CHAPTER-IV

Information Technology and its Impact on Libraries
The Internet has had a profound impact on society in general and on the field of library and information science in particular. Since 1990, scholars and librarians have striven to utilize various Internet technologies to improve library and information services. Since that time, the literature on the Internet and its impact on and role in libraries and research has exploded. A simple keyword search in Library Literature and Information Index, a primary electronic index of library and information science research literature, retrieves over 6,500 items related to the Internet. The dominance of the Internet not only provides great opportunities for libraries to provide better services, but also poses tremendous challenges to librarians and library and information science scholars. This volume includes discussions of current issues and trends, written by scholars and practitioners in the fields of library and information science, computer science, and computer engineering.

Information Technologies through Internet has had a vital impact on academic scenario. The avenues for exploitation of Internet by library and information centres (L&ICs) are unlimited and endless. Internet provides access to a variety of commercial and non-commercial information sources which include: bibliographic and full-text databases; table of contents; Paper presented in the 30th DRTC Workshop on Advances in Information Technology of primary journals; electronic and online journals, books and newsletters; almost all OPACs, graphics databases, multimedia, walk through programs, audio clip art databases; e-mail, directories,
product and library catalogues, campus information systems, etc. Internet is also a test bed for electronic document delivery, electronic publishing, publicity and marketing of products and services, and integrated access to local and external information.

Internet is also a resource of many varieties of information. For example, free software developed at various academic institutions and research organisations as well as by individuals and is made available through Internet, newspapers, electronic shopping merchandise, product information catalogues of various institutions and organisations, bulletin board discussion forums for exchange of professional views, news and research; shareware/clipware (made available for free trial before actual purchase, albeit with deletion of important routines), research articles and preprints. A lot of free of cost public domain software is available on various Internet sites which can be downloaded for personal and official use (but not for marketing purposes).

Technologies for accessing information sources on Internet are changing rapidly. Starting with provision of basic tools like e-mail, Telnet, and FTP, Internet has shifted emphasis to navigation aids like Wide Area Information Servers (WAIS), Archie, Mosaic, Usenet, Gopher, and the consumer-oriented home pages of the World Wide Web (WWW or simply the Web). Some of the avenues of Internet which the L&ICs can exploit are briefly dealt in the following paragraphs.
The Web is a subset of the Internet using a high level protocol (HTTP) and supports text, graphics, audio, video and multimedia. On the Internet today, WWW is the largest information resource of easily accessible information. The information sources around the world are getting interlinked through Web pages and Web servers spread around the globe. Several projects have also been initiated which focus on developing digital libraries to provide remote access over Internet to very large multimedia document collections, stored on distributed servers.

E-resources, the revolution of IT to academics in addition to the bibliographic resources has brought the literature to the researchers on their mouse clicks. An electronic journal is defined [McMillan, 1991] as any serial produced, published and distributed nationally or internationally via electronic networks such as Bitnet and the Internet. Electronic journal is different from online journal [Langschied, 1992]. The latter are the electronic counterparts of journals in print. The uses, impact and implications of electronic publishing and online journals on libraries and information centres has been discussed by Lakshmana Moorthy & Karisiddappa [1996].
Internet developments related to the publishing of scholarly journals and L&ICs include the increase in publishing of electronic and online journals and other primary sources of information like preprints and technical reports, and access to table of contents of journals and by full document delivery. Several journals are already available on the Net. Some journals like the Journal of Universal Computer Science, Electronics Letters Online, Online Journal of Knowledge Synthesis in Nursing, and Current Clinical Trials are available only on the Net. There is a well-established system for distributing and providing access to abstracts and full texts of preprints and technical reports in the areas of physics, mathematics and computer science in the academic community around the world. Services like ‘Uncover’ of Blackwell and ‘Contents First’ of OCLC offers Internet access to table of contents of several thousand journals, followed by online ordering of papers. Institutions have begun to take such services into account while planning their acquisitions, particularly journal subscriptions.

Major publishers like American Chemical Society and Elsevier are offering their journals on Internet and OCLC. Professional associations like the Association of Computing Machinery have nodes on Internet which offer mail forwarding accounts for their members at competitive rates.

Many libraries maintain an online catalogue of their publications over Internet/WWW which could be searched using navigational tools.
The users can select items of interest and click for further processing. Electronic Letters Online of the Institution of Electrical Engineers (UK) and all the eleven titles of IEE Proceedings are available over Internet along with many other scientific electronic journals through OCLC’s Electronic Journals Office (EJO) system. These are accessed through the graphical interface GUIDON of the OCLC and using the NetScape and Mosaic browsers these are also available over WWW.

Starting from 1996, the Institute of Physics Publishing of USA started issuing all its 31 journals in both printed and online (electronic) form. The online journals are available, along with the printed version, to the subscribing institutions on WWW at no extra cost. This has speeded up the dissemination/delivery of the primary journals by three weeks. Many publishers maintain the contents pages of their journals on Internet/WWW. For example, Elsevier Science Publishers maintain a table of contents (called ESTOC — Elsevier Science Table Of Contents) of about 900 journals published by them. The contents pages appear on the Web at the same time as the printed issue is released. Elsevier also provides this service free of charge on e-mail (on Internet only) two to three weeks in advance for browsing. Blackwell Scientific, Taylor and Francis and Aslib along with eight others are also planning contents of about 250 electronic journals the full text of which will be available online from January 1997. Such services can be effectively used for CAS/SDI services by the libraries which are subscribing the journals.

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McGraw-Hill is offering electronic version of its Business Week on America Online which has resulted in attracting new readers. It receives over half a million clicks on its pages every week and each ‘click’ generates revenue. This ‘feedback’ enabled editors to analyse and feel the pulse of the readers’ interest to revise content [The Economic Times, 1995].

Penthouse magazine of USA on Internet attracts about 2 million ‘hits’ daily, a record on Web. Readers are allowed to comment through an interactive message board appearing at the end of the feature. Now there are over 400 daily newspapers, 800 magazines, 1500 newsletters and other products are available, online via communication networks and the Internet. In 1995, the Association of Research Libraries brought out a Directory of electronic journals, magazines, newsletters and academic discussion lists and the updates are being announced in the NewJour on the Internet.

This is a useful tool for identifying the electronic publication one is interested. The number of journals available ‘online only’ are increasing day by day. For example, some of the journals offered by OCLC like Current Clinical Trials and The Online Journal of Knowledge Synthesis in Nursing have no print equivalent. These are published fast; the peer-
reviewed papers are edited and marked up in SGML and sent to OCLC which are made available online within 24 hours.

**Internet and OCLC Online Computer Library Centre (OCLC)** has been an important agency for providing access to online journals over Internet. Through its EJO service, OCLC offers peer-reviewed journals online over Internet. The electronic publication programme of OCLC started in July 1992 with the introduction of *The Online Journal of Current Clinical Trials* in association with the American Association for the Advancement in Science. This is the first scholarly peer-reviewed journal made available in the online environment [Dykhuis, 1994]. This was followed by *The Online Journal of Knowledge Synthesis in Nursing* and *Electronics Letters Online* (September 1993).

First Search Information System of OCLC is now available on Internet/WWW. Using Web browsers like Mosaic and Netscape Navigator through First Search, users have access to a world of information on topics including arts and humanities, business and economy, conferences and proceedings, education and training, engineering and technology, general and life sciences, medicine and health, general reference sources, social sciences, and news and current affairs. The member libraries of OCLC are rapidly increasing their use of Internet and the WWW. Approximately 85 per cent of First Search usage is on Internet.

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Subscribers can browse the contents of the online journals or search the entire collection by a variety of indexes, Boolean operators and proximity indicators. The Windows-based software Guidon of OCLC provides both colour and graphical images and equations along with the text [OCLC Newsletter, 1995]. Scholarly publishing on WWW and the Internet is on the increase. Though very insignificant portion of the world’s publicly available data is contained in the Web and Internet (a fraction of one per cent), it is estimated that in the next five to six years it would be increasing thousand fold and may hold about 80 per cent of the publicly available data [quoted in Cronin & McKim, 1996]. Institute of Scientific Information, USA recently announced the inclusion of some titles available on Internet for indexing and coverage in its databases. However, there are a number of problems associated with electronic scholarly publishing [see Lakshmana Moorthy & Karisiddappa, 1996]. A detailed discussion of the scholarly publishing on WWW can be found else where [OCLC, 1995]. The various problems associated with scholarly publishing over Internet such as cost, conviviality and convenience, novelty, community, and legitimacy are discussed by Cronin & McKim [1996].

The ‘Internet fever’ is slowly spreading in India also. Access to Internet is provided by a few networks which include ERNET, NICNET, VSNL, NICNET, CMC, and I-NET from public sector and SPRINT/RPG, BI Infotech, Datapro, UUNET, etc from private sector. ERNET, funded by UNDP, is facing an uncertain future. At present NICNET is a prime agency providing
Internet services. NIC proposes to provide access to about 15,000 medical, academic, R&D institutions and organisations.

NICNET established the first WWW server in India allowing users access to browsing tools like Mosaic and Cello, searching, display, publishing, Telnet, FTP, WAIS, Gopher and Hytelnet. The National Informatics Centre was to establish 30 Web servers all over India by July 1995 [Subramaniam & Gupta, 1995]. However, there are only four Web servers available at present (personal communication with NIC). About 35 Indian Web Servers and number Internet sites of interest to the librarians are listed by Wolinsky [1996].

These developments have major implications in our country related to information access and supply. We should ensure that all L&ICs have Internet connectivity and that they tune their acquisitions keeping in view what is accessible through international networks. Such connectivity, once in place, could be used for developing and offering services, both for domestic and international customers.

Since the Internet is generally provided by various networks, it may not be out of place to have an idea of the networking activities in the country. The 1990s have witnessed renewed interest in the planning, development and establishment of library networks. Keen interest has been shown by the library professionals as well as policy and decision makers.
makers in the activities of library automation, database development and networking. One major development is the establishment of metropolitan library networks like DELNET, CALIBNET, ADINET, etc.; the national bibliographic information networks like INFLIBNET, BTIS, NICNET and the establishment of computer communications networks like ERNET, NICMAIL/RENNIC which can also be used for transmission of bibliographic information. NISSAT of the Dept of Scientific and Industrial Research has been the backbone and the supporting agency for promoting the metropolitan networks like ADINET, BALNET, BONET, CALIBNET, DELNET, MYLIBNET and PUNUNET, while the University Grants Commission has been promoting the INFLIBNET.

While many libraries in the country have started efforts to create databases of their holdings, networking of these databases is yet to take shape. The library networks in the country are expected to play an increasingly important role in providing access to both indigenous and outside databases. Also, with the e-mail facility they are expected to provide users connectivity to communicate with remotely located people. However, to have Internet linking they are expected to subscribe to NICNET, ERNET or any other such public or private network. The participating L&ICs of the metropolitan networks and the INFLIBNET will be over 600 and when all these access and utilise the Internet resources, it would have a tremendous impact on the document acquisition, resource
sharing, and document delivery and information dissemination activities in the country.

The Internet is changing the notion of library from a walled place into a virtual library, i.e., a library without walls. Even public libraries like Atlanta-Fulton Public Library of USA are offering Internet access to the users including electronic reference service and remote log-in by dial-up [Agnew, 1996].

Although the Internet boasts of reaching 160 countries, there is not much to be happy about its impact on developing countries. The balance is heavily tilted towards developed countries; very few nodes with inadequate infrastructure and unreliable telecommunication links are available in the developing countries. It is a well established that the telephone infrastructure is synonymous with economic strength; poor infrastructure undoubtedly results in obstructing the economic growth. In a study undertaken in 1994, it was found that the computer nodes were strongly associated with per capita income. Of the 9,10,149 Internet connections in 1992, about 97 per cent were located in developed countries; about 65 per cent in USA alone followed by other wealthy countries of OECD. For her entire population of about 86 million, India had a mere 6 nodes [Jacobson, 1994]. Currently, the Internet connections in India amply make it clear that it is available in Government and financially strong research institutions only. It will take a few more years
before Internet and global network access technologies become easily available to all libraries in the country. The decentralised nature of the Internet, the WWW, and the lack of direct control of any participating host/network makes it impossible to provide the users with the same end-to-end network support that the users may get when subscribing to a network like NICNET or ERNET etc. However, the rate of progress depends upon several factors such as user acceptance, economics, commitment to established products and services and also the pace of technological advances.

The usage of information networks will have a positive impact on the way the information is generated, communicated, processed, stored, retrieved and disseminated. The availability of e-mail and file transfer capabilities have made the dissemination of the information faster across continents. The day is not too far when one may be navigating through a favorite magazine or a primary periodical on Internet. The only hindrance to it comes from the computer display resolution technology and the size of the VDU. These make the electronic book reading or viewing a tedious option to the conventional book reading. This calls for development of reader-friendly VDUs for achieving the limitless usage of Internet resources. Technology is causing important changes in how libraries in general, and undergraduate academic libraries in particular, function. It is especially fuelling increased user demands and expectations for information resources and their timely delivery. Yet very little has been written

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regarding designing libraries to take into account the impact of changing technologies.

In this author’s experience, many lay people believe that there will be no need for a physical place called a library in the future, given that everything in the information realm will be accessible from the computers on their desktops. A first observation is obvious: even electronically stored information takes physical space somewhere and requires plenty of equipment and staff to accession, index, retrieve and deliver it. The second is less obvious. According to recent estimates, less than five percent of current information is in some kind of electronic form (Moreno, 1995); it _may_ reach 10 percent by around 2001 (Reid, 1995). And for undergraduate academic library collections, which house primarily monographic types of materials, the continued likelihood that the printed form will predominate in the foreseeable future is high (Lucker, 1992).

Nevertheless, technology is affecting physical space needs in major ways: digitization is beginning to replace microforms, audio/visual resources are evolving into multimedia/hypermedia formats, and computer equipment is pervasive throughout the modern academic library ("ACRL", 1995). Also, major projects are underway to produce extensive digital libraries (Pool, 1994). Factors such as these have led at least one major academic library (Cornell University) to conclude that the
need for additional space will begin to slow after the year 2000, and may stop by 2010 (Matier & Sidle, 1993).

Other evidence suggests that "the library as a physical fact is becoming more important" (Moreno, 1995), and that the need will continue for academic libraries to serve "for self-education and discovery outside the classroom and laboratory." (Lucker, 1992)

What is needed, then, to determine future space needs for the library, is a reassessment of its mission in light of the probable impact of new technologies, and, consequently, how this is likely to translate into more specific space requirements for the various functions. The two sections to follow attempt to do this.

Most would agree that the primary function of a library will continue to be to provide organized, inexpensive access to information, no matter what its form. But technological innovation is likely to add a new need to "create on the network a knowledge-management system that enables scholars to navigate through [the] resources in a standard, intuitive, and consistent way." (Larsen, 1991) This will require new expertise and equipment to accomplish.

With regard to the information itself, the trend has been for quite some time to seek resources both inside and outside the library to meet user needs. Interlibrary loan networks have diversified and will most likely migrate to a common electronic medium, the Internet (Larsen, 1991). In
addition, fee-based document delivery services are being more widely uses for supply of externally-held materials. However, internal collections will continue to grow, not just in the conventional book category, but also in non-book formats, which still require space and equipment to access their contents (Holt, 1989).

Thus, if anything, technology is adding to the demands for libraries to accommodate more print and non-print materials than before. In addition, it is adding the need for ever more sophisticated telecommunication and computer systems to manage access to on site and external resources (Reid, 1995). Also, increased training and instruction must be performed by the library staff to help users cope with the new and varied systems. With regard to the need for physical space to fulfil the library’s revised mission, it becomes unlikely that less will be needed than currently, and most probably more, as described below.

Technology itself is causing increased demand for space in many areas of the library. There are growing numbers of computer workstations for patrons and staff alike and other equipment such as network file server’s needs specialized and additional space often not found in existing facilities. (Lucker, 1992)
Instruction: A growing role of the library is helping students and others learn to use the new technology to access information. This is requiring libraries to supply more space for face-to-face consultation with information professionals (Clemmer & Smith, 1992) and most often necessitating the provision of a large, well-equipped user instruction room (Bazillion, 1994). Thus, as the instructional mission of the library is becoming more important, due in large part to introduction of technology, more square footage needs to be supplied for this function.

Monographs:_ As discussed above, monographic collections, especially for undergraduate libraries, are likely to continue to grow steadily. While digitization of some materials may result in some physical space savings, there are more formats that the library needs to collect; most of these require additional space for equipment to access them, not to mention more specialized storage facilities to house them.

Periodicals:_ Serials in electronic format seem to be one of the best prospects for introducing space savings in academic libraries. Journals in electronic format will no doubt continue to increase, although those in scientific, technical, and medical disciplines are doing so at a more rapid rate (Lucker, 1992). Another factor also points in this direction, that being
the extra-inflationary increases in pricing by many publishers (Clemmer & Smith, 1992).

Processing: In most "behind the scenes" areas of the library, technology is often causing the need for more rather than less space for equipment to handle incompatible systems. While this may be ameliorated in the future, the immediate space needs for areas like cataloguing continue to grow (Johnson, 1992).

Reference: While technology is driving the need for more instructional space, it is impacting positively the need for space for reference materials themselves. A growing number of resources are available in electronic form, and often from resources housed outside the library. As in serials, however, collections more heavily reliant upon information in professional and scientific areas are experiencing space savings more dramatically (Matier & Sidle, 1993).

Study Space: A number of authors confirm this one's experience that technology is increasing the requirements for study space in academic libraries (Boss, 1987; Johnson, 1992; Lucker, 1992). Not only are more students relying on facilities like libraries on college and university
campuses for studying, more space per student is required to accommodate the use of technology (e.g., laptops and workstations).

Libraries in universities and colleges can no longer assume that their value will be recognised by the academic communities that they serve. The rapid change that now permeates higher education has blurred boundaries between libraries, IT, student support, and academic departments. In particular, for libraries, technology is altering the way in which knowledge is created, accessed and used. The effect has been that libraries cannot take for granted, if they ever could, that they have a monopoly over the provision of information to support teaching, learning, and research. This technological change forms part of wider societal and economic influences that are dramatically changing the face of higher education. These include increasing globalisation, greater consumerism, moves towards wider social inclusion, and placing more emphasis upon developing and maintaining a skilled workforce.

Higher education institutions are fundamentally being transformed with increased student numbers, greater diversity in the student community, higher expectations of fee-paying students, new ways of delivering teaching and learning, the development of widening participation strategies, greater pressure to deliver world class research, and an enhanced profile for knowledge transfer and supporting enterprise. This fast moving environment means new challenges and

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opportunities for higher education institutions – and for their libraries. It is not only a question of libraries being pro-active, taking on new roles, developing new partnerships, initiating new projects, and establishing new services.

Increasingly, libraries must also be able to demonstrate the value of what they are doing and provide evidence of the impact that they are making. There is a growing concern within higher education to seek the views of students about their learning experience. This year, the Higher Education Funding Council for England (HEFCE) has launched the National Student Survey that all final year students are being asked to complete. Most higher education institutions, as part of their quality procedures, conduct a regular ‘student satisfaction survey’. While these large-scale surveys may ask few, if any, questions directly about library services, they certainly reflect a growing trend for gathering the views of ‘consumers' that libraries cannot afford to ignore. It is not only funding council or institutional imperatives which are driving libraries to seek the views of their customers; there has long been an interest in ‘user behaviour’ which has been much more difficult to capture compared to the traditional counts of book issues and entries through the library gates.

Lead in time to publication can vary according to the prestige of the individual. Lead in time to publication can vary according to the date of the RAE. Some academics consider that it is impossible to construct a

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list of key journals in a particular research area because the area is too fluid and subjective. Journal status does change and individuals ultimately need to make their own assessment. Trends can be more significant than data relating to individual years. In some areas of research e.g. Religious Education - key journals are not assigned impact data and in depth knowledge of the area is critical. Academics with prestigious research outputs are more sceptical of journal impact data. Academics don’t always want to publish in journals with the highest quality sometimes they want the title that is most appropriate. Many new researchers depend on their supervisors recommendations when placing articles. The word “international" at the start of a journal title can be misleading; the editorial panel and publisher can be more useful. It can be difficult to publish within the American market.

Librarian’s role is crucial in maintaining automation in libraries. Some academics consider that it is impossible to construct a list of key journals in a particular research area because key word searches are too crude, and in-depth knowledge of the research area is always needed. That knowledge of journal impact factors is useful to all post-graduates and academic staff - particularly to academic staff new to a particular research area. It can be considered that citing from journals with high impact can improve the quality of a piece of work therefore JCR should be included in post-graduate training. Departments that are particularly pressurised to improve their research rating are more likely to be interested
in working more closely with impact data than those that are not. • Academics that are new to a particular research area find impact data useful as a starting point. • Impact data can be useful within Education in broadening the perspective of particular academics from specialised curriculum areas published in journals with less impact to those of wider impact. The Institute of Education were particularly interested in targeting their publications at journals with high impact data and there were over seventy enquiries relating to impact data from particular academics following the promotion of JCR and Ulrichs. Involvement of the Librarian was also subsequently sought in research away days, professorial staff meetings and in the preparation of one research bid.

Since Columbia University announced that it was merging (hereafter referred to as converging) its library and academic computing services in 1985 and naming Patricia Battin Vice President and University Librarian, many colleges and universities within the United States have merged various information technology offices on their campuses. Information Services is often used to describe a new administrative unit due to the exploding and converging of computing and communications technology.

When academic libraries began to apply computer technology to their operations in the late 1960s, they purchased service and computer storage from computing centres like other campus departments. Lyman
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(1989) described specific scenarios when academic libraries would be heavily dependent on academic computing: when the library system software is hosted by a central mainframe computer maintained by academic computing, when the library catalogue is accessible over the campus computer network, if the campus decides to write its own library system software, and if external databases are housed on the campus mainframe computer. Though the library and academic computing were linked by these functions, the departments still had to decide the following: which would support microcomputer hardware and software housed in the library, which was responsible for storing and providing access to the data files accessed via the library automation system, which trained users of databases accessible over library automated system, and which supported instructional software that was used at the university.

By the mid 1980s, increasingly related and overlapping responsibilities of the library and academic computing forced universities to begin to consider linking administration of the two departments. Woodsworth (1988) specifically noted that the break-up of AT & T led to a merging of computing and communication that caused universities to reassess computing and information delivery options. The reporting relationships of the library (usually academic affairs), administrative and academic computing (usually administrative affairs), and telecommunications (usually administrative affairs) were reconsidered. Convergence was considered for practical administrative reasons and
only toward the end of the 1980s were collaboration and convergence considered to improve strategic planning, development of campus information policy, the offering of educational programs, and to provide greater support to curriculum development (Creth, S. D., 1993). In the 1980s, 200 United States colleges and universities created Information Services divisions to oversee such areas that might include any or each of the following academic departments: the library, administrative and academic computing, voice and data technologies, technology planning, television services, institutional research, printing, copying, mail, and media service (Rosser & Penrod, 1990).

In 1987, the Association of College and Research Libraries noted in preliminary guidelines to convergence that Brown University, Carnegie Mellon University, Columbia University, Dartmouth College, Notre Dame University, University of New Mexico, University California at Berkeley, University of Minnesota, University of Michigan, and Virginia Technical Institute had already begun to successfully collaborate on computer networking, public access library catalogs, technology instruction, system maintenance, and housing of automation equipment (Bass, 1987). Hardesty noted that Richard Dougherty, Dean of Libraries at University of Michigan, began a publication at this time, Libraries & Computing Centres: Issues of Mutual Concern, to address issues of convergence. Convergence became less popular in larger universities following the 1980s, but by the mid 1990s, convergence regained momentum,

Johnson (1997) published one bibliography listing citations and some abstracts to over 50 sources related to convergence or library reorganization. The head of Information Services functions as a chief information officer (CIO). He or she usually has the title Vice President, Vice Provost, Dean, Associate Provost, Associate Vice President, Executive Director, Director, Chief Information Officer, or College (or University) Librarian (Hirshon, 1998). He or she might report to the chief executive officer of the institution or the chief academic officer. At times, a librarian or computer centre director will become CIO, and add the work of the CIO to his or her previous responsibilities; in some cases, a librarian or computer centre director will be named CIO, and another librarian or computer centre director will take his or her place in the former position; in other cases, an engineer or management professional will be named CIO (Hardesty, 1998 and Penrod, J. I., Dolence, M. C., & Douglas, J. V., 1990).

Why do institutions converge? Although some might consider personnel cost savings as a reason to converge, this is usually not the case in reality. One librarian CIO commented, "How can you save money by combining the old 'bottomless pit' [the library] with the new 'black hole'
[the computer centre]?” (Hardesty, 1998). Most CIOs earn over $100,000 a year and because the position relates closely to a position outside of academe, higher education must offer a salary competitive with business for such an officer (Hardesty, 1998). Others converge to facilitate administration; computing, library, multimedia, and telecommunications all relate to information: why not realign administration to reflect this similar function? Higginbotham (1986) noted that both units collect information and assist end users in using it; if libraries and computing centres remain separate, libraries will lose out, as electronic information replaces printed information. By converging units, it is clearer to the end user where to go for service and the institution saves by reducing redundant staff time and access points. Converging departments fosters “one-stop information shopping” (p.15).

In the field of technology and higher education, to converge is to combine academic library, computing services, and perhaps additional departments related to information technology. This research will describe reasons to converge, why convergence might be difficult, and if users services are directly enhanced after convergence. After convergence, do students, faculty, staff, and the general public (hereafter referred to as end users) receive better personal service when they use information sources? After convergence, are faculty receiving improved assistance as they attempt to implement information technology in curriculum development? After convergence, do end users have improved access
to the necessary computer hardware, software, and computer networks to meet their information needs?

A study of the primary source literature (primarily graduate papers) and secondary source literature revealed difficulties associated with convergence, philosophical and practical reasons to converge or at least collaborate, and specific examples of effects of convergence and collaboration on user services.

Difficulties Associated with Convergence the greatest reported difficulty associated with convergence was the difference in cultures between computing and library staffs. Academic library history is as long as university history and library collections have been seen as the heart of the university. The academic library has well established standards, philosophies, procedures, and connections with the book trade.

Academic computing is roughly 40 years old; it has operated in a rapidly changing environment and has strong connections to the commercial worlds of computer hardware and telecommunications (Weber, 1988). Another historical difference is that libraries have generally offered services free of charge (lending of materials, searching of databases, transacting interlibrary loans with other libraries, offering library bibliographic instruction) and focused on the user. Academic computing
has historically "charged back" university departments for its service and emphasized not the user but the tool (Saunders, 1996).

Librarians have seen service as a hallmark of their profession and many librarians claimed that this is not so in the computer field. Computer professionals have been viewed as eager to try a new venture, but less likely to support it after it has been installed. One librarian noted, "Supporting and educating is not in their vocabulary. There is also a sense that solutions are seen as providing hardware and connectivity," and another, "This may appear smug, but I see librarians more as educators and computer people more as technologists."

Computing staffers have commented, "The library has taken an attitude of being aggressively helpful, and I have taken an attitude, 'If you ask me, I will help,'" "I would say that our concern is much more with getting access, and we do not fret about the uses," and "While our views are extremely charitable toward the users, theirs [the librarians] are overly compensatory. There is almost the presumption of the user being lost. 'You cannot do without us.'". Furthermore, Hardesty notes that computing centre staffs often see convergence as "takeovers" by the library (Hardesty, 1998). Herro participated in one conversation about the convergence of library and academic computing services at Minnesota State University, Mankato. One librarian feared that convergence would lower librarian status on campus. The librarians (presently with faculty
status and accustomed to being treated with the respect of university faculty) might be viewed more as technical experts and possibly face a decline in status (and perhaps salary and benefits as well) in the eyes of academic colleagues on the campus.

University classroom faculty might be strong opponents of convergence, accustomed to libraries as scholarly, academic organizations and fearful that convergence would threaten library autonomy. Weiskel, a Yale anthropologist wrote of fear of losing traditional library service after convergence (Martin, 1992).

Woodsworth (1991) presented a historic mistrust of computer staffs by librarians. The bibliographic record is the intricate data record for each unique item that a library owns. Librarians have been reluctant to surrender control of these precious data records to non-librarians. The Association of College and Research Libraries formed a task force in the mid 1980s to prepare guidelines on library and computer center convergence because academic libraries were untrusting of convergence (the final guidelines submitted by the task force were not approved). Baker (1990), Associate Director of Massachusetts Institute of Technology Libraries, noted a degree of fear and paranoia that some librarians have: In the investigations for this paper, I feel that I have learned the answer to my original question: both libraries and computer centres have problems that we wish alliance with the other would solve.
Perhaps both libraries and computing have been adventurers, each hoping to make a killing by alliance with the other. Nevertheless, the larger problem--the support for information technology within the university--can best be addressed through an alliance. Not the least of our Strengths may be our record and talent for sound fiscal management. We need to have a clear sense of the strengths and motivations of our colleagues in computing.

With our eyes open--and with our hands on our wallets--we should form that mutually beneficial alliance. Though librarians have been viewed as being more "customer oriented" than computing professionals, Naylor (1988) notes that they might not be best equipped to be the service providers in an era of electronic information. Does unfamiliarity with electronic information outweigh perceived customer orientation? Naylor suggested that the cost of training librarians to be electronic information professionals might outweigh their tendency to be user centered professionals. Furthermore, Naylor noted that there is no conclusive evidence that convergence has led to an increased number of personal computers and work stations for the public to access the increased amount of electronic information.

Dougherty and McClure (1997) stressed that institutions should have modest expectations of convergence: Although case studies on restructuring campus information systems are rare, anecdotal evidence
supports the view that such changes are more likely to be successful in smaller academic organizations, than in larger, more complex research universities.

For all of the theoretical debates, the promise of quick and easy mergers proved to be illusory. Consequently, the goals of reorganization have generally become more modest. Even a simple streamlining of information units under one person has not always produced financial savings because the creation of the new administration often adds yet another layer to that hierarchy.

Philosophical and Practical Reasons to Converge Libraries and academic computing have much in common. Both services are concerned with tools and information. Libraries have tended to focus on how people use tools to meet their information needs while academic computing has tended to focus on how technology helps meet information needs. The units have shared networks, share staff shortages, and share the need to construct flexible facilities to meet user needs in the use of information (Saunders, 1996). Librarians are skilled in interpersonal relations, organizing knowledge, marketing, training, and sales; computer professionals are skilled in system development, telecommunications, and product development (Creth, 1993). Creth wrote that not only should libraries and academic computing collaborate or converge, but that they must: Libraries and computer centres are the two organizations within

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higher education that can provide leadership and create new directions for the campus through the application of information technology. They also have the most to lose. In order to be leaders--and not losers--librarians and computer professionals will have to be willing to make fundamental changes in all aspects of their roles and responsibilities, skills and knowledge, working relationships and organization cultures. By aggressively exploring opportunities to work collaboratively to deliver services including wholly new services, librarians and computer professionals can exploit the full potential of information technology in innovative and timely ways.

According to Woodsworth and Maylone, both units are involved in the specific functions of developing training tools and system documentation; designing and operating local area networks; planning and selecting system hardware and software; collecting software for end users; managing databases; performing system analyses; and providing technical assistance and consulting advice, instructing faculty, staff, and students on research strategies, file management techniques, and network access. Their professional goals are similar, to help users make optimum use of hardware, software, and communication systems to manipulate information. Libraries package information, computing centres store and retrieve it; libraries lend information, computing centres display it. Libraries acquire and borrow information and computer centres input it. Both deal with copyright, free access to information, ownership,
standards, site licenses; both are impacted by telecommunications, and media services (Martin, 1992).

With the library, computing, telecommunications, and other information units functioning as one administrative unit, universities may achieve a more efficient financial administration of information technology funds and all computer hardware, software, and networks could work in greater cohesion (Woodsworth, 1988). Convergence could lead to greater chances for obtaining capital for new technology initiatives, improved access for students and scholars, and a greater appreciation for the skills of all staff members involved in the information mission (Woodsworth, 1991).

Institutions that converge or collaborate are better at answering users direct questions, according to Bly (1996): Cooperation between the units would save much replication of effort and, in many cases, much frustration for both staffs of the library and computer centre, as well as for the user. In many cases, the user does not know whom to ask when confronting a “computer” problem or is put off by the answer received. At the same time, there are many times when the academic staff member who is asked does not know who is responsible for answering the question or solving the problem. A single coherent and predictable set of channels for dealing with questions and triage techniques must be developed among all information providers to meet this need (p. 215). How does
convergence and the establishment of a CIO enhance user service? Drake (1991) noted that both computer professionals and librarians are not customer oriented; the former are machine oriented and the latter are collection oriented. A CIO is needed to insure that information services prioritize the provision of quality customer service. The survey of Penrod, Dolence, and Douglas (1990) of CIOs revealed comments such as, “We are 100 percent service and have no other function,” “Service distinguishes us from similar institutions”, “If we can’t do it better, faster, cheaper than any other alternative, than we shouldn’t be doing it at all”, and “Our IRM [information resource management] unit’s existence is justified based on the services we offer; we seek to understand user expectations and perceptions by conducting ongoing evaluations of our service and align the services provided with those needed”.

Kesner (1994) suggested integrating total quality management as part of convergence. Amongst other steps in a successful convergence, staff members must be superior listeners of customers and totally customer driven. Implementing total quality management includes the sharing of ideas all staff to enhance user services. The establishment of information service help desks and improved training and documentation for end users are indicative of total quality management enhancements to users in information services.
Kesner (1994) defined information resource management (IRM) as “... the economical and efficient management, servicing, and support of all information...that is of value to the organization. The value added component of IRM is the information utility’s ability to deliver accurate specific information to the end-user in a timely manner”.

Information utility was defined, “Within any organization, the information utility includes all those resources, services, and facilities that comprise, process, and deliver information to the end-user. More than computer hardware and software, an information utility is an approach to customer service that emphasizes availability, ease of access, economy, efficiency, and accountability to the community”.

If the library invests in the information utility model, the user would benefit by better overall customer service and support, delivery of information to the individual desktop, enhanced integration among all information sources for better overall use of all available information, greater recognition of all information utilities contribution to the parent organization’s mission and goals, improved access to new information technologies, better resource planning, and staff cross training. Kesner noted that librarians are most likely to understand user needs and if librarians are true partners in information utility, this skill may be passed onto other professionals to supply improved user service.
Lester (1992) presented a checklist of skills needed for a user services professional in an information services division. The person must enjoy working with people in a cooperative environment, and not focus on winning and losing; the person must be willing to learn and continually experiment in all related areas; the person must possess excellent verbal and written skills; the person must be able to compromise and negotiate; the person must be able to see the larger and the smaller picture at the same time; the person must be able to admit ignorance yet search for knowledge; the person must be willing to fail; and the person must have an enthusiasm for technology, process, organization and public service.

Nguyen (1997) cited Internet training as a perfect example of collaboration between library and computing staffs to serve the wider university community. Some have noted that the training could have never been as successful if either unit had done it alone (“...collaborative workshops provide a further opportunity for these service units to join forces and offer the university community the experience and expertise developed by each department”). Creth (1993) also cited librarians and computing professional combining to help develop new approaches to instruction (such as hyper media); librarians teaching not only typical library skills, but combining with computer services to instruct patrons on effective use of all information sources and publishing, print and electronic.
Examples of Convergence and Collaboration Secondary literature and personal responses have revealed the success of convergence and or collaboration at Dickinson College, Rutgers University, San Jose State University, SUNY Albany, Carthage College, University of Wisconsin--Park side, UCLA Graduate School of Management, University of Montana, Rice University, Kalamazoo College, and Lehigh University.

From 1982-1987, computing and library staff at Dickinson College collaborated to convert 200,000 library records to electronic format so that the library catalogue could be accessible to over 200 campus users. The new search software enabled keyword searching, Boolean logic (the ability to combine terms with and, or, and not searching). Other colleges have also collaborated to automate the library catalogue, but Bechtel (1988) noted: For such collaboration to be successful, special skills are needed on both sides. The desire to cooperate is of utmost importance. Individualists, isolationists, and superstars need not apply. On the other hand, librarians and computing people who want to learn, who tend to respect each others' differences, and who are or who can become good negotiators, and who are committed to the educational aims of the institution can find enormous professional rewards in working together to enhance the educational process. Rutgers University and San Jose State University typified examples of collaboration to support improved micro computing for end users in academic libraries.
In 1985, Computing and Information Services of Rutgers received funds to install and provide hardware and software support for Apple and IBM compatible computers and printers that would be used to start an unmediated online search service for university users of the BRS After Dark online information service. Librarians provided user instruction and consultation for the online searching, as well as publicity and policies for the services. Librarians felt that this service was needed for non graduate student users, who seemed to be neglected from online searching services. As one professional stated, “...We have worked effectively together and look forward to continued cooperative ventures--both for our mutual benefit and that of the entire university community (Hoffman, Kesselman, Nash, Langschied, 1988).

The resolution of tensions involved in collaboration at San Jose State Library stemming from a new microcomputer lab reflect differences in cultures between libraries and academic computing, but also how these differences can be worked out. In 1986, Instructional Systems and Computing Group and the library launched a joint microcomputer 19 lab in the library of 23 Apple computers and three printers. Benefits of placing the lab in the library included the convenient and impartial campus location for users, the number of hours that the library was open, promotion of the library’s holistic view of information access, and the opportunity for the library staff to become more computers savvy. The Computing Group would hire and train student assistants for the lab,
maintain the software and hardware pay for supplies, and serve as liaison to the donor (Apple Computer). The library would provide the space, circulate the software, supervise the student assistants, and provide backup instructional services (Hafter & Kittinger, 1990).

Within six months after the lab opened, the library and Computing Group discovered problems. Neither had projected such a high cost for supplies (toner cartridges alone cost the Computing Group $3500 after six months). The Computing Group wanted the lab to showcase other Apple products, as it tried to foster the relationship with Apple for future donations; the library sought to limit the visibility of the Apple Company in the lab. Furthermore, the library staff was frustrated with the performance of the Computing Group’s students assistants in the lab and with the non-academic use of the lab. The lab was not increasing use of library services as much as promoting recreational microcomputer use. These differences underscored differences in library and computing cultures. The Computing Group saw its role as paying bills, providing equipment, and staffing the lab; the library saw its role as providing user support. The Computing Group was used to a self service model of service while the library was used to value added through professional service and one to one service between staff and user. The Computing Group viewed the lab as another campus computing lab while the library viewed it as an extension of library service (Hafter & Kittinger, 1990).
Differences and problems were resolved when the Computing Group became solely responsible for hardware and software issues and the library, with its innate service orientation, became solely responsible for recruiting, training, and staffing the lab. The library was also charged with funding the lab and it instituted a .25 per page printing fee. The hybrid facility was not been totally supported by either the Computer Group or the library, but did bring the greatest satisfaction to the end users. After having learned to collaborate on the computing lab, the two information units began to collaborate with the implementation of an online public access library catalogue and in campus wide computer planning equipment.

The Computer Group began to apply library circulation policies to loaning of its hardware and software and the library learned how to better relate to vendors and apply innovative uses of technology (Hafter & Kittinger, 1990).

Albany has implemented a model of decentralized service that has become common for end users. When the university upgraded the technology infrastructure to increase the number of campus computer network users from 2,000 to 20,000 people, the CIO knew that this would demand increased trainers by the information units. The university developed local technology coordinators in every school, college, university department, and residence hall. These coordinators represent
service providers for any information accessible from the desktop computer, information formerly accessed separately from the library, computing labs, or telecommunications office. As the single unit, the PC, has become a nearly comprehensive tool to gather all forms of information, service providers of information have become adept at serving all kinds of information needs. As long as the end user is able to forgo old service alliances and contacts and depend on the new local service provider, prospects for more efficient user support are possible (Butler, M. A. & DeLong, S. E., 1997).

Engledinger (Carthage College) and Meachen (University of Wisconsin--Parkside) (1996) have written on convergence in smaller institutions. The former rose from director of a liberal arts college library to a CIO and vice president of the college; the latter rose from the director of a smaller public university library to CIO and a vice president of the university. Parkside converged in 1992 and Carthage converged in 1993; the two are located near each other in south-eastern Wisconsin. Both library directors became CIOs because, “... each institution’s top administration believed the interests of their campus would be best served by the library’s overall vision, its public service philosophy, and its broad view of the use and importance of information technology. In neither case did the reorganization result from grass roots or rank-and-file [sic] staff initiative”.

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Convergence was obvious at Carthage, as computer service staff troubleshooted library computers and helped install new automated library system software, the newsletters of both information units were combined, the user instruction room was jointly planned, the units jointly planned and presented an annual “Information Technology Day” workshop for faculty and staff as well as “Computer Awareness Week” activities every spring. Furthermore, numerous instruction sessions related to computer resources, the campus network, and electronic library resources were planned and presented together by computer and library professionals for college students, faculty, staff, trustees, prospective students and their families, and conference participants using Carthage meeting facilities.

The college invested heavily in network able full text and other electronic resources and realized that increased staff would be needed for users to make best use of the tools. Convergence forced cross training of library and computer centre staffs. The Academic Information Services User Education task force realized that permanent staff and student assistants in former library and computer centres would have to become adept at providing service in all electronic information tasks, ranging from email, to library online public access catalogue, to word processing, to electronic periodical index, to World Wide Web support. (Engeldinger & Meachen, 1996).
At Parkside, convergence led to the modernization of laboratories and classrooms for advanced electronic information needs, enhanced faculty use of technology in instruction, the development of an Information Services newsletter, and enhanced user instruction. The university created two new positions for software instruction to students, faculty, and staff; the library became partially responsible for instruction in email, totally responsible for instruction in the use of the World Wide Web, and the new Computing Assistance Centre received funds and personnel from both the library and the computing centre budgets. This centre adapted a library reference desk model of service (Engeldinger and Meachen, 1996).

UCLA John E. Anderson Graduate School of Management pursued collaboration at the facilities level. Frand, Director of Computing Services, and Bellanti, Director of the Library, began to discuss an integrated information complex for the school in the late 1980s.

Donations by John E. Anderson and Eugene and Maxine Rosenfeld enabled the university to construct a single facility to serve as an information complex for the Management School. Bellanti and Frand surveyed faculty and students of the Management School in order to help determine the future information needs of the school. Their goal was to build a facility in which patrons could connect to a computer network anywhere in the complex, as well as remotely. There are 2467 Ethernet
ports in the building, one for every office, desktop, library and classroom seat. By accessing the computer network, users are able to access large library catalogs, subject specific CD ROM databases, and hopefully international company data and industry analyst reports. The two information units had been cooperating in computer training workshops since 1991 and in the construction of the graduate school home page since 1995 (Bellanti & Frand, 1996).

As Frand noted, users should not have to be separated by artificial divisions of library and computing centre and that if convergence has truly occurred, a user will have the necessary computer hardware and software at side wherever one consults information sources. Bellanti agreed by saying, “If it’s information that they need, they shouldn’t be compartmentalized in how they think about getting it” (Hall, 1990, p. 70).

Samson, Pengally, & Brown (1997) described how collaboration has benefited the user at the University of Montana. The university developed an Information Technology Plan through campus wide planning that included library and Computing and Information Services (CIS). Since 1991, the two have been offering joint Internet classes to users (presently, different classes are offered), as well as sessions devoted to integrating technology in curriculum planning for all disciplines, departmental workshops and seminars, conference workshops, and a three credit Honors course. The library and CIS cosponsored two information
technology conferences and an Internet teleconference and planned, designed, and maintained the university Gopher site together. From 1993-1994, university CD-ROM databases and library online public access catalogue became remotely accessible through the collaboration of the departments, and they jointly produced written aids to guide user access to the tools. Hardware and software issues are referred to CIS and information access questions are referred to the library. In 1994, help desk workers from each information unit exchanged positions for a limited time in order to provide continuing communication at each reference point, establish a basis for referrals, and expand communication between the two.

Rice University has had a CIO since 1989. In 1993, a new university department was formed, User Services Division, from former public service professionals from the library and academic computing. The division encompasses what had been library reference services, laboratory services, government documents services, training, and publications. According to Flowers and Martin (1995), “With our new organization, the focus is on serving customers. Customers have one interface to the organization, which implies that the rest of the organization must provide adequate backup support. In the new group, librarians and computing professionals are working side by side as part of the same team.
The new division formed a library in the computing center to supply manuals, journals, and reference service to campus computing users and a computing reference centre to allow users to test and research computer products before investing in them. It was staffed by a librarian. The division also established a computing lab in the library and developed the Rice’s campus wide information service (RiceInfo) as a gateway to local university information sources (such as the library online public access catalog, the course catalog, and a database of research and grant opportunities for Rice personnel) and links to external information sources (such as the Library of Congress). User Services also developed a virtual library, as librarians and computing professionals selected and installed external research databases (such as Current Contents, MLA Bibliography, and Expanded Academic Index) for internal and external access to university users.

Reference librarians and the training team of User Services have developed a series of Internet resource workshops for the campus; reference librarians and divisional representatives from the academic majors have planned informational presentations to academic departments; and the marketing and public relations team of User Services has developed a Technology Showcase in the library, which displays vendors products and university information system and curriculum development projects (Shapiro & Long, 1994). Since 1993, Rice has had an Information Arcade in the library that provides small group
computer facilitated interaction and individual information exploration. It features an electronic text center, curriculum development center, and electronic classroom. The Arcade contains a help desk and students, faculty, and staff have space, services, and professional guidance for the use of electronic information that they never had before (Flowers & Martin, 1995).

Long and Shapiro (1994) described how the new User Services division has implemented degrees of total quality management. It practices a “90% solution”, a goal that 90 percent of all user needs be successfully addressed as quickly as possible; a tiered staff that will be in the loop for all information related decisions; and a User Services staff that will be professionally trained in customer service skills and management of customer expectations. The division has established written mission and goals to provide superior customer service for all Rice users.

Kalamazoo College formed an Information Services department in 1997, after the library and computing center were both without a director. Palchick (1988), the new CIO, reported that a new curricular support division was established to assist faculty in implementing technology in curriculum, develop computer consulting in residence halls, and supply a help desk; that the library will implement a new Web based catalog, and that infrequently used materials will be moved to a off site storage facility to allow more current materials to expand. Furthermore, under the

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leadership of the new CIO, the college has secured grants for nearly 50 percent of all faculties to receive training in integrating technology in their courses by off campus professionals. The student portfolio requirement has been strengthened, as what was a Web based portfolio limited to the students’ own floppy disk is now supported by the college’s technology infrastructure, and the portfolio is now accessible over the campus computer network. A plan for a building renovation and addition includes additional teaching and learning facilities; a faculty, student, and staff development center; a media/video editing and production center, additional user support points, and teaching labs.

The new space will emphasize academic interaction, collaboration, and learning outreach for all Kalamazoo users. Foley (1997) described convergence at Lehigh University. The new Information Resources unit includes the following teams: Lead Team, Client Services Team, Information Infrastructure and Services Team, Technology Infrastructure and Services Team, and Resources Planning Team. The university included feedback from three faculty groups, one staff group, one administrator group, one undergraduate student group, one graduate student group, and one mixed group before creating its new Information Resources unit. The initial charge produced five recommendations: improvement of client orientation, improved availability of electronic information, increased usability and accessibility of networked information, improved quality and availability of classroom technology and support, and a developed plan.
for technology life cycle funding. According to Foley, two of the greatest challenges facing the new administrative structure were to staff the Client Services team with professionals who were flexible enough to serve the great multitude of user backgrounds and to maintain a positive working relationship between those in client services and those in infrastructure services.

The benefits of synergy, utility, and practicality were more evident than improved user services when CIOs were asked about reasons to converge and or results of convergence. The literature does reveal some concrete examples of improved user services following convergence or joint facilities, such as the examples cited from Rice University, Carthage College, University Wisconsin--Parkside, University of Montana, UCLA School of Management, and Lehigh University, but it appears that information services administration is guided more by practicality than by user satisfaction.

Like many decisions by administrators in United States higher education today, the overriding rationale for a decision seems to be financial cost. Many CIOs and much of the literature emphasize cost savings after convergence; services and staff operations are not duplicated, some middle management positions have been eliminated or left unfilled, and there is better fiscal management of technology resources. As government financial support continues to decline, income
from outside donors becomes more costly to attract, and the public becomes more and more sceptical of rising tuition costs, colleges and universities will have to continue to improve at "doing more [technologically] with less [money]". Economic realities, including relatively less income for more expensive instructional services, will continue to demand that information administrators consider cost efficiency and user services when making policy.

The experience of the author does conflict with some of the findings of the literature. Naylor’s (1988) suggestion that librarians might not be able to provide user service in an electronic environment has been proven wrong. As public service librarians use online catalogs, search the Internet, construct home pages, and train others to do likewise, it is clear that librarians have adjusted to this era of electronic information. The “service orientation” of the library culture and the “technical orientation” of the computing culture, including relationships to end users, described by Hardesty (1998) should not be generalized to include all colleges and universities. After serving as an academic librarian for over eight years, I have found academic librarians who have been both service and non-service oriented; furthermore, I have colleagues in computing services that range from the “read the darn manual” user response to computing center directors who have paid “office calls” to users to personally eliminate the most basic hardware problems. I have benefited from classroom training on UNIX, Windows, presentation software, and other
applications by computer service staffers, as well as having learned from their newsletters.

Computer staffers can teach and can care about user support. After having worked in academic libraries where librarians do not have faculty status and libraries in which they do, I can say that librarians are more fearful of losing their status and being associated as “techies” and not “academicians” in universities where they do have faculty status. Professional competence, and not job title or classification, should determine one’s credibility in higher education.

Decisions by administrators in higher education must be guided by both financial expediency and service to students, faculty, and staff, and service to students must remain of utmost importance. It is for the education of the student that higher education exists. Should a college or university converge its information units, or minimally, alter the administrative structure so that individual information managers report to the same administrator? I echo the words of Dougherty (1987): Over time, the new organizational infrastructure will take shape, but no specific structure will be universal. Rather, the organizational structures are more likely to reflect the history, traditions, and institutional personalities of individual campuses.
One guiding principle we should follow as we prepare our profession’s future is that changes should be based on plans that enhance the educational missions of our institutions, not on the mere impression that certain redirections are, to be blunt, trendy and likely to attract attention.

Information service units will lose patrons to commercial book stores and Internet service providers if service to users is not enhanced by convergence and or collaboration. Bly (1996) was correct in stating: If academic libraries and computing centers do not work in a cooperative effort to support the clientele of their universities, then that clientele will go elsewhere to find the information and support that they need....If libraries and computer centers are not able to coordinate and broaden their services to fill the needs of academia, libraries will become archives and repositories to retain records of the past, and computing centers will be limited to their old role as data processing units serving campus administrative needs, if these needs are not also contracted to an outside forum.

As a public service librarian, I have heard library patrons say, “You mean I don’t have to go to Barnes and Nobles?” One also must wonder why so many students, faculty, and staff decide that they must subscribe to America Online for Internet access when their university is an Internet provider. They are already paying for Internet access through tuition and
often times technology fees, yet the service and support are so inadequate that the user must pay twice and subscribe to a commercial provider. If converging information units does not decrease the need for such “double purchasing”, something is wrong.

Furthermore, I challenge my colleagues in user services of information units to put behind their fear of change, paranoia of each others’ departments, and “turf” battles and to put the user first. Shapiro and Long wrote eloquently (1994): If the library of the 21st century is to be more than a warehouse of old books staffed by a cadre of reference librarians, user services librarians must take the lead in forging new directions and new relationships with colleagues on campus. The transition will not be smooth because there are enormous cultural differences and mistrust between library and computing organizations that must be bridged. But the successful collaboration between our organizations will benefit not only these two organizations but more importantly our users who are, after all, at the heart of what we do.

Computers, communication and information access technologies are effecting revolutionary changes in the way the information is stored, retrieved, and disseminated. Internet, a network of more than 30,000 (as of May 1994) networks [Neesham, 1994], also called variously as the Cyberspace, Information Superhighway, the Net, etc has enabled global level inter-connectivity of computers and computer networks. Internet, a
traditional avenue for sharing research data and information, has brought in a new era in global communications. It is an open computer communication infrastructure of the world. It has been described as arguably the most complex structure yet discovered in the world.

The growth of Internet has been global and continuous. And it is growing at a rapid pace. In 1991 the Internet was in the reach of only 73 countries; 100 countries accessed it in 1993 and in 1995 it reached 148 countries. The number of host computers/sites and the number of users are almost doubling every year. In 1994, it had a user base of 20-25 millions with over two million connections which was expected to be doubled by the end of 1995. Now, Internet has about five million host computers with a new host added every ten minutes [see Treese, 1994], spread over 160 countries around the world. The Internet Architecture Board, one of the three erstwhile managing bodies of the Internet Society, has estimated a monthly growth rate of 10-15 per cent for computer hosts. It is providing connectivity to over 50 million users. And in North America alone, the Internet has over 37 million users. At present with a base of about 6.8 million subscribers, it is expected to reach 20 million by the turn of the century. It has been estimated that at any point of time two million new users try to browse what Internet can offer them [Eager, 1994]. There have been tremendous developments in the area of transmission speeds at which the information/data files are transmitted over the Net. Initially the transmission speeds used to be 64 kbps; this reached 1.5 Mbps in 1993.
However, recently the speed at which the information transmission is taking place reached 45 to 622 Mbps (in advanced countries) and is leaping towards achieving Gbps rates.