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COLLABORATIVE DIGITAL REFERENCE SERVICES IN LIBRARIES TO COMBAT POST COVID -19 CHALLENGES

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Abstract:

The COVID-19 pandemic affected almost all the dimensions of our society. The complete shutdown of many economic and educational activities forced the schools and colleges digital mode of teaching and learning. Libraries also started online service. In the digital environment, collaboration among reference service provider is also becoming more and more important for the purpose of information exchange and sharing. The present paper seeks to examine existing digital reference services with a view to analyze their structures, methods and functions for achieving collaboration. Collaborative structure models are proposed and basic collaborative methods and collaborative functions are concluded. A CDRS reference model is proposed. The study is intended to help libraries to identify quickly the necessary elements and mechanisms for the design of a proper degree of CDRS or to develop or evaluate digital reference services This paper also proposes and concludes collaborative structure models, methods, functions and a reference model of CDRS. It should prove helpful for libraries wishing to provide CDRS, as well as for further research on CDRS.

Keywords: Library Services, Collaborative Reference services, CDRS, Digital Reference Services, Internet, Covid -19.

1. Introduction:

The COVID-19 pandemic has severely impacted on social and economic activities. Since March 2020 Government opted for 'lockdown' to maintain distance between people. Considering educational activities, most of the educational institutes started online education, whereby the use of

Internet is certainly increased. Online teaching and learning environment is accepted by the students and teachers. Libraries are also started providing digital reference services as information resources become more web-based and more actively used by patrons over the internet. Digital reference can deliver a reference service by electronic means, such as e-mail and web forms to real-time via chat, web push, etc. An ideal digital reference service should provide professional reference service to patrons anywhere, any time, but in most cases, no single library will have the staff resources to operate a 24/7 digital reference service and answer all kinds of questions. Such goals might be achieved, however, if large groups of libraries collaborate to provide support for digital reference. This means that a collaborative digital reference service (CDRS) would allow libraries not only to increase their hours of service, but also to share experiences and exchange knowledge with one another (Jin et al., 2005).

An idea of collaborative digital reference service (CDRS) which have been already developed and widely deployed in developed countries such as Virtual Reference Desk and QuestionPoint (Jin et al., 2005). But their structures and methods for achieving collaboration have not so far been carefully analyzed and concluded. The most detailed description of collaborative methods appears in the Question/Answer Transaction Protocol (QATP), released by the National Information Standards Organization (2004). However one omission is that it does not take into account the process involving the knowledge base.

This paper studies the collaboration mechanism of the digital reference services and proposes three collaborative digital reference service models. We also form conclusions on the basic collaborative methods on which practical applications are based and collaborative functions that should be supported. A CDRS reference model is ultimately described, and it is intended to be a framework or a guideline for libraries which plan to provide CDRS for their patrons or to be a checklist to evaluate existing products. It should assist in quickly identifying necessary elements and mechanisms for offering a proper degree of CDRS.

2. Collaborative Models of Digital Reference Services

We study the realization of existing CDRS systems and conclude that there are three possible collaborative structure models that can be adopted. Each model, together with its pros and cons, will be discussed in detail below. In order to be clear, we assume that a library is an atomic entity that is going to collaborate with other libraries. However, a library may itself include logically distinct components that can collaborate amongst one another, but not be externally visible to other libraries.

And libraries that would like to provide CDRS are members of a group or a consortium and some sort of cooperative agreements have been made to support CDRS among them.

2.1 Peer-to-peer model: CDRS based on the peer-to-peer model means one library can collaborate with other member libraries directly. Every library is identical and there does not need to be one library to play the role of a center that can coordinate the collaborative activities of DIGITAL REFERENCE SERVICE. The peer-to-peer model can be symmetric or asymmetric. The symmetric model means every library can collaborate with all other member libraries directly and the asymmetric model means the collaboration is incomplete and some libraries may not collaborate with one another directly. Questions may be submitted to libraries that are not best able to answer them. Some libraries may get too many collaborative requests and may not be able to handle them efficiently due to the lack of centralized control. Besides, every library should manage collaborative activities by itself.

2.2 The center model: This model shows CDRS among member libraries being coordinated by one center. All collaborative requests are sent to the center first and then the center is responsible for assigning, tracking and managing them. So collaboration can be balanced among member libraries and collaborative requests can be forwarded to the libraries best able to handle them. It is also easy to extend service hours by the center or to assign duty times to different member libraries. This model can efficiently overcome the difficulties faced by the peer-to-peer model. The center plays a key role and efficiency of the CDRS would depends totally on the center's coordination and management. If the center cannot work properly, all member libraries will be affected. This model can be applied to large-scale collaboration. An example that uses the center model is QuestionPoint. The reference librarian of a QuestionPoint member library can submit unanswered questions to the QuestionPoint Global Reference Network, which acts as the center. The QuestionPoint Global Reference Network can automatically locate and display the best possibilities for obtaining an answer from specific QuestionPoint member libraries, by comparing the requirements of the question with the attributes of all QuestionPoint members.

2.3 The mixture model: The mixture model has features of both the peer-to-peer model and the center model. One library can collaborate with other member libraries directly. If it knows the best candidate, the collaborative request can be sent to that library directly without the center's intervention. This works the same way as the peer-to-peer model. Besides, collaborative requests can also be coordinated by the center and take advantage of the centralized control. The mixture model is

flexible and robust, and it is also more complicated to realize than previous two models.

Digital reference service efficiency of CDRS the would not only rely on the center, but also depend much on every library's awareness of what kind of collaborative requests should be coordinated by the center and which others just need to be sent to proper member libraries and processed by them directly. This model is also suitable for large-scale collaboration. DCDRS uses the mixture model for digital reference service collaboration among member libraries. Every participating library would host a DCDRS local system and provide digital reference service independently for its patrons. One library can collaborate with other libraries directly and a DCDRS central system is responsible for coordinating collaborative requests submitted to it from member libraries.

3. Collaborative Methods:

This section describes collaborative methods that can be adopted for practical applications. Collaboration among digital reference service can be achieved by three methods i. e. question routing; patron transfer; and knowledge base sharing.

3.1 Question routing: Most collaborative activities of digital reference service are about acquiring answers to questions. If one library is weak in a specialty area and finds that an answer to the question is beyond its local resources, this question can be routed to other libraries which are able to answer it. This allows their reference resources to be shared with one another and consequently benefits all libraries and patrons. The most important part of question processing and routing is how to find a candidate who is best able to handle the question. To do this, first the attributes of a question should be analyzed and evaluated. Attributes may include the subject and language of the question, the asker's education level, etc. The question attributes can then be compared with profiles of member libraries that describe their capabilities, services and expertise and a ranked list of candidates can be generated. The question can thus be routed to the most appropriate candidate on the list. If the first candidate is unable to answer, the question can be rerouted to the next likely candidate, and so on. In order to make this method applicable, an efficient question routing algorithm is needed and some factors, such as routing times, the response time, tracking and managing the status of questions, etc., should also be taken into account (Jin et al., 2005).

3.2 Patron transfer: To transfer an digital patron from one library to another library is also a useful collaborative method for DIGITAL REFERENCE SERVICE. This will happen if the reference librarian at one library cannot satisfy an digital patron, then the reference librarian can transfer him/her to any libraries that might be able to help him/her; or if the service hours of one library, such

as the center, are extended by assigning duty times to different libraries. If the library that is on duty cannot arrange enough staff to take care of real-time services for both the center and itself, it can map the service of the center to the library. Thus, patrons who visit the center will be automatically transferred to the corresponding library (Jin et al., 2005). It is very important for this method to maintain and share the list of member libraries that are currently available for providing real-time or non-real-time DIGITAL REFERENCE SERVICE. According to profiles of these libraries, the reference librarian can transfer a patron to a suitable library. It is also a convenient function for patrons if they themselves can browse the list and choose to visit any libraries they want.

3.3 Knowledge base sharing: Knowledge base sharing is becoming more and more important for CDRS. Digital reference service can be supported by the knowledge base, which stores previously asked questions and answers and can benefit the next patron who asks the same or similar question because s/he can be provided with a quick, relevant, and high-quality answer. If knowledge bases can be shared efficiently, patrons may get answers from knowledge bases before their questions are actually submitted (Jin et al., 2005). Knowledge base sharing can be achieved in two ways:

a. The first possible solution is real-time access to distributed knowledge bases of member libraries. This is simple, direct and can retrieve the latest records. But it is difficult for patrons to decide which knowledge base they should access to get the information they need. And every knowledge base may be primarily a key reference source customized to one library and its patrons' needs because of specialized local information and questions unique to local patrons. Thus there is no doubt that it would be quite time-consuming to access distributed knowledge bases and much unwanted local information would be returned among the search results.

b. Another solution to the knowledge base sharing is to build a central knowledge base. Records in the central knowledge base are from the knowledge bases of all member libraries and can be shared by them. Since records should be checked for duplication and quality before they are added to the central knowledge base, to access this single knowledge base can obviously improve the search performance. Accessing distributed knowledge bases should happen only when local information is needed. The key issue of this solution is how to harvest records from distributed knowledge bases into the central knowledge base. Recently most similar applications would adopt OAI-PMH to achieve metadata harvesting from distributed databases. The OAI-PMH, commonly referred to as the OAI protocol, is a client-server protocol layered over HTTP that is used to transfer metadata records with mechanisms for periodic and incremental updating (Suleman and Fox, 2002).

4. Collaborative Functions and Protocols:

4.1 Functions: The prevailing collaborative functions of digital reference service have been described by several authors (e.g. Balleste and Rus, 2003; Breeding, 2001; Jin et al., 2005) and in this section several more functions are listed based on the study of collaborative methods. Functions can be classified as synchronous and asynchronous. Synchronous functions establish real-time, digital communications with the patrons. They can make quick responses to patrons' needs, but when complex questions are raised, the reference librarian may not immediately satisfy the patron via synchronous means. Some synchronous functions need high a bandwidth network and corresponding hardware in order to work properly, such as voice/video over IP, application sharing, etc. Possible synchronous functions include chat, page push, co-browse, file sharing, application sharing, whiteboard, voice over IP, video over IP, knowledge base retrieval, patron transfer, etc. Asynchronous functions, on the other hand, are non-real-time with simple system requirements and are suitable for solving difficult questions. And of course, with the rapid development of computer technologies, the functions presented below prevail nowadays and are likely to change or adjust in the future. Possible asynchronous functions include e-mail, web forms, question routing, knowledge base harvesting, etc.

4.2 Protocols: Nowadays many digital reference service systems are widely used around the world. It is very useful and meaningful if one system can have the ability to work with other systems that might be using different software and technologies. However, collaboration among these disparate digital reference service systems is complicated because every system would have its own standard that might cover question and answer transaction, quality, statistics, measures, and metadata element sets, etc. So in order to enable a consistent exchange of information, an agreed-upon collaboration protocol needs to be defined and corresponding application interfaces should be developed. The protocol can extend the reach of one system by allowing it to assist and to be assisted by other protocol compliant systems. It can also efficiently enhance the ability of one system to interact with other systems. If a collaboration protocol can be widely supported, it would be feasible to provide cross-system CDRS. Just like once being TCP/IP compliant, communications over the internet become possible and easy. Fortunately, this issue has attracted more and more attention and some related standards have been released, such as the Virtual Reference Desk (2003; Lankes, 1999; Butler, 2000; McClure et al., 2002) and the National Information Standards Organization (2004). A key standard is the Question/Answer Transaction Protocol (QATP). The QATP has finished its trial

use period and is under revision and amendment. This protocol covers processing transactions for interchange of messages between digital reference domains and defines a set of messages and associated rules of syntax and semantics for the interchange. It is the most complete and detailed standard released so far. Since the QATP does not take into account the process involved the knowledge base, it should be a useful supplement to include knowledge base sharing in this protocol. Besides, to develop digital reference service is not just a technical issue; suggestions presented by Zheng (2006) are also very helpful for libraries that are going to provide DIGITAL REFERENCE SERVICE, especially in developing countries.

5. CDRS Reference Model

The CDRS reference model, which describes three steps to carry out collaborative digital reference services.

These steps are:

a. Determine which structure model should be adopted. This will depend on actual requirements and will affect the realization of CDRS.

b. Choose proper collaborative methods. Three methods can be considered to meet the collaborative needs.

c. Use corresponding collaborative functions to achieve CDRS according to point b.

During Covid -19 pandemic, the collaboration must be governed by the agreed-upon protocol; thus collaborative information can be exchanged between libraries smoothly and correctly. According to the different structure models, collaborative requests can be sent to a library directly, or to a center that can forward them to a suitable library.

6. Conclusion

Covid -19 pandemic has forced libraries to provide its services into digital mode. As more and more libraries provide digital reference services to their patrons with the prevalence of the web, efficient collaboration among them becomes a key issue for the development of digital reference services on a large scale. This paper has proposed three collaborative structure models – the peer-to-peer model, the center model and the mixture model – that can help libraries design a proper degree of CDRS. Descriptions of collaborative methods and collaborative functions can serve as a guide for quickly identifying necessary elements and functions for those who plan to develop or evaluate CDRS systems, as well as further research on CDRS. As technologies are always developing, it is

reasonable to assume that the collaborative structure models, methods and functions presented in this paper are likely to change in the future and need to be adjusted and amended.

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