library patrons at public database and Internet workstations.

The most detailed and strongly worded comment was found under the Operating Systems heading:

Forget Mac OS and forget DOS OS. All Lib[rary] Sci[ence] schools should prepare reference staff for Windows 2000 and Office 2000. These are highly technical issues that require constant work to keep up to date. What reference staff need is a wide and fairly deep understanding of Windows so they can troubleshoot application problems. The nature of OS use is changing. Five or ten years ago you had to understand a great deal about DOS to make things work. Like modern cars, I don't think there is much advantage in depth of knowledge [sic] about the OS. You probably can't fix it even if you know because you need specialized diagnostic tools, and then you're probably messing up the network.

The Productivity Software heading elicited some conflicting comments. One respondent stated that word processing, desktop publishing, and presentation software skills are often over-emphasized, and that the emphasis should be placed on the creation of quality content. Further, this respondent raised concerns about the future viability of proprietary document formats. Other comments, however, acknowledged the need for basic skills in all of the various types of productivity software listed in the questionnaire.

Several respondents included comments under the heading of Webpage Languages and Tools to clarify the fact that these skills may not be required of all reference librarians. Several stated that these skills are likely to become more important, and that skills in these areas are certainly an asset. Many reported that XML, SGML, and JAVA are too new to be required skills. Two respondents did state, however, that training opportunities should be provided as the need arises. One comment from this section that addresses many of the sub-headings bears inclusion.

> Persons who spend a significant amount of time
> creating or modifying Web pages need to know HTML
> very well and also need to be familiar with (and
> probably learn more about) XML, SGML, and Java.
> It isn't absolutely necessary for them to learn
> Web authoring tools such as Dreamweaver or

HomeSite, as long as they can code a Web page in some kind of editor. Some long-time Web developers advocate using text editors rather than Web authoring tools. While I do believe that is a better approach, it is also much more difficult to do well, so I have no problem with using the tools, as long as the librarian knows the tool well and is aware of any peculiar things the tool might do to standard code.

The heading of IP Authentication, along with the heading of Utility and Uses of Proxy Servers elicited contradictory comments. One respondent stated that these skills are in "the purview of network administrators." Others, however, stated that skills and knowledge in these areas are increasingly required of reference librarians. The following four paragraphs represent the views of four different respondents:

Goes back to general security issues. As part of our general education I believe everyone who works with networks and networked information ought to have a basic course in Internet topology and history, and in network layers, including TCP/IP standards. The issues surrounding authentication, authorization and identification are useful to know and should be part of such a course.

Librarians should know something about servers, proxy servers, Web servers, etc. At least a perspective on the architecture of servers and LANs. A deeper understanding of proxy servers might be reasonable, but not absolutely necessary.

Need to understand the reasons for creating proxy servers and how they can be used to accomplish different things. Also need to understanding how

frustrating they can sometimes be! I don't think the average librarian needs to know how to configure proxy servers.

Proxy servers are currently the most common form of doing IP authentication. The librarian should be an expert on this, because s/he will need to be able to explain it to patrons who are clueless as to what this means and why they have to do it.

One comment of particular note was "This may not seem like a technical skill at first, but the technology of authentication bears some investigation in light of our philosophical commitment to privacy."

While some respondents questioned the need for reference librarians to have extensive skills in relational database construction and indexing, other respondents linked skills in these areas to a librarian's searching competencies. Representative comments made by six respondents under the heading of Search Concepts and Techniques, and the sub-headings of Database Construction and Indexing included

> Yes, every reference librarian should have a course in database construction and search theory/practice. An understanding of indexing and structured subject headings is very important. Xerox is working on some very interesting expert systems for information retrieval. This seems to me an absolutely critical issue for those professionals involved in data retrieval.

> Absolutely essential. I know I am old fashioned, but I still think a grounding in

cataloging/indexing helps you be a better searcher.

I do not believe, speaking from personal experience however, that many librarians enter the profession with these skills, or even an understanding of these skills, mastered.

All librarians should have a basic understanding of both simple and complex database structures. After all, we store everything these days in relational data structures.

I believe this is ONE OF THE MOST IMPORTANT skills of a (reference) librarian. The bread and butter of libraries are lists of things; lists of books, journals, data, facts, information, information resources, people. In a digital world lists are manifested as databases. Relational databases, databases with more than one table that are related by similar concepts, are logical ways to organize lists. Once the knowledge of relational database design is understood productivity goes through the roof and database maintenance is ironically reduced.

Right next to a librarians text editor, Web browser, and email program, a relational database application should be a part of every librarian's desktop!

Four respondents provided summary comments that related to the questionnaire as a whole. Those comments are provided below.

In general, it is my conviction that librarians must be as expert with the tools of their trade as lawyers and doctors and engineers are. If the job requires them to use a computer, then they need to be comfortable enough with the computer to use it competently and diagnose and repair minor problems. They need to know enough about the computer's operating system and its features to be able to become proficient (and efficient)

operators of the computer. If the job requires them to use particular software (word processor, spreadsheet, desktop publisher, etc.), then they need to master that software, not just be able to do the basic things like copy and paste. If Web page design is an important part of the job, then they need to become good Web page designers.

Above all, the reference librarian must be able to explain to their patrons any of the things listed above that the patrons need to be able to do to access library resources. For example, if the library subscribes to a remote database that delivers full-text via a PDF file, then the librarian must be capable of explaining to the patron what PDF is, plus how to obtain and install a PDF reader. If configuring a browser to use a proxy server is necessary for the patron to access a particular remote database, then the librarian must be able to instruct the patron on how to do that on the most common browsers. Our profession is forevermore wedded to the use of computer and network technology to do what we do, to serve our clientele. We are less than professional if we don't know how to use that technology well.

I felt that the real issue with librarians and technology is often focused on the wrong area. All information specialists should have a strong grounding in the history and theory of digital technologies. Certainly they ought to have a very strong familiarity with the standard hardware configurations and peripherals; and better be passing familiar with Windows. Formal training, though, divorced from practice isn't very helpful. On the job training for many of the things you mention is important. So, if I need HTML or XML training because I've been assigned a Web page creation project, I should be able to obtain several levels of that training immediately. I might do that through CBT training, Web course access, or local training if available. Anytime, anywhere! The issues you outline are really ones of ongoing training. The technology landscape changes so dramatically so

quickly that by the time you process this survey
it may be irrelevant. How to learn is the issue;
and how to guarantee that the library is a
learning environment for the library
professionals is the key component here.

Let me share with you some of the activities that
reference librarians are/will be involved with:
        +working with Websites to create new links
                or keeping current links relevant
        +teaching information literacy
        +e-mail based reference
        +knowing about licensing; making or
                participating in decisions on how much
                access is enough access
        +on-call reference
        +developing online tutorials
        +creating handouts
        +evaluating Websites
        +in-depth reference using Web as major
                source
There are likely to be other duties that are less
directly tied to technology; e.g. marketing,
needs assessment, library/campus committee work.
I'm a big, big picture person. I don't know
squat about nitty-gritty tools.

Formulation of Questionnaire #2

The 14 respondents provided a total of 848 skill

statements in response to Round #1's open-ended question.

Multiple skill statements that described the same skill

were revised and combined into one uniformly worded skill

statement. In addition, when a given skill statement was

entered under multiple categories that statement was placed

under the single heading or sub-heading where it appeared

most often. This was particularly true when the same skill

statement appeared under multiple sub-headings. For

example, the skill statement "Format disks" appeared under the multiple sub-headings of DOS, MacOS, and Windows. In Questionnaire #2 it was entered only once under the broader heading of Operating System Basics.

After combining and revising headings, sub-headings, and skill statements, a total of 380 skill statements remained. These statements were organized under the following headings and sub-headings for Questionnaire #2:

Hardware Basics and Troubleshooting (29 statements)
Operating Systems Basics (13 statements)
  DOS (11 statements)
  Windows (17 statements)
  Unix/Linux (7 statements)
  MacOS (4 statements)
Local Area Network (LAN) Basics (14 statements)
  Network Printing (7 statements)
File Management (18 statements)
Productivity Software (21 statements)
  Text Editor (2 statements)
  Word Processing (22 statements)
  Spreadsheet (15 statements)
  Relational Database (12 statements)
  Presentation Software (14 statements)
  Desktop Publishing (7 statements)
  Graphics Software (20 statements)
  Calendaring System (5 statements)
Internet (27 statements)
  Browser (14 statements)
  Email (27 statements)
  Webpage Design (43 statements)
Search Concepts and Techniques (23 statements)
  Indexing (4 statements)
  Relevancy Ranking (4 statements).

Round #2 Data

Questionnaire #2 was comprised of the 380 skill statements that were derived from the responses to the first round questionnaire. Questionnaire #2 was distributed to 12 participants as a spreadsheet file. A printed copy of the questionnaire was sent to the other two participants. A total of 13 participants returned responses to Round #2.

In Round #2 respondents were asked to indicate the degree of importance of each skill statement using this Likert-type scale:

    5 = Critically Important
    4 = Very Important
    3 = Important
    2 = Not Very Important
    1 = Not Needed at All.

Responses to the Round #2 questionnaire were analyzed using standard descriptive statistics such as frequency, mean, and chi square goodness of fit. First, the frequency of responses to each Likert category was calculated for each skill statement. Although the total number of respondents in Round #2 was 13, some skill statements had a lower number of responses. If respondents felt they had insufficient knowledge of a particular skill statement, or they had no opinion, they were instructed to respond with a

"X." One respondent declined to respond to a number of the statements, as she/he felt that they lacked specificity.

While it is interesting to examine the distribution of responses to each item, it is also possible to say that responses to "Not Needed at All" or "Not Very Important" were "Negative" in nature. Likewise, it is possible to say that responses to "Important," "Very Important," or "Critically Important" were "Positive."

To facilitate an interpretation of these data, the percentages represented by the frequency of responses to each Likert category were determined. Then, the sum of responses to "Not Needed at All" and "Not Very Important" was calculated and labeled "Negative." The sum of responses to "Important," "Very Important," and "Critically Important" was calculated and labeled "Positive." Both, "Negative" and "Positive," were recalculated as a percent of the total number of responses to each item and labeled "Negative %" and "Positive %." Admittedly, collapsing the data into these two categories diminished the detail which the five original categories offered. Finally, chi square goodness of fit tests were used. These calculations were labeled "Chi Square of Neg/Pos." The "Chi Square of Neg/Pos" (χ^2) had to produce a value greater than the

critical value of $\chi^2_{critical}$=3.84 (α=.05 and df=1) to be statistically significant, and to demonstrate consensus among the respondents.

Questionnaire #2 and the resulting data from the calculations described above may be found in Appendix F. The analysis of data that follows will be presented according to the headings and sub-headings used in Questionnaire #2.

Hardware Basics and Troubleshooting

There were 29 skill statements under the heading of Hardware Basics and Troubleshooting. Of those, 19 skill statements had χ^2 values greater than $\chi^2_{critical}$=3.84. Additionally, all of these items had means of 3.23 or greater. These items are shown in Figure 3. The skill statements within Figure 3, and in each subsequent figures through Figure 16, are presented in descending mean order. Among the 19 items presented in Figure 3, the strongest consensus occurred on eight items, where the "Positive %" was 100 percent, the means ranged from 4.08 to 4.77, and the χ^2 values were 12.00 to 13.00. Three items had means greater than 3.0, but the calculated χ^2=3.77 values were slightly less than $\chi^2_{critical}$=3.84. Although these items did

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Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								

Hardware Basics and Troubleshooting

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
3	use a mouse	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
26	know when to call library IT staff	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
1	turn on the computer	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
2	turn off the computer	0	0	2	2	9	13	59	4.54	0	13	0%	100%	13.00
4	check cables & connections	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
6	know when and how to warm reboot	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
29	be aware of assistive technology available at that institution	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
7	know when and how to cold reboot	0	1	1	4	7	13	56	4.31	1	12	8%	92%	9.31
5	understand need for regular rebooting	1	0	1	5	6	13	54	4.15	1	12	8%	92%	9.31
14	understand the basics of printers in use	0	0	3	5	4	12	49	4.08	0	12	0%	100%	12.00
20	replace printer cartridges	0	1	3	3	6	13	53	4.08	1	12	8%	92%	9.31
19	clear paper jams and replace paper in printers	0	1	5	2	5	13	50	3.85	1	12	8%	92%	9.31
9	connect and troubleshoot keyboards	0	2	3	5	2	12	43	3.58	2	10	17%	83%	5.33
24	use a scanner	0	0	7	6	0	13	45	3.46	0	13	0%	100%	13.00
27	know differences & similarities in capabilities & compatibilities (CD-ROM vs. DVD-ROM)	0	1	7	3	2	13	45	3.46	1	12	8%	92%	9.31
21	replace/attach a new monitor	0	2	6	3	2	13	44	3.38	2	11	15%	85%	6.23
11	connect and troubleshoot LCD or other projectors (including light bulb replacement)	0	0	9	4	0	13	43	3.31	0	13	0%	100%	13.00
22	check & adjust monitor settings	0	1	8	4	0	13	42	3.23	1	12	8%	92%	9.31
23	replace/attach a new mouse or trackball	0	2	7	3	1	13	42	3.23	2	11	15%	85%	6.23

Figure 3. Hardware Basics and Troubleshooting
Items showing consensus in the positive Likert categories

not meet the χ^2 test for statistical significance, it is worth noting them since they did show 77 percent "Positive" responses and means of 3.08 - 3.54. These items were:

    replace/attach a new printer
    connect and troubleshoot peripherals (zip drives,
        speakers, microphones, scanners)
    run printer test programs.

The remaining seven items under the Hardware Basics and Troubleshooting heading had substantially lower χ^2 values. These values ranged from 0.08 to 2.27, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

    diagnose printer problems
    reset drives
    reboot from system start-up disk
    run printer self-clean programs
    connect scsi devices to cpu
    diagnose CD-ROM changer problems
    diagnose CPU problems.

Operating System Basics

There were 13 skill statements under the heading of Operating System Basics. In addition, the sub-headings of DOS, Windows, Unix/Linux, and MacOS contained 11, 17, 7, and 4 statements, respectively.

Of the 13 skill statements under the main heading of Operating System Basics, six skill statements had χ^2 values

greater than $\chi^2_{critical}$=3.84. Additionally, all of these items had means of 3.54 or greater. These items are shown in Figure 4. Two items had means greater than 3.0, but the calculated χ^2=3.77 values were slightly less than $\chi^2_{critical}$=3.84. Although these items did not meet the χ^2 test for statistical significance, it is worth noting them since they did show 77 percent "Positive" responses and means of 3.38 - 3.69. These items were:

> install programs and software applications from disk,
>   CD-ROM, or internet based sources
> determine available disk space.

The remaining five items under the Operating System Basics heading had substantially lower χ^2 values. These values ranged from 0.69 to 3.00, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

> use control panels to configure operating system
> password protect desktop
> format drives
> install filters, drivers for programs or hardware
> change "modes" on dual platform machines.

Among the 11 skill statements under the sub-heading of DOS, only one skill statement had a χ^2 value greater than $\chi^2_{critical}$=3.84. This item had a mean of 3.18. This item is included in Figure 4.

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Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								

Operating Systems Basics

33	format disks	0	1	5	1	6	13	51	3.92	1	12	8%	92%	9.31
40	know how to change directories	0	1	4	3	5	13	51	3.92	1	12	8%	92%	9.31
35	understand and interpret error messages	0	1	4	5	3	13	49	3.77	1	12	8%	92%	9.31
42	change settings for display, sound, and peripherals (mouse, keyboard, mouse, modem, printer)	0	1	5	4	3	13	48	3.69	1	12	8%	92%	9.31
31	update software applications through Internet downloads	0	2	4	4	3	13	47	3.62	2	11	15%	85%	6.23
37	identify the computer's IP address	0	2	4	5	2	13	46	3.54	2	11	15%	85%	6.23

DOS

48	know how to use wildcard symbols *.*	1	0	7	2	1	11	35	3.18	1	10	9%	91%	7.36

Windows

57	use Windows Explorer, My Computer, Start/Find, or other file management software to find, move, or delete files	0	0	1	4	8	13	59	4.54	0	13	0%	100%	13.00
54	identify desktop icons and their purpose	0	0	3	3	7	13	56	4.31	0	13	0%	100%	13.00
60	know how to resize windows	0	1	1	6	5	13	54	4.15	1	12	8%	92%	9.31
58	set up folders with application groups	0	1	3	3	6	13	53	4.08	1	12	8%	92%	9.31
69	use Windows multitasking to manipulate and transfer data between files and applications	0	1	4	1	7	13	53	4.08	1	12	8%	92%	9.31
62	use all basic and intermediate Windows functions that menu bars and Start - Programs menus offer in Windows 3.1, Windows 95, and Windows 98 environments	0	2	3	2	5	12	46	3.83	2	10	17%	83%	5.33
59	know keystroke equivalents for common tasks (Ctrl-C to copy, Ctrl-V to paste)	0	1	6	3	3	13	47	3.62	1	12	8%	92%	9.31
64	change windows preferences (view, display files, customizing screens, desktop, directory/ folder structures on hard drive)	0	2	4	4	3	13	47	3.62	2	11	15%	85%	6.23
63	modify windows environments for personal use (add menu bar buttons)	0	2	6	1	4	13	46	3.54	2	11	15%	85%	6.23

MacOS

80	know how to change directories	1	0	6	2	1	10	32	3.20	1	9	10%	90%	6.40

Figure 4. Operating System Basics
Items showing consensus in the positive Likert categories

The remaining 10 items under the DOS sub-heading had substantially lower χ^2 values. These values ranged from 0.00 to 3.00, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

    use scandisk
    use defrag
    understand the concept of DOS
    use memmaker for memory management
    use edit for text file editing
    use dos prompt to bypass windows
    use attributes for setup and display
    modify autoexec.bat
    modify config.sys
    write a batch file for routine tasks.

Of the 17 skill statements under the sub-heading of Windows, 10 skill statements had χ^2 values greater than $\chi^2_{critical}$=3.84. Additionally, all of these items had means of 3.38 or greater. These items are included in Figure 4. Two items had means greater than 3.0, but the calculated χ^2=3.77 values were slightly less than $\chi^2_{critical}$=3.84. Although these items did not meet the χ^2 test for statistical significance, it is worth noting them since they did show 77 percent "Positive" responses and means of 3.31 - 3.62. These items were:

    create a shortcut to an application
    run maintenance tasks such as disk cleanup, defrag,
        scandisk.

The remaining five items under the Windows sub-heading had substantially lower χ^2 values. These values ranged from 0.69 to 3.00, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

    use control panels to configure operating system
    modify and customize maintenance tasks such as disk
        cleanup, defrag, scandisk
    customize start program menus
    create simple batch files
    remove commercial advertisements, such as vendor
        logos, from systems.

Among the seven skill statements under the sub-heading of Unix/Linux, there were no skill statements that had a χ^2 value greater than $\chi^2_{critical}$=3.84. The calculated χ^2 values ranged from 0.09 to 2.27, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

    understand basics of UNIX
    understand and modify permissions, security and access
        to files and directories
    know how to change directories
    know how to change your path environment variable
    redirect output of commands
    create simple batch files
    pipe output to commands.

Of the four skill statements under the sub-heading of MacOS, only one skill statement had a χ^2 value greater than

$\chi^2_{critical}$=3.84. This item had a mean of 3.20. This item is included in Figure 4.

The remaining three items under the MacOS sub-heading had substantially lower χ^2 values. These values ranged from 0.11 to 2.27, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

turn operating system extensions on / off
assist remote users of this platform over the phone
create simple batch files.

Local Area Network (LAN) Basics

There were 14 skill statements under the heading of Local Area Network (LAN) Basics. In addition, the subheading of Network Printing contained seven statements.

Of the 14 skill statements under the main heading of Local Area Network (LAN) Basics, seven skill statements had χ^2 values greater than $\chi^2_{critical}$=3.84. Additionally, all of these items had means of 3.18 or greater. These items are shown in Figure 5. Three items had means greater than 3.0, but the calculated χ^2=3.77 values were slightly less than $\chi^2_{critical}$=3.84. Although these items did not meet the χ^2 test for statistical significance, it is worth noting them since they did show 77 percent "Positive" responses and means of 3.08 − 3.38.

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Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								
	LAN Basics													
83	login/logout and instruct others to do so	0	0	3	6	4	13	53	4.08	0	13	0%	100%	13.00
85	instruct others to use local area network	0	1	4	4	4	13	50	3.85	1	12	8%	92%	9.31
82	understand basic architecture of servers and LANs	0	1	3	5	3	12	46	3.83	1	11	8%	92%	8.33
94	access networked software for desktop use	0	2	3	4	4	13	49	3.77	2	11	15%	85%	6.23
84	know how to create and change passwords	0	1	7	3	2	13	45	3.46	1	12	8%	92%	9.31
90	log on as a different user	0	1	7	2	2	12	41	3.42	1	11	8%	92%	8.33
93	understand security options beyond simple login	0	1	8	1	1	11	35	3.18	1	10	9%	91%	7.36
	Network printing													
96	select and send jobs to local or networked printer	0	0	1	4	8	13	59	4.54	0	13	0%	100%	13.00
97	show others how to select and send jobs to printers	0	0	1	5	7	13	58	4.46	0	13	0%	100%	13.00
99	check the status of a print job	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
102	clear print queue and/or delete individual print jobs	0	0	7	1	5	13	50	3.85	0	13	0%	100%	13.00
100	use print controller to manage print jobs	0	1	5	3	4	13	49	3.77	1	12	8%	92%	9.31

Figure 5.   Local Area Network (LAN) Basics
Items showing consensus in the positive Likert categories

These items were:

    open file servers on a network
    load CD-ROMs in a tower
    update CD-ROM network when new disks arrive.

The remaining four items under the Local Area Network

(LAN) Basics heading had substantially lower χ^2 values.

These values ranged from 0.00 to 1.33, and therefore, the

responses to these items did not demonstrate a

statistically significant degree of consensus among the

respondents. These items were:

    utilize network for pc maintenance of library
       workstations (file update, deletion)
    bypass network login
    create a virtual drive
    map network drives.

Among the seven skill statements under the sub-heading

of Network Printing, five skill statements had χ^2 values

greater than $\chi^2_{critical}$=3.84. Additionally, all of these items

had means of 3.77 or greater and are included in Figure 5.

The remaining two items under the Network Printing

sub-heading had substantially lower χ^2 values. These values

were 0.08, and therefore, the responses to these items did

not demonstrate a statistically significant degree of

consensus among the respondents. These items were:

    install network printer on a computer
    set up network printers for multi-user printing.

File Management Skills

There were 18 skill statements under the heading of File Management Skills. Of those, 15 skill statements had χ^2 values greater than $\chi^2_{critical}$=3.84. Additionally, all of these items had means of 3.54 or greater. These items are shown in Figure 6. Among the 15 items, the strongest consensus occurred on 10 items, where the "Positive %" was 92 percent, the means ranged from 4.08 to 4.50, and the χ^2 values were 8.15 to 23.00. Two items had means greater than 3.0, but the calculated χ^2=3.77 values were slightly less than $\chi^2_{critical}$=3.84. Although these items did not meet the χ^2 test for statistical significance, it is worth noting them since they did show 77 percent "Positive" responses and means of 3.08 – 3.46. These items were:

> backup files to remote system or other PCs
> conserve disk space by archiving seldom used files.

The remaining item under the File Management Skills heading had a substantially lower χ^2 value of 1.92, and therefore, the responses to this item did not demonstrate a statistically significant degree of consensus among the respondents. This item was "write protect files."

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		1	2	3	4	5								
	File Management (skills applicable to local operating system)													
109	understand differences between "save" and "save as"	0	1	1	1	9	12	54	4.50	1	11	8%	92%	8.33
108	use "save as" to select drive and directory locations	0	1	1	3	8	13	57	4.38	1	12	8%	92%	9.31
110	move files from one directory/drive to another	0	1	1	3	8	13	57	4.38	1	12	8%	92%	9.31
112	understand basic differences between network and local file management	0	2	0	2	8	12	52	4.33	2	10	17%	83%	5.33
103	create folders/directories	0	1	2	4	6	13	54	4.15	1	12	8%	92%	9.31
104	move folders/directories	0	1	2	4	6	13	54	4.15	1	12	8%	92%	9.31
105	rename folders/directories and files	0	1	2	4	6	13	54	4.15	1	12	8%	92%	9.31
106	copy folders/directories and files	0	1	2	4	6	13	54	4.15	1	12	8%	92%	9.31
107	delete folders/directories and files	0	1	2	4	6	13	54	4.15	1	12	8%	92%	9.31
117	locate folders/files on the network	0	1	3	3	6	13	53	4.08	1	12	8%	92%	9.31
113	select names that indicate content	0	2	2	2	7	13	53	4.08	2	11	15%	85%	6.23
111	locate, display and change Properties (Permissions) for a file/folder	0	2	4	1	6	13	50	3.85	2	11	15%	85%	6.23
114	arrange file hierarchy to organize and store files	0	2	4	1	6	13	50	3.85	2	11	15%	85%	6.23
116	describe differences between file types based on extensions	0	2	3	4	4	13	49	3.77	2	11	15%	85%	6.23
120	zip and unzip files	0	2	5	3	3	13	46	3.54	2	11	15%	85%	6.23

Figure 6. File Management
Items showing consensus in the positive Likert categories

Productivity Software

There were 21 skill statements under the heading of Productivity Software. The sub-headings in this section, and the statements associated with each of them, were as follows: Text Editor 2, Word Processing 22, Spreadsheet 15, Relational Database 12, Presentation Software 14, Desktop Publishing 7, Graphics Software 20, and Calendaring System 5.

Of the 21 skill statements under the main heading of Productivity Software, 18 skill statements had χ^2 values greater than $\chi^2_{critical}$=3.84. Additionally, these items had means ranging from 3.36 to 4.46. These items are shown in Figure 7. Among the 18 items, the strongest consensus occurred on 15 items, where the "Positive %" was 100 percent, the means ranged from 3.92 to 4.46, and the χ^2 values were 13.00. One item had a mean greater than 3.0, but the calculated χ^2=3.77 value was slightly less than $\chi^2_{critical}$=3.84. Although this item did not meet the χ^2 test for statistical significance, it is worth noting since it did show 77 percent "Positive" response and a mean of 3.31. This item was "modify 'auto' features of applications."

A Comprehensive Inventory of Technology and Computer Skills for Academic Reference Librarians

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All (1)	Not Very Important (2)	Important (3)	Very Important (4)	Critically Important (5)	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos

Productivity Software

Q	Skill	1	2	3	4	5	(N)	Sum	Mean	Neg	Pos	Neg %	Pos %	Chi
123	copy text within a file	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
124	paste text within a file	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
125	move text within a file	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
126	delete/cut text	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
127	copy text from one file to another	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
128	paste text from one file to another	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
129	insert images in document	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
133	toggle between two or more windows	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
134	change page setup options	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
122	select text	0	0	3	2	8	13	57	4.38	0	13	0%	100%	13.00
130	right-click to pull up short-cut menus	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
121	understand functions of toolbar icons and/or menu options	0	0	4	2	6	12	50	4.17	0	12	0%	100%	12.00
132	save/ convert files to other formats	0	0	3	6	4	13	53	4.08	0	13	0%	100%	13.00
138	control page breaks	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
137	insert and edit headers and footers	0	0	5	4	4	13	51	3.92	0	13	0%	100%	13.00
131	customize toolbars	0	3	4	3	3	13	45	3.46	3	10	23%	77%	3.77
140	use ZoomText and other text enlargement software	0	1	8	2	2	13	44	3.38	1	12	8%	92%	9.31
135	use track changes options	1	0	6	2	2	11	37	3.36	1	10	9%	91%	7.36
139	use OCR software	1	1	8	2	0	12	35	2.92	2	10	17%	83%	5.33

Figure 7. Productivity Software
Items showing consensus in the positive Likert categories

One item under the Productivity Software heading had a χ^2 value of 5.33, but its mean of 2.92 indicated that the consensus on this item placed it in the "Negative" category. This item was "use OCR software."

The remaining item under the Productivity Software heading had a substantially lower χ^2 value of 1.92, and therefore, the responses to this item did not demonstrate a statistically significant degree of consensus among the respondents. This item was "import and install font(s)."

Among the two skill statements under the sub-heading of Text Editor, there were no skill statements that had χ^2 values greater than $\chi^2_{critical}=3.84$. Two items had means greater than 3.0, but the calculated $\chi^2=3.77$ values were slightly less than $\chi^2_{critical}=3.84$. Although these items did not meet the χ^2 test for statistical significance, they are worth noting since they did show 77 percent "Positive" responses and had means of 3.38. These items were:

    use a simple text editor (Notepad, WordPad, vi, pico)
      to create files
    use a simple text editor (Notepad, WordPad, vi, pico)
      to edit files.

Of the 22 skill statements under the sub-heading of Word Processing, 18 skill statements had χ^2 values greater than $\chi^2_{critical}=3.84$. Additionally, all of these items had

means of 3.08 or greater. These items are included in Figure 8. Among the 18 items, the strongest consensus occurred on 14 items, where the "Positive %" was 100 percent, the means ranged from 3.46 to 4.46, and the χ^2 values were 13.00. One item had a mean greater than 3.0, but the calculated $\chi^2=3.77$ value was slightly less than $\chi^2_{critical}=3.84$. Although this item did not meet the χ^2 test for statistical significance, it is worth noting since it did show a 77 percent "Positive" response with a mean of 3.31. This item was "use mail merge."

The remaining three items under the Word Processing sub-heading had substantially lower χ^2 values. These values ranged from 0.08 to 0.69, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

    make labels
    customize keyboard
    understand how to create a "back of the book" index.

Of the 15 skill statements under the sub-heading of Spreadsheet, seven skill statements had χ^2 values greater than $\chi^2_{critical}=3.84$. Additionally, all of these items had means of 3.15 or greater. These items are included in

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		1	2	3	4	5								

Word Processing Skills

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Neg	Pos	Neg %	Pos %	Chi Sq
144	create a file	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
145	edit a file	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
147	save a proprietary format wordprocessor file as a text file	0	0	1	5	7	13	58	4.46	0	13	0%	100%	13.00
146	save a file in proprietary wordprocessor format	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
149	create and format standard documents (memos, letters)	0	0	4	2	7	13	55	4.23	0	13	0%	100%	13.00
151	use find or find & replace	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
152	import a graphic into a word processing document	0	0	4	3	6	13	54	4.15	0	13	0%	100%	13.00
161	use spell checker	0	0	3	5	5	13	54	4.15	0	13	0%	100%	13.00
159	import, export, manipulate files	0	0	3	6	4	13	53	4.08	0	13	0%	100%	13.00
155	create bulleted and numbered lists (using automated features of program)	0	0	4	5	4	13	52	4.00	0	13	0%	100%	13.00
150	create and use templates	0	1	4	3	5	13	51	3.92	1	12	8%	92%	9.31
154	use indentation formatting features	0	0	5	5	3	13	50	3.85	0	13	0%	100%	13.00
153	import a spreadsheet into a word processing document	0	0	6	4	3	13	49	3.77	0	13	0%	100%	13.00
148	instruct others in word processing programs	1	1	3	3	5	13	49	3.77	2	11	15%	85%	6.23
162	use word count functions	0	1	5	4	3	13	48	3.69	1	12	8%	92%	9.31
157	work with tables	0	0	8	3	2	13	46	3.54	0	13	0%	100%	13.00
158	use column formatting	0	0	8	4	1	13	45	3.46	0	13	0%	100%	13.00
163	set up macros	0	2	9	1	1	13	40	3.08	2	11	15%	85%	6.23

Figure 8. Word Processing
Items showing consensus in the positive Likert categories

Figure 9. One item had a mean greater than 3.0, but the calculated $\chi^2=3.77$ value was slightly less than $\chi^2_{critical}=3.84$. Although this item did not meet the χ^2 test for statistical significance, it is worth noting since it did show a 77 percent "Positive" response with a mean of 3.15. This item was "create a graph from a spreadsheet."

The remaining seven items under the Spreadsheet sub-heading had substantially lower χ^2 values. These values ranged from 0.69 to 1.92, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

    import a tab-delimited text file
    export a tab-delimited text file
    create, rename, move, copy, and edit worksheets in and
        between workbooks
    sort data
    filter data
    freeze and unfreeze panes
    hide and unhide data.

Among the 12 skill statements under the sub-heading of Relational Database, 10 skill statements had χ^2 values greater than $\chi^2_{critical}=3.84$. Additionally, all of these items had means of 3.27 or greater. These items are included in Figure 9. Among the 10 items, the strongest consensus occurred on two items, where the "Positive %" was

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Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								

Spreadsheet skills

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
175	know the difference between a spreadsheet and a database, and choose appropriate application for the task	0	1	4	2	5	12	47	3.92	1	11	8%	92%	8.33
168	add/delete columns & rows	0	1	6	2	4	13	48	3.69	1	12	8%	92%	9.31
167	enter data	0	2	4	3	4	13	48	3.69	2	11	15%	85%	6.23
166	basic understanding of spreadsheets to use for internal record keeping	0	1	5	3	3	12	44	3.67	1	11	8%	92%	8.33
169	format cells/columns/rows (alignment, color, font, numeric display, size)	0	2	5	3	3	13	46	3.54	2	11	15%	85%	6.23
171	select print areas	0	2	6	2	3	13	45	3.46	2	11	15%	85%	6.23
170	create formulas, and know common formulas and their uses	0	2	7	2	2	13	43	3.31	2	11	15%	85%	6.23

Relational database skills

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
181	understand the differences between flat and relational databases	0	0	4	3	3	10	39	3.90	0	10	0%	100%	10.00
182	understand principles of relational database design	0	0	5	2	3	10	38	3.80	0	10	0%	100%	10.00
185	understand concept of fields	0	1	4	1	4	10	38	3.80	1	9	10%	90%	6.40
183	use relational databases	0	1	5	2	3	11	40	3.64	1	10	9%	91%	7.36
189	add, delete and edit data	0	1	6	1	3	11	39	3.55	1	10	9%	91%	7.36
186	identify primary key field	0	2	4	2	3	11	39	3.55	2	9	18%	82%	4.45
187	identify required fields	0	2	4	2	3	11	39	3.55	2	9	18%	82%	4.45
188	format fields	0	2	5	2	2	11	37	3.36	2	9	18%	82%	4.45
192	create and format reports	0	2	5	2	2	11	37	3.36	2	9	18%	82%	4.45
190	sort data	0	2	6	1	2	11	36	3.27	2	9	18%	82%	4.45

Figure 9. Spreadsheet and Relational Database Items showing consensus in the positive Likert categories

100 percent, the means ranged from 3.80 to 3.90, and the χ^2 values were 10.00.

The remaining two items under the Relational Database sub-heading had substantially lower χ^2 values. These values were 2.27, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

filter data
design a relational database.

Of the 14 skill statements under the sub-heading of Presentation Software, 13 skill statements had χ^2 values greater than $\chi^2_{critical}$=3.84. Additionally, all of these items had means of 3.46 or greater. These items are included in Figure 10. Among the 13 items, the strongest consensus occurred on four items, where the "Positive %" was 100 percent, the means ranged from 3.77 to 4.31, and the χ^2 values were 13.00. One item had a mean greater than 3.0, but the calculated χ^2=3.77 value was slightly less than $\chi^2_{critical}$=3.84. Although this item did not meet the χ^2 test for statistical significance, it is worth noting since it did show a 77 percent "Positive" response with a mean of 3.08. This item was "apply animation effects within slides."

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For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale:
5 = Critically Important   4 = Very Important
3 = Important   2 = Not Very Important
1 = Not Needed at All

Question	Skill	Not Needed at All (1)	Not Very Important (2)	Important (3)	Very Important (4)	Critically Important (5)	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
Presentation software skills														
193	utilize presentation software for teaching/instruction or professional presentations	0	0	3	3	7	13	56	4.31	0	13	0%	100%	13.00
195	capture Webpages and images and incorporate in presentations	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
198	run a presentation/slide show (go back, go forward, use slide sorter)	0	1	3	2	7	13	54	4.15	1	12	8%	92%	9.31
196	resize images and text boxes	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
205	use presentation software for off-line demonstrations	0	1	4	3	5	13	51	3.92	1	12	8%	92%	9.31
197	apply slide backgrounds and layouts	0	0	6	4	3	13	49	3.77	0	13	0%	100%	13.00
194	instruct others in basic use of presentation software	1	0	5	2	5	13	49	3.77	1	12	8%	92%	9.31
201	select colors and fonts appropriate for display and	0	1	5	3	4	13	49	3.77	1	12	8%	92%	9.31
202	edit graphics (resize, crop)	0	1	5	4	3	13	48	3.69	1	12	8%	92%	9.31
204	create hyperlinks (internal slides/external resources)	0	1	5	4	3	13	48	3.69	1	12	8%	92%	9.31
199	incorporate multi-media into presentations	0	1	6	4	2	13	46	3.54	1	12	8%	92%	9.31
200	apply transition effects between slides	0	1	7	2	3	13	46	3.54	1	12	8%	92%	9.31
206	convert presentation to HTML	0	2	5	4	2	13	45	3.46	2	11	15%	85%	6.23
Desktop publishing skills														
207	produce brochures, handouts, newsletters, posters	0	0	6	4	2	12	44	3.67	0	12	0%	100%	12.00
208	incorporate and edit images	0	0	8	2	2	12	42	3.50	0	12	0%	100%	12.00
209	understand design concepts and elements	0	1	6	2	2	11	38	3.45	1	10	9%	91%	7.36
210	know how to do basic page layout	0	0	9	1	2	12	41	3.42	0	12	0%	100%	12.00
211	apply appropriate fonts and styles	0	0	9	1	2	12	41	3.42	0	12	0%	100%	12.00
212	import files, graphics, or objects from other applications	0	0	9	1	2	12	41	3.42	0	12	0%	100%	12.00
213	create library signage	0	2	7	1	2	12	39	3.25	2	10	17%	83%	5.33

Figure 10. Presentation Software and Desktop Publishing Items showing consensus in the positive Likert categories

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There were no items under the Presentation Software sub-heading with χ^2 values below the $\chi^2_{critical}$=3.84.

Of the seven skill statements under the sub-heading of Desktop Publishing, all seven had χ^2 values greater than $\chi^2_{critical}$=3.84. Additionally, all of these items had means of 3.25 or greater. These items are included in Figure 10. Among the seven items, the strongest consensus occurred on five items, where the "Positive %" was 100 percent, the means ranged from 3.42 to 3.67, and the χ^2 values were 12.00.

There were no items under the Desktop Publishing sub-heading with χ^2 values below the $\chi^2_{critical}$=3.84.

Among the 20 skill statements under the sub-heading of Graphics Software, 19 skill statements had χ^2 values greater than $\chi^2_{critical}$=3.84. Additionally, all of these items had means of 3.15 or greater. These items are included in Figure 11. Among the 19 items, the strongest consensus occurred on five items, where the "Positive %" was 100 percent, the means ranged from 3.46 to 3.85, and the χ^2 values were 13.00.

The remaining item under the Graphics Software sub-heading had a substantially lower χ^2 value of 1.33, and

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Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								
Graphics Software Skills														
228	understand copyright restrictions as they apply to images and their use	0	1	3	3	5	12	48	4.00	1	11	8%	92%	8.33
232	save/download images from Webpages	0	0	5	5	3	13	50	3.85	0	13	0%	100%	13.00
217	select appropriate file format for intended use (Web, print, archival storage)	0	0	7	3	3	13	48	3.69	0	13	0%	100%	13.00
222	explain to others how to view and save various types of files (PDF, gif, tiff)	0	0	7	3	3	13	48	3.69	0	13	0%	100%	13.00
231	capture screen images	0	0	6	5	2	13	48	3.69	0	13	0%	100%	13.00
216	understand delivery implications of various file formats	0	1	6	1	4	12	44	3.67	1	11	8%	92%	8.33
220	select appropriate viewer based on file format	0	1	6	3	3	13	47	3.62	1	12	8%	92%	9.31
221	create and edit graphics files	0	1	7	2	3	13	46	3.54	1	12	8%	92%	9.31
229	use a scanner to capture images	0	0	9	2	2	13	45	3.46	0	13	0%	100%	13.00
219	convert/save graphics from one format to another	0	1	7	3	2	13	45	3.46	1	12	8%	92%	9.31
218	know appropriate storage format for size and compression	0	1	7	2	2	12	41	3.42	1	11	8%	92%	8.33
214	locate and import clipart and images	0	1	8	2	2	13	44	3.38	1	12	8%	92%	9.31
224	create/edit lines	1	0	7	3	2	13	44	3.38	1	12	8%	92%	9.31
227	edit graphic files: crop, resize, change color scheme	0	2	6	3	2	13	44	3.38	2	11	15%	85%	6.23
223	create/edit a simple drawing, using auto shapes	1	0	8	2	2	13	43	3.31	1	12	8%	92%	9.31
230	acquire / create image files through digital cameras	0	1	9	1	2	13	43	3.31	1	12	8%	92%	9.31
226	create, modify and edit simple graphics such as buttons, banners and letterhead	1	1	6	3	2	13	43	3.31	2	11	15%	85%	6.23
215	know special features and strengths of various graphics software packages	0	2	7	1	2	12	39	3.25	2	10	17%	83%	5.33
225	create/edit a simple free form painting	1	1	8	1	2	13	41	3.15	2	11	15%	85%	6.23

Figure 11. Graphics Software
Items showing consensus in the positive Likert categories

therefore, the response to this item did not demonstrate a statistically significant degree of consensus among the respondents. This item was "use Gif animators."

Among the seven skill statements under the sub-heading of Calendaring System, there were no skill statements that had a χ^2 value greater than $\chi^2_{critical}$=3.84. The calculated χ^2 values ranged from 0.00 to 1.33, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

    schedule resources (rooms, equipment)
    view calendar of self and others
    schedule meetings/appointments
    delete meetings/appointments
    set up privileges.

Internet

There were 27 skill statements under the heading of Internet. In addition, the sub-headings of Browser, Email, and Webpage Design contained 14, 27, and 4 statements, respectively.

Among the 27 skill statements under the main heading of Internet, 25 skill statements had χ^2 values greater than $\chi^2_{critical}$=3.84. Additionally, all of these items had means of 3.08 or greater. These items are included in Figure 12. Among the 25 items, the strongest consensus occurred on 13

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Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								
Internet														
239	understand the differences between telnet, FTP, and the HTTP protocols	0	0	1	5	6	12	53	4.42	0	12	0%	100%	12.00
242	open an http connection to remote host	0	0	3	2	8	13	57	4.38	0	13	0%	100%	13.00
255	understand privacy and intellectual freedom implications of IP authentication/authorization	0	0	1	7	4	12	51	4.25	0	12	0%	100%	12.00
252	understand the construction of a URL	0	0	4	2	6	12	50	4.17	0	12	0%	100%	12.00
240	telnet to remote hosts	0	0	4	3	6	13	54	4.15	0	13	0%	100%	13.00
245	upload and download files to server	0	0	3	5	5	13	54	4.15	0	13	0%	100%	13.00
253	explain URL construction to others	0	0	5	1	7	13	54	4.15	0	13	0%	100%	13.00
241	telnet to local host	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
243	FTP to and from remote host	0	1	4	3	5	13	51	3.92	1	12	8%	92%	9.31
260	understand different uses of Proxy Servers (I.e. enabling vs. restricting access)	0	0	5	4	3	12	46	3.83	0	12	0%	100%	12.00
256	basic functional knowledge of IP authentication and how addressing applies to service	0	1	3	5	3	12	46	3.83	1	11	8%	92%	8.33
264	understand video-based conferencing tools	0	0	5	5	2	12	45	3.75	0	12	0%	100%	12.00
259	understand fire walls and limitations they impose	0	0	7	2	3	12	44	3.67	0	12	0%	100%	12.00
254	understand the use and importance of a PURL	0	1	5	3	3	12	44	3.67	1	11	8%	92%	8.33
263	understand Web-based chat and conferencing tools	0	1	4	5	2	12	44	3.67	1	11	8%	92%	8.33
262	explain proxy server configuration to others	0	0	8	2	3	13	47	3.62	0	13	0%	100%	13.00
244	instruct others to use FTP	1	0	6	2	4	13	47	3.62	1	12	8%	92%	9.31
247	create, rename, and delete files and directories with FTP	0	1	6	3	3	13	47	3.62	1	12	8%	92%	9.31
261	configure browser to use a proxy server and authenticate to a remote service	0	1	5	5	2	13	47	3.62	1	12	8%	92%	9.31
265	use a common chat or conferencing tool	0	1	6	4	2	13	46	3.54	1	12	8%	92%	9.31
248	understand metadata standards	0	0	7	4	1	12	42	3.50	0	12	0%	100%	12.00
246	know the difference between ascii and binary uploads, and know when and how to use either	0	1	6	3	2	12	42	3.50	1	11	8%	92%	8.33
251	understand cookies	0	2	5	3	2	12	41	3.42	2	10	17%	83%	5.33
249	understand public keys	1	1	7	2	1	12	37	3.08	2	10	17%	83%	5.33
250	understand certificates	1	1	7	2	1	12	37	3.08	2	10	17%	83%	5.33

Figure 12. Internet
Items showing consensus in the positive Likert categories

items, where the "Positive %" was 100 percent, the means ranged from 3.50 to 4.42, and the χ^2 values were 12.00 to 13.00.

The remaining two items under the Internet heading had a substantially lower χ^2 value of 1.92, and therefore, the responses to these items did not demonstrate a statistically significant degree of consensus among the respondents. These items were:

use IP addresses as locators
set up IP addresses in network PC.

Of the 14 skill statements under the sub-heading of Browser, all 14 had χ^2 values greater than $\chi^2_{critical}=3.84$. Additionally, all of these items had means of 3.23 or greater. These items are included in Figure 13. Among the 14 items, the strongest consensus occurred on 11 items, where the "Positive %" was 100 percent, the means ranged from 3.46 to 4.77, and the χ^2 values were 12.00 to 13.00.

There were no items under the Browser sub-heading with χ^2 values below the $\chi^2_{critical}=3.84$.

Of the 27 skill statements under the sub-heading of Email, all 27 had χ^2 values greater than $\chi^2_{critical}=3.84$. Additionally, all of these items had means of 3.31 or greater. These items are included in Figure 13. Among the

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Question	*For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale:* *5 = Critically Important 4 = Very Important* *3 = Important 2 = Not Very Important 1 = Not Needed at All*	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								

Browser Skills

Question		1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square
266	navigate to different sites or pages	0	0	0	3	10	13	62	4.77	0	13	0%	100%	13.00
267	identify main parts of the browser window (title bar, menu bar, body, status bar)	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
269	move among previously visited URLS	0	0	1	3	9	13	60	4.62	0	13	0%	100%	13.00
275	manage bookmarks and bookmark folders (create, delete, sort, change)	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
268	interpret status and error messages	0	0	3	2	8	13	57	4.38	0	13	0%	100%	13.00
278	understand difference between saving as .htm and .txt	0	0	2	4	6	12	52	4.33	0	12	0%	100%	12.00
273	use toolbar and menu commands	0	0	2	5	6	13	56	4.31	0	13	0%	100%	13.00
277	print or transfer (copy/save) information to a different format	0	0	2	5	6	13	56	4.31	0	13	0%	100%	13.00
272	re-size windows	0	0	3	5	5	13	54	4.15	0	13	0%	100%	13.00
276	utilize Preferences to optimize browser performance	0	0	2	7	4	13	54	4.15	0	13	0%	100%	13.00
279	empty cache for privacy and efficiency of operation	0	1	3	5	4	13	51	3.92	1	12	8%	92%	9.31
271	adjust font size	0	0	8	4	1	13	45	3.46	0	13	0%	100%	13.00
274	add/delete toolbars	1	0	6	4	2	13	45	3.46	1	12	8%	92%	9.31
270	change font type	0	1	9	2	1	13	42	3.23	1	12	8%	92%	9.31

Email

Question		1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square
281	retrieve/receive mail	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
282	send mail	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
280	identify elements within the inbox (messages, headers, rec'd date)	0	0	1	3	9	13	60	4.62	0	13	0%	100%	13.00
287	forward a message	0	0	1	4	8	13	59	4.54	0	13	0%	100%	13.00

Figure 13. Browser and Email
Items showing consensus in the positive Likert categories

A Comprehensive Inventory of Technology and Computer Skills for Academic Reference Librarians

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								

Email - Continued

Question		Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
288	reply to a message	0	0	1	4	8	13	59	4.54	0	13	0%	100%	13.00
289	save a message	0	0	1	5	7	13	58	4.46	0	13	0%	100%	13.00
290	cut, copy, and paste between email and other applications	0	0	1	5	7	13	58	4.46	0	13	0%	100%	13.00
292	view attachments	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
291	send attachments	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
293	save attachments	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
294	organize and manage folders	0	0	1	6	6	13	57	4.38	0	13	0%	100%	13.00
283	format message content	0	0	2	5	6	13	56	4.31	0	13	0%	100%	13.00
298	understand email discussion groups (e.g. listservs)	0	0	2	5	5	12	51	4.25	0	12	0%	100%	12.00
284	spellcheck messages	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
301	"open" hyperlinks within a message	0	0	2	6	5	13	55	4.23	0	13	0%	100%	13.00
304	locate, identify and change options/preferences	0	0	2	6	5	13	55	4.23	0	13	0%	100%	13.00
286	create address, contact, and distribution lists	0	0	3	5	5	13	54	4.15	0	13	0%	100%	13.00
295	archive and save messages out of your email program	0	0	2	7	4	13	54	4.15	0	13	0%	100%	13.00
300	post messages to email discussion groups	0	0	2	7	4	13	54	4.15	0	13	0%	100%	13.00
299	use email discussion group commands (subscribe, unsubscribe, suspend)	0	0	2	8	3	13	53	4.08	0	13	0%	100%	13.00
302	create a hyperlink in a message	0	0	3	6	4	13	53	4.08	0	13	0%	100%	13.00
303	understand various email clients and how to configure them to retrieve email from servers	0	0	4	5	3	12	47	3.92	0	12	0%	100%	12.00
306	know and utilize advanced features of your email system	0	1	3	5	3	12	46	3.83	1	11	8%	92%	8.33
296	understand that your email box is not a to-do list or filing system	1	1	2	3	5	12	46	3.83	2	10	17%	83%	5.33
285	create an Autosignature	0	0	6	5	2	13	48	3.69	0	13	0%	100%	13.00
305	use free Web based email	0	1	6	4	2	13	46	3.54	1	12	8%	92%	9.31
297	set up filters for incoming messages	0	1	7	5	0	13	43	3.31	1	12	8%	92%	9.31

Figure 13. Continued

27 items, the strongest consensus occurred on 23 items, where the "Positive %" was 100 percent, the means ranged from 3.69 to 4.69, and the χ^2 values were 12.00 to 13.00.

There were no items under the Email sub-heading with χ^2 values below the $\chi^2_{critical}$=3.84.

Of the 43 skill statements under the sub-heading of Webpage Design, 32 skill statements had χ^2 values greater than $\chi^2_{critical}$=3.84. Additionally, all of these items had means of 3.09 or greater. These items are included in Figure 14. Among the 32 items, the strongest consensus occurred on 16 items, where the "Positive %" was 100 percent, the means ranged from 3.62 to 4.33, and the χ^2 values were 12.00 to 13.00. One item had a mean greater than 3.0, but the calculated χ^2=3.77 value was slightly less than $\chi^2_{critical}$=3.84. Although this item did not meet the χ^2 test for statistical significance, it is worth noting since it did show a 77 percent "Positive" response with a mean of 3.31. This item was "apply XML encoding to documents."

The remaining 10 items under the Webpage Design sub-heading had substantially lower χ^2 values. These values ranged from 0.08 to 3.00, and therefore, the responses to these items did not demonstrate a statistically significant

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5 = Critically Important   4 = Very Important
3 = Important   2 = Not Very Important   1 = Not Needed at All

Webpage Design

Question	Skill	Not Needed at All (1)	Not Very Important (2)	Important (3)	Very Important (4)	Critically Important (5)	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
307	knowledge of which languages are supported by the home institution	0	0	2	4	6	12	52	4.33	0	12	0%	100%	12.00
316	import/paste existing content into an HTML file	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
311	utilize Web authoring software compatible with institution's Web server and browser platforms	0	0	4	3	6	13	54	4.15	0	13	0%	100%	13.00
315	create simple original Webpages	0	0	2	7	4	13	54	4.15	0	13	0%	100%	13.00
326	create links (hyperlinks to other Webpages and target links within the same Webpage)	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
345	have professional development opportunities to learn SGML and/or XML as needed	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
313	use basic functions of a common authoring tool	0	0	4	5	4	13	52	4.00	0	13	0%	100%	13.00
310	create Webpages using a text editor	0	0	6	2	5	13	51	3.92	0	13	0%	100%	13.00
328	preview pages in Web browser(s)	0	0	6	2	5	13	51	3.92	0	13	0%	100%	13.00
319	distinguish between print design & Web design	0	0	3	7	2	12	47	3.92	0	12	0%	100%	12.00
321	understand differences in browsers and how they effect display	0	0	4	5	3	12	47	3.92	0	12	0%	100%	12.00
314	create new pages based on templates	0	0	6	4	3	13	49	3.77	0	13	0%	100%	13.00
324	design effective navigation within a site using navigation bars, buttons, icons	0	0	5	6	2	13	49	3.77	0	13	0%	100%	13.00
338	stay current on developments relating to ADA compliance	0	1	4	5	3	13	49	3.77	1	12	8%	92%	9.31
322	identify text attributes that detract from design and hinder viewing/printing	0	0	5	7	1	13	48	3.69	0	13	0%	100%	13.00

Figure 14. Webpage Design
Items showing consensus in the positive Likert categories

A Comprehensive Inventory of Technology and Computer Skills for Academic Reference Librarians

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								
Webpage Design - Continued														
308	instruct others in use of HTML, Web authoring tools, and basic Webpage design	0	2	4	3	4	13	48	3.69	2	11	15%	85%	6.23
309	understand differences in HTML versions	0	0	5	6	1	12	44	3.67	0	12	0%	100%	12.00
336	insert metadata into header	1	1	1	7	2	12	44	3.67	2	10	17%	83%	5.33
323	select and modify graphics to conserve bandwidth	0	0	6	6	1	13	47	3.62	0	13	0%	100%	13.00
312	select tools that do not add superfluous tags, or use these tools and edit out bad code	0	1	5	5	2	13	47	3.62	1	12	8%	92%	9.31
349	have professional development opportunities to learn Java as needed	0	2	5	2	4	13	47	3.62	2	11	15%	85%	6.23
337	create HTML forms	1	0	3	7	1	12	43	3.58	1	11	8%	92%	8.33
327	create links to non-HTML files	0	2	5	4	2	13	45	3.46	2	11	15%	85%	6.23
339	understand XML encoding principles and their importance	0	1	6	4	1	12	41	3.42	1	11	8%	92%	8.33
340	understand SGML encoding principles and their importance	0	1	6	4	1	12	41	3.42	1	11	8%	92%	8.33
331	create and edit tables	1	0	7	3	2	13	44	3.38	1	12	8%	92%	9.31
325	design an effective color scheme	0	3	3	6	1	13	44	3.38	3	10	23%	77%	3.77
320	construct a Web site pre-planning guide	0	1	6	5	0	12	40	3.33	1	11	8%	92%	8.33
346	understand Java	0	1	8	1	2	12	40	3.33	1	11	8%	92%	8.33
343	understand DTD	0	1	7	3	0	11	35	3.18	1	10	9%	91%	7.36
332	add frames to a Webpage	1	1	6	3	1	12	38	3.17	2	10	17%	83%	5.33
344	encode appropriate DTDs	1	0	7	3	0	11	34	3.09	1	10	9%	91%	7.36

Figure 14. Continued

degree of consensus among the respondents. These items were:

> organize elements for publishing, and publish
> sites/individual pages
> import and export sites
> create and edit an imagemap
> embed video in a Webpage
> apply SGML encoding to documents
> create page(s) strictly based on HTML 3.2 or later
> embed audio in a Webpage
> modify existing Java scripts
> create page(s) strictly based on HTML 2.0
> write original Java code.

Search Concepts and Techniques

There were 13 skill statements under the heading of Search Concepts and Techniques. In addition, the sub-headings of Indexing and Relevancy contained 4 statements each.

Of the 23 skill statements under the main heading of Search Concepts and Techniques, all 23 had χ^2 values greater than $\chi^2_{critical}=3.84$. Additionally, all of these items had means of 3.67 or greater. These items are included in Figure 15. Among the 23 items, the strongest consensus occurred on 19 items, where the "Positive %" was 100 percent, the means ranged from 4.08 to 4.92, and the χ^2 values were 13.00. There were no items under the Search Concepts and Techniques heading with χ^2 values below the $\chi^2_{critical}=3.84$.

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A Comprehensive Inventory of Technology and Computer Skills for Academic Reference Librarians

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								
Search Concepts & Techniques														
350	construct searches using advanced features in Library's OPAC, subscription databases, and major Web search engines	0	0	0	1	12	13	64	4.92	0	13	0%	100%	13.00
369	browse by journal titles, subjects or other main index fields	0	0	0	1	12	13	64	4.92	0	13	0%	100%	13.00
356	construct Boolean search statements and know how the syntax varies from one search interface to another	0	0	1	0	12	13	63	4.85	0	13	0%	100%	13.00
357	construct bound-phrase search strings and know how the syntax varies from one search interface to another	0	0	1	0	12	13	63	4.85	0	13	0%	100%	13.00
358	construct search strings using proximity operators and know how the syntax varies from one search interface to another	0	0	1	0	12	13	63	4.85	0	13	0%	100%	13.00
366	use controlled vocabulary, thesauri, and classification schemes	0	0	1	0	12	13	63	4.85	0	13	0%	100%	13.00
368	identify available formats (citation, abstract, full text) for most commonly used resources	0	0	1	0	12	13	63	4.85	0	13	0%	100%	13.00
351	instruct others in a range of search techniques and options	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
359	use truncation and know how the syntax varies from one search interface to another	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
360	qualify with limiters and know how the syntax varies from one search interface to another	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
365	efficiently navigate database help screens to answer questions and assist users	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00

Figure 15. Search Concepts and Techniques
Items showing consensus in the positive Likert categories

A Comprehensive Inventory of Technology and Computer Skills for Academic Reference Librarians

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	1 Not Needed at All	2 Not Very Important	3 Important	4 Very Important	5 Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos

Search Concepts & Techniques - Continued

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
361	construct search strings with nested Boolean search phrases and know how the syntax varies from one interface to another	0	1	0	0	12	13	62	4.77	1	12	8%	92%	9.31
352	distinguish between Search Engine, Subject Directory, Meta-Search Engine and select resource best suited to the search	0	0	2	0	11	13	61	4.69	0	13	0%	100%	13.00
362	limit searches to a particular field	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
363	view search history	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
355	distinguish between an index and databases, and why someone would use	0	0	1	3	9	13	60	4.62	0	13	0%	100%	13.00
371	print/save/email search results	0	0	1	3	9	13	60	4.62	0	13	0%	100%	13.00
364	combine sets	0	1	0	2	10	13	60	4.62	1	12	8%	92%	9.31
353	describe relative strengths and weaknesses of major search engines	0	1	0	2	9	12	55	4.58	1	11	8%	92%	8.33
370	construct "natural language" search statements when applicable	0	0	2	2	9	13	59	4.54	0	13	0%	100%	13.00
367	describe client/server interaction and interpret common error messages to determine the source of problems	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
354	understand Z39.50 protocol principles	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
372	download/import records into a personal bibliographic software package (like EndNote)	0	1	5	3	3	12	44	3.67	1	11	8%	92%	8.33

Figure 15. Continued

Of the four skill statements under the sub-heading of

Indexing, all four had χ^2 values greater than $\chi^2_{critical}$=3.84.

Additionally, all of these items had means of 4.42 or

greater. These items are included in Figure 16. All four

items, showed strong consensus. The "Positive %" was 100

percent, the means ranged from 4.42 to 4.67, and the χ^2

values were 12.00. There were no items under the Indexing

sub-heading with χ^2 values below the $\chi^2_{critical}$=3.84.

Of the four skill statements under the sub-heading of

Relevancy Ranking, all four had χ^2 values greater than

$\chi^2_{critical}$=3.84. Additionally, all of these items had means of

3.91 or greater. These items are included in Figure 16.

All four items, showed strong consensus. The "Positive %"

was 100 percent, the means ranged from 3.91 to 4.18, and

the χ^2 values were 11.00 to 12.00. There were no items

under the Relevancy Ranking sub-heading with χ^2 values below

the $\chi^2_{critical}$=3.84.

Summary

This study was designed to develop a comprehensive

inventory of the technology and computer skills required of

reference librarians in today's academic library

environment. This study was conducted using the Delphi

A Comprehensive Inventory of Technology and Computer Skills for Academic Reference Librarians

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Square of Neg/Pos
		1	2	3	4	5								

Indexing

374	understand role of controlled vocabulary	0	0	1	2	9	12	56	4.67	0	12	0%	100%	12.00
376	understand local OPAC indexing to do "power searching"	0	0	1	2	9	12	56	4.67	0	12	0%	100%	12.00
373	understand the construction of index systems and instruct others in their use	0	0	0	5	7	12	55	4.58	0	12	0%	100%	12.00
375	understand metadata	0	0	1	5	6	12	53	4.42	0	12	0%	100%	12.00

Relevancy ranking

377	understand ranking systems in general terms, including advantages and disadvantages	0	0	3	3	5	11	46	4.18	0	11	0%	100%	11.00
379	explain various systems' ranking criteria and their implications to users	0	0	4	4	4	12	48	4.00	0	12	0%	100%	12.00
380	explain language ambiguity and it implications in relevancy ranking	0	0	4	5	3	12	47	3.92	0	12	0%	100%	12.00
378	understand how rankings within a system are calculated	0	0	4	4	3	11	43	3.91	0	11	0%	100%	11.00

Figure 16. Indexing and Relevancy Ranking
Items showing consensus in the positive Likert categories

Method, and consisted of two rounds. The first round began
with the open-ended question "What are the technology and
computer skills required of reference librarians in
academic libraries?" A number of headings and sub-headings
were provided as an organizational aid. The 14 respondents
provided 848 skill statements and numerous other comments
in response to the open-ended question. Multiple
statements that described the same skill were revised and
combined into a single uniformly worded skill statement.
The revised inventory contained 380 skill statements.

The 380 skill statements formed the basis for the
Round #2 questionnaire, in which the 14 participants were
asked to use a Likert-type scale to indicate the level of
importance of each skill. Thirteen participants completed
Round #2.

The responses to the Round #2 questionnaire were
analyzed using descriptive statistics. The frequency of
responses to each Likert category was calculated for each
skill statement. The percentages represented by the
frequency of responses to each Likert category were
determined. Then, the sum of responses to "Not Needed at
All" and "Not Very Important" was calculated and labeled
"Negative." The sum of responses to "Important," "Very

Important," and "Critically Important" was calculated and labeled "Positive." Both, "Negative" and "Positive," were recalculated as a percent of the total number of responses to each item and labeled "Negative %" and "Positive %." Finally, chi square goodness of fit tests were used. These calculations were labeled "Chi Square of Neg/Pos." The "Chi Square of Neg/Pos" (χ^2) had to produce a value greater than the critical value of $\chi^2_{critical}=3.84$ ($\alpha=.05$ and df=1) to be statistically significant, and to demonstrate consensus among the respondents.

Items with a mean greater than 3.0 and a "Chi Square of Neg/Pos" (χ^2) value greater than the critical value of $\chi^2_{critical}=3.84$ ($\alpha=.05$ and df=1) were considered to show consensus and to have been considered important by the respondents.

Of the 380 skill statements, 285 met the criteria described in the previous paragraph. Additionally, 19 statements had chi square values of 3.77, means of greater than 3.0, and at least 77 percent of the responses were "Positive." While these statements did not meet the χ^2 test for statistical significance, they are worth noting nonetheless. The remaining 76 items had substantially lower chi square values, as well as lower means and

percentages of "Positive" responses. Items with a mean greater than 3.0 and a "Chi Square of Neg/Pos" (χ^2) value greater than the critical value of $\chi^2_{critical}=3.84$ ($\alpha=.05$ and df=1) were considered to show consensus and to have been considered important by the respondents.

CHAPTER V

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

The purpose of this study was to develop a comprehensive inventory of the computer and related technology skills required of reference librarians in the academic library environment. The intent was to develop a comprehensive list, comprised of all computer and related technology skills that may be applicable, with the understanding that not all will apply to every reference librarian in every academic library.

Summary

Using the Delphi Method, the study began Round #1 by asking the 14 participants the following question: "What are the technology and computer skills required of reference librarians in academic libraries?" The participants were asked to provide all of the possible responses, keeping in mind that all skills listed may not be required of all academic reference librarians. Additionally, participants were asked to consider all of the duties for which academic reference librarians may be

responsible. These duties might include, for example, bibliographic instruction, services to remote users (including technical support), and serving as a Webmaster or Web Editor.

The 14 respondents provided a total of 848 skill statements in response to Round #1's open-ended question. Multiple skill statements that described the same skill were revised and combined into one uniformly worded skill statement. In addition, when a given skill statement was entered under multiple categories that statement was placed under the single heading or sub-heading where it appeared most often. After combining and revising headings, sub-headings, and skill statements, a total of 380 skill statements remained and comprised Questionnaire #2. Thirteen respondents completed Questionnaire #2.

Items with a mean greater than 3.0 and a "Chi Square of Neg/Pos" (χ^2) value greater than the critical value of $\chi^2_{critical}=3.84$ ($\alpha=.05$ and df=1) were considered to show consensus and to have been considered important by the respondents. Of the 380 skill statements, 285 met these criteria. Additionally, 19 statements had chi square values of 3.77, means of greater than 3.0, and at least 77 percent of the responses were "Positive." While these

statements did not meet the χ^2 test for statistical significance, they are worth noting nevertheless. The remaining 76 items had substantially lower χ^2 values, as well as lower means and percentages of "Positive" responses.

The comments and data related to Hardware Basics and Troubleshooting, as reported in Chapter IV, support a delineation of responsibilities between reference librarians, and systems librarians or technical support personnel. It seems clear, nonetheless, that possessing skills in these areas is a valuable asset for reference librarians as they strive to maintain efficiency and acceptable levels of hardware performance for library patrons. Additionally, reference librarians who possess higher level skills in these areas are likely to communicate information about hardware problems to the appropriate systems and technical support personnel in a clear and systematic manner. The ability to clearly communicate problems can foster better working relationships between reference librarians and technical support personnel, potentially improving service to patrons.

The comments and data reported for skill statements under the Operating Systems Basics heading illustrate two points that are important to note. First, regardless of individual's points of view, it is clear that respondents acknowledge Windows' dominance. Obviously, the need for skills in other operating systems, like MacOS, will be dictated by the platforms that are supported at an individual institution. In particular, reference librarians who provide telephone or email support to remote users may need these skills. Second, some respondents viewed skills in DOS and Unix/Linux as the provenance of systems librarians. Again, depending on the responsibilities of individual reference librarians and the operating environment within a particular library these skills may be more important.

An anomaly occurred with a skill statement under the Operating Systems Basics heading. The statement "use control panels to configure operating system" actually appeared twice: first, under the heading of Operating Systems Basics, and second, under the sub-heading of Windows. In the first instance, this statement had a mean of 3.38, with 69 percent "Positive" responses, and a chi square of 1.92. In the second instance, this statement had

a mean of 3.58, with 75 percent "Positive" responses and a chi square of 3.00. The presence of this statement under the Operating Systems Basics heading was, in reality, a duplicative error in the preparation of Questionnaire #2. Since this skill statement is stated in Windows terminology, it is not surprising that the reported statistics are higher for the instance of the statement under the Windows sub-heading.

The lack of importance placed on spreadsheet and database skills was rather surprising, given the widespread use of these software packages in libraries. Even though an individual librarian may not be required to design database structures, knowledge and understanding of their construction and capabilities is a valuable asset in building expert search skills in library catalogs and other databases. The respondents' comments under the heading of Search Skills and Techniques, as reported in Chapter IV, were strongly supportive of the need for database skills, even though the skill statements under the Relational Database sub-heading garnered less support. Additionally, the skills to filter, import, and export data in spreadsheet and database applications may be critical for some reference librarians, depending on their particular

situation, although the respondents did not place great importance on them.

None of the calculated values for the skill statements under the sub-heading of Calendaring Software met the criteria for statistical significance and consensus. This is somewhat surprising, given the fact that many integrated email software packages now include calendaring functions. In addition, many integrated library management systems provide tools for scheduling facilities and resources. These skills are likely to become more important as libraries implement and take advantage of these newer tools.

Without repeating the analysis of data found in Chapter IV, it is the researcher's contention that some items generated a low score because they are so new that some librarians have yet to recognize their importance and implications. This would also explain the vagueness of some skill statements generated by the respondents that related to newer technologies like JAVA, XML, and SGML. As true standards emerge and are adopted, and as libraries become more actively involved in the creation of digital documents, knowledge and skills in these areas will likely become more desirable and widespread.

The responses to skill statements under the Internet heading and its sub-headings of Email and Browser were particularly noteworthy. Of the 68 skill statements under the heading and sub-headings, only two statements failed to meet the criteria for statistical significance and consensus. Eleven of the 14 statements under Browser and 24 of the 27 statements under Email had means ranging from 3.46 to 4.77, 100 percent "Positive" responses, and chi square values of 12.00 to 13.00. This substantiates the importance of the World Wide Web and electronic data transfer in the mission of today's academic libraries.

The calculated values for the skill statement "organize elements for publishing, and publish sites/individual pages," under the Webpage Design sub-heading did not meet the criteria for statistical significance and consensus. This was somewhat puzzling, since many of the more specific skills that are implied by this broader statement were ranked strongly "Positive."

There was clear recognition of the importance of skills related to proxy servers and IP authentication. As libraries increasingly strive to provide remote access to information resources, it is important that librarians can

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clearly explain the process and mechanics of proxy servers and authentication to patrons. In order to improve librarians' skills in these it may be necessary to provide training that covers basic Internet topology, as well as authentication and authorization issues.

All of the statements under the Search Concepts and Techniques heading, as well as its sub-headings of Indexing and Relevancy Ranking, had means ranging from 3.91 to 4.92, 100 percent "Positive" responses, and chi square values of 11.00 to 13.00. This was the only heading and sub-heading group to achieve this high level of consensus and statistically significant level of importance for all skill statements.

One respondent's comment that she/he had no knowledge of relevancy ranking was striking given the fact that most Web search engines use relevancy ranking to process queries. In addition, most of the current generation of library catalog systems incorporate relevancy ranking in at least one search mode. This response supports the premise of libraries using an inventory like this one to identify needs among librarians and develop appropriate training opportunities.

An inventory of this nature can only provide a snapshot of the skills required at the time the survey was completed. Due to the rapidly changing technological environment of libraries and higher education, the content of such an inventory will quickly become outdated. As academic libraries continually seek to improve access to information through emerging technologies, the skills required of librarians will constantly change and evolve. Thus, an inventory of skills should be updated and administered at periodic intervals.

Academic reference librarians are being required to assume new roles that go well beyond what might have been considered traditional reference services in the past. Today, librarians function in a world of duality. Knowledge of resources and formats from the past and the skills to use them effectively are still required to maintain comprehensive services. Concurrently, as new delivery mechanisms are adopted, librarians must assimilate new skills, and increasingly, train users to use the new tools effectively. Increasingly, librarians are becoming creators of digital content. As their roles continue to change, additional skills will be required. It is imperative that academic reference librarians have timely

access to training to provide them with the skills required to fulfill these new roles. Without these opportunities, the ability of academic reference librarians to successfully assist and educate library patrons will be compromised. Without adequate patron assistance and instruction, it is likely that new technologies and products will be underutilized and that the financial investments in technology made by academic libraries will not be justified. It is also critical for librarians to demonstrate technological competency to retain their credibility with the patrons they serve.

As reflected in the comments from some of the study's participants, the primary goal of technology training programs for librarians should be to make the library a learning environment. Learning how to learn is the critical element that will enable librarians to quickly learn new skills and adapt to new technologies as they are adopted and implemented. In order to benefit from such an environment, librarians must first have adequate opportunities to develop a basic level of competency based on the skills identified in the inventory that are pertinent to their current responsibilities. Once a basic level of competency is achieved, librarians will be in a

much better position to learn additional skills as they are required.

Developing a basic level of competency provides a challenge for academic libraries as they seek to develop training programs for those already in the profession. Budgetary constraints make it imperative for libraries to conduct thorough needs assessments prior to implementing training programs, to insure that financial investments are wisely targeted. An inventory like the one that resulted from this study could provide a valuable tool for academic library administrators in assessing needs and developing training opportunities to meet those needs. Formal training divorced from immediate need and the opportunity to put the new skills into practice will not generally be beneficial over the long term. Libraries would be well advised to thoroughly investigate the availability of training opportunities available on their campuses, as well as exploring the availability and cost effectiveness of Web-based training programs. It seems unlikely that an individual library could supply in-house training in all areas and truly achieve the ideal of "just-in-time" and "anytime-anywhere" learning opportunities.

Many practicing reference librarians are highly
motivated and have likely done an admirable job of seeking
out opportunities on their own as needs arose. There is,
however, an inherent risk that morale and productivity may
suffer if academic libraries fail to offer training
opportunities for those that need or prefer guided training
options. Technostress is a real risk in today's
environment, but it can be lessened with adequate training.

As library schools reexamine and revise their
curricula, it may be useful for administrators and faculty
to review an inventory of computer and technological
skills. In a comment quoted in Chapter IV, one respondent
observed that entry-level librarians often lack
well-developed search skills. The need for thorough
preparation of students in the use of traditional
paper-based resources is still necessary. However, as the
process of information retrieval becomes increasingly
automated, preparation in computer-based information
retrieval is increasingly important.

Recommendations for Further Study

The inventory generated as a result of this study will
require constant updating and revision if it is to remain
viable and useful. As part of that process, it would be

useful to seek further input from additional respondents. As part of that process it may be advisable to revise statements that begin with "understand" to make them more specific and measurable. This addresses a concern raised by one respondent that some of the statements lacked specificity.

Further, it is recommended that a study be conducted that asks practicing academic reference librarians these questions:

1. What is your current level proficiency for each skill listed?
2. Where did you acquire each of the skills at which you are already proficient?
3. What is the level of importance of each skill in the daily performance of your job duties?
4. Would you benefit from additional training on the listed skills?
5. Beyond those listed, what additional skills are required in your position?

It is also recommended that a survey of library school curricula be conducted to determine the extent to which these skills are being taught in the required curricula.

Conclusions

Reference librarians working in academic libraries are faced with an ever-increasing number of electronic resources, many with unique interfaces and technical requirements. Navigating these changes, let alone

assisting library users who have widely varying levels of computer skills, is indeed a challenge. Many academic reference librarians received their formal education prior to the introduction of automation in libraries. Many of these librarians have been faced with learning new skills on the job, often with little systematic training. Coping with a continuously changing technological environment can lead to poor morale and higher job turnover. Providing adequate and timely training opportunities to address these needs presents challenges for academic library administrators as they strive to maintain levels of resources and services in the face of declining or stagnant budgets. It is critical that careful needs assessments be conducted to insure that training programs are carefully targeted and effective. Additionally, library schools are faced with the need to carefully analyze and update curricula to prepare new librarians for this evolving technological environment.

An inventory of the technology and computer skills required of reference librarians in academic libraries can be a valuable tool to assist academic library administrators and library school administrators as they face these challenges.

At the core of their mission, academic librarians have always been concerned with the physical preservation of materials. In today's environment there is increasing recognition of the need to refresh and migrate digital media to new formats to maintain viability and access. This same attention to preservation must be focused on the renewal of human resources. There are those that might argue that the current need for training is due to the predominance of librarians that entered the profession prior to library automation. If advances in technology continue at the pace of the past ten years, we may assume that the need for continuous evaluation and training will remain with us well into the future.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL

Signature:

_____   December 7, 1999
Carol Olson, Director of University Research Compliance   Date

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APPENDIX B

INITIAL CONTACT LETTER

January 25, 2000

«Salutation» «First_Name» «Last_Name»
«Title»
«Mailing_Address»

Dear «Salutation» «Last_Name»:

My name is Anne Prestamo. I am the researcher in a project entitled: *A Comprehensive Inventory of Technology and Computer Skills for Academic Reference Librarians*. This Delphi study will comprise a significant portion of my doctoral dissertation. This project is being undertaken through the School of Education Studies at Oklahoma State University.

The purpose of the study is to develop an inventory of the computer and related technology skills required of reference librarians in an academic library environment. The intent is to develop a comprehensive list, comprised of all computer and related technology skills that may be applicable, with the understanding that not all will apply to every reference librarian in every academic library.

A panel of 12 to 15 experts and practicing academic reference librarians, such as yourself, is being identified. As a panel member, your identity and the questionnaires that you return will be assigned numerical codes to preserve your anonymity. It is expected that the study will entail at least two questionnaires, but will not go beyond three. The procedures for the study are outlined in detail in the enclosed consent form. If you wish to receive a copy of my dissertation proposal I will be happy to send one to you.

The approximate timetable, subject to adjustment to accommodate panel members' schedules, is as follows:

Round #1 Questionnaire distributed to panel: Feb. 7, 2000
Round #1 Questionnaire returned to researcher: Feb. 18, 2000
Round #2 Questionnaire distributed to panel: Mar. 6, 2000
Round #2 Questionnaire returned to researcher: Mar. 13, 2000

If needed:
Round #3 Questionnaire distributed to panel: Mar. 27, 2000
Round #3 Questionnaire returned to researcher: Apr. 3, 2000

I would be grateful if you would consent to serve as one of the members of the expert panel by completing the enclosed information sheet and consent form, and returning them to me in the enclosed postage-paid envelope by February 4, 2000. I would also be happy to hear from you via email at prestamo@worldnet.att.net As I am looking forward to getting started on this project and having the opportunity of working with you, I would appreciate hearing from you as soon as possible.

Thank you for your consideration. I sincerely hope that you will find time to contribute to this research project. I look forward to hearing from you.

Sincerely,

Anne Prestamo, Coordinator
Digital Library Services
Edmon Low Library
Oklahoma State University

Mailing Address: 1808 Faircloud Drive
                 Edmond, OK 73034
Daytime Phone: 405-744-9161
FAX: 405-744-7579
Email: prestamo@worldnet.att.net

Please complete/correct the contact information below and return with the signed consent form.

Name:
Title:
Institution:
Address:

Day Phone:
FAX:
Email:

Please list any conflicts with dates outlined in the cover letter:

Please attach a current biography. Thank you.

APPENDIX C

WRITTEN CONSENT FORM

Written Consent Form

To be read and completed by all human subjects prior to their participation in this study.

My name is Anne Prestamo. I am the researcher in the project entitled: A Comprehensive Inventory of Technology and Computer Skills for Academic Reference Librarians. This study, as presented herein, will comprise a significant portion of my doctoral dissertation.

This project is being undertaken through the School of Education Studies at Oklahoma State University. I am the principal investigator of this project and I may be contacted at this number, (405) 744-9161, should you have any questions. You may also choose to contact me via email at prestamo@worldnet.att.net.

The purpose of the study is to develop an inventory of the computer and related technology skills required of reference librarians in an academic library environment. The intent is to develop a comprehensive list, comprised of all computer and related technology skills that may be applicable, with the understanding that not all will apply to every reference librarian in every academic library.

A panel of 12 to 15 experts and practicing academic reference librarians, such as yourself, is being identified. All panel members and the questionnaires that they return will be assigned numerical codes to preserve the anonymity of the participants.

Questionnaires will be distributed to panel members via email attachments, whenever possible. Each questionnaire will be distributed in an Excel workbook and respondents will record their responses in the electronic document provided. Each respondent will return the document to the researcher via email.

The data collected from the first questionnaire will consist of short statements of skills and competencies identified by the respondents in response to the initial open-ended question of "What are the technology and computer skills required of reference librarians in academic libraries?" The researcher will provide a number of sub-headings to

assist the respondents in organizing their statements. It will be clearly stated that these sub-headings are not meant to dictate the responses, but are provided purely as an organizational tool.

The initial responses to Questionnaire #1 will be analyzed and sorted. They will then be returned to the respondents as Questionnaire #2. In this round, respondents will be asked to rank items according to importance or rate them using a Likert scale. They will also be given the opportunity to modify or clarify items. Although each respondent sees all responses, the anonymity of each respondent will always preserved. Responses to Questionnaire #2 will be analyzed to determine if there is an emerging consensus among the respondents. Subsequent rounds will be conducted for those items that lacked consensus, until the researcher is satisfied that it is unlikely that consensus will be reached. Since Gentry reported that the greatest consensus emerges after Round #2, this researcher does not plan to go beyond Round #3. Following analysis of the final questionnaire, a final report will be prepared that summarizes the goals, process, and results.

Your participation is very much appreciated. There are no direct benefits due to you as a result of your participation in this project. However, I would like to reassure you that as a participant in this research project you have several rights.

Your participation is entirely voluntary and will be held in confidence. Respondents will be assigned numerical codes and will not be identified by name. Project files will be kept in a secure place at my residence and will not be made public. You are free to refuse to answer any question at any time. You are also free to withdraw from project at any time and will be kind enough to notify me if you chose to do so.

Data gathered from interviews and questionnaires may be made part of the research reports and the final doctoral dissertation. I would be grateful if you would sign this form to show that you have read it, understand its content, and agree to participate in this research project.

_____
Signature

_____
Date

_____
Name Typed or Printed

Please sign and return one copy of the consent form in the enclosed postage-paid envelope. Keep the second copy for your records.

APPENDIX D

QUESTIONNAIRE #1

A Comprehensive Inventory of Technology and Computer Skills
for
Academic Reference Librarians

Questionnaire #1

As a point of departure for the first round of the study, please provide all of the possible responses to the following question:

> What are the technology and computer skills required of reference librarians in academic libraries?

As you formulate your responses, please consider all of the duties for which academic reference librarians may be responsible. These duties might include bibliographic instruction, services to remote users (including technical support), Webmaster or Web Editor activities, etc. The intent is to create a comprehensive list, with the understanding that all skills listed may not be required of all academic reference librarians.

Please respond with brief descriptive phrases beginning with verbs whenever possible. Please describe each skill in a separate phrase.

The following list of headings and sub-headings are provided solely as an organizational tool for your responses. Sample skill statements are provided as examples. Headings are in boldface, sub-headings are in boldface and indented, and sample skill statements are in italics.

Please feel free to include or exclude headings, sub-headings, and/or sample skill statements as you construct your list. The sample skill statements shown in italics are provided solely to indicate the level of specificity the researcher is seeking.

The attached Excel file has been set up with the headings and sub-headings shown below. Please enter your responses under the appropriate headings and sub-headings. Please delete those that you feel are unnecessary, and enter

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additional headings and sub-headings that you feel are needed. A number of blank rows have been inserted following each heading and sub-headings. Please feel free to insert additional rows if needed.

Please attach your completed Excel file to an email message and return to me via email by March 9, 2000. My email address is: prestamo@worldnet.att.net

Again, allow me this opportunity to thank you for your participation in this study and assistance in providing your input on a timely basis.

===

Hardware Basics and Troubleshooting
> *check cables and connections*
> *know when to reboot*
> *reset drives*
> *diagnose printer problems*
> *clear paper jams in printers*
> *replace printer cartridges*

Operating System Basics
> **DOS**
> > *install and configure applications*
> > *copy files*
> > *move files from a hard drive to a network drive*
> > *format disks and drives*
>
> **UNIX/Linux**
> > *install and configure applications*
> > *copy files*
> > *move files from a hard drive to a network drive*
> > *format disks and drives*
>
> **MacOS**
> > *install and configure applications*
> > *copy files*
> > *move files from a hard drive to a network drive*
> > *format disks and drives*
>
> **Windows**
> > *install and configure applications*
> > *copy files*
> > *move files from a hard drive to a network drive*
> > *format disks and drives*

Navigating Windows
    create a shortcut to an application
    use Windows Explorer to find files
    copy data from one application to another
    copy data within a document
    move data from one application to another
    move data within a document
    insert images in documents

Local Area Network Basics
    Login/logout
    Mapping drives
    Network printing
    File management

Productivity Software
    Word processing skills
    Spreadsheet skills
    Presentation software skills
    Desktop publishing skills
    Graphics
        understand different file formats
        identify proper applications to view graphic files
        manipulate/edit graphic files
        convert graphics from one format to another

Webpage Languages and Tools
    HTML
    XML
    SGML
    Java
    Web authoring tools

Email and Internet Tools
    Email
        open incoming messages
        send messages
        attach files and data to messages being sent
        view attachments
        save attachments
        spell-check messages
    FTP
        download applications
        upload files to a Web server

Web addressing conventions
IP authentication
Utility & uses of proxy servers

Search Concepts and Techniques
Relational database construction
Indexing
Relevancy ranking

Technology and Computer Skills	Comments/Clarification
Hardware Basics and Troubleshooting	
Operating System Basics	
DOS	
UNIX/Linux	
MacOS	
Windows	

Technology and Computer Skills	Comments/Clarification
Navigating Windows	
Local Area Network Basics	
Login/logout	
Mapping drives	
Network printing	
File management	

Technology and Computer Skills	Comments/Clarification
Productivity Software	
Word processing skills	
Spreadsheet skills	
Presentation software skills	
Desktop publishing skills	
Graphics	

Technology and Computer Skills	Comments/Clarification
Webpage Languages and Tools	
HTML	
XML	
SGML	
Java	

Technology and Computer Skills	Comments/Clarification
Web authoring tools	
Email and Internet Tools	
Email	
FTP	
Web addressing conventions	
IP authentication	

Technology and Computer Skills	Comments/Clarification
Utility & uses of proxy servers	
Search Concepts and Techniques	
Relational database construction	
Indexing	
Relevancy ranking	

APPENDIX E

QUESTIONNAIRE #2

A Comprehensive Inventory of Technology and Computer Skills
for
Academic Reference Librarians

Questionnaire #2

The attached Excel file contains the responses generated by participants in the first round of the study, in answer to the following question:

What are the technology and computer skills required of reference librarians in academic libraries?

Because the researcher has attempted to eliminate duplicates, blend similar responses, and place each response in the category where it appeared most often, some responses were edited. Therefore, please do not be surprised if some responses do not appear exactly as submitted.

For Questionnaire II, please consider all of the duties for which academic reference librarians may be responsible. These duties might include bibliographic instruction, services to remote users (including technical support), and Webmaster or Web Editor activities. Keep in mind that all of the skills listed may not be required of all academic reference librarians.

It is estimated that it will take approximately 30 - 60 minutes to complete Questionnaire II. For each listed skill, please insert a number in Column B, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. The intent is not to rank the items by relative importance, but rather to indicate whether the item is important in order for an academic reference librarian to fulfill his/her job responsibilities. Please use the following scale:

1 = Not Needed at All
2 = Not Very Important
3 = Important
4 = Very Important
5 = Critically Important

For items where you feel that you have insufficient knowledge to answer, please enter

X = Insufficient Knowledge or No Opinion

In Questionnaire II, please note that items in parentheses are provided as examples, and are not intended to be all-inclusive lists.

Please attach your completed Excel file to an email message and return to me via email by March 31, 2000. My email address is: prestamo@worldnet.att.net

Once all responses to Questionnaire II have been received and compiled, standard statistical analysis will be used to determine the level of consensus among the responses to each item. It is possible that a third questionnaire will be distributed containing only those items that lacked consensus at the conclusion of Questionnaire II. Again, allow me this opportunity to thank you for your participation and assistance in providing your input on a timely basis.

A Comprehensive Inventory of Technology and Computer Skills for Academic Reference Librarians

Questionnaire II

> For each listed skill, please insert a number in Column B, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale:
>
> 　5 = Critically Important
> 　4 = Very Important
> 　3 = Important
> 　2 = Not Very Important
> 　1 = Not Needed at All
> 　X = Insufficient Knowledge or No Opinion

Hardware Basics and Troubleshooting

1	turn on the computer
2	turn off the computer
3	use a mouse
4	check cables & connections
5	understand need for regular rebooting
6	know when and how to warm reboot
7	know when and how to cold reboot
8	connect and troubleshoot peripherals (zip drives, speakers, microphones, scanners)
9	connect and troubleshoot keyboards
10	connect scsi devices to cpu
11	connect and troubleshoot LCD or other projectors (including light bulb replacement)
12	reset drives
13	diagnose CPU problems
14	understand the basics of printers in use
15	replace/attach a new printer (dot matrix, laser, inkjet)
16	run printer test programs
17	run printer self-clean programs
18	diagnose printer problems
19	clear paper jams and replace paper in printers
20	replace printer cartridges
21	replace/attach a new monitor
22	check & adjust monitor settings
23	replace/attach a new mouse or trackball
24	use a scanner
25	diagnose CD-ROM changer problems
26	know when to call library IT staff
27	know differences & similarities in capabilities & compatibilities (CD-ROM vs. DVD-ROM)
28	reboot from system start-up disk
29	be aware of assistive technology available at that institution

Operating Systems Basics

30	install programs and software applications from disk, CD-ROM, or internet based sources
31	update software applications through Internet downloads
32	install filters, drivers for programs or hardware
33	format disks
34	format drives
35	understand and interpret error messages
36	determine available disk space
37	identify the computer's IP address is
38	use control panels to configure operating system
39	change "modes" on dual platform machines
40	know how to change directories
41	password protect desktop
42	change settings for display, sound, and peripherals (mouse, keyboard, mouse, modem, printer)

DOS

43	understand the concept of DOS
44	use dos prompt to bypass windows
45	write a batch file for routine tasks
46	use scandisk
47	use defrag
48	know how to use wildcard symbols *.*
49	use memmaker for memory management
50	use attributes for setup and display
51	use edit for text file editing
52	modify autoexec.bat
53	modify config.sys

Windows

54	identify desktop icons and their purpose
55	create simple batch files
56	create a shortcut to an application
57	use Windows Explorer, My Computer, Start/Find, or other file management software to find, move, or delete files
58	set up folders with application groups
59	know keystroke equivalents for common tasks (Ctrl-C to copy, Ctrl-V to paste)
60	know how to resize windows
61	use control panels to configure operating system
62	use all basic and intermediate Windows functions that menu bars and Start - Programs menus offer in Windows 3.1, Windows 95, and Windows 98 environments
63	modify windows environments for personal use (add menu bar buttons)
64	change windows preferences (view, display files, customizing screens, desktop, directory/ folder structures on hard drive)
65	run maintenance tasks such as disk cleanup, defrag, scandisk
66	modify and customize maintenance tasks such as disk cleanup, defrag, scandisk
67	customize desktop
68	remove commercial advertisements, such as vendor logos, from systems
69	use Windows multitasking to manipulate and transfer data between files and applications
70	customize start program menus

Unix/Linux

71	understand basic of UNIX
72	redirect output of commands
73	pipe output to commands
74	understand and modify permissions, security and access to files and directories
75	know how to change your path environment variable
76	know how to change directories
77	create simple batch files

MacOS

78	create simple batch files
79	turn operating system extensions on / off
80	know how to change directories
81	assist remote users of this platform over the phone

LAN Basics

82	understand basic architecture of servers and LANs
83	login/logout and instruct others to do so
84	know how to create and change passwords
85	instruct others to use local area network
86	update CD-ROM network when new disks arrive
87	load CD-ROMs in a tower
88	create a virtual drive
89	bypass network login
90	log on as a different user
91	map network drives
92	utilize network for pc maintenance of library workstations (file update, deletion)
93	understand security options beyond simple login
94	access networked software for desktop use
95	open file servers on a network

Network printing

96	select and send jobs to local or networked printer
97	show others how to select and send jobs to printers
98	install network printer on a computer
99	check the status of a print job
100	use print controller to manage print jobs
101	set up network printers for multi-user printing
102	clear print queue and/or delete individual print jobs

File Management (skills applicable to local operating system)

103	create folders/directories
104	move folders/directories
105	rename folders/directories and files
106	copy folders/directories and files
107	delete folders/directories and files
108	use "save as" to select drive and directory locations

File Management (skills applicable to local operating system - continued)

109	understand differences between "save" and "save as"
110	move files from one directory/drive to another
111	locate, display and change Properties (Permissions) for a file/folder
112	understand basic differences between network and local file management
113	select names that indicate content
114	arrange file hierarchy to organize and store files
115	conserve disk space by archiving seldom used files
116	describe differences between file types based on extensions
117	locate folders/files on the network
118	backup files to remote system or other PCs
119	write protect files
120	zip and unzip files

Productivity Software

121	understand functions of toolbar icons and/or menu options
122	select text
123	copy text within a file
124	paste text within a file
125	move text within a file
126	delete/cut text
127	copy text from one file to another
128	paste text from one file to another
129	insert images in document
130	right-click to pull up short-cut menus
131	customize toolbars
132	save/ convert files to other formats
133	toggle between two or more windows
134	change page setup options
135	use track changes options
136	modify "auto" features of applications
137	insert and edit headers and footers
138	control page breaks
139	use OCR software
140	use ZoomText and other text enlargement software
141	import and install font(s)

Text Editor Skills

142	use a simple text editor (Notepad, WordPad, vi, pico) to create files
143	use a simple text editor (Notepad, WordPad, vi, pico) to edit files

Word Processing Skills

144	create a file
145	edit a file
146	save a file in proprietary wordprocessor format
147	save a proprietary format wordprocessor file as a text file
148	instruct others in word processing programs
149	create and format standard documents (memos, letters)

Word Processing Skills (continued)

150	create and use templates
151	use find or find & replace
152	import a graphic into a word processing document
153	import a spreadsheet into a word processing document
154	use indentation formatting features
155	create bulleted and numbered lists (using automated features of program)
156	use mail merge
157	work with tables
158	use column formatting
159	import, export, manipulate files
160	make labels
161	use spell checker
162	use word count functions
163	set up macros
164	customize keyboard
165	understand how to create a "back of the book" index

Spreadsheet skills

166	basic understanding of spreadsheets to use for internal record keeping
167	enter data
168	add/delete columns & rows
169	format cells/columns/rows (alignment, color, font, numeric display, size)
170	create formulas, and know common formulas and their uses
171	select print areas
172	create a graph from a spreadsheet
173	import a tab-delimited text file
174	export a tab-delimited text file
175	know the difference between a spreadsheet and a database, and choose appropriate application for the task
176	freeze and unfreeze panes
177	hide and unhide data
178	create, rename, move, copy, and edit worksheets in and between workbooks
179	sort data
180	filter data

Relational database skills

181	understand the differences between flat and relational databases
182	understand principles of relational database design
183	use relational databases
184	design a relational database
185	understand concept of fields
186	identify primary key field
187	identify required fields
188	format fields
189	add, delete and edit data
190	sort data
191	filter data
192	create and format reports

Presentation software skills

193	utilize presentation software for teaching/instruction or professional presentations
194	instruct others in basic use of presentation software
195	capture Webpages and images and incorporate in presentations
196	resize images and text boxes
197	apply slide backgrounds and layouts
198	run a presentation/slide show (go back, go forward, use slide sorter)
199	incorporate multi-media into presentations
200	apply transition effects between slides
201	select colors and fonts appropriate for display and projection
202	edit graphics (resize, crop)
203	apply animation effects within slides
204	create hyperlinks (internal slides/external resources)
205	use presentation software for off-line demonstrations
206	convert presentation to HTML

Desktop publishing skills

207	produce brochures, handouts, newsletters, posters
208	incorporate and edit images
209	understand design concepts and elements
210	know how to do basic page layout
211	apply appropriate fonts and styles
212	import files, graphics, or objects from other applications
213	create library signage

Graphics Software Skills

214	locate and import clipart and images
215	know special features and strengths of various graphics software packages
216	understand delivery implications of various file formats
217	select appropriate file format for intended use (Web, print, archival storage)
218	know appropriate storage format for size and compression
219	convert/save graphics from one format to another
220	select appropriate viewer based on file format
221	create and edit graphics files
222	explain to others how to view and save various types of files (PDF, gif, tiff)
223	create/edit a simple drawing, using auto shapes
224	create/edit lines
225	create/edit a simple free form painting
226	create, modify and edit simple graphics such as buttons, banners and letterhead
227	edit graphic files: crop, resize, change color scheme
228	understand copyright restrictions as they apply to images and their use
229	use a scanner to capture images
230	acquire / create image files through digital cameras
231	capture screen images
232	save/download images from Webpages
233	use Gif animators

Calendaring System

234	set up privileges
235	schedule meetings/appointments
236	delete meetings/appointments
237	schedule resources (rooms, equipment)
238	view calendar of self and others

Internet

239	understand the differences between telnet, FTP, and the HTTP protocols
240	telnet to remote hosts
241	telnet to local host
242	open an http connection to remote host
243	FTP to and from remote host
244	instruct others to use FTP
245	upload and download files to server
246	know the difference between ascii and binary uploads, and know when and how to use either
247	create, rename, and delete files and directories with FTP
248	understand metadata standards
249	understand public keys
250	understand certificates
251	understand cookies
252	understand the construction of a URL
253	explain URL construction to others
254	understand the use and importance of a PURL
255	understand privacy and intellectual freedom implications of IP authentication/authorization
256	basic functional knowledge of IP authentication and how addressing applies to service
257	set up IP addresses in network PC
258	use IP addresses as locators
259	understand fire walls and limitations they impose
260	understand different uses of Proxy Servers (I.e. enabling vs. restricting access)
261	configure browser to use a proxy server and authenticate to a remote service
262	explain proxy server configuration to others
263	understand Web-based chat and conferencing tools
264	understand video-based conferencing tools
265	use a common chat or conferencing tool

Browser Skills

266	navigate to different sites or pages
267	identify main parts of the browser window (title bar, menu bar, body, status bar)
268	interpret status and error messages
269	move among previously visited URLS
270	change font type
271	adjust font size
272	re-size windows
273	use toolbar and menu commands
274	add/delete toolbars
275	manage bookmarks and bookmark folders (create, delete, sort, change)
276	utilize Preferences to optimize browser performance
277	print or transfer (copy/save) information to a different format
278	understand difference between saving as .htm and .txt
279	empty cache for privacy and efficiency of operation

Email

280	identify elements within the inbox (messages, headers, rec'd date)
281	retrieve/receive mail
282	send mail
283	format message content
284	spellcheck messages
285	create an Autosignature
286	create address, contact, and distribution lists
287	forward a message
288	reply to a message
289	save a message
290	cut, copy, and paste between email and other applications
291	send attachments
292	view attachments
293	save attachments
294	organize and manage folders
295	archive and save messages out of your email program
296	understand that your email box is not a to-do list or filing system
297	set up filters for incoming messages
298	understand email discussion groups (e.g. listservs)
299	use email discussion group commands (subscribe, unsubscribe, suspend)
300	post messages to email discussion groups
301	"open" hyperlinks within a message
302	create a hyperlink in a message
303	understand various email clients and how to configure them to retrieve email from servers
304	locate, identify and change options/preferences
305	use free Web based email
306	know and utilize advanced features of your email system

Webpage Design

307	knowledge of which languages are supported by the home institution
308	instruct others in use of HTML, Web authoring tools, and basic Webpage design
309	understand differences in HTML versions
310	create Webpages using a text editor
311	utilize Web authoring software compatible with institution's Web server and browser platforms
312	select tools that do not add superfluous tags, or use these tools and edit out bad code
313	use basic functions of a common authoring tool
314	create new pages based on templates
315	create simple original Webpages
316	import/paste existing content into an HTML file
317	create page(s) strictly based on HTML 2.0
318	create page(s) strictly based on HTML 3.2 or later
319	distinguish between print design & Web design
320	construct a Web site pre-planning guide
321	understand differences in browsers and how they effect display
322	identify text attributes that detract from design and hinder viewing/printing
323	select and modify graphics to conserve bandwidth
324	design effective navigation within a site using navigation bars, buttons, icons
325	design an effective color scheme
326	create links (hyperlinks to other Webpages and target links within the same Webpage)
327	create links to non-HTML files

Webpage Design (continued)

328	preview pages in Web browser(s)
329	create and edit an imagemap
330	import and export sites
331	create and edit tables
332	add frames to a Webpage
333	organize elements for publishing, and publish sites/individual pages
334	embed audio in a Webpage
335	embed video in a Webpage
336	insert metadata into header
337	create HTML forms
338	stay current on developments relating to ADA compliance
339	understand XML encoding principles and their importance
340	understand SGML encoding principles and their importance
341	apply SGML encoding to documents
342	apply XML encoding to documents
343	understand DTD
344	encode appropriate DTDs
345	have professional development opportunities to learn SGML and/or XML as needed
346	understand Java
347	modify existing Java scripts
348	write original Java code
349	have professional development opportunities to learn Java as needed

Search Concepts & Techniques

350	construct searches using advanced features in Library's OPAC, subscription databases, and major Web search engines
351	instruct others in a range of search techniques and options
352	distinguish between Search Engine, Subject Directory, Meta-Search Engine and select resource best suited to the search
353	describe relative strengths and weaknesses of major search engines
354	understand Z39.50 protocol principles
355	distinguish between an index and databases, and why someone would use
356	construct Boolean search statements and know how the syntax varies from one search interface to another
357	construct bound-phrase search strings and know how the syntax varies from one search interface to another
358	construct search strings using proximity operators and know how the syntax varies from one search interface to another
359	use truncation and know how the syntax varies from one search interface to another
360	qualify with limiters and know how the syntax varies from one search interface to another
361	construct search strings with nested Boolean search phrases and know how the syntax varies from one search interface to another
362	limit searches to a particular field
363	view search history
364	combine sets
365	efficiently navigate database help screens to answer questions and assist users
366	use controlled vocabulary, thesauri, and classification schemes
367	describe client/server interaction and interpret common error messages to determine the source of problems
368	identify available formats (citation, abstract, full text) for most commonly used resources

Search Concepts & Techniques - Continued

369	browse by journal titles, subjects or other main index fields
370	construct "natural language" search statements when applicable
371	print/save/email search results
372	download/import records into a personal bibliographic software package (like EndNote)

Indexing

373	understand the construction of index systems and instruct others in their use
374	understand role of controlled vocabulary
375	understand metadata
376	understand local OPAC indexing to do "power searching"

Relevancy ranking

377	understand ranking systems in general terms, including advantages and disadvantages
378	understand how rankings within a system are calculated
379	explain various systems' ranking criteria and their implications to users
380	explain language ambiguity and it implications in relevancy ranking

APPENDIX F

ANALYSIS OF DATA
QUESTIONNAIRE #2

A Comprehensive Inventory of Technology and Computer Skills for Academic Reference Librarians

Questionnaire II

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Hardware Basics and Troubleshooting

		1	2	3	4	5	(N)	Sum	Mean	Neg	Pos	Neg %	Pos %	Chi
3	use a mouse	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
26	know when to call library IT staff	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
1	turn on the computer	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
2	turn off the computer	0	0	2	2	9	13	59	4.54	0	13	0%	100%	13.00
4	check cables & connections	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
6	know when and how to warm reboot	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
29	be aware of assistive technology available at that institution	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
7	know when and how to cold reboot	0	1	1	4	7	13	56	4.31	1	12	8%	92%	9.31
5	understand need for regular rebooting	1	0	1	5	6	13	54	4.15	1	12	8%	92%	9.31
14	understand the basics of printers in use	0	0	3	5	4	12	49	4.08	0	12	0%	100%	12.00
20	replace printer cartridges	0	1	3	3	6	13	53	4.08	1	12	8%	92%	9.31
19	clear paper jams and replace paper in printers	0	1	5	2	5	13	50	3.85	1	12	8%	92%	9.31
9	connect and troubleshoot keyboards	0	2	3	5	2	12	43	3.58	2	10	17%	83%	5.33
15	replace/attach a new printer (dot matrix, laser, inkjet)	0	3	3	4	3	13	46	3.54	3	10	23%	77%	3.77
24	use a scanner	0	0	7	6	0	13	45	3.46	0	13	0%	100%	13.00
27	know differences & similarities in capabilities & compatibilities (CD-ROM vs. DVD-ROM)	0	1	7	3	2	13	45	3.46	1	12	8%	92%	9.31

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								
	Hardware Basics and Troubleshooting - Continued													
21	replace/attach a new monitor	0	2	6	3	2	13	44	3.38	2	11	15%	85%	6.23
11	connect and troubleshoot LCD or other projectors (including light bulb replacement)	0	0	9	4	0	13	43	3.31	0	13	0%	100%	13.00
22	check & adjust monitor settings	0	1	8	4	0	13	42	3.23	1	12	8%	92%	9.31
23	replace/attach a new mouse or trackball	0	2	7	3	1	13	42	3.23	2	11	15%	85%	6.23
8	connect and troubleshoot peripherals (zip drives, speakers, microphones, scanners)	0	3	6	3	1	13	41	3.15	3	10	23%	77%	3.77
16	run printer test programs	0	3	7	2	1	13	40	3.08	3	10	23%	77%	3.77
18	diagnose printer problems	0	5	4	4	0	13	38	2.92	5	8	38%	62%	0.69
12	reset drives	1	2	6	2	0	11	31	2.82	3	8	27%	73%	2.27
28	reboot from system start-up disk	1	4	5	3	0	13	36	2.77	5	8	38%	62%	0.69
17	run printer self-clean programs	0	6	4	3	0	13	36	2.77	6	7	46%	54%	0.08
10	connect scsi devices to cpu	1	4	6	2	0	13	35	2.69	5	8	38%	62%	0.69
25	diagnose CD-ROM changer problems	0	6	5	2	0	13	35	2.69	6	7	46%	54%	0.08
13	diagnose CPU problems	1	7	5	0	0	13	30	2.31	8	5	62%	38%	0.69

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Operating Systems Basics

		1	2	3	4	5								
33	format disks	0	1	5	1	6	13	51	3.92	1	12	8%	92%	9.31
40	know how to change directories	0	1	4	3	5	13	51	3.92	1	12	8%	92%	9.31
35	understand and interpret error messages	0	1	4	5	3	13	49	3.77	1	12	8%	92%	9.31
42	change settings for display, sound, and peripherals (mouse, keyboard, mouse, modem, printer)	0	1	5	4	3	13	48	3.69	1	12	8%	92%	9.31
30	install programs and software applications from disk, CD-ROM, or internet based sources	0	3	2	4	4	13	48	3.69	3	10	23%	77%	3.77
31	update software applications through Internet downloads	0	2	4	4	3	13	47	3.62	2	11	15%	85%	6.23
37	identify the computer's IP address is	0	2	4	5	2	13	46	3.54	2	11	15%	85%	6.23
36	determine available disk space	1	2	4	3	3	13	44	3.38	3	10	23%	77%	3.77
38	use control panels to configure operating system	0	4	4	1	4	13	44	3.38	4	9	31%	69%	1.92
41	password protect desktop	1	2	4	3	2	12	39	3.25	3	9	25%	75%	3.00
34	format drives	2	2	4	3	2	13	40	3.08	4	9	31%	69%	1.92
32	install filters, drivers for programs or hardware	2	3	3	3	2	13	39	3.00	5	8	38%	62%	0.69
39	change "modes" on dual platform machines	1	3	4	3	0	11	31	2.82	4	7	36%	64%	0.82

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								
	DOS													
48	know how to use wildcard symbols *.*	1	0	7	2	1	11	35	3.18	1	10	9%	91%	7.36
46	use scandisk	1	2	4	4	1	12	38	3.17	3	9	25%	75%	3.00
47	use defrag	1	2	6	2	1	12	36	3.00	3	9	25%	75%	3.00
43	understand the concept of DOS	2	3	4	2	2	13	38	2.92	5	8	38%	62%	0.69
49	use memmaker for memory management	1	2	6	0	1	10	28	2.80	3	7	30%	70%	1.60
51	use edit for text file editing	3	2	5	1	1	12	31	2.58	5	7	42%	58%	0.33
44	use dos prompt to bypass windows	2	5	4	1	1	13	33	2.54	7	6	54%	46%	0.08
50	use attributes for setup and display	2	2	5	1	0	10	25	2.50	4	6	40%	60%	0.40
52	modify autoexec.bat	2	3	3	2	0	10	25	2.50	5	5	50%	50%	0.00
53	modify config.sys	2	5	3	2	0	12	29	2.42	7	5	58%	42%	0.33
45	write a batch file for routine tasks	3	4	4	2	0	13	31	2.38	7	6	54%	46%	0.08

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								
	Windows													
57	use Windows Explorer, My Computer, Start/Find, or other file management software to find, move, or delete files	0	0	1	4	8	13	59	4.54	0	13	0%	100%	13.00
54	identify desktop icons and their purpose	0	0	3	3	7	13	56	4.31	0	13	0%	100%	13.00
60	know how to resize windows	0	1	1	6	5	13	54	4.15	1	12	8%	92%	9.31
58	set up folders with application groups	0	1	3	3	6	13	53	4.08	1	12	8%	92%	9.31
69	use Windows multitasking to manipulate and transfer data between files and applications	0	1	4	1	7	13	53	4.08	1	12	8%	92%	9.31
62	use all basic and intermediate Windows functions that menu bars and Start - Programs menus offer in Windows 3.1, Windows 95, and Windows 98 environments	0	2	3	2	5	12	46	3.83	2	10	17%	83%	5.33
59	know keystroke equivalents for common tasks (Ctrl-C to copy, Ctrl-V to paste)	0	1	6	3	3	13	47	3.62	1	12	8%	92%	9.31
64	change windows preferences (view, display files, customizing screens, desktop, directory/ folder structures on hard drive)	0	2	4	4	3	13	47	3.62	2	11	15%	85%	6.23
56	create a shortcut to an application	0	3	3	3	4	13	47	3.62	3	10	23%	77%	3.77
61	use control panels to configure operating system	0	3	3	2	4	12	43	3.58	3	9	25%	75%	3.00
63	modify windows environments for personal use (add menu bar buttons)	0	2	6	1	4	13	46	3.54	2	11	15%	85%	6.23
67	customize desktop	1	1	6	2	3	13	44	3.38	2	11	15%	85%	6.23
65	run maintenance tasks such as disk cleanup, defrag, scandisk	1	2	4	4	2	13	43	3.31	3	10	23%	77%	3.77
66	modify and customize maintenance tasks such as disk cleanup, defrag, scandisk	2	3	3	3	2	13	39	3.00	5	8	38%	62%	0.69
70	customize start program menus	2	1	8	0	2	13	38	2.92	3	10	23%	77%	3.77
55	create simple batch files	1	2	7	1	1	12	35	2.92	3	9	25%	75%	3.00
68	remove commercial advertisements, such as vendor logos, from systems	3	5	2	1	2	13	33	2.54	8	5	62%	38%	0.69

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Unix/Linux

		1	2	3	4	5	(N)	Sum	Mean	Neg	Pos	Neg %	Pos %	Chi Sq
71	understand basic of UNIX	2	1	7	0	1	11	30	2.73	3	8	27%	73%	2.27
74	understand and modify permissions, security and access to files and directories	2	3	4	0	2	11	30	2.73	5	6	45%	55%	0.09
76	know how to change directories	2	3	5	1	1	12	32	2.67	5	7	42%	58%	0.33
75	know how to change your path environment variable	2	4	4	0	1	11	27	2.45	6	5	55%	45%	0.09
72	redirect output of commands	3	3	4	0	1	11	26	2.36	6	5	55%	45%	0.09
77	create simple batch files	2	4	4	1	0	11	26	2.36	6	5	55%	45%	0.09
73	pipe output to commands	3	4	3	0	1	11	25	2.27	7	4	64%	36%	0.82

MacOS

		1	2	3	4	5	(N)	Sum	Mean	Neg	Pos	Neg %	Pos %	Chi Sq
80	know how to change directories	1	0	6	2	1	10	32	3.20	1	9	10%	90%	6.40
79	turn operating system extensions on / off	2	1	4	3	0	10	28	2.80	3	7	30%	70%	1.60
81	assist remote users of this platform over the phone	2	1	6	2	0	11	30	2.73	3	8	27%	73%	2.27
78	create simple batch files	2	2	5	0	0	9	21	2.33	4	5	44%	56%	0.11

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All 1	Not Very Important 2	Important 3	Very Important 4	Critically Important 5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
	LAN Basics													
83	login/logout and instruct others to do so	0	0	3	6	4	13	53	4.08	0	13	0%	100%	13.00
85	instruct others to use local area network	0	1	4	4	4	13	50	3.85	1	12	8%	92%	9.31
82	understand basic architecture of servers and LANs	0	1	3	5	3	12	46	3.83	1	11	8%	92%	8.33
94	access networked software for desktop use	0	2	3	4	4	13	49	3.77	2	11	15%	85%	6.23
84	know how to create and change passwords	0	1	7	3	2	13	45	3.46	1	12	8%	92%	9.31
90	log on as a different user	0	1	7	2	2	12	41	3.42	1	11	8%	92%	8.33
95	open file servers on a network	0	3	5	2	3	13	44	3.38	3	10	23%	77%	3.77
93	understand security options beyond simple login	0	1	8	1	1	11	35	3.18	1	10	9%	91%	7.36
87	load CD-ROMs in a tower	0	3	6	3	1	13	41	3.15	3	10	23%	77%	3.77
86	update CD-ROM network when new disks arrive	0	3	6	4	0	13	40	3.08	3	10	23%	77%	3.77
92	utilize network for pc maintenance of library workstations (file update, deletion)	1	5	4	2	1	13	36	2.77	6	7	46%	54%	0.08
89	bypass network login	1	5	4	1	1	12	32	2.67	6	6	50%	50%	0.00
88	create a virtual drive	1	3	8	0	0	12	31	2.58	4	8	33%	67%	1.33
91	map network drives	1	6	3	1	1	12	31	2.58	7	5	58%	42%	0.33

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Network Printing

Question		Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
96	select and send jobs to local or networked printer	0	0	1	4	8	13	59	4.54	0	13	0%	100%	13.00
97	show others how to select and send jobs to printers	0	0	1	5	7	13	58	4.46	0	13	0%	100%	13.00
99	check the status of a print job	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
102	clear print queue and/or delete individual print jobs	0	0	7	1	5	13	50	3.85	0	13	0%	100%	13.00
100	use print controller to manage print jobs	0	1	5	3	4	13	49	3.77	1	12	8%	92%	9.31
98	install network printer on a computer	1	5	4	3	0	13	35	2.69	6	7	46%	54%	0.08
101	set up network printers for multi-user printing	1	5	6	1	0	13	33	2.54	6	7	46%	54%	0.08

File Management (skills applicable to local operating system)

Question		Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
109	understand differences between "save" and "save as"	0	1	1	1	9	12	54	4.50	1	11	8%	92%	8.33
108	use "save as" to select drive and directory locations	0	1	1	3	8	13	57	4.38	1	12	8%	92%	9.31
110	move files from one directory/drive to another	0	1	1	3	8	13	57	4.38	1	12	8%	92%	9.31
112	understand basic differences between network and local file management	0	2	0	2	8	12	52	4.33	2	10	17%	83%	5.33
103	create folders/directories	0	1	2	4	6	13	54	4.15	1	12	8%	92%	9.31
104	move folders/directories	0	1	2	4	6	13	54	4.15	1	12	8%	92%	9.31
105	rename folders/directories and files	0	1	2	4	6	13	54	4.15	1	12	8%	92%	9.31
106	copy folders/directories and files	0	1	2	4	6	13	54	4.15	1	12	8%	92%	9.31
107	delete folders/directories and files	0	1	2	4	6	13	54	4.15	1	12	8%	92%	9.31

For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale:
5 = Critically Important 4 = Very Important 3 = Important
2 = Not Very Important 1 = Not Needed at All

File Management (skills applicable to local operating system) - Continued

Question	Not Needed at All (1)	Not Very Important (2)	Important (3)	Very Important (4)	Critically Important (5)	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
117 locate folders/files on the network	0	1	3	3	6	13	53	4.08	1	12	8%	92%	9.31
113 select names that indicate content	0	2	2	2	7	13	53	4.08	2	11	15%	85%	6.23
111 locate, display and change Properties (Permissions) for a file/folder	0	2	4	1	6	13	50	3.85	2	11	15%	85%	6.23
114 arrange file hierarchy to organize and store files	0	2	4	1	6	13	50	3.85	2	11	15%	85%	6.23
116 describe differences between file types based on extensions	0	2	3	4	4	13	49	3.77	2	11	15%	85%	6.23
120 zip and unzip files	0	2	5	3	3	13	46	3.54	2	11	15%	85%	6.23
118 backup files to remote system or other PCs	0	3	5	1	4	13	45	3.46	3	10	23%	77%	3.77
115 conserve disk space by archiving seldom used files	0	3	7	2	1	13	40	3.08	3	10	23%	77%	3.77
119 write protect files	1	3	5	2	2	13	40	3.08	4	9	31%	69%	1.92

Productivity Software

Question	Not Needed at All (1)	Not Very Important (2)	Important (3)	Very Important (4)	Critically Important (5)	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
123 copy text within a file	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
124 paste text within a file	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
125 move text within a file	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
126 delete/cut text	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
127 copy text from one file to another	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
128 paste text from one file to another	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
129 insert images in document	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Productivity Software - Continued

Question		1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
133	toggle between two or more windows	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
134	change page setup options	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
122	select text	0	0	3	2	8	13	57	4.38	0	13	0%	100%	13.00
130	right-click to pull up short-cut menus	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
121	understand functions of toolbar icons and/or menu options	0	0	4	2	6	12	50	4.17	0	12	0%	100%	12.00
132	save/ convert files to other formats	0	0	3	6	4	13	53	4.08	0	13	0%	100%	13.00
138	control page breaks	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
137	insert and edit headers and footers	0	0	5	4	4	13	51	3.92	0	13	0%	100%	13.00
131	customize toolbars	0	3	4	3	3	13	45	3.46	3	10	23%	77%	3.77
140	use ZoomText and other text enlargement software	0	1	8	2	2	13	44	3.38	1	12	8%	92%	9.31
135	use track changes options	1	0	6	2	2	11	37	3.36	1	10	9%	91%	7.36
136	modify "auto" features of applications	2	1	4	3	3	13	43	3.31	3	10	23%	77%	3.77
141	import and install font(s)	1	3	5	3	1	13	39	3.00	4	9	31%	69%	1.92
139	use OCR software	1	1	8	2	0	12	35	2.92	2	10	17%	83%	5.33

Text Editor Skills

Question		1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
142	use a simple text editor (Notepad, WordPad, vi, pico) to create files	1	2	5	1	4	13	44	3.38	3	10	23%	77%	3.77
143	use a simple text editor (Notepad, WordPad, vi, pico) to edit files	1	2	5	1	4	13	44	3.38	3	10	23%	77%	3.77

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								
Word Processing Skills														
144	create a file	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
145	edit a file	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
147	save a proprietary format wordprocessor file as a text file	0	0	1	5	7	13	58	4.46	0	13	0%	100%	13.00
146	save a file in proprietary wordprocessor format	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
149	create and format standard documents (memos, letters)	0	0	4	2	7	13	55	4.23	0	13	0%	100%	13.00
151	use find or find & replace	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
152	import a graphic into a word processing document	0	0	4	3	6	13	54	4.15	0	13	0%	100%	13.00
161	use spell checker	0	0	3	5	5	13	54	4.15	0	13	0%	100%	13.00
159	import, export, manipulate files	0	0	3	6	4	13	53	4.08	0	13	0%	100%	13.00
155	create bulleted and numbered lists (using automated features of program)	0	0	4	5	4	13	52	4.00	0	13	0%	100%	13.00
150	create and use templates	0	1	4	3	5	13	51	3.92	1	12	8%	92%	9.31
154	use indentation formatting features	0	0	5	5	3	13	50	3.85	0	13	0%	100%	13.00
153	import a spreadsheet into a word processing document	0	0	6	4	3	13	49	3.77	0	13	0%	100%	13.00
148	instruct others in word processing programs	1	1	3	3	5	13	49	3.77	2	11	15%	85%	6.23
162	use word count functions	0	1	5	4	3	13	48	3.69	1	12	8%	92%	9.31
157	work with tables	0	0	8	3	2	13	46	3.54	0	13	0%	100%	13.00
158	use column formatting	0	0	8	4	1	13	45	3.46	0	13	0%	100%	13.00
156	use mail merge	0	3	5	3	2	13	43	3.31	3	10	23%	77%	3.77
163	set up macros	0	2	9	1	1	13	40	3.08	2	11	15%	85%	6.23
160	make labels	1	5	5	1	1	13	35	2.69	6	7	46%	54%	0.08
164	customize keyboard	2	3	7	1	0	13	33	2.54	5	8	38%	62%	0.69
165	understand how to create a "back of the book" index	1	4	7	0	0	12	30	2.50	5	7	42%	58%	0.33

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Spreadsheet Skills

Question		Not Needed at All (1)	Not Very Important (2)	Important (3)	Very Important (4)	Critically Important (5)	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
175	know the difference between a spreadsheet and a database, and choose appropriate application for the task	0	1	4	2	5	12	47	3.92	1	11	8%	92%	8.33
168	add/delete columns & rows	0	1	6	2	4	13	48	3.69	1	12	8%	92%	9.31
167	enter data	0	2	4	3	4	13	48	3.69	2	11	15%	85%	6.23
166	basic understanding of spreadsheets to use for internal record keeping	0	1	5	3	3	12	44	3.67	1	11	8%	92%	8.33
169	format cells/columns/rows (alignment, color, font, numeric display, size)	0	2	5	3	3	13	46	3.54	2	11	15%	85%	6.23
171	select print areas	0	2	6	2	3	13	45	3.46	2	11	15%	85%	6.23
170	create formulas, and know common formulas and their uses	0	2	7	2	2	13	43	3.31	2	11	15%	85%	6.23
172	create a graph from a spreadsheet	0	3	6	3	1	13	41	3.15	3	10	23%	77%	3.77
173	import a tab-delimited text file	0	4	5	2	2	13	41	3.15	4	9	31%	69%	1.92
174	export a tab-delimited text file	0	4	5	2	2	13	41	3.15	4	9	31%	69%	1.92
178	create, rename, move, copy, and edit worksheets in and between workbooks	0	4	5	2	2	13	41	3.15	4	9	31%	69%	1.92
179	sort data	0	4	5	2	2	13	41	3.15	4	9	31%	69%	1.92
180	filter data	0	5	4	2	2	13	40	3.08	5	8	38%	62%	0.69
176	freeze and unfreeze panes	0	5	5	3	0	13	37	2.85	5	8	38%	62%	0.69
177	hide and unhide data	0	5	6	2	0	13	36	2.77	5	8	38%	62%	0.69

Question		For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
			1	2	3	4	5								

Relational Database Skills

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
181	understand the differences between flat and relational databases	0	0	4	3	3	10	39	3.90	0	10	0%	100%	10.00
182	understand principles of relational database design	0	0	5	2	3	10	38	3.80	0	10	0%	100%	10.00
185	understand concept of fields	0	1	4	1	4	10	38	3.80	1	9	10%	90%	6.40
183	use relational databases	0	1	5	2	3	11	40	3.64	1	10	9%	91%	7.36
189	add, delete and edit data	0	1	6	1	3	11	39	3.55	1	10	9%	91%	7.36
186	identify primary key field	0	2	4	2	3	11	39	3.55	2	9	18%	82%	4.45
187	identify required fields	0	2	4	2	3	11	39	3.55	2	9	18%	82%	4.45
188	format fields	0	2	5	2	2	11	37	3.36	2	9	18%	82%	4.45
192	create and format reports	0	2	5	2	2	11	37	3.36	2	9	18%	82%	4.45
190	sort data	0	2	6	1	2	11	36	3.27	2	9	18%	82%	4.45
191	filter data	0	3	5	1	2	11	35	3.18	3	8	27%	73%	2.27
184	design a relational database	1	2	6	1	1	11	32	2.91	3	8	27%	73%	2.27

Presentation Software Skills

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
193	utilize presentation software for teaching/instruction or professional presentations	0	0	3	3	7	13	56	4.31	0	13	0%	100%	13.00
195	capture Webpages and images and incorporate in presentations	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
198	run a presentation/slide show (go back, go forward, use slide sorter)	0	1	3	2	7	13	54	4.15	1	12	8%	92%	9.31
196	resize images and text boxes	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All 1	Not Very Important 2	Important 3	Very Important 4	Critically Important 5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos

Presentation Software Skills - Continued

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq
205	use presentation software for off-line demonstrations	0	1	4	3	5	13	51	3.92	1	12	8%	92%	9.31
197	apply slide backgrounds and layouts	0	0	6	4	3	13	49	3.77	0	13	0%	100%	13.00
194	instruct others in basic use of presentation software	1	0	5	2	5	13	49	3.77	1	12	8%	92%	9.31
201	select colors and fonts appropriate for display and projection	0	1	5	3	4	13	49	3.77	1	12	8%	92%	9.31
202	edit graphics (resize, crop)	0	1	5	4	3	13	48	3.69	1	12	8%	92%	9.31
204	create hyperlinks (internal slides/external resources)	0	1	5	4	3	13	48	3.69	1	12	8%	92%	9.31
199	incorporate multi-media into presentations	0	1	6	4	2	13	46	3.54	1	12	8%	92%	9.31
200	apply transition effects between slides	0	1	7	2	3	13	46	3.54	1	12	8%	92%	9.31
206	convert presentation to HTML	0	2	5	4	2	13	45	3.46	2	11	15%	85%	6.23
203	apply animation effects within slides	0	3	6	4	0	13	40	3.08	3	10	23%	77%	3.77

Desktop Publishing Skills

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq
207	produce brochures, handouts, newsletters, posters	0	0	6	4	2	12	44	3.67	0	12	0%	100%	12.00
208	incorporate and edit images	0	0	8	2	2	12	42	3.50	0	12	0%	100%	12.00
209	understand design concepts and elements	0	1	6	2	2	11	38	3.45	1	10	9%	91%	7.36
210	know how to do basic page layout	0	0	9	1	2	12	41	3.42	0	12	0%	100%	12.00
211	apply appropriate fonts and styles	0	0	9	1	2	12	41	3.42	0	12	0%	100%	12.00
212	import files, graphics, or objects from other applications	0	0	9	1	2	12	41	3.42	0	12	0%	100%	12.00
213	create library signage	0	2	7	1	2	12	39	3.25	2	10	17%	83%	5.33

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Graphics Software Skills

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
228	understand copyright restrictions as they apply to images and their use	0	1	3	3	5	12	48	4.00	1	11	8%	92%	8.33
232	save/download images from Webpages	0	0	5	5	3	13	50	3.85	0	13	0%	100%	13.00
217	select appropriate file format for intended use (Web, print, archival storage)	0	0	7	3	3	13	48	3.69	0	13	0%	100%	13.00
222	explain to others how to view and save various types of files (PDF, gif, tiff)	0	0	7	3	3	13	48	3.69	0	13	0%	100%	13.00
231	capture screen images	0	0	6	5	2	13	48	3.69	0	13	0%	100%	13.00
216	understand delivery implications of various file formats	0	1	6	1	4	12	44	3.67	1	11	8%	92%	8.33
220	select appropriate viewer based on file format	0	1	6	3	3	13	47	3.62	1	12	8%	92%	9.31
221	create and edit graphics files	0	1	7	2	3	13	46	3.54	1	12	8%	92%	9.31
229	use a scanner to capture images	0	0	9	2	2	13	45	3.46	0	13	0%	100%	13.00
219	convert/save graphics from one format to another	0	1	7	3	2	13	45	3.46	1	12	8%	92%	9.31
218	know appropriate storage format for size and compression	0	1	7	2	2	12	41	3.42	1	11	8%	92%	8.33
214	locate and import clipart and images	0	1	8	2	2	13	44	3.38	1	12	8%	92%	9.31
224	create/edit lines	1	0	7	3	2	13	44	3.38	1	12	8%	92%	9.31
227	edit graphic files: crop, resize, change color scheme	0	2	6	3	2	13	44	3.38	2	11	15%	85%	6.23
223	create/edit a simple drawing, using auto shapes	1	0	8	2	2	13	43	3.31	1	12	8%	92%	9.31
230	acquire / create image files through digital cameras	0	1	9	1	2	13	43	3.31	1	12	8%	92%	9.31
226	create, modify and edit simple graphics such as buttons, banners and letterhead	1	1	6	3	2	13	43	3.31	2	11	15%	85%	6.23
215	know special features and strengths of various graphics software packages	0	2	7	1	2	12	39	3.25	2	10	17%	83%	5.33
225	create/edit a simple free form painting	1	1	8	1	2	13	41	3.15	2	11	15%	85%	6.23
233	use Gif animators	2	2	6	2	0	12	32	2.67	4	8	33%	67%	1.33

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Calendaring System

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
237	schedule resources (rooms, equipment)	0	4	1	4	3	12	42	3.50	4	8	33%	67%	1.33
238	view calendar of self and others	0	4	2	2	4	12	42	3.50	4	8	33%	67%	1.33
235	schedule meetings/appointments	0	4	2	3	3	12	41	3.42	4	8	33%	67%	1.33
236	delete meetings/appointments	0	4	2	3	3	12	41	3.42	4	8	33%	67%	1.33
234	set up privileges	0	6	5	0	1	12	32	2.67	6	6	50%	50%	0.00

Internet

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
239	understand the differences between telnet, FTP, and the HTTP protocols	0	0	1	5	6	12	53	4.42	0	12	0%	100%	12.00
242	open an http connection to remote host	0	0	3	2	8	13	57	4.38	0	13	0%	100%	13.00
255	understand privacy and intellectual freedom implications of IP authentication/authorization	0	0	1	7	4	12	51	4.25	0	12	0%	100%	12.00
252	understand the construction of a URL	0	0	4	2	6	12	50	4.17	0	12	0%	100%	12.00
240	telnet to remote hosts	0	0	4	3	6	13	54	4.15	0	13	0%	100%	13.00
245	upload and download files to server	0	0	3	5	5	13	54	4.15	0	13	0%	100%	13.00
253	explain URL construction to others	0	0	5	1	7	13	54	4.15	0	13	0%	100%	13.00
241	telnet to local host	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
243	FTP to and from remote host	0	1	4	3	5	13	51	3.92	1	12	8%	92%	9.31
260	understand different uses of Proxy Servers (I.e. enabling vs. restricting access)	0	0	5	4	3	12	46	3.83	0	12	0%	100%	12.00
256	basic functional knowledge of IP authentication and how addressing applies to service	0	1	3	5	3	12	46	3.83	1	11	8%	92%	8.33

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								
	Internet - Continued													
264	understand video-based conferencing tools	0	0	5	5	2	12	45	3.75	0	12	0%	100%	12.00
259	understand fire walls and limitations they impose	0	0	7	2	3	12	44	3.67	0	12	0%	100%	12.00
254	understand the use and importance of a PURL	0	1	5	3	3	12	44	3.67	1	11	8%	92%	8.33
263	understand Web-based chat and conferencing tools	0	1	4	5	2	12	44	3.67	1	11	8%	92%	8.33
262	explain proxy server configuration to others	0	0	8	2	3	13	47	3.62	0	13	0%	100%	13.00
244	instruct others to use FTP	1	0	6	2	4	13	47	3.62	1	12	8%	92%	9.31
247	create, rename, and delete files and directories with FTP	0	1	6	3	3	13	47	3.62	1	12	8%	92%	9.31
261	configure browser to use a proxy server and authenticate to a remote service	0	1	5	5	2	13	47	3.62	1	12	8%	92%	9.31
265	use a common chat or conferencing tool	0	1	6	4	2	13	46	3.54	1	12	8%	92%	9.31
248	understand metadata standards	0	0	7	4	1	12	42	3.50	0	12	0%	100%	12.00
246	know the difference between ascii and binary uploads, and know when and how to use either	0	1	6	3	2	12	42	3.50	1	11	8%	92%	8.33
251	understand cookies	0	2	5	3	2	12	41	3.42	2	10	17%	83%	5.33
249	understand public keys	1	1	7	2	1	12	37	3.08	2	10	17%	83%	5.33
250	understand certificates	1	1	7	2	1	12	37	3.08	2	10	17%	83%	5.33
258	use IP addresses as locators	1	3	5	3	1	13	39	3.00	4	9	31%	69%	1.92
257	set up IP addresses in network PC	1	3	6	2	1	13	38	2.92	4	9	31%	69%	1.92

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								
Browser Skills														
266	navigate to different sites or pages	0	0	0	3	10	13	62	4.77	0	13	0%	100%	13.00
267	identify main parts of the browser window (title bar, menu bar, body, status bar)	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
269	move among previously visited URLS	0	0	1	3	9	13	60	4.62	0	13	0%	100%	13.00
275	manage bookmarks and bookmark folders (create, delete, sort, change)	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
268	interpret status and error messages	0	0	3	2	8	13	57	4.38	0	13	0%	100%	13.00
278	understand difference between saving as .htm and .txt	0	0	2	4	6	12	52	4.33	0	12	0%	100%	12.00
273	use toolbar and menu commands	0	0	2	5	6	13	56	4.31	0	13	0%	100%	13.00
277	print or transfer (copy/save) information to a different format	0	0	2	5	6	13	56	4.31	0	13	0%	100%	13.00
272	re-size windows	0	0	3	5	5	13	54	4.15	0	13	0%	100%	13.00
276	utilize Preferences to optimize browser performance	0	0	2	7	4	13	54	4.15	0	13	0%	100%	13.00
279	empty cache for privacy and efficiency of operation	0	1	3	5	4	13	51	3.92	1	12	8%	92%	9.31
271	adjust font size	0	0	8	4	1	13	45	3.46	0	13	0%	100%	13.00
274	add/delete toolbars	1	0	6	4	2	13	45	3.46	1	12	8%	92%	9.31
270	change font type	0	1	9	2	1	13	42	3.23	1	12	8%	92%	9.31

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								
	Email													
281	retrieve/receive mail	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
282	send mail	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
280	identify elements within the inbox (messages, headers, rec'd date)	0	0	1	3	9	13	60	4.62	0	13	0%	100%	13.00
287	forward a message	0	0	1	4	8	13	59	4.54	0	13	0%	100%	13.00
288	reply to a message	0	0	1	4	8	13	59	4.54	0	13	0%	100%	13.00
289	save a message	0	0	1	5	7	13	58	4.46	0	13	0%	100%	13.00
290	cut, copy, and paste between email and other applications	0	0	1	5	7	13	58	4.46	0	13	0%	100%	13.00
292	view attachments	0	0	2	3	8	13	58	4.46	0	13	0%	100%	13.00
291	send attachments	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
293	save attachments	0	0	2	4	7	13	57	4.38	0	13	0%	100%	13.00
294	organize and manage folders	0	0	1	6	6	13	57	4.38	0	13	0%	100%	13.00
283	format message content	0	0	2	5	6	13	56	4.31	0	13	0%	100%	13.00
298	understand email discussion groups (e.g. listservs)	0	0	2	5	5	12	51	4.25	0	12	0%	100%	12.00
284	spellcheck messages	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
301	"open" hyperlinks within a message	0	0	2	6	5	13	55	4.23	0	13	0%	100%	13.00
304	locate, identify and change options/preferences	0	0	2	6	5	13	55	4.23	0	13	0%	100%	13.00
286	create address, contact, and distribution lists	0	0	3	5	5	13	54	4.15	0	13	0%	100%	13.00
295	archive and save messages out of your email program	0	0	2	7	4	13	54	4.15	0	13	0%	100%	13.00

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Email - Continued

Question		1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
300	post messages to email discussion groups	0	0	2	7	4	13	54	4.15	0	13	0%	100%	13.00
299	use email discussion group commands (subscribe, unsubscribe, suspend)	0	0	2	8	3	13	53	4.08	0	13	0%	100%	13.00
302	create a hyperlink in a message	0	0	3	6	4	13	53	4.08	0	13	0%	100%	13.00
303	understand various email clients and how to configure them to retrieve email from servers	0	0	4	5	3	12	47	3.92	0	12	0%	100%	12.00
306	know and utilize advanced features of your email system	0	1	3	5	3	12	46	3.83	1	11	8%	92%	8.33
296	understand that your email box is not a to-do list or filing system	1	1	2	3	5	12	46	3.83	2	10	17%	83%	5.33
285	create an Autosignature	0	0	6	5	2	13	48	3.69	0	13	0%	100%	13.00
305	use free Web based email	0	1	6	4	2	13	46	3.54	1	12	8%	92%	9.31
297	set up filters for incoming messages	0	1	7	5	0	13	43	3.31	1	12	8%	92%	9.31

Webpage Design

Question		1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
307	knowledge of which languages are supported by the home institution	0	0	2	4	6	12	52	4.33	0	12	0%	100%	12.00
316	import/paste existing content into an HTML file	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
311	utilize Web authoring software compatible with institution's Web server and browser platforms	0	0	4	3	6	13	54	4.15	0	13	0%	100%	13.00
315	create simple original Webpages	0	0	2	7	4	13	54	4.15	0	13	0%	100%	13.00
326	create links (hyperlinks to other Webpages and target links within the same Webpage)	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
345	have professional development opportunities to learn SGML and/or XML as needed	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
313	use basic functions of a common authoring tool	0	0	4	5	4	13	52	4.00	0	13	0%	100%	13.00
310	create Webpages using a text editor	0	0	6	2	5	13	51	3.92	0	13	0%	100%	13.00

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								
	Webpage Design - Continued													
328	preview pages in Web browser(s)	0	0	6	2	5	13	51	3.92	0	13	0%	100%	13.00
319	distinguish between print design & Web design	0	0	3	7	2	12	47	3.92	0	12	0%	100%	12.00
321	understand differences in browsers and how they effect display	0	0	4	5	3	12	47	3.92	0	12	0%	100%	12.00
314	create new pages based on templates	0	0	6	4	3	13	49	3.77	0	13	0%	100%	13.00
324	design effective navigation within a site using navigation bars, buttons, icons	0	0	5	6	2	13	49	3.77	0	13	0%	100%	13.00
338	stay current on developments relating to ADA compliance	0	1	4	5	3	13	49	3.77	1	12	8%	92%	9.31
322	identify text attributes that detract from design and hinder viewing/printing	0	0	5	7	1	13	48	3.69	0	13	0%	100%	13.00
308	instruct others in use of HTML, Web authoring tools, and basic Webpage design	0	2	4	3	4	13	48	3.69	2	11	15%	85%	6.23
309	understand differences in HTML versions	0	0	5	6	1	12	44	3.67	0	12	0%	100%	12.00
336	insert metadata into header	1	1	1	7	2	12	44	3.67	2	10	17%	83%	5.33
323	select and modify graphics to conserve bandwidth	0	0	6	6	1	13	47	3.62	0	13	0%	100%	13.00
312	select tools that do not add superfluous tags, or use these tools and edit out bad code	0	1	5	5	2	13	47	3.62	1	12	8%	92%	9.31
349	have professional development opportunities to learn Java as needed	0	2	5	2	4	13	47	3.62	2	11	15%	85%	6.23
337	create HTML forms	1	0	3	7	1	12	43	3.58	1	11	8%	92%	8.33
333	organize elements for publishing, and publish sites/individual pages	0	3	2	5	2	12	42	3.50	3	9	25%	75%	3.00
327	create links to non-HTML files	0	2	5	4	2	13	45	3.46	2	11	15%	85%	6.23
339	understand XML encoding principles and their importance	0	1	6	4	1	12	41	3.42	1	11	8%	92%	8.33
340	understand SGML encoding principles and their importance	0	1	6	4	1	12	41	3.42	1	11	8%	92%	8.33

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								
	Webpage Design - Continued													
331	create and edit tables	1	0	7	3	2	13	44	3.38	1	12	8%	92%	9.31
325	design an effective color scheme	0	3	3	6	1	13	44	3.38	3	10	23%	77%	3.77
320	construct a Web site pre-planning guide	0	1	6	5	0	12	40	3.33	1	11	8%	92%	8.33
346	understand Java	0	1	8	1	2	12	40	3.33	1	11	8%	92%	8.33
330	import and export sites	1	2	4	3	2	12	39	3.25	3	9	25%	75%	3.00
343	understand DTD	0	1	7	3	0	11	35	3.18	1	10	9%	91%	7.36
332	add frames to a Webpage	1	1	6	3	1	12	38	3.17	2	10	17%	83%	5.33
344	encode appropriate DTDs	1	0	7	3	0	11	34	3.09	1	10	9%	91%	7.36
329	create and edit an imagemap	1	2	5	3	1	12	37	3.08	3	9	25%	75%	3.00
342	apply XML encoding to documents	1	2	5	5	0	13	40	3.08	3	10	23%	77%	3.77
335	embed video in a Webpage	1	2	5	4	0	12	36	3.00	3	9	25%	75%	3.00
341	apply SGML encoding to documents	1	3	4	5	0	13	39	3.00	4	9	31%	69%	1.92
318	create page(s) strictly based on HTML 3.2 or later	2	1	7	3	0	13	37	2.85	3	10	23%	77%	3.77
334	embed audio in a Webpage	1	3	5	3	0	12	34	2.83	4	8	33%	67%	1.33
347	modify existing Java scripts	2	3	5	2	1	13	36	2.77	5	8	38%	62%	0.69
317	create page(s) strictly based on HTML 2.0	3	4	3	3	0	13	32	2.46	7	6	54%	46%	0.08
348	write original Java code	2	5	4	2	0	13	32	2.46	7	6	54%	46%	0.08

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Search Concepts & Techniques

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
350	construct searches using advanced features in Library's OPAC, subscription databases, and major Web search engines	0	0	0	1	12	13	64	4.92	0	13	0%	100%	13.00
369	browse by journal titles, subjects or other main index fields	0	0	0	1	12	13	64	4.92	0	13	0%	100%	13.00
356	construct Boolean search statements and know how the syntax varies from one search interface to another	0	0	1	0	12	13	63	4.85	0	13	0%	100%	13.00
357	construct bound-phrase search strings and know how the syntax varies from one search interface to another	0	0	1	0	12	13	63	4.85	0	13	0%	100%	13.00
358	construct search strings using proximity operators and know how the syntax varies from one search interface to another	0	0	1	0	12	13	63	4.85	0	13	0%	100%	13.00
366	use controlled vocabulary, thesauri, and classification schemes	0	0	1	0	12	13	63	4.85	0	13	0%	100%	13.00
368	identify available formats (citation, abstract, full text) for most commonly used resources	0	0	1	0	12	13	63	4.85	0	13	0%	100%	13.00
351	instruct others in a range of search techniques and options	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
359	use truncation and know how the syntax varies from one search interface to another	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
360	qualify with limiters and know how the syntax varies from one search interface to another	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
365	efficiently navigate database help screens to answer questions and assist users	0	0	1	1	11	13	62	4.77	0	13	0%	100%	13.00
361	construct search strings with nested Boolean search phrases and know how the syntax varies from one search interface to another	0	1	0	0	12	13	62	4.77	1	12	8%	92%	9.31
352	distinguish between Search Engine, Subject Directory, Meta-Search Engine and select resource best suited to the search	0	0	2	0	11	13	61	4.69	0	13	0%	100%	13.00
362	limit searches to a particular field	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
363	view search history	0	0	1	2	10	13	61	4.69	0	13	0%	100%	13.00
355	distinguish between an index and databases, and why someone would use	0	0	1	3	9	13	60	4.62	0	13	0%	100%	13.00

Question	For each listed skill, please insert a number in the space provided, indicating the level of importance you believe it should have when considering its applicability to academic reference librarians and their duties. Please use the following scale: 5 = Critically Important 4 = Very Important 3 = Important 2 = Not Very Important 1 = Not Needed at All	Not Needed at All	Not Very Important	Important	Very Important	Critically Important	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
		1	2	3	4	5								

Search Concepts & Techniques - Conitnued

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
371	print/save/email search results	0	0	1	3	9	13	60	4.62	0	13	0%	100%	13.00
364	combine sets	0	1	0	2	10	13	60	4.62	1	12	8%	92%	9.31
353	describe relative strengths and weaknesses of major search engines	0	1	0	2	9	12	55	4.58	1	11	8%	92%	8.33
370	construct "natural language" search statements when applicable	0	0	2	2	9	13	59	4.54	0	13	0%	100%	13.00
367	describe client/server interaction and interpret common error messages to determine the source of problems	0	0	3	4	6	13	55	4.23	0	13	0%	100%	13.00
354	understand Z39.50 protocol principles	0	0	4	4	5	13	53	4.08	0	13	0%	100%	13.00
372	download/import records into a personal bibliographic software package (like EndNote)	0	1	5	3	3	12	44	3.67	1	11	8%	92%	8.33

Indexing

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
374	understand role of controlled vocabulary	0	0	1	2	9	12	56	4.67	0	12	0%	100%	12.00
376	understand local OPAC indexing to do "power searching"	0	0	1	2	9	12	56	4.67	0	12	0%	100%	12.00
373	understand the construction of index systems and instruct others in their use	0	0	0	5	7	12	55	4.58	0	12	0%	100%	12.00
375	understand metadata	0	0	1	5	6	12	53	4.42	0	12	0%	100%	12.00

Relevancy Ranking

Question	Skill	1	2	3	4	5	(N)	Sum	Mean	Negative	Positive	Negative %	Positive %	Chi Sq of Neg/Pos
377	understand ranking systems in general terms, including advantages and disadvantages	0	0	3	3	5	11	46	4.18	0	11	0%	100%	11.00
379	explain various systems' ranking criteria and their implications to users	0	0	4	4	4	12	48	4.00	0	12	0%	100%	12.00
380	explain language ambiguity and it implications in relevancy ranking	0	0	4	5	3	12	47	3.92	0	12	0%	100%	12.00
378	understand how rankings within a system are calculated	0	0	4	4	3	11	43	3.91	0	11	0%	100%	11.00

VITA

Anne M. Prestamo

Candidate for the Degree to

Doctor of Education

Thesis: A COMPREHENSIVE INVENTORY OF TECHNOLOGY AND COMPUTER
         SKILLS FOR ACADEMIC REFERENCE LIBRARIANS

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