Digital Reference Services: State of the Art in the Focus on Quality

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I am going to start this paper by outlining the current role of digital reference services in the information society. I will continue with an overview of the developmental stage of this relatively new service that has been reached so far. Advantages and disadvantages of the diverse variants will also be discussed. In the final part of this paper I am going to focus on quality criteria that can be used to evaluate and improve digital reference services in practice.

1. The Role of Digital Reference in the Information Society

The roots of digital reference go back as far as the 1980s. From humble beginnings it has since developed into a standard library service. With the advent of the digital era, libraries at first started to make their catalogues available for searches on the web and offered FAQs that answered standard questions. To be able to present the whole spectrum of library services on the internet an equivalent to the traditional reference service had to be developed for the world wide web.

However, this is not the only reason for the development of digital reference services. The web has changed and still changes the information culture of the users, who now expect a faster and easier service. Additionally, commercial services, such as “Google Answers”, “Lycos IQ” etc., now compete with library reference services. Therefore, digital reference had to be developed quickly to react to the challenges posed by commercial rivals and the changed user behaviour. Only in this way could it be proved that library reference services have one immense advantage over search engines and web catalogues: traditional and therefore also digital reference services do not aim at answering the questions the users ask, but instead they aim to provide the information that the users really require.
Even in the first half of the 20th century it was acknowledged through the experience of reference services in the USA that users often ask general and frequently side-tracking

questions rather than articulating what they are really looking for. To this end, the technique of the reference interview has been developed enabling the librarian and the user to determine together the actual information that is required. While search engines can only work with the syntax and the semantics of a question asked, library reference services can also deal with the third, pragmatic dimension. I.e. search engines and other navigation instruments on the internet work object-oriented, whereas digital reference provided by library experts offers subject-oriented services. Libraries with elaborate digital reference are therefore well prepared for the challenges of the information society – in fact, they are even more irreplaceable than before.

2. Definition and Forms of Digital Reference

The terms used for digital reference vary enormously. For example, digital and virtual reference are often applied synonymously. Terms such as electronic, online or live-online reference are also used. The following definition is common to all of the above:

"...the provision of reference services, involving collaboration between library user and librarian, in a computer-based medium. These services can utilize various media, including e-mail, Web forms, chat, video, Web customer call center software, Voice over Internet Protocol (VoIP), etc." [Sloan 2002]

This citation mentions the most important technically and organisationally diverse forms of digital reference, which will be described briefly with their respective strengths and weaknesses below. Asynchronous forms, i.e. forms in which the communication between users and librarians is experienced with a time delay, are the two oldest forms: reference via email and web form. Sometimes, so called "chatterbots" are also included in this category. Synchronous forms, i.e. forms in which the communication happens real-time, are enabled through chat and include various sub-forms such as Voice over Internet Protocol (VoIP) and Video Conferencing.

Digital Reference	
Asynchronous	**Synchronous**
Email	Simple Chat
Web Form	Instant Messaging as a chat variant
Chatterbot/FAQ	Extended Chat
	VoIP
	VideoConferencing

Two further variants of digital reference should be mentioned at this point: the Web Contact Center, which combines several forms of digital reference offered by a library, and collaborative reference, which is provided by several libraries pooling their resources and sharing the workload.

Email Reference:
Reference via email is technically easy to implement, cheap and improves the accessibility and scope of library reference services. The psychological barrier that stops some users from asking for help in the library is considerably reduced. Email communication is fast and has the advantage that, additionally to plain text, images and more extensive word or data files can be attached to the answer. The users can ask their questions even when the library is closed; however, these will then be answered with a time delay. This is a disadvantage particularly for the actual reference process. The usually indispensable process of clarification

via a reference interview is impaired and sometimes even impossible. Thus, reference via email does not reach the quality of subject-oriented services. Only the question as articulated by the user is answered, oblivious of a possible discrepancy between the question asked and the actual information needed. Another disadvantage is the loss of any non-verbal communication elements that can help identify user specific contexts. Reference via email is therefore mainly useful for simple factual queries. Where complex information needs are concerned it is advisable to change to a different medium of communication. Email reference has nevertheless, without a doubt, meant a big improvement for libraries as they can now offer individual information services on the web, in addition to more general and static services such as the catalogue etc. Another advantage is that any questions and in particular any related answers can be stored and indexed easily and effortlessly in a knowledge base for future use.

Reference via Web Form:

The experiences that were made with email reference prompted librarians to alleviate some of the problems by replacing this unstructured form of digital reference with web forms. The web form has to be accessed from the library homepage or the reference webpage, the fields then have to be filled in by the user and the form is finally submitted back to the library. Answers are usually provided by email, phone or post.

Web forms usually consist of a few compulsory categories, for example for personal and contact details, and several additional, optional fields. Notes provide guidance on the type of information required and advise the users that the more relevant details are given the higher the success and the faster the turnaround. In this way, libraries try to replicate the reference interview at least in part without forcing users to fill in too many detailed fields which could result in them not completing the whole process. Reference via web forms allows users to provide further and more structured details about their information needs. However, the disadvantages of asynchronous communication can only be partly compensated for and thus, this form of digital reference is unsuitable for more complex needs, such as detailed research queries for example.

Chatterbots:

Chatterbots are created by computer software which analyses the questions submitted by users for the keywords contained using linguistic programmes and mechanisms. Ideally, these keywords are already linked to particular answers in the knowledge base which are then offered to the user. In this form of digital reference, the user therefore does not communicate with a librarian but instead an interactive database that contains a range of pre-prepared information. Chatterbots are technically similar to full-text search engines, but they portray the illusion of an online chat: the users enter their queries in the fields provided and receive immediate replies. To increase the attractiveness of this service, chatterbots are fitted out with a symbolic body, so called avatars, in the form of pictures or animated images. Chatterbots are often used as help assistants in computer software, as adverts on company websites and as additions to digital reference. They are available 24/7 and to several users concurrently. However, they only provide answers to standard questions and are in essence a simple FAQ which simulates a chat using artificial characters. As chatterbots do not allow any communication with a reference librarian it is questionable whether they can, in fact, be seen as a real form of digital reference. Users nevertheless enjoy the “chat” with a well-made chatterbot even if they only get standardised answers.

The asynchronous forms of digital reference have, as we have seen, several positive features and extend the radius of a library enormously. However, they have various disadvantages in comparison with traditional face-to-face reference services. These forms of digital reference

are useful first and foremost for answering directional queries and questions concerning facts and figures. Synchronous communication on the internet could be implemented following the development of technical solutions to this end in the late 1990s.

Simple Chat Reference:

In general, communication via chat enables the user and the addressees (e.g. reference librarian or other users) to exchange brief written messages in quick succession. The communicating parties are online at the same time and can therefore react immediately to any messages received. A separate window or field is used for writing and sending off messages. The complete dialogue is shown and updated real-time in the chat window. Chat reference thus allows the reference interview to take place without any time delays in a virtual environment. A copy of the whole dialogue can be sent to the user once the reference process is completed and can also be indexed in an archive database. This database gives access to statistical information on the references processes dealt with via chat, such as topics or themes, locations of the users, duration, peak times etc.

However, some restrictions also apply to reference via chat. Any non-verbal communication is lost and the need to type all messages using a keyboard can be awkward for some questions or users. Very complex queries can therefore either only be answered unsatisfactorily or not at all. In addition, users accustomed to chat are generally used to receiving very fast replies and have little patience. Technical limits mean that exclusively text information can be communicated in this way. Within chat circles a particular language, jargon and communication style have developed that also need to be taken into consideration. American librarians have used their experiences with chat to develop suggestions and specific guidance for communication via chat reference [Lipow 2003, pp. 173-175; Radford/Thompson 2004]. Overall, chat reference has proven to be positive progress from reference via email or web forms, but it cannot fulfil all the expectations of an efficient, user-oriented information service on the web.

Instant Messaging as a variant of Simple Chat Reference:

Instant Messaging is a variant form of chat communication that has become increasingly popular. Therefore, libraries have been experimenting with IM-Reference for some time. Instant Messaging incorporates various interesting features, but users have to install client software to make use of these. Using this software users can create their own address lists, so called buddy lists. When a user logs in, it is immediately visible who from that buddy list is also online and communication via chat can commence directly. Other common IM features are the ability to leave messages for other users (email function), send data files or play online games together. Some suppliers also provide opportunities for phoning over the internet ("audio chat" or VoIP) and transmitting images simultaneously ("video chat" or image phone). Instant Messaging is very attractive for digital reference due to its popularity among users, however, it also has a range of disadvantages. Suppliers finance their products through advertising to be able to offer these software packages free of charge. This is the main reason for the popularity of this service. Library and user have to use the same software though, as most products by different suppliers are incompatible. Security and data protection cannot be guaranteed either as all communication between the two parties is transferred via the supplier's server.

Extended Chat Reference:

Any communication via chat can be combined with additional features, such as page pushing, escorting and co-browsing, through the use of specific software that is often part of more extensive Web Contact Center software. Page pushing allows the librarian to send internet pages from the library browser to the user's browser. Escorting consists of repeated page

pushing, thus enabling the user to follow the whole navigation process that the librarian is demonstrating. Collaborative or co-browsing gives the librarian as well as the user the opportunity to actively engage in the navigation process. Chat reference that is extended in this way has great potential for teaching information literacy, which shows that digital reference also plays a key role in the context of new e-learning developments.

VoIP ("Audio-Chat" or Internet Phoning):
Voice over Internet Protocol (VoIP) is a technology that enables the simultaneous transfer of voice and other data via the standard internet protocol. In addition to standard hardware equipment both parties need to have speakers and microphones installed on their PCs. When both of these components become standard and their use is a matter of course it is possible that chat turns out to have been an interim technology. Already, software that allows communication via VoIP and is particularly targeted at digital reference is available on the market. However, even though according to the latest sector news VoIP is on the verge of becoming a mass medium, it will be some time before the influence of VoIP reference on the overall digital reference market can be assessed [Meola/Stormont 2002, p. 25].

Reference via Video:
Software for video conferencing has also been tested for digital reference purposes by several American libraries. However, the results have so far not been very encouraging [Morgan 1996; McGeachin 1999; Pagell 1996]. This is due in part to the additional requirements of hard- and software packages in comparison to VoIP as both parties need to own webcams. In addition, it is doubtful whether this means of communication will gain general acceptance in the community. For the foreseeable future, only a small minority of users will have access to internet connections that are powerful and resilient enough to transfer the amount of data required for this process. Nevertheless, some American libraries are using video conferencing techniques in particular for communication between outlying parts of the campus and the central library [see Videoconferencing 2001].

The synchronous variants raise the quality level of digital reference enormously. Especially chat reference that is extended by page pushing and co-browsing opens up new possibilities. The whole spectrum of state of the art technology and the capabilities of digital reference can be used to their full potential when the local interface is optimised through Web Contact Center software and this is then combined with cooperation with other libraries in collaborative reference services.

Web Contact Center:
Some libraries are already using Web Contact Center software which has been developed for e-commerce applications for digital reference purposes. Web Contact Center offer a variety of features. They allow communication via email, web form and chat, but also enable more interactive collaboration through tools such as the already mentioned page pushing, escorting and co-browsing. Further functionalities like monitoring, cooperative answering, administration and statistics should also be pointed out [see Rösch 2003, pp. 120-125]. Librarians can utilize the monitoring tool for example to supervise all user navigation processes on the library server and can then offer help via chat where required. Cooperative answering allows several colleagues to work on one reference process together and also forms the technical basis for digital reference services offered in collaboration with other libraries. The administrative tools can be applied for instance when dealing with waiting lists at peak times or to direct particular queries to specific members of staff via automated routines. Finally, Web Contact Center software includes a wide range of statistical measures that record all transactions and can be used for evaluating the service.

Collaborative Reference:
There are numerous reasons for offering digital reference services in collaboration. Having access to the knowledge of several librarians broadens the range of subjects that can be covered and thus raises the level of quality. Sharing the workload and shifts enables libraries to offer this service during longer hours, and software and database costs are reduced due to the negotiation powers of consortia. Some of the more famous projects in this area include for example the British public libraries collaborative reference service "Enquire" (www.peoplesnetwork.gov.uk/enquire/index.html) and the Danish project "Biblioteksvagten" (www.biblioteksvagten.dk) which includes over 60 public and academic libraries. The most ambitious project is jointly lead by OCLC and the Library of Congress. Several hundred libraries worldwide participate in "QuestionPoint" (www.questionpoint.org). The focus lies on American libraries, but Australian, Asian and even some European libraries also contribute. QuestionPoint offers a wide range of modules and functionalities which cannot be described in detail in this context. Being able to answer and administer questions per email and chat constitutes the core of this service. A library profile module is used to coordinate the collaboration amongst the participating libraries. This profile module stores information about each library's central subject areas and main competencies, which enables the software to automatically forward specific queries to the most relevant library that is available at that point in time. Another module can be installed to build up and maintain an archive database ("Knowledge Base") in which all queries and answers can be classified and anonymously stored for future reference. The fourth module administers the personal profile and settings for each individual reference librarian. However, the QuestionPoint software can also be used stand-alone in an individual library to offer digital reference via email or chat on a local level without participating in any collaborative reference services.

3. Quality Criteria for the Evaluation and Improvement of Digital Reference in Practice

Over the last few years libraries worldwide have had the opportunity to gain experiences with the diverse variants and organisational forms of digital reference. Already, some efforts have been made to compare and evaluate the existing services and to develop quality criteria. In the following section I would like to briefly demonstrate why quality criteria are important in the context of digital reference and how such criteria can be developed methodically. I will also touch on the core general quality aspects that need to be considered.

Individual libraries make use of local quality criteria for a variety of reasons. Members of staff can thus act according to the standards set for their daily work practice. This creates stability and a more conscious approach towards aspects of quality and also forms the basis for regular evaluations and further developments of these standards. When these local standards form part of a wider spectrum of quality criteria that are applied across a range of libraries, this allows individual libraries to compare their own practices with others and to better identify strengths and weaknesses in their services. From a broader perspective these quality measurements are important for benchmarking and ranking exercises which are used to improve and secure quality. Especially when several libraries join up to collaborate in digital reference, as happens ever more frequently nowadays, all partners have to agree on a single set of performance indicators. This presupposes the development and supervision of mutual guidelines, standards or quality criteria [see for example QuestionPoint-Member Guidelines 2005].

Local policies that already exist in most libraries and set standards for the form and scope of individual digital reference services should be consulted, compared and analysed when

developing more overarching quality criteria. These policies contain a description of the performance levels that users can expect of the library's digital reference service and aim to guide members of staff internally and at the same time communicate this information to users externally. The information gleaned from these policies should then be combined with the statistical data available about digital reference in representative libraries. In the context of digital reference, most of the data needed can be easily accessed through log files. Ideally, libraries regularly compare the targets that are specified in their policy statements with their actual performance verified through statistical data [Wasik 2003; VET 2004]. In cases where such evaluations are published these present a wealth of material that can be used to develop quality criteria. However, apart from these policies, statistics and evaluations, libraries also need to think conceptually to develop quality criteria that allow state of the art, user- and market-oriented digital reference and that makes use of the full performance potential of the collaborating libraries. Some such important and interesting attempts already exist [Arnold 2005; Kwon 2006].

In general, quality criteria for digital reference can be divided into seven main categories that I will briefly describe in the following, final section:

Organisation of the reference process
Efficiency
Breadth / Extent of the service
Communication process
Quality of the answers
Usage of the service
Methods for evaluation

The organisation of the reference process is concerned with the availability and accessibility of the service, the structure of the user interface and the number of languages that can be used to communicate with the reference librarian. In addition, it is important to determine which variants of digital reference should be offered, which software is used, what qualifications library staff need to have and what the turnaround times should be. Within this context it also needs to be considered whether the service should be freely available to all users or whether particular user groups should be targeted. The final criteria that belong into this category are the three "p"s – policy, privacy, and publicity. These include detailed and to all users accessible rules and regulations, details about the digital storage of any session transcripts (length of time they are stored for, who has got access to these transcripts, reassurance that any data will be stored in an anonymous way etc.), and lastly the whole spectrum of publicity, marketing and advertising for the service.

As part of the efficiency of the service the duration of the average digital reference process and the staff resources required for each reference query need to be monitored. Information about any software licensing costs and resources for the technical servicing of the facility should also be detailed in this category. Ideally, this will enable libraries to calculate the precise overall costs for individual reference processes, differentiated by the types of queries and the targeted user groups.

The breadth and extent of the service is defined by the types of questions that qualify for this service. Usually, libraries differentiate between directional, bibliographic, simple factual, and complex information and research queries. The second important criterion is the style and scope of the answers provided. This could be supplying references to information sources, providing the actual full-text information needed, or forwarding the query on to other information providers or experts. Some libraries specify which and how many different

reference sources should be consulted for individual queries. Finally, a knowledge base can also be an important part of the service as this allows librarians to index and classify the transcripts of any closed reference queries and to make these freely available for searching. The core of any digital reference service is the communication process, which therefore needs to be focused on in particular in the context of quality. Performance indicators in this category are for example the use of polite language and style, automatically generated acknowledgements of the queries received via email of web form, and the personal identification of the reference librarian. Another measure is if and how a reference interview takes place during the digital reference process. When answering queries users should in addition be provided with descriptions of the information finding or research processes and should be questioned about their overall satisfaction with the service. Questions about further information needs should also be included in any reply.

From the user's perspective the quality of the answers provided is, of course, highly important. However, the criteria used to measure quality are often subjective and dependent on the individual context. Therefore, a quality assurance team which aims to provide neutral or deferred assessments through peer review will always encounter difficulties. Main performance indicators in this context are the avoidance of any loss in the quality of the service in comparison with face-to-face reference services, and the use of core, quality information sources for which full references are given in the reply. The reply needs to be accurate, adequate and complete. The librarian has to remain strictly neutral during the reference process and ensure that the level of any answer given corresponds to the level of the question asked and is correctly pitched to the specific user.

The usage of the service covers mainly quantitative criteria such as the number of queries received, answered, and not answered, and the ratio between digital and face-to-face reference services in the library. The saturation rate, i.e. the ratio between digital reference and overall library users, and the user return rate are also important. Furthermore, data about the usage frequency should be collected for this category and ranked by time of day, day of week, and month.

Finally, the evaluation of the service in general is a major area for the development of digital reference quality criteria. Methodologically this can be achieved through a variety of means. Users can be asked for feedback immediately following the reference process either directly via email or via a form with pre-defined scales. Alternatively, user surveys via email or phone can be useful at a later stage. User satisfaction is measured using the three following criteria: satisfaction with the answer and with the service mentality and the willingness to use the service again in the future. Ultimately, the quality of the answers can be evaluated through peer reviewing or peer monitoring. However, it has already been mentioned that this is not a straightforward and completely neutral process.

Quality Criteria for Digital Reference	
Organisation of the reference process	Availability
	Variants of digital reference
	Software
	Staff qualifications
	Turnaround times
	Free access, targeted user groups
	Policy
	Privacy
	Publicity
Efficiency	Duration of an individual reference process
	Staff resources for each reference process
	Software licensing costs
	Resources for technical servicing
	Overall costs for each reference process
Breadth / Extent of the service	Allowed question types
	Style and scope of answers
	Knowledge base
Communication process	Polite language and style
	Automatically generated acknowledgements of queries received
	Personal identification of the reference librarian
	Role and breadth of the reference interview
	Description of the information finding or research process
	Follow-up regarding user satisfaction
	Questions about further information needs
Quality of the answers	No loss in quality in comparison with conventional reference services
	Use of core, quality information sources
	Full references for sources quoted
	Accurate and complete answers
	Adequate and neutral answers
Usage of the service	Number of queries received
	Number of queries answered
	Number of queries not answered
	Ratio between digital and conventional reference services in the library
	Saturation rate – ratio between digital reference users and overall library users
	User return rate
	Usage frequency – ranked by time of day, day of week, month
Service evaluation	Request for user feedback immediately following the reference process
	User survey via email, phone etc. at a later stage
	Quality control via peer review and peer monitoring

4. Summary

In this context it was only possible to briefly mention potential quality criteria for the evaluation of digital reference services. However, what has become apparent is that differentiated catalogues of criteria have to be developed on the basis of this paper and other similar compilations [see White/Abels/Kaske 2003; VRD-Facets 2003], such as those by the American Library Association [ALA/RUSA-Guidelines 1998] and IFLA [IFLA-Digital Reference Guidelines 2003]. These criteria have to relate to the various forms of digital reference, be able to satisfy the specific requirements for collaborative reference, and allow for the diverse range of question types. Any further differentiations will have to take particular target groups and library types into consideration. Only this will allow libraries to analyse and compare statistics in a meaningful way that will result in continuous evaluations and improvements in the services. Developing and applying these criteria will involve a considerable amount of work which will, however, pay off in the long term.

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