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# SMART LIBRARIES AND NEXT GEN-LIBRARIES: ANALYTICAL STUDY ACCORDING TO 4.0 LIBRARIES STANDARDS

Library & Information Science

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## ABSTRACT

A library equipped with "Smart Library" technology can serve patrons without any staff present. Remote control of library facilities, including automatic doors, lighting, self-service kiosks, and public computers, is made possible by the technology. During self-access hours, Smart Library members can use the self-service kiosks to: Borrow, return, and renew library books. Make copies, print, and use Wi-Fi when using public computers. Modernization, automation, and digitization are the three stages that characterize the evolution of libraries. A smart library is an information hub that connects to networks of other libraries and their services in a wider global information ecosystem. Being smart entails measuring the creation of new library e-tools and services against actual resources and users. In the modern day, a library outfitted with "smart library" technology is to be permitted to operate unattended and be freely accessible to library users. Automatic doors, lights, auto-services pavilions, and any computers are only a few of the technological features that allow for operating and monitoring library buildings. It grants access to materials 24 hours a day, 7 days a week, allowing readers to utilize the library whenever it is most convenient for them. The "smart library" needs "smart librarians" that provide user-centric and user-friendly service. Due to the evolving needs of its customers, the function of librarians and libraries is changing in the modern period. Three elements are necessary for a smart library to function effectively: smart patrons, smart employees, and smart services. Briefly, the author discusses the development of "smart librarians," This work, which is entirely theoretical in nature and concentrates on smart libraries, is discussed by the author.

## KEYWORDS

Smart Libraries, Next Gen-Libraries, 4.0 Libraries, Libraries of 21 Century

### 1.0 INTRODUCATION

The Smart Library (SL) is a library that has no printed books, no shelves, no physical loan items, and just huge servers that are kept cool and connected to digital archives with copying and distribution equipment via digital networks. The SL is that anyone with a computer and access to the library networks can access not only the books and other resources housed there, but also a variety of information accessible through local, regional, and international networks like the internet and intranet, all without physically visiting the library. The library is viewed as a source of information by knowledgeable readers with an interest in any subject. Library services and materials have seen significant changes since the Internet's inception. In the information era, we are just getting started. Academic institutions are the superstructures of our society. The brain, or the very heart, of these organisations is the library. The finest libraries focus on maximising the utilisation of available space, services, and service visibility. How to establish standards for academic libraries is a major challenge for NAAC and UGC, two strong regulatory bodies for higher education. A library is considered to be "smart" if it has smart patrons, smart e-resources, smart spaces, smart Wi-Fi, green eco-environments, smart services, and smart librarians. The author of this article talked about a library where all books are kept digitally, processed digitally, and accessed through a computer running common digital software (Dspace/E-Print), content management software, and a web-based OPAC.

### 2.0 SMART LIBRARIES

The green library has similarities to the idea of the smart library, particularly in terms of the importance of information and the fusion of people, technology, and institutions. This discovery serves as the basis for the paper's development of a new definition of the "smart library," which may be divided into four categories:

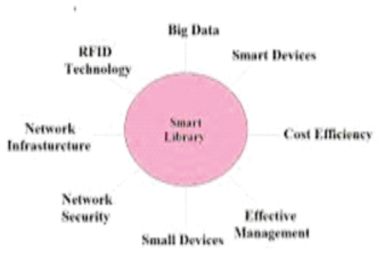


**Image 1 Smart Library**

"smart services," "smart people," "smart places," and "smart governance." However, the idea of a "smart library" does not represent a singular model or project but rather a procedure, a more creative and imaginative method of carrying out tasks that is less linear and structured.

**Concept of Smart Libraries:** The idea behind the Smart Library (SL) is to provide all library services to its clients faster, better, and more intelligently by utilising digital technology in various software programmes with the aid of the Internet and Intranet. The author claims that the Smart Library (SL) is a library that offers smart readers AI and IoT-based services. The SL (Smart Library) produces: creating an atmosphere that is smart, mobile access, production of new knowledge, dynamic content In an adaptable manner, intelligent content creation technology, knowledge detection that is clever, clever interface (organization of interaction with the user), clever services (e.g., personal informing, mobile application usage).

**Elements for Smart Library:** High-speed Internet, uninterruptible power supply, meta data, RFID, bar codes, smart cards, software to detect plagiarism, IR software, Wi-Fi/Li-Fi on library property, ETD databases, green library building, own library website, library blog, sound budget, standard ILMS, e-library orientation, and electronic resources are some of the other features that are available (e-databases-books, e-journals, e-reference tools, CD, DVD, audio sets, e-newspapers, and Mandalay reference tools,) There are many tools available, such as a scanner, printer, digital Xerox machine, CC camera, sensor, library digital gate, and more.

**Functions of Smart Library:** The functions of the Smart Library (SL) are to create collections in a systematic manner, save and organize knowledge and information digitally, and make them accessible from a variety of locations at reasonable prices over the internet. The following are the core capabilities of Smart Library (SL): Access to online learning resources should be made available to readers, together with web-based library services. It makes a variety of digitally accessible publications for educational purposes available via ICT.

**Revolutionary Changes in Library Systems:** The notion of the library system can be revolutionised, and it can be turned into a digital library, thanks to the convergence of digital information storage technology and ICT. A conceptual model for a national, centralised smart library system has been created and put into action. The whole operation of a library is automated in a smart library, and all of the

information is digitally preserved and made available to all public, academic, and research institution libraries online. Through a search function, a user can obtain any information from any e-books, newspapers, magazines, journals, and back issues. The limitation of uneven library resource sharing across institutions in rural and urban areas will also be eliminated by this new paradigm.

**2.1 A framework for the creation of smart libraries:** For the e-marketing and advocacy of academic libraries, LIS created new products and concepts to address the demands of new digital resources and technological issues. Some of these ideas made an impression and were effective insofar as they were shaped, like;

**Information commons:** This term is used to define particular tools and services, such as free online digital libraries and journal-based open access databases. For the marketing and promotion of all kinds of libraries, it is a potent idea. It implies that each reader will obtain information from centres for common knowledge or information.

**Learning Centers:** It should be the focal point of the institution, organisation, or city and well-decorated inside with resources and outside with performance on campus, such as learning commons, media commons, and, most importantly, learning centres.

**Green Libraries:** These are libraries designed to have as little negative impact on the environment as possible while maximising the quality of the indoor environment. This is accomplished by carefully choosing the location, using natural building materials and biodegradable products, conserving resources (water, energy, and paper), and disposing of waste in a responsible manner (recycling, etc.). The larger green library buildings and environmental movement include green libraries.

**Global Library:** The library's goods and services ought to be widely advertised to both small and large libraries everywhere in the world. This means that a comprehensive strategy should be developed for library management and marketing ("global library").

**2.2 Dimensions of Smart Libraries:** The SM is broken down into seven categories: smart services, smart people and living, smart government, smart environment, smart economy, and smart mobility. Four of the seven dimensions—smart services, smart people, smart environments, and smart governance—have been highlighted in this article.

**Smart Services:** The application of the "spirit of innovation" of smart readers to the creation of contemporary library services is the first dimension that can be said to exist inside it. SL technologies like RFID, mobile and wireless access, remote assistance, semantic web, AI, IoT, voice and image recognition, sensors, CCTV, natural language processing, augmented reality, and other technologies can all be used to bring SL services to readers and offer new ways for them to enjoy cultural material. In a larger information ecosystem, the smart library is a hub for information that is connected to other libraries and urban services. But these cutting-edge products and services are only smart if they are easy to use and focused on the customer.

**Smart Readers:** It denotes smart living in relation to buildings and entails things like building monitoring and control, monitoring of electrical devices, personal safety, and a healthy atmosphere for the workers as well as for the general public. Smart Library readers should be adaptable, imaginative, and tolerating; they should also value globalism, female emancipation, and civic engagement. There are two categories of intelligent readers: community and knowledge creation. Smart residents, Smart Library patrons, and library personnel make up a smart community. The library staff is made up of intelligent individuals who manage the creation and analysis of information and data (data librarians) or the management of discovery tools. The second tier of the smart reader community has the potential to contribute to the creation of new knowledge in the smart library.

**Smart Place:** The library is described in the third dimension as both a structure and a location. This component can be broadly characterized as "smart environments" and environmental monitoring. To allow readers to sit comfortably and read effectively, the location should be technologically and environmentally smart.

**Smart Governance:** Smart governance is the final component of the Smart Library. It encompasses all the components that, in the state or nation, symbolize the idea of "smart government," which includes things like cooperation, partnership, engagement of citizens, and participation. The patron of the library becomes an active participant in the management and administration of the library. Shared obligations between the library staff, the neighborhood around the library, and other institutions are the foundation of smart governance. We refer to this as "collective intelligence."

## 1.0 NEXT GEN-LIBRARIES

One of the newest developments in library computing is the use of "next-generation libraries," a practice that would be considered intelligent if it were carried out by a human. The development of computer systems or computers that think, act, and in fact rival human intelligence is the ultimate promise of artificial intelligence in libraries, and this plainly has significant ramifications for librarianship. Artificial intelligence is being widely used in libraries nowadays. In addition to virtual reality for immersive learning, they also include expert systems for reference services, robots that can read books and bookshelves, and others. Although it may seem like integrating artificial intelligence into libraries will alienate librarians from their patrons, this is certainly not the case. Instead of replacing librarians' work, AI will likely enable libraries to do more. Their ability to provide services will be improved. In this way, AI will significantly enhance library operations and services, thus upgrading and enhancing the relevance of libraries in an ever-changing digital world. Humans rely on deep cognition, but artificial intelligence relies on perceptual perception. The strength and benefit of artificial intelligence lie in the fact that machines are capable of efficiently identifying patterns at a scale and pace that humans are not. The growing demand for information access, which libraries are the primary source of, has recently aided in societal progress. Because of the rapid advancement in computer technology and software applications, particularly artificial intelligence, there has been a paradigm shift in the format and dynamics of information and knowledge, which has caused libraries to experience a demand for the corresponding supply of the same technologies. The supply of information and services by libraries may become obsolete in this day and age if they don't start to make use of the new technology. Many industries, including the military, business, education, gaming, libraries, and medicine, use artificial intelligence. It was first proposed in 1990 to build AI systems for libraries. For the benefit of both library personnel and users, these smart library systems offer knowledge-based, AI-based services (Asemi & Asemi, 2018). A few examples of how artificial intelligence is used in library systems include descriptive cataloguing, subject indexing, reference services, technical services, shelf reading, collection building, and information retrieval systems. These transcend the realms of knowledge-based services and natural language processing (NLP). Making a smart library is not just a possibility—it's only a matter of time, thanks to advances in artificial intelligence programming. The creation of intelligent systems that can think and act like librarians—library robots—by academics and specialists in the field of artificial intelligence is supported by Corke's (2013) paper, which supports this claim.

### 3.1 The Use of Artificial Intelligence in Next Gen -Libraries

Next Gen-Libraries have accumulated and maintained a variety of information resources throughout different ages to satisfy the information needs of their user groups. A library was similarly technically described as a feature of the physical structure where books were maintained for reading and other uses. Due to the fact that virtual libraries don't have physical walls and that services can be provided to users from a distance, the definition of a library today goes beyond the actual structure and instead focuses on the collections and services provided. Consequently, libraries have investigated, incorporated, and transformed through numerous technological revolutions of clay tablets, stones, papyrus, parchments, paper, microforms, computers, the Internet, virtual libraries, library 2.0, and so forth in order to meet the dynamic information needs of their clientele and maintain their relevance in this constantly evolving technological society. It's interesting to note that artificial intelligence is the modern technology that has flourished with great potential and prospective uses in libraries. Given that Corke (2013) predicted that artificially intelligent systems (robots) will play a significant role in technology in the twenty-first century, it is necessary to investigate this technology, as well as its advantages and disadvantages, in order to fully capitalize on its wealth of benefits for innovative and optimal service delivery in libraries. In a nutshell, the main benefit of using artificial intelligence

systems in libraries is that they are less likely to make mistakes than humans are; they can work nonstop for 24 hours a day, seven days a week; this frees up librarians' time for other tasks. In the end, processing library items will be done more quickly, more efficiently, and effectively, improving library service delivery at all levels since computers can work efficiently at scales and speeds that are faster than human capabilities. This chapter will concentrate on the theories, underpinnings, applications, and developments of artificial intelligence in libraries; the use of robots; virtual, augmented, and mixed realities in libraries; and the promises, advantages, and disadvantages they represent for future libraries.

### 3.2 Robots in Next Gen-libraries

One of the current trends in the use of artificial intelligence in Next Gen libraries is the use of robots for library tasks. The hallmark of the digital age is easy access to the massive amount of information available on the internet. But much of the world's knowledge is still contained within the written pages of books. These books are difficult and frequently time-consuming to trace in libraries. Robots for book recovery and shelving are now being created. It obtains full access to printed materials stored on shelves and removes books from the shelf and transports them to a remote scanning facility. Stone (2019) asserts that although this technology has long been around and has been employed in manufacturing, it is only recently that it has been implemented in libraries. The bookBot is a system for delivering books that uses the library's computerised catalogue to find books for patrons on demand. When a request is made, one of the bookBot's robotic cranes quickly locates the item on the shelves and delivers it to the responsible unit for later delivery to the user inside or outside the library, depending on whether the user plans to borrow the item. Radio Frequency Identification (RFID) tags are being incorporated into libraries' collections. Using wireless, handheld RFID scanners/readers, these tags—which take the form of barcodes—contain unique identifying labels for each book in the library and are used to quickly scan the collection. Despite being more accurate than humans, these intelligent systems are expensive to create and maintain. The technicalities entailed will include drawing a precise map of the complete library for the robot's movements as well as computing and processing the distance between the robot and an obstacle (shelf, books, tables, or users) to foresee changes in direction. It should be noted that museums and archival facilities are also looking into how artificial intelligence may help them deliver services to visitors more effectively. Given what has been said thus far, it is clear that libraries and information centres stand to benefit much from the practical employment of robotics and artificial intelligence in museums, libraries, and archives. This technology makes library operations more efficient and effective and makes it easier for the library to connect, whether it's used for library instruction (education), knowledge organization (shelving and shelf-reading), information retrieval and delivery, or making information materials accessible.

### 3.3 The Advantages of AI in Next-Generation Libraries

Generally speaking, artificial intelligence is installed in machines or computers to reduce human casualties in wars, hazardous work environments, car accidents, plane crashes, fire explosions, or disasters as a result of human error. Furthermore, artificial intelligence facilitates human work with greater speed, efficiency, and effectiveness in work environments such as next-generation libraries. In the classification, cataloging, and indexing of library materials, artificial intelligence and expert systems are used. Through the use of optical character recognition and neural networks, the system is able to obtain the bibliographic records of books and classify them accordingly. Natural language processing can be used to reduce language barriers. For instance, one has to learn Chinese in order to study in China. The availability of Natural Language Processing systems in their libraries can assist foreign students to translate and understand Chinese. Moreover, natural language processing systems can also assist in searching for information in multilingual databases. In addition, expertise is needed in the provision of qualitative service delivery in libraries. As a result, artificial intelligence and expert systems will improve the performance of library services, eliminate human errors and defects, and will most likely perform tasks faster than a human. Next generation libraries could facilitate the searching and retrieval of new media with greater efficiency and effectiveness by their patrons and introduce them to new material they may never have found otherwise. In addition to convenience and entertainment value, using artificial intelligence to suggest similar materials could also help library clients who are carrying out research by combing through the library database in an instant. Generally speaking, artificial intelligence systems can read to you, inform you, advise you, teach you, correct your mistakes, and patiently respond to your myriad demands. Thus, artificial intelligence holds great potential for library and information services.

A good librarian can deliver a far more customized service by engaging with a user, possibly leveraging time saved by artificial intelligence.

The following is a succinct summary of the advantages of artificial intelligence in libraries:

1. Artificial intelligence in libraries can increase research discoverability, which can increase faculty members' research output.

2. Time Bridge: Constant access to informational resources and services.

3. Bridge in Space: The introduction of digitization, electronic copies, and the employment of robotic cranes that store and retrieve books from a small off-site storage location have reduced the space used by piles of books, journals, bound newspapers, and other information items.

4. Efficiency maximization: This relates to the effectiveness of library operations, including content selection and procurement, technical services, circulation services, reference services, serial management, etc.

5. Greater efficiency thanks to enhanced customer service and the abolition of human error in library operations.

6. Minimization of Effort: The application of artificial intelligence systems in libraries can reduce the amount of time that librarians spend on technical services, circulation services, reference services, serial management, etc.

7. An enhanced and engaging user experience when providing library services.

### 3.4 Using AI in libraries: Challenges and Opportunities

Most libraries do not now use artificial intelligence technologies in their daily operations. Artificial intelligence system implementation in libraries has the following drawbacks:

1. A lack of technical know-how among library staff to use and operate artificial intelligence systems.

2. Inadequate funding for the development or acquisition of artificial intelligence systems in libraries Since the budgets for hardware and software are frequently tight, there's always a constraint to the type of system the library can purchase or develop.

3. Artificial intelligence systems in libraries have high system development and maintenance costs.

4. Erratic power supply to power artificial intelligence systems in libraries, especially in developing countries.

5. Inherent complexities of expert and artificial intelligence systems' development

6. Limited natural language skills

7. Intelligent systems don't have that common base of human knowledge, which limits the kinds of tasks they can do in a big way.

8. The level of effort and technical expertise required to develop artificial intelligence systems for libraries The level and nature of effort that must be invested to develop an intelligent library system is directly proportional to the power and complexity of the system. This implies that the more intelligent the system is, the more effort that must be invested therein. Currently, the required skilled personnel with expensive development tools or techniques needed to develop sophisticated intelligent systems in libraries are lacking or costly, hence, the lack of such systems in libraries.

9. Library automation vendors have a scarcity of artificial intelligence experts. The field of artificial intelligence is complex and thus requires

specialised knowledge in that aspect far beyond the development of conventional library automation systems. So, this means that libraries will have to hire new people to work in that area before they can do any big, wide-scale work on artificial intelligence systems.

### 3.5 Future Plans for Next Generation Libraries and Smart Libraries

The development of shelf reading robots demonstrates that it won't be long until new applications based on artificial intelligence are widely used in libraries of the future. Similar to the introduction of the electric light bulb, it seemed almost magical, and no one could have imagined that it would result in the creation of telephones, radios, TVs, computers, and other electronic devices. The next quasi-magical phenomenon that has emerged is artificial intelligence. We have yet to fully understand how artificial intelligence will be used in not only libraries but in every aspect of our life, just like when electricity first began to be developed. The library will undergo a major transformation in the future thanks to Next Generation and Smart Libraries. What will happen to libraries and librarians once computers are able to read books? He gave the GeoDeepDive tool, which uses AI algorithms to extract data from journal articles, tables, and figures, as an illustration. The time is shifting! Because a machine would have already read all the books and be more adept at analysis and decision-making, librarians may not need to read a library book to gather information to inform their users or make a decision. When artificial intelligence can answer a query for us in a matter of seconds, we won't spend hours on library computers doing research. Furthermore, we would not seek information from a human librarian if artificial intelligence could provide a more accurate response in a much shorter amount of time. The future of the Smart Library will be totally automated. Future libraries will use robots and intelligent devices to complete duties like reference services, shelf reading and organisation, circulation operations (registering, charging, and discharging of materials), producing library data, cataloguing and categorization, etc. The library as we currently know it will undergo a significant transformation thanks to artificial intelligence. The promise is a perfect librarian who can answer reference questions from users using speech recognition, natural language processing, and neural networks; quick, efficient, and effective processing of library items; and cutting-edge service delivery to clients, even from remote locations. Future libraries will be those that respond to and adopt new technology.

## 2.0 SMART LIBRARIES STANDARDS

A predefined set of guidelines, conditions, or specifications governing terminology definitions, component classifications, material, performance, or operation specifications, procedure definitions, or quantity and quality measurement when describing materials, products, systems, services, or practices.

### 4.1 Resource Description Formats

The W3C standard for online data is Resource Description Format (RDF). It enables data to be "grounded" in semantic descriptions of the data and to be linked anywhere. RDF's basic data model is relatively straightforward. A group of triples have been arranged into an RDF graph. A general framework for representing related data on the web is the Resource Description Framework (RDF). Metadata is described and exchanged using RDF statements, allowing for the standardized sharing of data based on relationships. Multiple sources of data are combined using RDF.

**BIBFRAME:** The Library of Congress created BIBFRAME to lay the groundwork for the future of bibliographic description, both online and in a larger networked environment that is based on Linked Data methods. One of the initiative's main goals is to determine a transition path for the MARC 21 formats while maintaining the robust data exchange that has allowed resource sharing and cost-savings in cataloguing in recent decades.

**Encoded Archival Description (EAD):** The Technical Subcommittee on Encoded Archive Standards of the Society of American Archivists, in collaboration with the Library of Congress, maintains the Encoded Archival Description (EAD), an XML standard for encoding archival finding aids.

**The Extended Date/Time Format (EDTF):** The Library of Congress developed the Extended Date/Time Format (EDTF) with input from communities with comparable interests as well as cooperation from the bibliographic community. It outlines the characteristics that a date/time string should have, characteristics that are helpful for a variety of purposes.

**Metadata Authority Description Schema (MADS):** A set of authority elements called the Metadata Authority Description Schema (MADS) is an XML schema that can be used to give metadata about terms, events, and agents (people and organizations) (topics, geographics, genres, etc.). The Metadata Object Description Schema (MODS) and MADS work together to give metadata about the authoritative entities used in MODS descriptions. The Network Development and MARC Standards Office of the Library of Congress, as well as user feedback, assist the MODS/MADS Editorial Committee in maintaining the standard.

**MARC Standards:** The Network Development and MARC Standards Office's MARC 21 formats and associated code lists are described in summary on this page. The format's official standard is the full online version. All Updates (identified by number, month, and year) are incorporated into the current base edition. Twice a year, the full online format is updated. Prior to 60 days after they are published in the full online MARC format documentation, format modifications that have occurred since the last format update should not be used in record

**MARC XML:** A straightforward XML structure containing MARC data serves as the foundation of the MARC XML framework. When complete MARC records are required, this base schema output can be used. It can also serve as a "bus" to allow MARC data records to undergo additional transformations, such as conversion to Dublin Core and/or processes like validation. Minor changes to MARC21 won't require updating the MARC XML schema. The MARC semantics are still there in the schema.

**The Metadata Object Description Format (MODS:** The Metadata Object Description Format (MODS) is a bibliographic element set schema that can be used for many applications, but is especially useful for library applications. With help from users, the Library of Congress's Network Development and MARC Standards Office keeps the standard in place.

**VRA Core:** A data standard for the description of works of visual culture and the pictures that support them is the VRA Core. The Visual Resources Association collaborates with the Network Development and MARC Standards Office of the Library of Congress (LC) to host the standard.

### 4.2 Digital Library Standards

To facilitate the long-term preservation of digital content, a data dictionary and accompanying XML standards are required. Technical metadata for text-based digital objects are described in TextMD (Technical Metadata for Text), an XML schema.

**ALTO:** When updating ALTO schemas from version 1 to version 2, whole numbers for modifications that violate backward compatibility will be used, and decimals for updates that won't (2.0 to 2.1). The namespace will only alter itself in major versions (ns-v2 to ns-v3). The schema files will be stored in the following locations: At www.loc.gov/alto, each major version will have its own subdirectory, and the current schema (minor version) can be found there under the name alto.xsd.

**Audio MD and VideoMD:** Technical metadata for audio- and video-based digital objects is described by the XML Schemas audioMD and videoMD, respectively. In objectCharacteristicsExtension> in PREMIS version 2.0 or later, they are frequently used as extension schemas within the Metadata Encoding and Transmission Standard (METS) administrative metadata section. They can also be added to other structures, such as Material eXchange Format (MXF) files, as embedded metadata or used independently as metadata documents.

**METS (Metadata Encoding and Transmission Standard):** The World Wide Web Consortium's XML schema language is used to define the METS schema, which is a standard for recording descriptive, administrative, and structural metadata about objects in a digital library. The Network Development and MARC Standards Office of the Library of Congress, together with the METS Board, maintain the standard, which was originally a project of the Digital Library Federation.

**MIX:** In collaboration with the NISO Technical Metadata for Digital Still Images Standards Committee and other knowledgeable parties, the Library of Congress' Network Development and MARC Standards Office is creating an XML schema for a set of technical data elements needed to manage digital image collections. The schema offers a representation for the data described in the Technical Metadata for Digital Still Images Data Dictionary (ANSI/NISO Z39.87-2006). The name of this schema is "NISO Metadata for Images in XML (NISO MIX)" at the moment. MIX is written in the World Wide Web Consortium's XML schema language. The Network Development and MARC Standards Office of the Library of Congress, along with user input, maintain MIX for NISO.

**PREMIS:** The international standard for metadata to enable the preservation of digital arte facts and assure their long-term usage is the PREMIS Data Dictionary for Preservation "Metadata." PREMIS was created by a global team of professionals, and it is supported by a number of open-source and for-profit digital preservation technologies and systems. PREMIS is used in digital preservation initiatives all around the world. The Data Dictionary, an XML schema, and supporting documentation make up the standard, which is updated and used by the PREMIS Editorial Committee.

**Text MD:** textMD is an XML Schema that details technical metadata for text-based digital objects. It most commonly serves as an extension schema used within the Metadata Encoding and Transmission Schema (METS) administrative metadata section. However, it could also exist as a standalone document. TextMD can be used within the PREMIS element objectCharacteristicsExtension> as an extension for format-specific metadata within the PREMIS preservation metadata XML Schema versions 2.0 and 2.1.

### 4.3 Information Resource Retrieval Protocols

A private information retrieval (PIR) protocol in cryptography enables a user to retrieve an object from a server that holds a database without disclosing the identity of the object being retrieved. A computer-to-computer communications protocol called Z39. 50 was created to assist information searching and retrieval in a distributed network setting. The Z39. 50 standard is continually being updated to accommodate the shifting requirements of information producers, distributors, and consumers.

**CQL:** Contextual Query Language (CQL), a formal language, is used to represent queries to information retrieval systems including online indexes, bibliographic catalogues, and information about museum collections. The language must be intuitive while retaining the expressiveness of more sophisticated languages, and queries must be human readable and writen. Traditionally, query languages have been divided into two categories: either simple and straightforward languages that lack the power to express complicated concepts, or powerful, expressive languages that are difficult for non-experts to comprehend or write (such as SQL, PQF, and XQuery) (e.g. CCL and Google). In order to handle complicated notions when appropriate, CQL aims to blend the ease of use and intuitiveness of expression for straightforward, daily queries with the depth of more expressive languages.

**SRU:** Contextual Query Language (CQL), a standard syntax for describing inquiries, is used in SRU, a standard XML-based protocol for search queries.

**Z39.50:** The resources for Z39.50, the upkeep of the Z39.50 standard, and the implementation and use of Z39.50—a client/server-based protocol for looking up data from remote databases—are all covered on this page. Information retrieval (Z39.50): Application Service Definition and Protocol Specification, ISO 23950, and ANSI/NISO Z39.50 are both referred to as "Z39.50" in this context. The two standards are equivalent in terms of technical content, and the Library of Congress serves as both the maintenance agency and registration authority.

### 4.4 Information Resource Retrieval Standards

The process of locating information system resources that are pertinent to a particular information demand from a collection of those resources is known as information retrieval (IR) in computing and information science. Searches may use full-text indexing or another type of content-based indexing.

**ISO 639-2:** The International Standard, Codes for the depiction of names of languages—Part 2: alpha-3 code, has designated the Library of Congress as the ISO 639-2/RA for the purpose of processing requests for alpha-3 language codes. According to the standards outlined in the standard, the ISO 639-2/RA receives and evaluates requests for both the addition of new language codes and the modification of existing ones. It refreshes registered language codes, keeps an accurate record of the information related to them, and regularly sends out updated registered language codes to subscribers and other parties.

**ISO 639-5:** The International Standard, Codes for the representation of names of languages—Part 5—ISO 639-5 for alpha-3 language codes, has been assigned to the Library of Congress as the maintenance authority. Language groupings and families are coded in alpha-3. While not an exhaustive list, ISO 639-2 does cover certain language families and groups. The goal of ISO 639-2's code elements for language groups and language families is to provide a way to record a document's language even when that particular language is not listed in the code table. The coding of language groups and language families in ISO 639-2 is supplemented by this section of ISO 639. However, rather than offering a comprehensive list of languages spoken worldwide, the depth and level of coding in this section of ISO 639 is meant to assist the overall language coding of the ISO 639 series of International Standards.

**ISO/DIS 25577:** The control fields and the record identifier field are regarded as elements, with the tag acting as an attribute. Data fields are viewed as elements with characteristics for both the tag and the indicators. With the subfield code acting as an attribute, subfields are considered as sub elements. The elements "leader" and "control field" are used in the Marc change schema for the ISO 2709 "record label," "record identification field," and "reference field," respectively, and the elements "data field" and "leader" are used for the ISO 2709 "data field." The extension to ISO 2709 is this schema. Two characteristics are added to indicate the content of a record: "format" to specify the MARC format and "type" to specify the type of record. It permits the use of "data fields" for all acceptable ISO 2709 tags, including 001 to 009, 00A to 00Z, and 00a to 00z.

**ISO 20775:** The XML encoded schema for the Abstract Schema for Holdings Information found in ISO 20775, Information and Documentation—Schema for Holdings Information, is made available for download and inspection on this website.

## 3.0 CONCLUSION

In a nutshell, a library is a disciplined, connected repository for all of human knowledge. Data and information can now be visualized thanks to the current trend of digital tools in every nation. Smart libraries now have additional opportunities because to this. Since any piece of information may now be found from a variety of sources, academic libraries must prepare for quick change if they want to remain relevant. The four components of the Smart Library are smart services, smart people, smart spaces, and smart governance. Changing to Smart Library will eliminate some of the dangers and drawbacks of the current library systems. By consistently implementing several smart methods and/or smart functions, it is feasible to construct a fully complete smart library (providing personalized information resources via personal account). The author's argument is that there should be one location where individuals can go to get all types of ICT-enabled services online.

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