

Impact of ICT on University libraries: Challenges for library professionals

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ABSTRACT

Information and Communication Technology (ICT) has emerged as a fundamental component in the modernization of academic libraries, significantly enhancing the efficiency and effectiveness of library operations and service delivery. The integration of ICT has transformed conventional library practices by facilitating resource sharing, improving the quality and speed of information services, reducing operational time, and providing innovative platforms for the promotion and dissemination of library resources and services. Furthermore, ICT enables users to access information quickly, accurately, and conveniently while ensuring continuous communication and timely dissemination of information to all stakeholders.

The adoption of ICT has automated numerous library housekeeping operations, including acquisition, accessioning, cataloguing, classification, serials control, circulation, stock verification, and information retrieval through Integrated Library Management Systems (ILMS). In addition, ICT has revolutionized communication and information services by enabling the use of e-books, e-journals, online databases, institutional repositories, digital libraries, audio and audiovisual resources, e-mail services, internet-based information retrieval, search engines, social media platforms, teleconferencing, mobile technologies, and cloud computing. These technological innovations have substantially improved access to scholarly information, enhanced communication between libraries and users, promoted resource sharing among institutions, and increased the overall effectiveness of library management.

The contemporary digital environment, ICT has become indispensable for academic libraries in supporting teaching, learning, and research activities. It facilitates the organization, preservation, retrieval, and dissemination of information while enabling libraries to provide user-centred, efficient, and technology-enabled services. Consequently, ICT plays a pivotal role in the transformation of academic libraries into dynamic knowledge centres capable of meeting the evolving information needs of the academic community.

.KEYWORDS: Information and Communication Technology (ICT), University Libraries, Library Automation, Computerized Library Services, Information Services, Integrated Library Management System (ILMS), Digital Library Services, Information Retrieval, ICT Environment.

1. INTRODUCTION

The contemporary Information and Communication Technology (ICT) era, information has become one of the most valuable resources for the advancement of higher education, research, and society. ICT encompasses a wide range of technologies, including computer systems, communication networks, software applications, and digital media, that facilitate the collection, processing, storage, retrieval, transmission, and dissemination of information in various formats such as text, images, audio, video, and multimedia. In the context of university libraries, ICT refers to the application of computer-based technologies and communication systems to automate and enhance library operations and services, including acquisition, cataloguing, classification, circulation, serials management, reference services, information retrieval, and digital resource management.

The rapid advancement of ICT has transformed university libraries from traditional repositories of printed materials into dynamic digital knowledge centres. Through ICT-enabled services, users can access a vast array of electronic resources, including e-books, e-journals, online databases, institutional repositories, digital libraries, and open-access resources, regardless of time and geographical location. This transformation has significantly reduced the time and effort required to locate and retrieve information while improving the speed, accuracy, and quality of library services. Furthermore, ICT facilitates resource sharing through library networks and consortia, thereby expanding access to scholarly information and promoting collaborative teaching, learning, and research.

Information and Communication Technology represents the convergence of computing, telecommunications, and information management for the efficient creation, organization, storage, communication, and dissemination of knowledge. It enables information to be transmitted through digital networks by converting text, images, audio, and video into electronic signals that can be processed and shared efficiently. In universities, ICT provides the technological infrastructure necessary to support academic programmes, research activities, e-learning, and institutional administration. Consequently, university libraries must continuously adopt emerging technologies to meet the evolving information needs of students, faculty members, researchers, and other stakeholders. To accomplish this, library professionals must possess adequate ICT competencies and continuously update their technical skills to manage modern information systems effectively.

The significance of knowledge in national development was emphasized by Dr. A. P. J. Abdul Kalam, former President of India, in his Republic Day Address (2003), where he observed that a nation's progress depends on its ability to create, disseminate, and effectively utilize knowledge across sectors such as information technology, industry, agriculture, healthcare, and education. His vision highlights the indispensable role of university libraries as centres of knowledge that foster innovation, support research, and promote lifelong learning through efficient information organization and dissemination.

The adoption of ICT has significantly redefined the roles and responsibilities of library professionals. The automation of housekeeping operations and the increasing availability of digital resources have shifted librarians'

responsibilities from traditional custodial functions to technology-driven services, including digital resource management, electronic information retrieval, institutional repository management, research support, digital preservation, scholarly communication, information literacy instruction, and user education. As university libraries continue to evolve into hybrid and fully digital learning environments, librarians are expected to acquire expertise in information technology, digital librarianship, intellectual property rights (IPR), copyright management, research data management, artificial intelligence, and emerging digital technologies.

ICT has transformed library services by enabling university libraries to provide user-centred, value-added, and on-demand information services. Digital libraries, Online Public Access Catalogues (OPACs), virtual reference services, remote access to subscribed electronic resources, institutional repositories, cloud-based library systems, mobile library applications, and social media platforms have greatly enhanced accessibility, communication, and user engagement. These technological innovations have improved operational efficiency, strengthened communication between libraries and users, and reinforced the role of university libraries in supporting teaching, learning, innovation, and research.

2. COMPUTERIZED (ICT-BASED) LIBRARY SERVICES

The application of Information and Communication Technology (ICT) has revolutionized library services by enabling academic and university libraries to deliver information more efficiently, accurately, and conveniently. ICT plays a significant role in enhancing document delivery services, resource sharing, communication, and access to digital information resources. The use of computers, the Internet, Integrated Library Management Systems (ILMS), digital repositories, online databases, cloud computing, and library automation software has transformed traditional library services into user-centred, technology-enabled services that can be accessed anytime and from anywhere.

ICT-based library services are designed to meet the diverse information needs of students, faculty members, researchers, and other users. These services improve the accessibility, availability, and dissemination of scholarly information while supporting teaching, learning, and research activities. By integrating modern technologies into library operations, academic libraries can provide faster, more reliable, and value-added information services.

The major computerized (ICT-based) library services provided by academic and university libraries include:

- **Online Public Access Catalogue (OPAC):** Enables users to search the library catalogue electronically by author, title, subject, keyword, or accession number and determine the availability and location of library resources.
- **Internet and Network Services:** Provide access to online information resources, institutional networks, Wi-Fi facilities, and web-based information services.
- **Online Reference Services:** Offer virtual reference assistance through e-mail, chat services, web portals, and digital reference platforms.
- **Multimedia Services:** Provide access to audio, video, images, presentations, educational software, and other multimedia learning resources.
- **Library Consortia Services:** Facilitate resource sharing through national and international library networks such as the INFLIBNET Centre, DELNET, and other library consortia.

- **Online Reservation and Renewal Services:** Allow users to reserve, renew, and manage borrowed library materials remotely through the library management system.
- **Online and Offline Databases:** Provide access to bibliographic, full-text, citation, and subject-specific databases for academic and research purposes.
- **Electronic Mail (E-mail) Services:** Enable communication between the library and users regarding notices, overdue reminders, new arrivals, and library announcements.
- **Electronic Publications:** Provide access to e-books, e-journals, e-newspapers, conference proceedings, theses, dissertations, and other digital publications.
- **INFLIBNET N-LIST Services:** Offer authenticated access to a wide range of subscribed electronic journals, e-books, and other scholarly resources through the National Library and Information Services Infrastructure for Scholarly Content (N-LIST).
- **News Clipping and Current News Services:** Deliver scanned newspaper articles and digital news updates relevant to users' academic and research interests.
- **Social Media and Networking Services:** Utilize platforms such as Facebook, WhatsApp, X (formerly Twitter), Instagram, YouTube, and Telegram to disseminate information, promote library resources, and engage users.
- **Information Literacy Programmes:** Conduct user education, orientation programmes, and training sessions to develop information retrieval, evaluation, and digital literacy skills.
- **Current Awareness Service (CAS) and Selective Dissemination of Information (SDI):** Provide users with timely information on newly acquired resources and personalized updates based on their subject interests.
- **Abstracting and Indexing Services:** Facilitate quick identification and retrieval of scholarly literature through abstracts, indexes, and bibliographic databases.
- **Short Message Service (SMS) and Mobile Alerts:** Send notifications regarding due dates, reservations, overdue books, library events, and important announcements directly to users' mobile devices.

The implementation of ICT-based library services has significantly improved the efficiency, accessibility, and quality of information services in academic and university libraries. These services enable libraries to provide faster document delivery, seamless access to electronic resources, enhanced communication, and personalized user support. Consequently, ICT has strengthened the role of libraries as modern knowledge centres that effectively support teaching, learning, research, and innovation while meeting the evolving information needs of the academic community.

2.1. Impacts of ICT on University Libraries

- **Automation of Housekeeping Operations:** Routine tasks like acquisition, circulation, serial control, and stock verification are now seamlessly managed via integrated library management systems.
- **Remote Access & Digital Libraries:** The implementation of Web OPACs (Online Public Access Catalogs), institutional repositories, and subscribed online databases allows users to access materials from anywhere.

- **Resource Sharing:** Consortia and networking enable university libraries to share vast amounts of digital content, overcoming traditional spatial limitations

3. IMPACT OF ICT ON THE CHANGING ROLE OF LIBRARY PROFESSIONALS

The rapid advancement of Information and Communication Technology (ICT) has significantly transformed the roles and responsibilities of library professionals. Traditionally, librarians were primarily responsible for acquiring, organizing, preserving, and circulating printed information resources. However, the emergence of digital technologies has expanded their responsibilities to include the management of electronic resources, digital libraries, institutional repositories, research support services, information literacy programmes, and technology-based user services. Modern librarians are no longer merely custodians of information; they have become information managers, technology facilitators, educators, research partners, and digital knowledge specialists.

To perform these evolving roles effectively, library professionals must possess both technical and soft skills. Technical competencies include proficiency in Integrated Library Management Systems (ILMS), digital library software, database management, metadata standards, institutional repository management, web technologies, cloud computing, digital preservation, artificial intelligence applications, and information retrieval systems. Equally important are soft skills such as communication, leadership, teamwork, problem-solving, adaptability, time management, decision-making, customer service orientation, professional ethics, confidence, and a positive attitude. These competencies enable librarians to respond effectively to the changing expectations of users and the rapidly evolving technological environment.

ICT has revolutionized library collection management by transforming the processes of acquisition, organization, storage, preservation, and dissemination of information resources. The adoption of digital technologies has facilitated electronic acquisition, metadata creation, digital preservation, resource discovery, and efficient collection management. Furthermore, the availability of electronic resources, institutional repositories, open-access publications, and library consortia has expanded the scope and accessibility of library collections. Advanced data analytics and user behaviour analysis have also enabled libraries to develop user-centred collections and improve decision-making regarding resource selection and management.

As technology continues to evolve, library professionals must engage in continuous learning and professional development to acquire new technological competencies. They should remain flexible and adaptable in adopting emerging technologies to ensure that library collections and services remain relevant, accessible, and responsive to the changing needs of the academic and research community. Consequently, ICT has redefined librarianship by positioning library professionals as key contributors to knowledge management, digital scholarship, and lifelong learning.

4. ADVANTAGES OF ICT IN LIBRARIES

The adoption of Information and Communication Technology has brought significant improvements to library operations and information services. Some of the major advantages of ICT in libraries are as follows:

- Improves the efficiency and effectiveness of library operations and services.

- Automates routine housekeeping functions such as acquisition, cataloguing, circulation, serials control, and stock verification.
- Facilitates quick, accurate, and efficient retrieval of information.
- Enables remote access to library resources through the Internet and institutional networks.
- Provides 24×7 access to electronic resources such as e-books, e-journals, online databases, and digital repositories.
- Saves time, effort, and operational costs for both library staff and users.
- Enhances communication between libraries and users through e-mail, social media, SMS alerts, and mobile applications.
- Promotes resource sharing through library networks and consortia.
- Supports digitization and digital preservation of rare and valuable documents, thereby reducing physical storage requirements.
- Improves the quality, speed, and accessibility of library services.
- Facilitates online user services such as OPAC, document delivery, reservation, renewal, and virtual reference services.
- Supports teaching, learning, research, and innovation by providing seamless access to scholarly information.
- Enables effective collection management through metadata standards, digital cataloguing, and data analytics.
- Enhances user satisfaction by providing personalized, value-added, and technology-enabled library services.
- Strengthens the role of libraries as modern digital knowledge centres in the information society.

ICT has transformed libraries into efficient, user-oriented, and technology-driven information centres. It has enhanced the professional role of librarians, improved the management of library resources, and significantly increased the quality and accessibility of information services, thereby supporting the academic, research, and lifelong learning needs of users.

5. CHALLENGES OF USING ICT TO DELIVER LIBRARY SERVICES

The integration of Information and Communication Technology (ICT) has significantly improved the quality and efficiency of library services. However, despite its numerous advantages, the successful implementation and effective utilization of ICT in academic and university libraries face several challenges. Libraries are expected to maintain modern technological infrastructure, including computers, servers, scanners, printers, networking equipment, and library management software, while simultaneously supporting both traditional and digital library services. Financial constraints, technological limitations, inadequate infrastructure, and a shortage of skilled personnel often hinder the effective adoption and utilization of ICT in libraries. The major challenges are discussed below.

5.1. Limited Financial Resources

One of the primary challenges in implementing ICT in libraries is the lack of adequate financial resources. The acquisition, installation, and maintenance of ICT infrastructure require substantial investment. Many academic libraries face budgetary constraints that limit their ability to procure modern computer systems, networking equipment, licensed software, digital library platforms, and electronic information resources. Insufficient funding also affects subscriptions to e-journals, e-books, online databases, and membership in library consortia, thereby restricting users' access to current scholarly information.

5.2. Inadequate ICT Infrastructure and Technical Skills

Effective ICT-based library services depend on reliable technological infrastructure, including high-performance computers, servers, high-speed Internet connectivity, wireless networks, and uninterrupted power supply. In many institutions, inadequate ICT infrastructure and limited Internet bandwidth negatively affect access to Online Public Access Catalogues (OPACs), digital repositories, online databases, and other electronic resources. Furthermore, many library professionals and users lack the necessary ICT competencies to effectively utilize modern library technologies. Continuous professional development and user training programmes are therefore essential for maximizing the benefits of ICT.

5.3. Lack of Comprehensive ICT Policies

The absence of well-defined ICT policies and strategic planning is another significant challenge, particularly in developing countries. Effective ICT implementation requires institutional policies governing technology acquisition, digital preservation, cybersecurity, data management, software licensing, electronic resource management, and user access. Without clear ICT policies, libraries often face difficulties in planning, implementing, and sustaining technology-based services. Strategic ICT policies are therefore essential to ensure the efficient management and long-term sustainability of digital library initiatives.

5.4. Cybersecurity and Data Privacy Issues

Modern libraries manage large volumes of digital information, including bibliographic records, institutional repositories, user databases, and subscription-based electronic resources. As a result, they are increasingly exposed to cybersecurity threats such as malware, ransomware, phishing attacks, unauthorized access, and data breaches. Protecting digital assets and safeguarding users' personal information have become critical responsibilities of libraries. Implementing robust cybersecurity measures, regular system updates, secure authentication mechanisms, data backup procedures, and privacy policies is essential to ensure the security and integrity of library information systems.

5.5. Inadequate Maintenance of ICT Equipment

The sustainability of ICT-based library services depends largely on the regular maintenance of technological infrastructure. Many libraries lack adequate financial resources, technical personnel, and maintenance policies to ensure the proper functioning of ICT equipment. Computers, servers, scanners, printers, networking devices, and other hardware require periodic servicing, software updates, and timely replacement. The absence of a systematic maintenance culture often results in equipment failures, service interruptions, and reduced operational efficiency.

5.6. Rapid Technological Obsolescence

ICT technologies evolve rapidly, making hardware and software obsolete within a relatively short period. Libraries must continuously upgrade their technological infrastructure, library management systems, and digital platforms to remain compatible with emerging technologies and user expectations. Frequent upgrades require additional financial investment and continuous staff training, posing a significant challenge for many institutions.

5.7. Power Supply and Internet Connectivity Issues

Reliable electricity and stable Internet connectivity are essential for the successful delivery of ICT-based library services. In many regions, frequent power outages, inadequate backup power facilities, and slow or unreliable Internet connections adversely affect access to digital resources, online databases, and cloud-based library services. These challenges reduce the effectiveness of library automation and negatively impact user satisfaction.

5.8. Resistance to Technological Change

The successful implementation of ICT depends not only on technological infrastructure but also on the willingness of library staff and users to adopt new technologies. Resistance to change, inadequate awareness, fear of technology, and reluctance to learn new systems may delay the successful adoption of ICT-based services. Continuous orientation programmes, training workshops, and change management strategies are necessary to encourage positive attitudes towards technological innovation.

5.9. Digital Divide Among Users

Although ICT has expanded access to information, disparities in digital literacy, access to personal computers, smartphones, and reliable Internet connectivity continue to exist among library users. Such inequalities create a digital divide that limits equitable access to electronic resources and digital library services. Academic libraries should therefore organize information literacy and digital skills programmes to ensure inclusive access to information resources.

6. POWER SUPPLY

A reliable and uninterrupted power supply is fundamental to the successful operation of ICT-based library services. The performance of computers, servers, networking devices, digital repositories, and other electronic equipment depends entirely on the availability of electricity. Frequent power interruptions, voltage fluctuations, and inadequate backup power systems can disrupt library operations, restrict access to electronic resources, and reduce the effectiveness of automated services. Therefore, academic and university libraries should ensure uninterrupted power through appropriate backup facilities such as Uninterruptible Power Supply (UPS) systems, generators, and renewable energy solutions to maintain continuous access to digital library services.

7. OTHER CHALLENGES FACED BY LIBRARY PROFESSIONALS

In addition to financial and infrastructural constraints, library professionals encounter several challenges while implementing and managing ICT-based library services.

7.1. Insufficient Internet Bandwidth

High-speed Internet connectivity is essential for accessing online databases, e-journals, digital repositories, cloud-based applications, and other web-based library services. Limited bandwidth results in slow access to electronic resources, delays in information retrieval, and reduced user satisfaction.

7.2. Rapid Technological Change

The continuous evolution of information and communication technologies requires libraries to upgrade their hardware, software, and digital platforms regularly. Keeping pace with emerging technologies demands continuous investment and strategic planning, making technology management a significant challenge.

7.3. Continuous Professional Development

Library professionals must continuously update their ICT competencies to effectively manage modern library systems and digital services. Regular training programmes, workshops, certification courses, and professional development initiatives are essential to enhance their technical knowledge and adapt to technological innovations.

7.4. Management of Multiple Systems and Platforms

Modern libraries often operate multiple software applications and digital platforms, including Integrated Library Management Systems (ILMS), institutional repositories, discovery services, digital libraries, authentication systems, and electronic resource management platforms. Managing, integrating, and maintaining these systems require specialized technical expertise and additional institutional resources.

7.5. Accessibility for Users with Disabilities

Academic libraries are responsible for providing equitable access to information for all users, including persons with disabilities. Ensuring accessibility requires compliance with universal design principles and accessibility standards by providing screen-reader compatibility, accessible websites, alternative formats, assistive technologies, captioned multimedia resources, and other inclusive digital services.

7.6. Space Management

Although digital resources reduce the need for physical storage, libraries must effectively balance traditional print collections with expanding digital infrastructure. Providing sufficient space for computer laboratories, collaborative learning areas, digital learning centres, and technology-enabled study environments presents an ongoing challenge in library planning and resource allocation.

7.7. Collaboration and Partnerships

Successful ICT implementation requires strong collaboration with technology vendors, software developers, academic departments, research organizations, library consortia, and other libraries. Establishing and maintaining these partnerships can be complex but is essential for resource sharing, technological support, and service innovation.

7.8. Sustainable Financial Support

The implementation and maintenance of ICT infrastructure require continuous financial investment for hardware procurement, software licensing, network infrastructure, electronic resource subscriptions, cybersecurity, equipment maintenance, and staff training. Securing sustainable funding remains a major challenge for many academic and university libraries.

CONCLUSION

Information service skills have become increasingly important in the Information and Communication Technology (ICT) era, as they enable library professionals to organize, manage, retrieve, and disseminate information efficiently in both print and digital formats. To maximize the effective use of academic library resources, students and other library users should receive appropriate training in computer applications, information literacy, digital literacy, and information retrieval techniques. Such training equips users with the skills required to identify, evaluate, access, and utilize information resources effectively for learning, teaching, and research.

The rapid development of ICT has fundamentally transformed the methods of information storage, organization, retrieval, preservation, and dissemination. Traditional library services have evolved into technology-enabled services that provide seamless access to electronic resources such as e-books, e-journals, online databases, institutional repositories, and digital libraries. Consequently, academic libraries have shifted from being repositories of printed materials to becoming dynamic digital knowledge centres that support education, research, and lifelong learning.

The emergence of ICT has also redefined the competencies required of library professionals. Modern librarians must acquire comprehensive knowledge of digital information management, Integrated Library Management Systems (ILMS), electronic resource management, metadata standards, digital preservation, information retrieval systems, research support services, and emerging technologies such as artificial intelligence and cloud computing. Continuous professional development through training programmes, workshops, seminars, and certification courses is essential for keeping pace with technological advancements and meeting the evolving expectations of library users.

The effectiveness of an academic library largely depends on the quality of the information services it provides and the competencies of its library professionals. ICT has introduced a new paradigm in librarianship by improving operational efficiency, expanding access to global information resources, and enabling innovative, user-centred services. Therefore, library professionals must continuously update their technological knowledge and professional skills to remain relevant, deliver high-quality information services, and effectively support teaching, learning, research, and knowledge creation in the digital age.

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