Information and reference services in the digital library

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Abstract. Information and reference services are one major component of library services. This article attempts to describe the paradigm of information and reference services in the digital library. Based on the fact that automatic digital library technologies are solving more and more information needs and changing the mode of user service, the authors suggest a three-levelled system that supports users’ information needs. The role of reference librarians at each level is discussed. Finally, digital reference service, a new means of delivering services, is briefly reviewed. The authors emphasize that a systematic process to support users’ information needs in the digital library is required.

Keywords: Information services, reference services, academic libraries, digital libraries

1. Introduction

As a major component of library services, information and reference services are constantly developing as is the library itself. The earliest concept of modern reference work is usually traced to Samuel Swett Green’s 1876 paper entitled “Personal relation between libraries and readers” in which he advocated the importance of personal service and guidance to the library patron [10]. Over the following hundreds of years the concepts and practices of reference work have been expanded and have evolved significantly. Based on Green’s ideas, Bopp and Bunge categorized the practices of reference services into three groups [4]:

1. Information services that take the forms of ready reference questions, bibliographic verification, interlibrary loan and document delivery, information and referral services, research questions and fee-based services and information brokering;
2. Guidance, including readers’ advisory services, bibliotherapy, term-paper counselling, selective dissemination of information (SDI, also called current awareness service);
3. One-to-one or group instruction.

As the library evolves into the digital library, librarians have been considering how to adjust services to the new environment and new information needs. According to some statistics, for example, users’ enquiries at the reference desk are declining [19, 26]. Despite this, however, most researchers and practitioners agree that reference services and user education are still necessary in the digital library [6,18,20, 23]. Nevertheless, some aspects of the service have changed quite dramatically and something new has emerged. A search of relevant literature shows that digital reference services have become a hot topic in the library service sector over recent years and considerable attention has been concentrated on the

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process of questions and answers. It is clear, however, that the notion of “question” and “answer” is not
the only issue that reference services must face. “Why someone is asking a question is often as important
as what they are asking” [18]. This suggests that librarians should think about the motivation behind in-
ququirers’ questions as well as trying to answer them. As the guidelines by the Reference and User Services
Association (a division of the American Library Association ) state, “the goal of information services is
to provide the information sought by the user. Information service should anticipate as well as meet user
needs. It should encourage user awareness of the potential of information resources to fulfill individual
information needs” [30]. How does the digital library provide users with the information they need? In
other words, what should information and reference services in the digital library be?

In order to understand the complete scene of information and reference services in the digital library,
the authors describe a model that supports users’ information needs, by redefining the paradigm of ser-
vice in response to the demands of the new environment. The authors will put the digital library into
the context of information service, and, conversely, put information service into the context of the digital
library. To begin with, it is worth asking why the digital library should be integrated into the information
service stream. Firstly, it is a fact that automatic digital library technologies are solving more and more
information needs and changing the mode of service dramatically. This paper contends that it would
be one-sided to overlook the role of digital libraries in information services since some reference work
has greatly decreased or has been substituted by digital library tools. Some authors have already men-
tioned the impact of digital libraries and personalized web services on users’ information needs (for
example, [6]). Secondly, it is well known that user service is the primary mission of a library and our
profession is service-oriented. The development of the library is driven by users’ needs which are af-
fected by the changing environment. Currently, distance learning and e-learning are flourishing. Library
services are now operating within a user-centred and self-learning world. User behaviour is shifting from
a passive learning pattern to an active one in which customers want simple, helpful self service and
personal help only at times of greatest need. Consequently, more attention should be focused on users’
self-help modes in order to enhance services for the community. Meanwhile, human help still forms an
essential part of the support system.

The authors propose a three-levelled support system and discuss each level separately thereafter. The
paper discusses what reference librarians do in the development and management of digital libraries –
both behind-the-scenes work and frontline work as well. Finally, the role of the digital library in the
context of the digital university and the Managed Learning Environment is noted as a topic requiring
further research.

2. Three levelled information service system in the digital library

How does a digital library support users’ information needs and solve the problems they face with their
information seeking activities?

2.1. Users’ information needs

Users’ needs are a complex and constantly evolving issue. We can never meet all users’ needs because
of their individual, personal and changing nature. The ways in which people express their information
needs also vary. However, information professionals are committed to understanding and defining library
clienteles’ needs and trying to meet them effectively. In his classic theory, Taylor described four levels
of information needs and the configuration of question which represents each level [32]:
Q1 – the actual, but unexpressed need for information (the visceral need);
Q2 – the conscious, within-brain description of the need (the conscious need);
Q3 – the formal statement of the need (the formalized need);
Q4 – the question as presented to the information system (the compromised need).

For most users, the librarian is often seen as part of the information system. A user may submit a question to an automatic system (self-help) or to a librarian. “An enquiry is merely a micro-event in shifting non-linear adaptive mechanism” [32]. As outlined above, some needs are explicit and some are implicit. An enquiry to the reference desk, an explicit need, is a component of levels 3 or 4. Comparatively speaking, users’ implicit needs in level 1 and level 2 are more complicated and difficult to capture. Only thorough user studies and deep interviews can help us understand them better and subsequently meet them effectively.

2.2. Three-levelled information and reference support system in the digital library

This paper contends that, in terms of personalization and generalization, users’ information needs can be roughly divided into three levels, depending on their specificity:

L1 – first level: general, almost all the library users’ needs and expectations;
L2 – second level: some users’ needs, groups with common interest such as undergraduate students, research staff, engineering masters students;
L3 – third level: individual needs, relevant only to specific questions.

Accordingly, the digital library can be conceived of as providing a three-levelled information and reference services to cope with the three levels of needs separately.

On the first level, technologies, resources and services are integrated into the digital library. For users, it is a portal, an easy-access interface to support their information needs. The interface is “designed taking into account the information needs of everyone and their expectations with regard to access, functionality and personalization” [1]. This level affects all the users in the community since every member must access resources through the interface. Thus, it is an one-to-all service mode although because the interface can be personalized for individuals, it is also a one-to-one mode. On this level, reference librarians do a lot of work behind-the-scenes to support the functions of the digital library, e.g., resource development, configuration of interface, etc.

On the second level, information professionals provide induction and training courses to educate users to use the digital library. All kinds of materials such as FAQs, online help and self-guided information resources are prepared in anticipation of users’ questions to help them find answers on their own. In this case, users are treated as groups with similar interests or questions or needs. Thus it is an one-to-group pattern.

On the third level, reference librarians are waiting for users’ questions at the reference desk, on the telephone, via email or an interactive system, etc. They offer personal help to users in a variety of ways. This level is time consuming since the services are provided to patrons one by one.

Given the size of population to be reached, the first level is the most cost-effective method and the third level, the enquiry system, is least. With regard to the number of staff that are needed in each level, the first level is least labour-intensive and the enquiry system is most labour-intensive, while the second level is targeted at a group and lies in the middle between the other two. This reinforces the idea mentioned above that librarians ought to place more emphasis on the first level and “move toward a more efficient application of our unique skills, talents, perspectives, training and experience” [14].
Table 1 illustrates in detail the three levels of users’ needs and how the digital library meets them accordingly.

The three levels of service are closely related to each other and can interchange dynamically. The intelligent digital library is easy for all kinds of users to access, that is to say, the digital library resolves many information needs in a pre-defined way. If some needs are left unresolved, the users go to browse FAQs or attend some training courses. If some questions are still left unanswered, they go to ask a librarian for help. They can also ask for help from a colleague or an expert on the web, etc. Since here we are discussing only how a library supports its users, those other situations are ignored.

Conversely, if some individual questions have been asked frequently, the librarian may realize that the questions are common and representative and therefore add them to FAQs or remind users specifically when training. If some questions are asked too frequently or user studies reveal that there are some factors hindering use of the library, the librarian may consider addressing them through improving the functions of the digital library such as introducing a more user-friendly interface.

By representing the digital library as a three-levelled support system, we can better understand why users’ enquiries to the reference desk have dropped in recent years. To a great extent, owing to the digital library and plenty of self-help information, users feel able to access resources and service themselves. Also their information literacy has improved through attending training sessions.

Using the three-levelled support system, we conclude that a systematic process is still needed to meet users’ information needs. The phenomenon of decreasing user enquiries does not mean that users do not need reference librarians any more thereby signalling the end of reference services. More than ever before is being done to support users’ information needs especially behind-the-scenes work to improve services which may lead to fewer direct enquiries. This article argues that a digital library supports users’

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<tr>
<th>Items</th>
<th>Generalized</th>
<th>Levels</th>
<th>Personalized</th>
</tr>
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<tr>
<td><strong>Features of users’ needs</strong></td>
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<tr>
<td>Attributes of information needs</td>
<td>General, abstract</td>
<td>Group: some users’ common needs</td>
<td>Specific, particular, concrete, personal</td>
</tr>
<tr>
<td>How users express their needs</td>
<td>Expectations, representative questions</td>
<td>A group’s common information needs</td>
<td>Expressed as a direct enquiry</td>
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<tr>
<td><strong>How the digital library meets users’ needs</strong></td>
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<td>Methods of meeting</td>
<td>Automatic digital library technology with librarians’ expertise embedded</td>
<td>User education, FAQ and self-help materials</td>
<td>Direct communication between users and librarians</td>
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<td>users’ needs</td>
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<tr>
<td>The aims of meeting users’ needs</td>
<td>To solve general problems, improve efficiency and usage</td>
<td>To know how, to improve users’ skills</td>
<td>To know what or know how</td>
</tr>
<tr>
<td>Coverage/ Impact</td>
<td>All members in the community: one-to-all</td>
<td>A group within the community: one-to-group</td>
<td>One-to-one</td>
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<tr>
<td>Librarian’s attitude</td>
<td>Active: to redefine users’ needs and translate them into available automatic information systems</td>
<td>Active: to redefine users’ needs and fulfil them through human effort</td>
<td>Passive: to wait for customers’ questions</td>
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Table 1 indicates in detail the three levels of users’ needs and how the digital library meets them accordingly.
2.3. Digital libraries and information services – the first level

2.3.1. Digital libraries and portals

The digital library is still in its developmental phase. Halm commented that currently “increased attention seems to focus on portals” and defined the digital library as “an entity providing integrated and coherent access to a well-defined range of heterogeneous information resources independent of location, format and curatorial domain within an appropriate organization and legal framework” [11]. He identified portals as the first distinct components of the digital library. Technically, portals involve issues of resource discovery, information retrieval and the integration of resources and user interface, all critical for serving user needs. Portals are therefore the key between technologies and information seekers. An effective portal can dramatically improve a user’s ability to use library resources and services. As Rockman asserts, one must consider the role of the librarian in portal interface design when thinking about the future of reference services [29]. In this section, the authors take portals as an example of how the digital library meet users’ information needs.

2.3.2. Portals and users’ expectations

The library is faced with internal and external factors encouraging it to change. Externally, growing numbers of commercial portals on the web attract growing numbers of users. Users prefer the convenience of the web to library resources. A survey found that “too many students, because they know how to use the Web, are using only the Web itself to find material for their assignments, rather than trying the periodical indexes that we offer via the Web” [33]. Many other reports reveal a similar situation, indicating that the library is viewed as less convenient than commercial search engines and this represents a barrier to many users. Complicated access will exclude potential users and lead to low usage. Jackson pointed out that “libraries must gear up to provide a competing level of convenience while retaining the authority and quality of information delivery for which they have been traditionally known” [13].

Internal issues also force the library to change. Libraries are subscribing to more and more expensive electronic databases and e-journals. At the same time, print resources continue to exist which means most media will be hybrid for the foreseeable future. Increasing web-based resources are also a feature. Users feel overloaded and need assistance to navigate high quality resources and services in such a complex environment. How do they figure out which database to search for information on their topic? Most users have little patience to try one database after another, with different interfaces, over and over again. They do not like having to remember a lot of different passwords. Similarly, users prefer full-text sources to a citation or a catalogue record. Neither do they want to “bother” the reference librarian, though the latter is happy to offer help [21]. What the users expect is easy-access, one-stop, self-help information services, with the convenience of surfing the web and with high quality resources as well.

From the above discussion, the main obstacles preventing access to library resources can be summarized as follows:

1. Information overload makes it difficult to locate appropriate databases or resources rapidly;
2. Many unique interfaces and access points mean a user needs to master different searching methods;
3. It is difficult to remember a lot of different passwords for particular resources.

Bentham noted that “there is a danger that unless librarians start coming up with innovative and flexible solutions for easy and convenient access to electronic resources, then academics and students will go elsewhere, by-passing the libraries ‘quality controlled’ resources completely” [3].
Presently, portals are such a solution that fits with users’ expectations. The Joint Information Systems Committee defines a portal as “a network service that brings together content from diverse distributed resources using technologies such as cross searching, harvesting, and alerting, and collate this into an amalgamated form for presentation to the user” [16]. Library portals aim to “integrate the diverse licensed and owned electronic holdings of libraries for users, through the whole process of discovery and searching to final delivery, regardless of the content’s format, the metadata standard in use, publisher interface, authentication mechanism” [8]. A portal is a gateway between the information-seeking user and digital library resources. As the first level to manage users’ needs, the interface of the digital library is designed to suit all the members of the community. A portal can be personalized by user profiles and, hence, is flexible for different users, both novices and advanced users. An effective portal will help to remove the threshold for users and enable them to access the library’s collections and services with optimum convenience. Users will find it easy to discover and use library resources to seek the information they need, and so the problems they encounter will decrease. Meanwhile, the usage of library resources will increase, therefore the promise of digital libraries will be fulfilled.

2.4. User education and enquiry support – the second and third levels

Information and reference services exist to help users access the holdings and services in the library both actively and passively. On the first level, the digital library is intended to provide optimum information access to users of varying skills and personalities. Reference librarians do play an important part during the development phase of digital libraries. But Bunge and Bopp noted that it is “the nature of complex information tools and systems that they will always develop faster than will self-help components and interfaces, making personal assistance of experts necessary for the full use of the newest and most powerful information resources” [4]. It is still necessary for reference librarians to do frontline work, that is to say, human assistance is irreplaceable even in digital library services. Moya and Robinson found that the human element of the service makes the patrons more comfortable and confident with the technology [25].

User education and enquiry support are the core of traditional information and reference services. The two levels are regarded as having a natural connection to each other. Morgan mentioned that “enquiry and reference services are often perceived as adjuncts to the user education programmes. – They are complementary activities with a symbiotic relationship” [24].

2.4.1. User education in the digital library

It is accepted that user education in the forms of library instruction, tours and programmes is still necessary in the digital library. Soergel asserts it should be seen as an integrated part of the digital library. He pointed out that “some see DLs (Digital libraries) primarily as a means for accessing information, but in order to reach their full potential, DLs must go beyond that and support new ways of intellectual work. This requires developments of the two components of the total system of intellectual work: computer system component, through innovative system development; and the user component, through user education and training in the use of new methods” [31].

On the one hand, resources need to be “pushed” to the users so that quality resources can be used widely and so that users utilize library collections optimally. On the other hand, training with digital libraries tools should be provided to help users benefit fully from them. Kibirige and DePalo conducted a pilot study which revealed the need for constant continuing education for the end-user to master digital library access languages [17]. At the moment, both digital library technologies and resources are undergoing great development and are far from mature and stable. The continuing change means instruction
to users is a continuous task. At the second level, user education and plenty of online tutorials help users explore the digital library and make up for some of the defects of the first level.

2.4.2. Enquiry support in the digital library

When users have mastered the information skills necessary to use the digital library and self-help systems effectively, it is still likely that some users will need personal help from librarians. As Marchionini noted, “although there is good progress in creating dynamic query interfaces that closely couple the query and navigation tactics so that people can quickly and easily explore DLs the need for reference librarians assistance remains a significant challenge in DLs” [23]. An enquiry system in the digital library is a must therefore. Being the last support level, the enquiry services should be able to adapt to users with varying skills and habits. Otherwise, where else can they get their answer? Morgan regarded readers’ enquiry services as an effective back-up. He explained that “as part of library’s customer-oriented service, the work carried out at the enquiry desk represents a significant contribution to helping users on an individual basis. This particular service taken alongside its other conventional partners, –, goes some way to plugging the information gaps inevitably left by the other services” [24].

An enquiry system within a digital library environment consists of multiple delivery modes including face-to-face, email, telephone, web-form, computer-based systems and so on. All the different methods will be necessary to ensure services are accessible to everyone. Firstly, every mode has its own specific strengths and weaknesses and digital reference is no different. Secondly, it is important to take users’ various situation into account. For example, the “digital divide” is a line between the computer and the Internet “haves” and “have-nots” [5]. Those who cannot access a computer or Internet cannot benefit from computer-based or web-based services. Thirdly, users’ personalities are various. Just as Lessick indicated, “some users, whether because of inclination or learning style, will prefer and want human help even more than online help. In addition, librarians will still be called upon to provide assistance when users become stymied while searching for information. Other users will prefer to use computer systems without assistance” [19]. Retting conceived a law – “Every reader his freedom” and applied it to the mode of delivery – “in-person, telephone, online-and tomorrow to holographic interactions and 3D virtual reality” [27]. In recent years, a new service, virtual reference, has been experimented with widely. However, it is still a matter of dispute and development. This paper will present a brief overview of virtual reference in the next section and consider, specifically, the role of the reference librarian in relation to such a system.

3. The role of reference librarians in a digital library project

Easy-to-use digital libraries enable users to access information on their own. As a result, the paradigm of information searching is shifting away from professional-mediated mode to end-user self-service mode. As part of reference work, mediated information searching and fee-based services have dramatically declined in recent years. Also, some of the librarians’ intermediary work has been substituted by automatic tools. For example, SDI is being carried out by resource providers automatically without human mediation. No wonder some people have raised the question of “whether or not we need reference librarians in the digital library” [2].

In fact, as the gateway between resources and users, the main role of reference librarians has remained much the same as in the traditional library although the way they carry out the role has changed substantially. Information professionals are, and have always been, expert at identifying users’ information needs and high quality resources. Rather than helping users directly, though, much of their work now
During the development of a digital library, reference librarians contribute a lot of intellectual work to many aspects. A case study of Boston College libraries explains some of the work that needs to be undertaken in the development of digital library systems. Boston College libraries chose MetaLib (www.aleph.co.il/MetaLib/) as the library portal and renamed it MetaQuest. The main features of MetaLib include cross-database searching, customisations and highlighted links. Table 2 shows the responsibilities of reference librarians during the implementation of this portal.

<table>
<thead>
<tr>
<th>Development phase</th>
<th>Information professionals’ role (the corresponding level)</th>
<th>Work</th>
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<tbody>
<tr>
<td>A. During portal implementation</td>
<td>Configuration for MetaLib and SFX, support resource development (the first level)</td>
<td>“making deliberate recommendations about sources to consult”; “By offering links, we highlight the intangible of staffing expertise and the professional and informed thinking that resulted in the selection of these resources for the library’s collection.”</td>
</tr>
<tr>
<td>B. After implementation</td>
<td>Instruction session and answering question about portals (the second and third levels)</td>
<td>“MetaQuest was rolled out in early January 2002 for the Spring semester and integrated in instruction sessions and interactions at the reference desk when appropriate”</td>
</tr>
<tr>
<td>C. Continuous effort: portal technology is still developing and needs enhancement</td>
<td>Collecting information and user feedback to help improve product (the first level)</td>
<td>“MetaLib is a challenge because the product generally works best with simple cross-databases searching and those researchers with more complex searches are directed to the databases’ native interface.” “These issues can be addressed through instruction and product enhancement.”</td>
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User studies occupy a major area in digital library research. The final section of this paper reviews some of the likely developments and challenges that lie ahead for both reference librarians and references services operating within a digital library environment.

4. Digital reference services: trends and challenges

A search of relevant literature shows that reference librarians, particularly those in the USA, have placed considerable emphasis on digital reference services. This final section briefly reviews the current state of digital reference research. The notion that digital reference is just one method of providing reference services in the context of the three levels of user support outlined above is stressed.
4.1. Digital reference service

Digital reference services began in the mid 1980s but have developed rapidly in recent years. As with the evolving names of electronic library, virtual library and digital library, digital reference services were once, and sometimes still are, termed electronic reference and virtual reference.

Digital reference services, also known as “AskA service”, are “Internet-based question-and-answer services that connect users with experts in a variety of subject areas” [35]. In its broadest sense, digital reference services is a term that depicts reference services delivered via electronic means using both asynchronous (email, web-forms) and synchronous software (real-time system). Whilst email or web-form reference has been a routine service provided in many libraries for some time, real time reference is still in its trial phase. In its narrowest sense, digital reference is often used as a synonym for real time electronic reference.

Traditional reference services are carried out face-to-face or by telephone or fax from within the library. When the library is closed, that help is not available to users. With digital reference, however, users can access reference services despite time and distance. There is no doubt that digital reference provides more alternatives and flexibility to users, especially those operating within a virtual learning environment.

4.2. Trends and challenges

Many libraries are experimenting with live reference service. However, it has been noted that most libraries in the USA are still in the first phase even after several years’ experimentation [34]. Researchers in this area are also discussing the significance of digital reference. If the year 2001 can be called the spring for digital reference development because of the vast increase in interest and experimentations at that time, then the year 2002 saw the cool autumn as many negative voices were heard. McKinzie’s anti-digital-reference article “Virtual reference: overrated, inflated, and not even real” aroused a huge debate on professionals’ discussion lists [22]. Similar perspectives were also put forward in recent conferences. Commentators and librarians began to consider the appropriate place for digital reference in library services. Has the role of digital reference been exaggerated? Do the possible advantages outweigh its disadvantages?

There is no doubt that digital reference is a new powerful method of delivering a reference service. The authors contend, however, that it should be utilized in conjunction with other service points and methods, not as a substitute. As another mode alongside all the others, it is just one form of the third level in the support system. Like all the other modes, digital reference has its weaknesses and strengths. For instance, a survey by Janes found that the “best” questions for digital reference include ready reference questions, those from regular library users and those in popular culture or entertainment [15]. Many libraries limit online interaction time to 15 minutes and so more complex enquiries usually need to be followed by an interview with subject specialists or even an in-depth fee-based service.

Presently, there are three main directions in the research and development of digital reference: searchable knowledgebase, chat (live) software and collaboration projects. The reasons that they are being challenged include:

- Chat has some negative aspects for digital reference which makes it problematic to operate. Question negotiation, for example, is difficult since the librarian has little knowledge of the user’s status and is short of nonverbal cues. It is also difficult to control interview time effectively in a digital conversation.
Cost: both software and staff time are expensive. It is stated that there would be a large increase in workload when digital reference is fully utilized [28]. It is also questionable whether it is economic to have somebody wait for a question 24/7 when most questions occur within regular office hours.

Collaboration: Theoretically it would be ideal to let users throughout the world benefit from the knowledge of professionals around the globe. However, firstly, we need to question whether this is necessary at the moment. Coffman doubted the necessity of collaborative digital reference. He stated, “based on the data I’ve seen, the likely explanation is that with easy access to online resources, most libraries now have everything they need to answer the vast majority of questions they get on their own” [7]. Secondly, is it practicable or feasible? Due to the proliferation of institution-specific questions and language issues the meaning of collaboration across institutions and even throughout the world is debatable. The great difference between academic libraries and public libraries makes cross-sectoral cooperation difficult. Some researchers have queried the usefulness of multilingual collaboration in general and joint global knowledge bases in particular. A subject-based consortia, rather than geographic contiguity, was suggested in the 4th Virtual Reference Desk Conference (www.vrd.org) and the creation of small regional consortia instead of a large global one has proved more effective.

It has also been suggested that inappropriate emphasis on digital reference may undermine the value of library services. Dilevko (as cited in [12]) argues that a rush to embrace new technology in the form of a call-centre model for dealing with reference queries, runs the risk of deprofessionalizing the librarian. He warns that this model will lead to the librarian being reduced to a mere information retriever, not cognisant with the information being dispensed.

Currently the main issue is how to fit digital reference into ongoing activities, not just a pilot or as an add-on. Whatever we do, the principle of service is to make users get the most of the library at most convenience. Multiple forms of reference service allow easy access to users with varying personalities, knowledge levels, skills and economic conditions. The digital library should provide an effective enquiry-support system consisting of different forms of communication accessible to everyone.

5. Conclusion and further research

From the literature reviewed, it is apparent that currently in the UK more attention is focused on levels 1 and 2, while in the USA levels 1 and 3 are emphasized more. Regarding the digital reference area, Bains noted that “developments have been pioneered in the USA, but the UK library sector now appears to be catching up”. The authors argue that a systematic process to meet users’ information needs is required since users’ needs are a complex issue. No level should be overlooked. This article has also analysed the role of reference librarians in the digital library. To improve information services in the digital library we must:

- Increasingly enhance the functionalities of the digital library in order to serve the users automatically and support the self-help mode. Greater attention should be paid to the design of user interfaces or library portals on the basis of good user studies and high quality selected resources, a function which has always been part of the role of information professionals.
- Provide well-organized user education programmes and online tutorials to improve users’ information skills and ensure they make full use of the available technologies, resources and services within the digital library. Although digital library technology will make it simpler to access resources, it
is still necessary to induct users so they make the most of the changing technologies. It is also important to train users to identify and evaluate the resources properly on their own. After all, this has become an important skill in an information-overloaded environment.

- Offer enquiry support and point-of-need help to users promptly when needed. A range of types of media can be used to meet individuals’ different needs, representing a mix of on-demand support systems. Regarding the changing environment and information needs, new technology should be experimented with and integrated into current practice effectively and efficiently. Digital reference is a new development in this area and is certainly the focus of a lot of experimentation and support. Nevertheless, it is worth noting that digital reference is just one of the forms in the third level to deal with users’ enquiries, and the effort to support users’ information needs should be put into a broad and systematic context.

In summary, the ideal model for information and reference service in a digital library should be an intelligent digital library system, coupled with high training and effective personalized assistance. The digital library is not isolated when supporting users’ information needs. It has a great deal to do with the environment. For Higher Education (HE) libraries it is a part of the digital university. As Virtual Learning Environments (VLE) and Mediated Learning Environments (MLE) become more widespread, how to interact with departmental portals and integrate them into the university portals and then seamlessly merge into the mainstream learning, teaching and research of the institutions is an emerging issue. Further research is still needed.

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