



SMART LIBRARY MODELS FOR FUTURE GENERATIONS

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Abstract:

The concept of library in educational institutions is changing as the major constituents of library like physical books, hard copies of journals and newspapers are vanishing and a new format called e-format of these resources emerging through advents in computer science, information science and e-storage technology. The physical copies of books, journals and newspapers are thumbing and their electronic format do not need space for storage and single copy of such resource can be shared by any number of users so as the name of library has no longer validity. Hence libraries are now renamed as Resource Centres with online facility to provide resource sharing services to its registered users. Future libraries so called 'Resource Centres' do not need large reading rooms, large book/journal old volume storage area or even independent library building. Individual institutions also do not need independent libraries. There should be one Resource centre for a country or even only one for the entire world through which everybody can connect through ICT for uploading and downloading audio, text and video files so that equality in terms of accessibility to any of these types of resources can be maintained irrespective of gender, region, religion, economical background and the country origin of the users. The paper discusses the possibility of such transformation of Library into 'Universal Resource Center' and the consequences of such transformation to information sharing throughout the World and further changes in the model of costless higher education and extended opportunity for new knowledge creation. We also discuss how such transformed Libraries as Universal Resource Centres may provide automated customized service for individuals ubiquitously by incorporating smart library model.

Index Terms: Smart Library, Universal Resource Centre, E-Library Concept & Future Library System

1. Introduction:

The objective of education is enhancing knowledge by collecting and understanding useful information. The three major sources of information in systematic education system were teacher, books, and libraries. In classical education system, each learning centre called schools or colleges had teachers for teaching new concepts, specified books based on curriculum for studies, and libraries for additional reference. The library is considered as place of accumulated information for the students in any area of interest. After invention of internet, it became major source of collecting information for education and research. The advent of internet as a product of Information Communication Technology (ICT) became a boon for improvement in conventional education system and is now emerged as online ubiquitous education system. In this changing scenario of education system, the concept of classical information resources like teachers, books, and even libraries are also changing. Teachers are renamed as Learning Enabler, Books are changing the format as audio/video e-books, and the libraries are changing as Learning Resource Centres. Progress in electronic and communication technology is miniaturising the devices and increasing the speed of communication involving huge amount of data. Further progress in technology through general purpose nanotechnology, opening up many

improvements and opportunities in information communication and storage processes, along with solutions to all other problems in the society [1-7].

2. Effect of Information Communication Technology on Library Concept:

The concept of library in educational institutions are changing as the major constituents of library like physical books, hard copies of journals and newspapers are vanishing and a new format called e-format of these resources emerging through advents in computer science, information science and e-storage technology. The physical copies of books, journals and newspapers are thumbing and their electronic format do not need space for storage and single copy of such resource can be shared by any number of users so as the name of library has no longer validity. Hence libraries are now renamed as Resource Centres with online facility to provide resource sharing services to its registered users. Future libraries so called 'Resource Centres' do not need large reading rooms, large book/journal old volume storage area or even independent library building.

3. Present Status in Library Systems:

In the present system, there are many libraries in the country classified as public libraries and educational institutional libraries. These libraries provide information to the users in the form of books, newspapers, periodicals, magazines, and Journals both physical and through online services (fig. 1).

Advantages:

- ✓ Physical libraries are the repositories of books in different subjects, periodicals, newspapers, journals and their back volumes.
- ✓ Physical library provides reading room where users can study the information without any disturbance.
- ✓ Libraries provide book borrowing facility to the users so that users can take the books to their home for specified days.
- ✓ Physical libraries provide networking opportunity for the users with similar interested people in a given subject or in a given course.
- ✓ College libraries provide information to the students on any subject for their academic use.

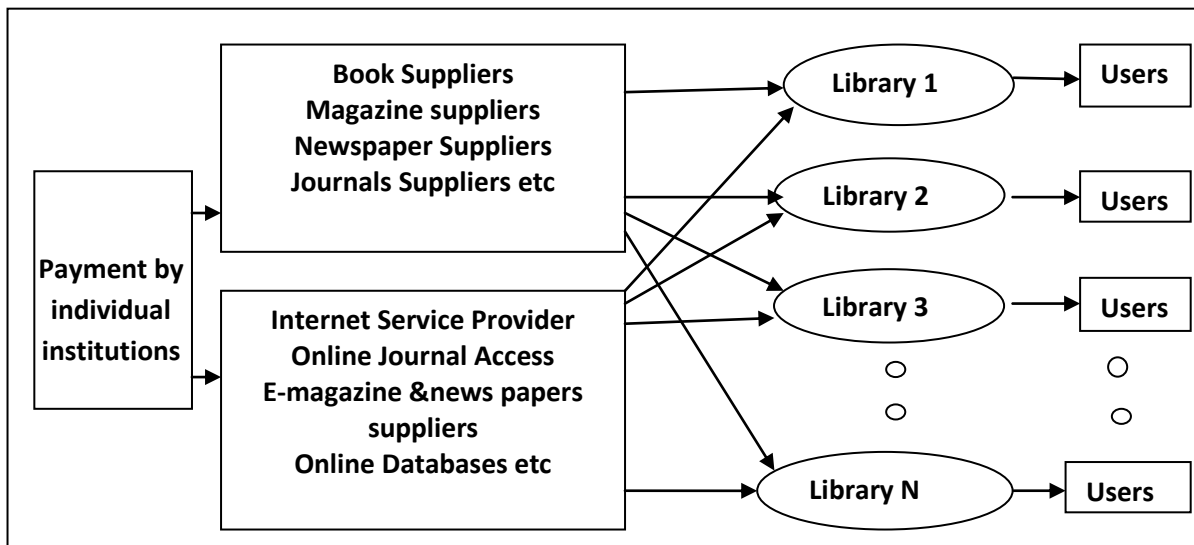


Figure 1: The conceptual model of present library system.

Benefits:

- ✓ Libraries are information resource centres. People can spend their leisure time either to enhance their knowledge or to read story books for recreation.

- ✓ Students get benefit of availability of information, research articles and databases related to in their chosen course.
- ✓ Libraries provide easy access to information to the users which reduce the cost of purchasing such resources individually by users.

Constraints:

- ✓ Restriction in information resources due to constraint in budget.
- ✓ Requirement of library building and space which cannot be expandable quickly based of enhanced demand.
- ✓ Maintaining physical copy of books in all subjects at a place is difficult and costly process.

Disadvantages:

- ✓ Cost of maintaining big libraries is high.
- ✓ Every user need different books at different time.
- ✓ Duplication of all physical books available in all subjects in every library is not possible for few users.
- ✓ Physical libraries cannot satisfy every users requirements.

The conceptual model of physical library system is shown in figure 1 where each libraries should have independent resources both physical and electronic resources to provide service to the users. Here lot of resources are underutilized or users may not get satisfactory information due to the constraints of the library. Even though several innovations and best practices like computerization of library, providing new library services through institutional website etc. are introduced in higher educational institutions [8-9], complete digitization of library information is essential for future education systems.

4. Effect of Electronic & Optical Storage Technologies on Library Concept:

The advents in information communication technology, internet, and digitization of books, periodicals, newspapers, magazines, journals, video lectures, and most of the reference books, changed the concept of conventional libraries, and provided new model of library called Resource centres. These digital resources can be stored in the library using electronic and optical storage technology or subscribed online from such service providers to reduce and avoid storage of paper based books, journals and periodicals as old volumes. By introducing digital library concept, present libraries can reduce book storage space, provide easy search & access facility through the provision of various database search facility, and decreases the cost of maintenance of libraries in education institutions. Due to huge storage ability of computers, the concept of book stack system is vanishing and as a result, huge space requirement in the library building is also vanishing. Accordingly, the employees required in the library are also decreased. Individual institutions also do not need independent libraries. There should be one Resource centre for a country or even only one for the entire world through which everybody can connect through ICT for uploading and downloading audio, text and video files so that equality in terms of accessibility to any of these types of resources can be maintained irrespective of gender, region, religion, economical background and the country origin of the users.

5. Revolutionary Changes in Library Systems – Smart Library:

Digital information storage technology and information communication technology together can revolutionize the concept of library system and can transform it into digital library. A country can take initiation in developing national electronic library system called smart library to cater the need of every citizen of the country. The conceptual model of Centralized National Smart Library System is depicted in figure 2.

In smart library, the entire library factions are automated and a central library will digitize all the information and provide such service to all public and educational & research institutional libraries in e-form. These local libraries should have electronic reading systems to retrieve any information based on search facility to the readers. Such local client libraries will become paperless systems. This concept changes local libraries as E-resource centres. A user can get access to any information through e-books, e-newspapers, e-magazines, e-journals and their back volumes through search facility. Such smart libraries have advantages in terms of reduced cost to maintain resourceful libraries without any physical copies of the resources. A developing country should have such smart libraries to cater the information need of their citizens. Depending on the model of smart library, either the national government can spend the expenditure of the National Central Smart library or through subscription fee to every local client libraries or users, the system can generate its revenue for maintenance. Table 1 contains the comparison of conventional physical libraries with national Smart library model.

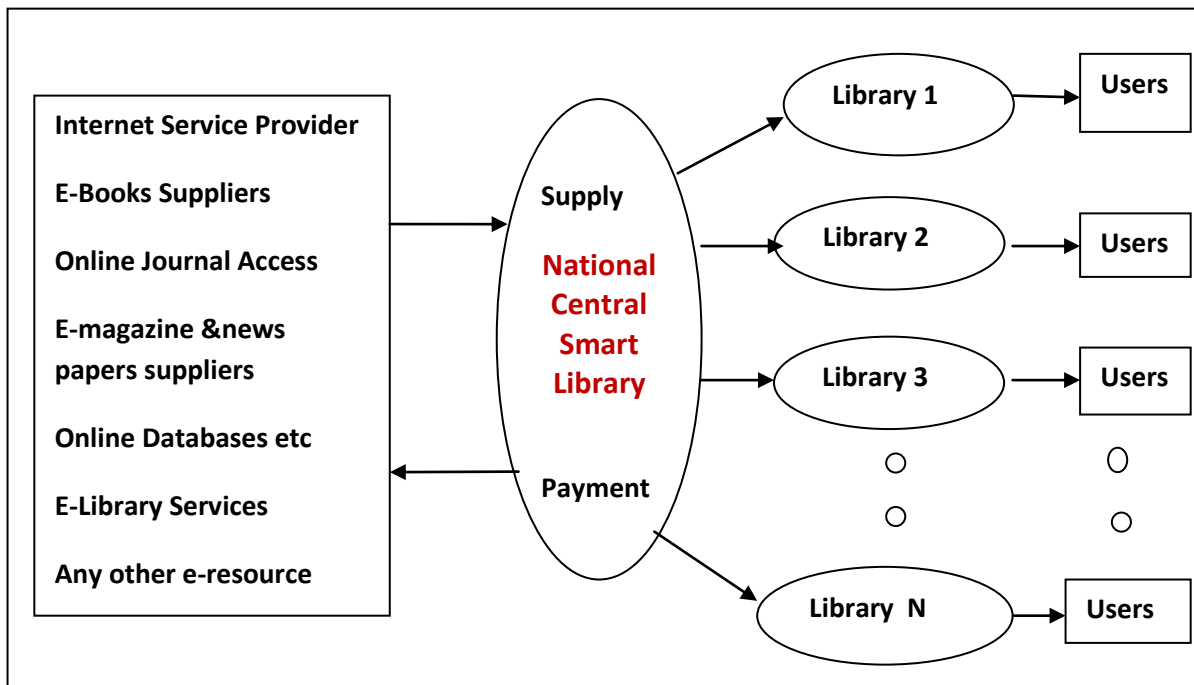


Figure 2: The conceptual model of Centralized National Smart Library system.

In smart library system, the client libraries act as electronic information resource centres networked with National Smart Library through internet or private networks. Such client libraries functioning in Educational institutions by replacing conventional libraries can be called as Information Resource Centres (IRC).IRC will provide huge benefits to educational institutions as well as users (faculty members and students) due to unrestricted information availability and reduced cost. This new model will also removes the constraint of unequal sharing of library resources between rural and urban institutions.

Table 1: Comparison between Conventional library & National Smart library systems

S.No	Conventional Library	National e-library service through Smart Library
1	Huge physical infrastructure requirement	Small infrastructure required without any book storage facility
2	More employees required to	Less employees required to maintenance

	maintenance	
3	Higher expenditure for providing more print books and journals in many subjects.	Fixed expenditure to individual Resource centres
4	Service available only during official working hours	Service can be provided 24 hours a day in the campus through wireless network.
5	Service quality is low due to non availability of many books and journals	Service quality is high due to availability of many books and journals on digital form through National network.
6	Latest editions of books and journals takes more time to reach.	Online books and journals are updated simultaneously throughout the country

6. Institutional Resource Centres:

All educational and research institutions can get the advantage of National Smart library, by becoming client library. Based on this model, students of every educational institution get equal opportunity for availing required information irrespective of their location in the country.

Advantages:

- ✓ All public libraries and educational institutional libraries will have access to equal amount of resources.
- ✓ No physical storage of books and other materials are required.
- ✓ No responsibility on purchase of new books and other resources periodically.
- ✓ Institutional resource centres act as electronic distribution centres in the premises of schools, colleges and in identified public places.
- ✓ Through high speed internet/private networks and computer terminals, IRC's provide access to huge depository of information available in National Smart Library systems through powerful search facility.
- ✓ Through wireless network, the IRC can extend its resource access facility to entire campus so that users can access IRC resources from Hostels, classrooms or any other places inside the campus.
- ✓ Removes the discrimination among the students based on geographical location and the students of public and private schools/colleges.

Benefits:

- ✓ Publics and students get access to quality and reliable information at their native place/school/college.
- ✓ The effort and the cost of developing and maintaining IRC is comparatively low.
- ✓ The benefit of accessibility of innumerable information at any time in any interested subject in audio, video and text form (multimedia) is available to every user.
- ✓ User can store the required information in their electronic storage drives for future use without any additional cost. This also avoids physical copies and contributes for sustainable environment.
- ✓ IRC provides complete solution to any type of users information resource requirements.
- ✓ Using advanced information communication technology, IRC supports equality in terms of information resource distribution in the society.
- ✓ Contributes fast national development by supporting the researchers to increase national research output.

- ✓ IRC supports and contributes for economical, social, political and scientific development of the country.

Constraints:

- ✓ Availability of high speed internet connectivity or private networks in the entire country.
- ✓ Decision and investment on creation of National Central Smart library by the country government.
- ✓ Changing the conventional brick and mortar libraries to click and mortar Information Resource Centre is difficult due to initial resistance from the users.
- ✓ Changing mindset of people initially to utilize new system.
- ✓ Educating the people to use new system.
- ✓ Changing the mindset of publishers to convert their publications for online open access system.

Disadvantages:

- ✓ High investment at initial stage
- ✓ Existing investment on physical resources are going to be waste
- ✓ The profit for publishers will decline.

7. Concept of Universal Resource Centre:

Universal resource centre is considered as an ideal library with ideal characteristics. It should contain all information for everybody from everywhere. Characteristics of an ideal business system [10-11], an ideal education system [12-14], an ideal technology [15] are identified and discussed for realizing such systems in practice, Similarly, ideal characteristics of an energy system [16], a banking system [17], an ideal strategy [18] and an ideal software [19] are also studied. The Universal Resource Centre is a concept for integrated information system for entire world and even for entire universe to refer, retrieve, manipulate, store, and share any kind of information of any kind including academic, research and development, business, and governmental systems. Figure 1 shows the model of such Universal Resource Centre and table 1 lists the characteristic features of Universal Resource Centre.

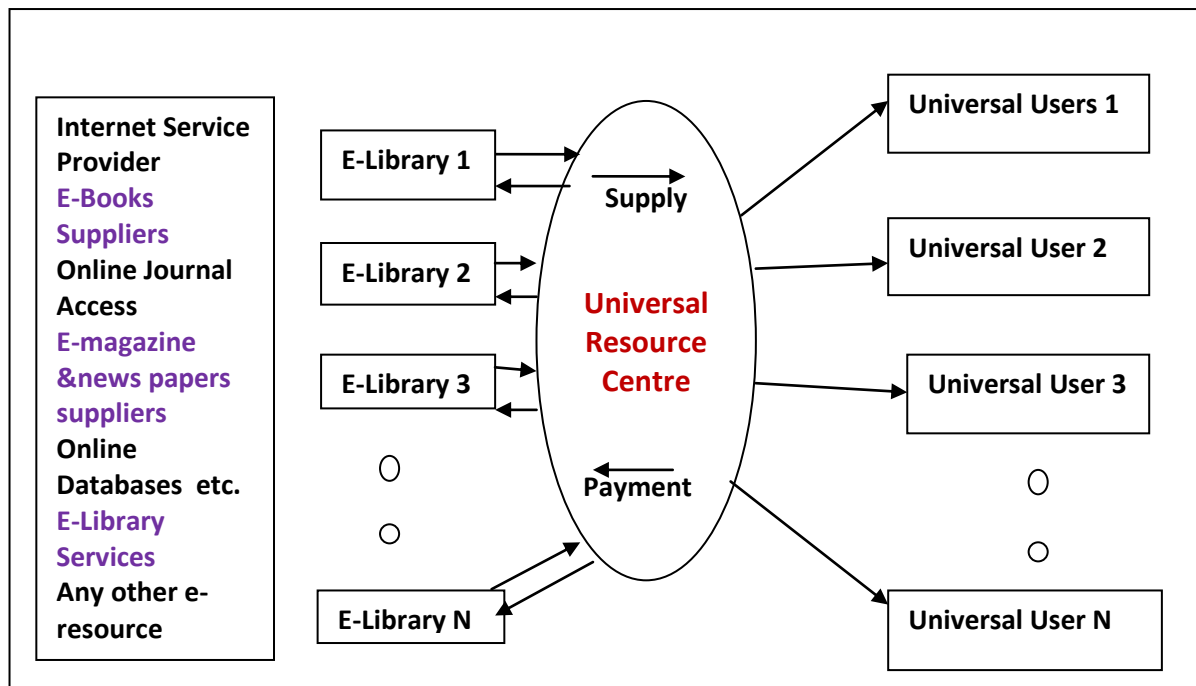


Figure 3: The conceptual model of future e-library system (Universal Resource Centre).

Table 2: The characteristics of Universal Resource Centre compared to Ideal library.

S.No	Characteristics of Universal Resource Centre	Characteristics of Ideal Library
1	Universal information resources	Infinite information resources
2	Information Access to every registered candidate of the world at very nominal annual fee	Free information access to everybody in the universe
3	Data & Information uploading facility for every registered member	Data & Information uploading facility for every user
4	Advanced automated system with minimum employees	Advanced automated system with no employees
5	Inter-connected local libraries to provide universal service.	One library for entire universe

8. ABCD Analysis of Universal Resource Centre:

ABCD listing and ABCD framework are two models of qualitative [20-24] and quantitative ABCD analysis [25-31] respectively. In this section, we have used ABCD analysis for qualitative listing of advantages, benefits, constraints and disadvantages from business service providers and customer's point of view.

Advantages:

- ✓ An integrated source of information for entire universe.
- ✓ A subscriber can get any information ubiquitously i.e., anywhere, any time and any amount of time in the entire universe.
- ✓ Every registered member can upload any piece of information.
- ✓ Sharing of information online through such smart system decreases inequality between people of different regions of different country due to the fact that information is intangible resource.
- ✓ URC supports paperless education system which supports environmental sustainability.
- ✓ Every country governments can pay the annual subscription charges so that information for education and research for individuals can be free.
- ✓ Bargaining power of users will improve and that of big publishers who have created a niche around them by creating artificial quality brand will break so that equality in information sharing without discrimination is possible.
- ✓ URS supports fast development of civilization in the world through equally shared knowledge.
- ✓ Educational and research organizations can save huge amount of money by avoiding their investment for developing and maintaining institutional libraries.
- ✓ Digital information can be copied and shared with any number of users without any additional expenditure through open access model.

Benefits:

- ✓ Easy access to information to everybody without individual expenditure.
- ✓ No discrimination for accessing and sharing the educational and research information between people of different countries, religions, race and genders.
- ✓ Customized information is available to users through powerful search machines.
- ✓ Users can avail and share information through their mobile device irrespective of their location.
- ✓ Countries can support their citizens to make use of relevant information for education and research so that they can maintain equality in terms of access to information. This will remove the divide between urban and rural.

- ✓ Everybody in the world will get same information which removes the barrier for quality research for developing countries compared to developed countries.
- ✓ Equal information sharing is possible for quality research which provides benefit to poor people of the entire world.
- ✓ Discrimination between researchers due to unavailability of reference information as well as their inability of publishing results quickly to the entire world can be eliminated.

Constraints:

- ✓ Sharing information between people of different countries is difficult due to the fact of different language.
- ✓ Research Information sharing is difficult due to proprietary rights like patents, copyrights etc.
- ✓ High speed internet accessibility in every location in developing countries is still a constraint.
- ✓ Everybody can access information using advanced technology only if they have adopted such technology and able to use information for their advancement.
- ✓ Information sharing for education and research between different countries is difficult unless the entire world is evolved as an integrated economic union.
- ✓ Many developed countries may not show keen interest in implementation of such system due to business reasons.

Disadvantages:

- ✓ The need of information for different people and for different purpose is different.
- ✓ Developing an integrated universal resource system is difficult due to resistance in sharing education and research related information between different countries.
- ✓ Realizing such model is difficult due to many constraints of technology, society, certain sections of business organizations.
- ✓ Decreases huge employment opportunity available in conventional library system due to universal automation.
- ✓ People perception of such system to adopt due to difference in culture, tradition of people of different countries.

9. Anticipated Time-Frame for Changes:

The national central smart library concept can be realized based on political decision of the central government. Strong visionary in at Countries Central government can take decision to create policies regarding providing free/subsidized digital information to every citizen of the country. Online open access information publication model that enables the dissemination of research articles to the global community without restriction through the internet. Thus, all articles published under open access can be accessed by anyone. The open access form of books, journals in all fields of society is essential for the development of civilization and equality among the countries. It is expected that all the journals and book publishers have to adopt new open access policy in the entire world by 2020. As a result, if the country governments are ready with high speed information communication technology to support Central smart library and client Information Resource Centres, the National Smart libraries and free access to educational and research information to every citizen of the country by 2020. The time to realize Universal Resource Centre (URC) may require few more years (two to three years), due to copyright and payment issues between different countries for free information exchange.

10. Conclusion:

Advances in information communication technology disclosed a new opportunity for innovation in conventional library models. Using the state of the art technology, the countries can convert brick & mortar libraries in to click and mortar libraries to provide quick and complete information requirement to common man and the students of the entire country and the world without any discrimination. The proposed Universal Resource Centre is expected to be an innovation in advents of technology to share the intangible information resource between every human being of the world without any barrier.

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