

## Conceptual Model to design a Virtual Library for Iranian Universities of Medical Sciences

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### Abstract:

*Current developments in the area of technology and the formation of a web network and widespread use of the Internet have brought about numerous changes in the realm of education. In Iran, the increase of demand for continuing education and the variety of fields and lack of adequate resources in universities along with several issues in the constant medical education, in-service education of employees and the necessity of communicating with the graduate students in order to hold short-term and long-term educational courses have all led the Ministry of Health and Medical Education to take advantage of the required information and communication substructures and provide virtual education through establishing a virtual university. Virtual universities operate regardless of spatial and temporal limitations and provide flexible learning opportunities. One of the main requirements of virtual universities is the learners' access to educational materials and contents. Since the current study aimed to present a comprehensive model for the library in cyberspace, all aspects of the topic were examined. In this regard, the researchers collected print and electronic sources and took notes of the existing texts and standards and scrutinized all dimensions of the problem. Moreover, the fundamental commonalities and differences for defining intervening dimensions in designing the library were considered through identifying and comparing active virtual libraries in the educational*

*area affiliated with various universities. The factors which might intervene in the virtual library were examined through using the Delphi technique and the expert's comments and the first draft of the comprehensive model was prepared. In addition, the required data were gathered and evaluated through using a survey and were confirmed for being implemented. Finally, a model will be presented for designing a virtual library in the university in the area of medical education in cyberspace.*

**Keywords:** Conceptual Model, Cyberspace, Medical Universities, Virtual Library, Virtual University, Iran.

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## **Introduction**

The application of information technology in the world today is expanding at an increasing speed and all dimensions of life are transforming in various ways. Information technology is used for the production, processing, storage, and distribution of materials and information in various forms. These technologies have a crucial role in providing for educational, research, managerial, health, remedial, and therapeutic goals in different organizations. In the realm of education, development of electronic-learning is among the most important achievements of these technologies (Patra, 2005).

The significance and necessity for the cooperation of libraries and their integration in learning management systems by creating virtual libraries and their effects in increasing and enhancing learning in addition to cooperative learning have been greatly emphasized in the literature (Brophy et al., 2003; Dalili et al., 2008; Jayawardana et al. 2001; Rieger et al., 2004; Yaghoubi et al., 2008; Zarghani, et al. 2015). Integrating digital libraries and virtual learning environments can result in integrated access to the sources and content of both environments, resulting in an increase of using library sources. In line with making information available, libraries are attempting to use all facilities in order to provide access to all necessary information sources for their users. The biggest dilemma in this case is the libraries' little funding, rising price of information resources, high volume of publishing information resources, media variety in circulating information resources, and the like. As a result, libraries do not have the required capacity to provide for all the information resources necessary due to the aforementioned reasons. For this means, libraries are endeavouring to create an academy of bibliographic information and their whereabouts from outspread libraries in various regions in order to make possible the identification of resources in various libraries. In addition, they attempt to use the ability to exchange information to create access to library resources from other libraries (Brophy et al., 2003; McLean and Clifford, 2004; Pattie et al. 2015).

In Iran, the increase of demand for educational academic courses, increase in variety of fields of study, and limitation in primary resources of universities are among various issues in the realm of constant medical education, in-service education of employees, and the necessity of communicating with the graduate students in order to hold short-term and long-term educational courses have all led the Ministry of Health and Medical Education to take advantage of the required information and communication substructures and provide virtual education through establishing a virtual university (Majidi and Shabani, 2013). One of the national master plans in virtual universities is virtual library which can provide educational support through the use of digital resources. One of the most important necessities for a virtual university is user access to educational materials and contents. While libraries are traditionally considered as of the most important active sections in the realm of education in all universities, their conjunction with new environments will result in changes in their structure, function, and goals and hence result in the creation of concepts such as the hybrid

library, electronic library, digital library and virtual library. These issues have created an opportunity for libraries to combine and integrate their resources and services in virtual learning systems for cooperation in learning and education.

With regard to the dispersion of libraries in various universities of medical sciences across the country and endeavors to use the existing facilities in different universities, it is necessary that the national medical virtual library plan provide the ability to integrate the existing facilities in universities nationwide in line with integrated access to information resources. For this means, it is necessary that the integration model, appropriate protocols for metadata exchange, access to digital information resources, and metadata standards suitable for integration be identified and the digital libraries be localized based on the existing circumstances. As a result, an appropriate integration model should be proposed and implemented. In the next stage, based on the findings in this section, the executive plan for designing an integrated network can be created.

Despite the fact that the combination of library activities in virtual environments of medical education will result in quicker and easier access to resources and content needed by users, differences existing in the essence and working principles of the libraries' traditional and virtual training in the field of medicine has created problems and issues in this realm. The infrastructures necessary, human resources, physical and content structures, manner of organization and approaches for access to resources are among the most important issues which are of significance in designing libraries for virtual universities in the field of medicine. In many cases, differences exist between these services and traditional and tangible services of libraries (Saumure and Shiri, 2006).

In this regard, and in order to identify different effective dimensions in designing a suitable library to be established in the virtual university environment in the field of medical sciences and provide an applicable model, the existing and related standards of virtual libraries were analyzed. This was done for the localization of digital libraries by using the integration model, appropriate protocols for the exchange of metadata and making accessible the digital information resources and metadata standards suitable for integration and identification based on current conditions. Based on studying and identifying the current condition, and in order to obtain a virtual library that can support teaching in a virtual university, identifying an appropriate pattern for the design and implementation of virtual libraries is necessary. For this reason, part of the plan is assigned to identify the best executive patterns and approaches to implement these patterns in the form of a virtual library for medical science universities with special attention to localization of global patterns in the local environment of medical libraries.

Numerous research studies have been carried out nationally and internationally in the realm of digital and virtual libraries and its different aspects in virtual training, which will be briefly pointed out.

Some authors in a research entitled "A look into digital libraries and their supportive role in holding long-distance educational courses" consider this topic one of the proposed issues in information societies, and evaluated the phenomenon of long-distance education, its characteristics, advantages and functions and also the supportive role of libraries in establishing such modern educational systems (Mohammad Esmail and Rahiminejad, 2008). In another study, Majidi presented the role of digital libraries in supporting electronic training. In this study, he has explained and defined the electronic training process, and proceeded about the digital library and the role of digital librarians, describing the information

resources services and ways to train users (Majidi, 2009). Also, in a case study entitled “Integrating digital libraries with the virtual learning environment”, discussed the significance of electronic learning and stated that one of the educational and learning models in organizations and educational centers such as universities is electronic learning and due its great number of advantages, it has been seriously considered in universities (Majidi and Shabani, 2013). On the other hand, numerous projects such as projects implemented by the common committee of information systems have considered these issues and presented solutions for them. However, in this regard, it should be considered that national systems are different from international ones, and thus it is necessary that they are individually evaluated and studied technically, and that localized solutions are adopted based on the national environment. Even though evaluating texts has shown that issues in technology have an important and effective role in bringing these two environments together, some projects and authors have indicated that combining these two environments is not only an issue of technology, but organizational challenges, cultural issues, training employees, cooperation and an attitude of partnership are also effective.

Also, Zarghani et al. in a study entitled, “Virtual Library: an essential element in the structure of virtual training” evaluated the viewpoint of managers and students in regard to the mission and services of a virtual library and also the reasons for establishing a virtual education system using a descriptive survey. Overall, he proposed the main reason for inability to establish a virtual library to be lack of adequate knowledge about virtual libraries (Zarghani et al., 2015).

In the international literature, various studies have been carried out in the realm of virtual libraries and their expansive role in electronic education and learning, which are proposed as follows:

Joint, in his research, Joint evaluated the strategic approaches to digital libraries and virtual learning environments (Joint, 2005). Also, Adio and Olasina in a study entitled “The role of libraries in educational development”, have stated that a virtual library encompasses different types of traditional and digital libraries that can create modern educational methods and provide lifetime learning opportunities for all citizens (Adio and Olasina, 2007). Other studies have also evaluated specific aspects of digital libraries, for example the role of user interface design, with design of the user interface screen unit for virtual learning environments and the digital library. Here users will be able to enter the user interface of another environment without exiting the user interface screen of one of these two environments, and thus it will be effective in the time, focus and information retrieval speed and for providing services and possibility for integrated search (McLean and Clifford, 2004; Rieger et al., 2004; Saumure and Shiri, 2006).

This issue will eventually result in user and faculty member satisfaction in relation to using the two environments and will increase the systems usability aspects. Also, in another study, Pattie evaluated the cooperative model of Texas University’s digital library, the data collection process and creating data sources and other required measures (Pattie et al., 2015).

### **Research Objectives**

The main objective of the present research is proposing a model to establish a medical virtual library in Iranian medical science universities. In order to reach this goal, it is necessary to consider the following secondary objectives:

- Identifying the digital content and metadata status of medical science university libraries nationwide in order to create a virtual library

- Identifying the software status of medical science university libraries nationwide in order to create a virtual library
- Identifying the hardware status of medical science university libraries nationwide in order to create a virtual library
- Identifying models, exchange protocols and integration standards in virtual libraries

## Methodology

The current research is a practical study using the mixed-method research. In order to obtain the research objective, the following stages were carried out:

### Stage 1:

The initial study in the realm of information exchange and providing questionnaires related to identifying the current status of libraries in medical science universities from the information exchange perspective. The main objective of this stage was to develop questionnaires to study the current status of libraries of medical science universities in Iran. In order to obtain this goal, library studies were carried out.

### Stage 2:

The main objective of this stage was to identify the current status of the libraries in medical science universities in Iran from the information exchange perspective. For this means, a research survey method was used. Data collection was carried out through questionnaires developed in the previous stage. Descriptive statistics was use for data analysis.

### Stage 3: Identifying models, protocols and standards for information exchange

The objective of this stage is to identify models, protocols and standards for the exchange of information. In order to obtain this goal, library studies were carried out.

### Stage 4: Proposing a model, protocol and appropriate standard for the exchange of information

The objective of this stage is to propose a model, protocol and appropriate standard for the exchange of information in libraries of medical science universities nationwide.

## Findings

Universities of medical sciences and health services in Iran are under the supervision of the Ministry of Health and Medical Education. The purpose of a medical science virtual library in the current study is also a virtual library that has collected all resources and information of medical science universities of Iran by developing the required regulations by authorities. This is done based on the policies of the Ministry of Health and Medical Education and agreement with each of the medical science universities of the country, in order to provide access to this information and content to its users. The following is a list of medical science universities in Iran (Table 1):

**Table 1. Medical Science Universities of Iran**

Row	Uni. Name	Row	Uni. Name
1.	Semnan	23.	Arak
2.	Shahrud	24.	Ardebil
3.	Shahrekord	25.	Urumie
4.	ShahidBeheshti	26.	Esfahan
5.	Shiraz	27.	Ahvaz

6.	Rehabilitation Science and Welfare	28.	Iran
7.	Fasa	29.	Ilam
8.	Qazvin	30.	All (Islamic Azad ersity)
9.	Qom	31.	Babol
10.	Kashan	32.	Baghiatallah
11.	Kordestan	33.	Bandar Abbas
12.	Kerman	34.	Booshehr
13.	Kermanshah	35.	Birjand
14.	Golestan	36.	Tabriz
15.	Gonabad	37.	Tehran
16.	Gilan	38.	Jahrom
17.	Lorestan	39.	North Khorasan
18.	Mazandaran	40.	Rafsanjan
19.	Mashhad	41.	Zabol
20.	Hamedan	42.	Zahedan
21.	Yasoj	43.	Zanjan
22.	Yazd	44.	Sabzevar

Initially, in order to identify the current status of existing libraries of medical science universities in Iran, a questionnaire was developed and completed by authorities of the 44 centers. The results of these questionnaires based on the availability of resources in physical, analog, and digital versions and search ability of all texts with regard to copyright are put forth in Table 2.

**Table 2. Type of content supported by libraries in Iran's Medical Science Universities**

Content Type	Physical/ Analog	Digital Electronic Only	Analog to Digital Converting	Providing Services with regard to copyright regulations	Searching full text by Optical Character Recognition (OCR) for digital sources	Digital format of file storage
Books	44	19	9	40	3	PDF\Doc(x)
Journals	44	32	11	38	6	PDF\ Doc(x)
Pictures	19	29	1	25	0	TIF\ JPEG
Maps	8	19	1	15	0	TIF\ JPEG
Research Projects	44	41	40	41	24	PDF\ Doc(x)
Technical Reports	37	40	30	39	16	PDF\ Doc(x)
Dissertations and Thesis	44	44	44	44	1	PDF\ Doc(x)
Papers	44	44	26	44	1	PDF\ Doc(x)
Audio	35	43	6	25	0	Mp3\wav
Video	26	42	5	23	0	Mp4\avi
Educational Content	31	41	28	30	0	Variable
Other	19	8	2	15	1	Variable

In the following, the status of hardware, software, standards, and protocols used in libraries of Iran's universities of medical sciences are evaluated and put forth in Table 3.

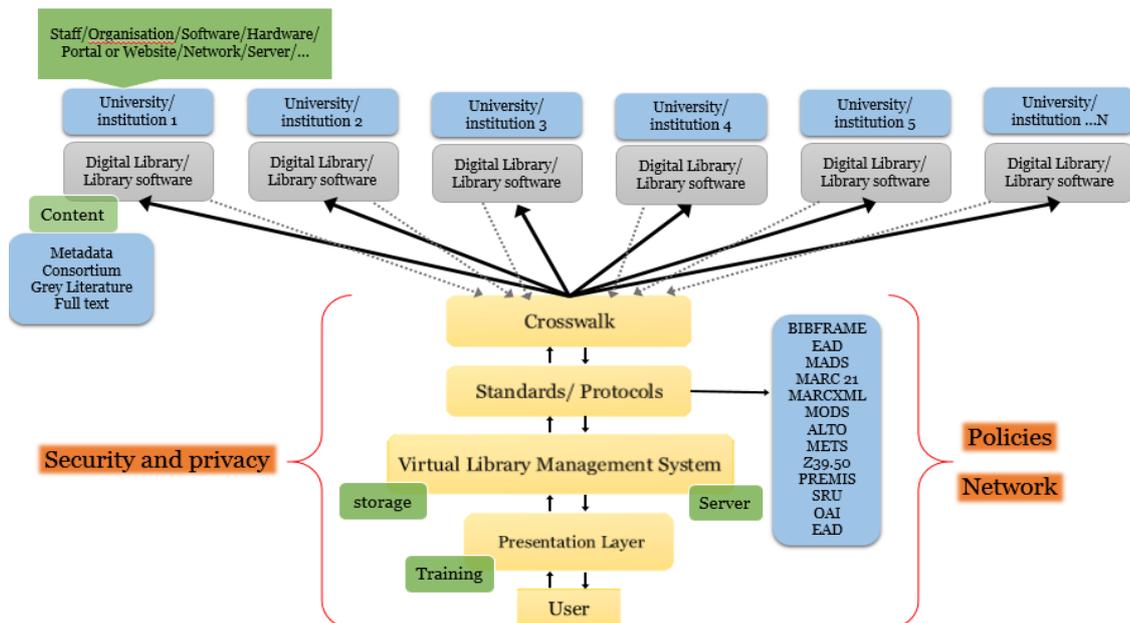
**Table 3. The status of hardware, software, standards and protocols used in libraries of Iran's universities of medical sciences**

<b>Title</b>	<b>Details</b>
Management Database Software	28 Oracle SQL 11 5 MySQL
Access to software database of digital library and its tables	41
Context (Background layer standards)	XML\ ISO text\ HTML
Metadata layer standards	MARC\ Doblin Core\ METS\ MODS
Standards at higher levels for structural and management metadata	EAD
Librarian :ability to receive metadata output by users	28 cases
Means to obtain output required by the system	Internet
Means to link metadata with source file	By using capability of hypertext given in metadata
Indexing and Access to metadata by public or technical search engines on the web	34 cases
Exchange of metadata with other data system of the centre	41 cases
Memorandum of understanding for exchange of metadata	Service Z39.50 OAI- provider/receiver
Accessibility of data resources	Fulltext\Metadata
Source digital to access type of service for provider	Online\Offline
Hardware Facilities	Server\H.D.D\Scanner\etc.
Resourced	Expert\Prof.

By considering the general framework of libraries in Iran's universities of medical sciences, a panel of experts was selected. This panel provided an initial conceptual model of the virtual library of medical sciences universities (Fig. 1). The mentioned model is categorized at six levels:

1. User: individual or individuals who search their required information resources by means of the unified search network of the virtual library in order to obtain necessary information in their specialized field. Based on the accessibility levels defined, accessibility to a part or the entire text is provided.
2. User interface: the portal of the virtual library of Iran's medical science universities which includes images, texts, diagrams, modules, tables, videos, and their colors and locations which are available from various platforms.
3. The virtual library's information management system: a software system which focuses mainly on managing a collection of electronic content. This content can be in the form of text, audio, image, or video files with electronic structures and includes metadata of all libraries at medical science universities. As a result, it has the capability of simultaneously searching all centers affiliated to the virtual library. This system can include its unique server and storage space, however it generally uses the server and storage space of the source libraries.
4. Standard: are standards used in the information management system of the virtual library in which all information exchange with source library software is carried out based on these standards.

5. Information Exchange: with regard to various standards of libraries, the management system of the virtual library provides access to any resource from any center by means of Crosswalk and presents the search results in the standard form requested by the user. By transforming different standards to the standard used by the virtual library management system and also transforming the standard used in the virtual library management system to standards of other centers, Crosswalk provides simultaneous search for users of all centers.
6. Software and Hardware of Source Libraries: all software and hardware facilities of libraries in Iran's medical science universities used for the set up and expansion of the virtual library, result in minimized costs and higher speed in carrying out duties.



**Figure 1. A conceptual model of the virtual library of Iran medical sciences universities**

## Conclusion

With regard to the dispersion of resources in the medical science libraries nationwide, and the necessity for access to up-to-date and appropriate resources in minimum time by professors, students, managers, librarians, and other users, it is necessary to establish a center that can integrate a software between libraries of medical science universities at the national level to facilitate access to metadata and content of all digital texts. Results obtained from the present study provided a unique collection of dimensions, criteria, and general factors in the realm being discussed and also the means for integrating libraries which are obtained by implementing this model, which is itself exquisite. A considerable advantage in the findings of the current study includes a comprehensive outlook obtained from identifying all medical science libraries nationwide which also includes the smallest components in each of these libraries. Components derived from libraries result in creating multi-dimensional views to the topic and can be used in various research studies. Finally, it can be stated with certainty that the conceptual model put forth has provided the main requirements for creating a virtual library in the country's medical science universities. Therefore, if the integration of digital libraries of medical science universities

nationwide is considered, this issue should be emphasized in the development and strategic plans of the Ministry of Health and Medical Education. The virtual universities of medical sciences, by designing and implementing the virtual library, a plan which has been entrusted to Iran University of Medical Sciences, reinforce the linking point between professors and students of this university and create the necessary grounds for more optimized interaction of beneficiaries, certainly resulting in abundant added value at the national and international level.

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