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Attfield, Simon ORCID: <https://orcid.org/0000-0001-9374-2481>, Makri, Stephann, Kalbach, James, Blandford, Ann, De Gabrielle, Stephen and Edwards, Mark (2008) Prioritisation, resources and search terms: a study of decision-making at the virtual reference desk. Lecture Notes in Computer Science (5173) . ISSN 0302-9743 [Article]
(doi:10.1007/978-3-540-87599-4_12)

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Prioritisation, resources and search terms: A study of decision-making at the virtual reference desk

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Abstract. The reinterpretation of the traditional reference service in an online context is the virtual reference desk. Placing reference services into an online setting, however, presents many challenges. We report a study and analytic framework which addresses support for decision-making during virtual enquiry work. Focusing on specialist law-libraries, the study shows that enquirers do not volunteer important information to the service and that asynchronous communication media and some social obstacles present barriers to prompting. Also, previous enquiries are frequently used to inform current enquiry strategies but barriers exist in accessing this information. We conclude that email is an inadequate medium for supporting virtual reference services, and that system should support automatic, speculative matching between new enquiry content and integrated enquiry knowledge bases. The contribution of the framework is to offer a structured approach to evaluation in multiple virtual reference contexts and enable rapid convergence on barriers to efficient and effective service.

Keywords: virtual reference service, evaluation, collaborative information access

1. Introduction

The digital library (DL) revolution and the possibilities created for information search and delivery over the Web has provided opportunities for greater end-user autonomy in finding and retrieving information. Systems for information access, which were once the sole preserve of the library setting and frequently of librarian expertise are now accessed by end-users remotely, thus allowing access to a wide array of published information with new levels of convenience. The case is increasingly being made, however, that the model of DLs as purely “disintermediated” technologies which exclude the need or opportunity for search mediation is too limited. It is argued that DLs should act as gateways to a range of information services [1, 2], including personal library services such as the reference desk [3]. According to this ‘extended’ model, DLs are conceived of not only as places in which end-users can search

themselves, but where they can additionally also access a range of related services, including reference service assistance for finding information.

Reference services provide reactive, personal assistance in the pursuit of information [4], and as such are a logical adjunct to online information retrieval systems, particularly where users lack the search and resource knowledge necessary to resolve their own information needs. The reinterpretation of the traditional library reference service in an online context is the virtual reference desk. Users are offered the possibility of submitting enquiries via email or web forms and having librarians respond with appropriate information or guidance [4].

Placing reference services into an online setting, however, presents its own challenges. For example, reference interviews typically rely upon rich communicative interaction between patron and librarian. Given challenges such as this, there is a need for research which addresses the design and evaluation of such services with a focus on supporting both online patrons and also reference librarian stakeholders. With this in mind, the current paper reports a study of virtual reference services in specialist law libraries from the perspective of the librarian responding to enquiries. Our aim is to develop an understanding of everyday virtual reference work and to use this to inform the design and configuration of systems through which it is achieved. We take a sociotechnical approach which addresses practical issues related to service efficiency and effectiveness with a focus on synergy, or lack thereof, between systems and their users.

An initial study of a small group of librarians operating an email-based virtual reference service in a corporate law-library led to the identification of a series of barriers experienced when addressing enquiries. These centred around access to information for supporting enquiry-related decision-making. Virtual reference librarians make many decisions when dealing with enquiries and understanding their needs when making these decisions has implications for the design of systems that support this work. This initial study formed the basis for a questionnaire study used to triangulate the initial findings against a broader sample. In this paper we report results from the initial study and the questionnaire study concerning three types of decision: prioritising enquiries, selecting resources, and selecting search terms. These findings inform support for information communication, storage and access.

In reporting these results we describe a framework which was developed as a means for decomposing and structuring data analysis in a way that draws out some key areas of concern. This delineates three main factors: 1) decisions 2) information that informs those decisions, and 3) sources of that information. The needs of reference librarian work varies according to information domain and the organisational context in which the work takes place. The framework provides a generalised tool for performing similar evaluations in different enquiry services settings.

In section 2 we briefly review literature relating to user-intermediary interaction and the virtual reference service research agenda; in section 3 we describe the data gathering methods we used; in section 4 we report our findings; and in section 5 these are discussed.

2. Background

User-intermediary interaction has received considerable attention over the past 40 years [e.g. 5, 6, 7, 8]. Taylor's seminal work on question-negotiation [5] identified five filters librarians use to understand information needs: subject matter, motivation, personal characteristics, relationship of the enquiry to the file organisation and what the client anticipates in the form of an answer. Eliciting this information in the reference interview can be an imprecise craft, however, mired in interpersonal communication issues and situational factors. Dewdney and Ross [9], for instance, demonstrate the ineffectiveness of reference services as judged from the user's perspective.

Virtual reference (also referred to as digital reference) involves the use of software and the internet to facilitate human intermediation at a distance [10]. Question negotiation in this setting poses new challenges, as well as new opportunities. Nonetheless, the role of the intermediary remains the same: determining what is important to know in order to satisfy the information need.

Digital reference is a distinct and growing practice [10] with several initiatives in providing platforms and applications for digital reference having taken place in recent years. These include RefTracker [11] and QuestionPoint [12]. QuestionPoint, for example, aims to create a global service, built on the collaborative wisdom of many librarians, to facilitate timely and appropriate responses to users' information needs.

Such initiatives, however, have remained primarily the province of the practitioner with research providing little support [10]. In response, Lankes [10] defines a research agenda for virtual reference services which stems from a symposium held at Harvard in 2002. Lankes defines the central question as how to incorporate human expertise into information systems to effectively and efficiently answer information seekers questions. He then decomposes this into five component areas. These are: questions about the nature of human expertise in the system; how to measure efficiency and effectiveness; the ideal configuration of technology; questions concerning the expression of information needs; and questions about how to provide answers. Here we engage most directly with three of these. We focus on how librarians deploy their expertise in resolving enquiries within given virtual reference settings. To the extent that this expertise involves negotiation with the enquirer, we also address questions of need expression. These then informs the system question, with a particular interest in terms of the "necessary and sufficient architecture of an information system in respect to virtual reference"[10].

3. Method

Interviews, observations and focus group

The first stage of the study was conducted with three law librarians working in the library of an international corporate law firm within their main London office. The library dealt with approximately 600 enquiries a month; more than half of all enquiries were received by email.

We interviewed one librarian at her desk and performed a contextual enquiry observation [13] with another, taking photographs during both sessions. Voice recordings were made, transcribed and coded for emergent themes based around techniques from Grounded Theory [14]. This informed a subsequent focus group with three librarians in which scenarios of an imaginary enquiry management system was used to elicit further detail.

Analysis of this initial data drew attention to the importance of decision-making and gave rise to a framework for analysing different decisions in terms of a set of element types that were common to all decisions. These were: *decision*, *information* and *sources* (represented in figure 1 with respect to a single decision). For any decision there may be multiple types of information (or factors) that contribute to its outcome, and access to these affects decision-making capabilities and outcomes. No commitment is made the nature of the contribution beyond the possibility that some information may be more important than other information.

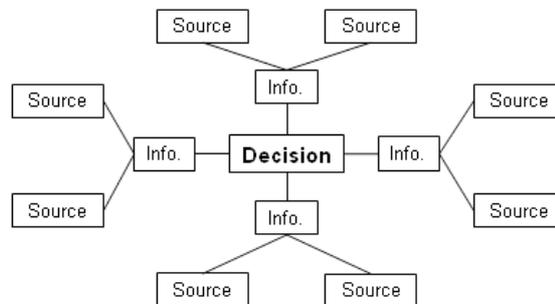


Figure 1. The decision, information and sources framework.

Whilst the *information* elements related to a decision represent things that the decision maker would find useful to know, *source* elements represent routes through which each element of information might be obtained. And whilst there may be multiple types of information relevant to a decision, there may also be multiple sources for each type of information. Further, obtaining information from a source can be understood as incurring different levels and types of cost to the decision-maker,

which themselves can be mitigated by system design. Hence, the framework focuses attention on particular design issues.

The framework, then, is underpinned by a formulation of the evaluation problem as one of analysing decision-making in terms of supporting access to information. Conversely, the design problem is formulated as one of providing easy access to the information that users value in their own decision-making.

The questionnaire

To explore the generalisability of the initial findings, an online questionnaire was developed. This was promoted on two mailing lists specifically for law librarians and ultimately completed by 57 respondents who dealt with virtual reference enquiries within a range of organisations worldwide. The questionnaire was organised into sections, each dealing with a given decision. Within each section, a composite question probed for the extent that different kinds of information contributed to the decision, and subsequent questions asked the extent to which different sources were used to obtain that information (where applicable). Responses were made using a Likert-type scale with four possibilities: Always, Frequently, Sometimes and Never. For each question an ‘open’ response option was also provided.

4. Results

The three decisions we report here are: prioritising enquiries; selecting resources; and selecting search terms.

Prioritising enquiries

In the initial study setting, email enquiries arrived in a shared inbox using a dedicated service address. At any time there could be multiple enquiries pending and the librarians prioritised these depending on a number of factors. These factors informed a series of questionnaire items relating specifically to prioritisation, the results of which are shown in Figure 2 and discussed in the text below in conjunction with the initial study data. Open responses are not included in figure 2, but are discussed in the text.

Figure 2 is structured in terms of the *decision, information* and *sources* framework. The central rectangle shows the type of decision to be made (in this case prioritising enquiries). Immediately surrounding this are four types of information that were found to contribute to such decisions (urgency, order received, end-user role, enquirer role). The outer rectangle shows potential sources for each information element. The circle associated with each element indicates the most common (modal) response for a corresponding question across the 57 completed questionnaires (Always, Frequently, Sometimes or Never). These questions prompted for the frequency that this information was considered in relation to the decision and the frequency that the

sources were used to obtain the information. Clockwise ordering of elements corresponds to the level of modal response (starting with Always at 12' o'clock).

Our initial data showed that the librarians dealt with enquiries in the order that they were received except where perceived urgency afforded them higher priority. Enquirers were encouraged to indicate this by expressing time-limits and using email 'importance' flags. The enquirers were not necessarily the information end-users, since research was often delegated by lawyers to trainees assigned to them. Further, the organisational roles of the end-user and the enquirer had some significance for enquiry prioritisation. One librarian emphasised that they need to know this information in order to make an appropriate response. In particular, different privileges were associated with different roles. For example, trainees were expected to do much of their research as part of their training, whereas qualified lawyers could expect more support.

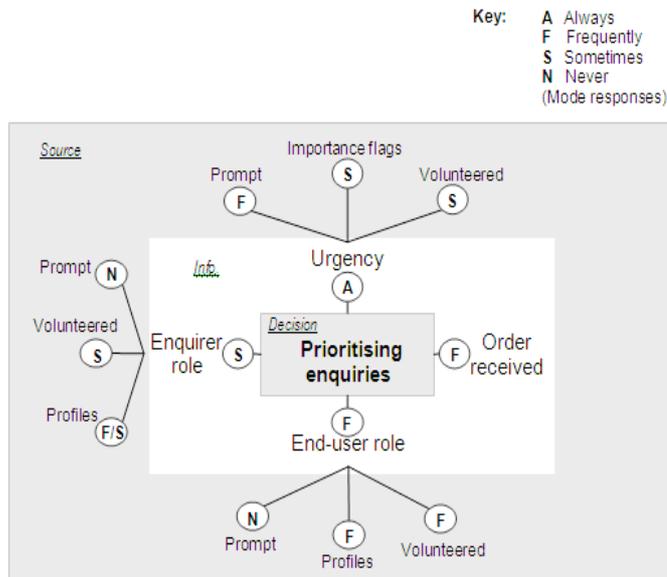


Figure 2. Results from questions about enquiry prioritisation

The questionnaire results (see figure 2) corroborate the initial data in terms of the relative importance of urgency and receipt order for prioritisation. They also show that librarians frequently need to prompt enquirers for urgency information. The need to prompt enquirers arises elsewhere in the results of this study. We will note here that given the asynchrony and restricted bandwidth of communications between virtual reference service librarian and their enquirers, this represents a barrier to efficiency.

The results of the questionnaire also show that the organisational role of the information end-user is *frequently* considered, and the organisational role of the enquirer is *sometimes* considered in prioritisation decisions. This ordering is explained by the usual seniority of the end-user. However, the results also show that

librarians never prompted for this information despite the fact that the end-user role, at least, was an important consideration and was not always volunteered. Our initial data indicated that this arises from a social barrier. Librarians were reluctant to ask enquirers for their role for fear causing offence—their preference was to consult online staff profiles. Indeed, one face-to-face reference interview was observed in which, unbeknown to the enquirer, the librarian looked-up their staff profile during a conversation across the enquiry desk. This preference for consulting staff profiles for role information rather than prompting was supported by the questionnaire results.

Deciding on resources

The librarians in the initial setting had access to a large range of information resources. Selecting the right resources was part of the skill of the librarian. The initial data informed questionnaire items about information used to make resource decisions during an enquiry. The results are shown in figure 3.

Our initial data showed that when using multiple resources for an enquiry it was important to keep track of those used so far, particularly on a busy enquiry desk where interruptions could be frequent. The librarians often created written strategies for an enquiry and annotated these to record their progress by ticking-off the resources. The questionnaire respondents indicated that they *frequently* used this information (represented by ‘resources tried by librarian’), that they *frequently* maintained such records and *sometimes* consulted their browser histories.

The questionnaire respondents also *frequently* referred to similar previous enquires and used colleagues’ suggestions. The initial study had shown that enquiries could be similar or even identical to those dealt with previously. Recognisable topic trends emerged, and it was useful to know what resources had been used previously. The librarians searched their email records and browsed their strategy notes (which they tended to retain for a week or two). Both were shown to be used *frequently* by the questionnaire respondents. Open responses indicated that some libraries maintained databases of enquiries with logs of solutions and resources. However, our initial data also showed that email client search capabilities were not able to support speculative matching between a current enquiry and previous similar enquiries. The initiative to search depended on a librarian explicitly recognising a similarity with a previous enquiry, and recalling sufficient details (e.g. enquirer, time-period) to support retrieval. Hence access to previous similar enquiries was limited to those enquiries that could be recalled by the librarians who happened to be on duty.

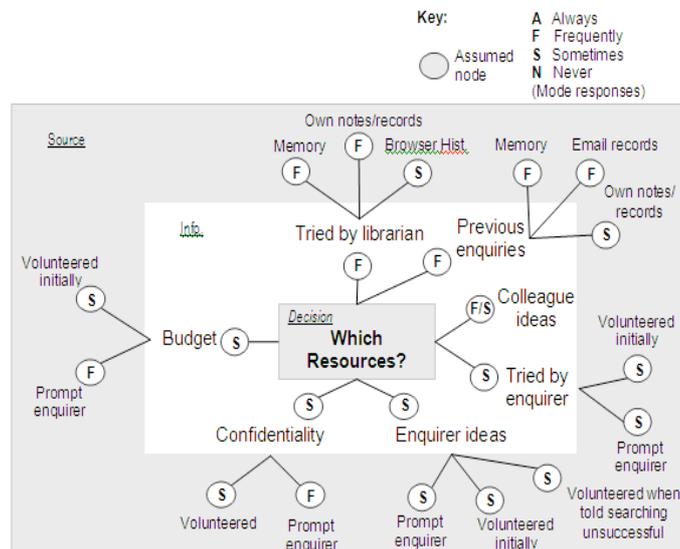


Figure 3. Results from questions about selecting resources.

The questionnaire results indicated that factors that were considered less frequently in making resource decisions included: resources already tried by the enquirer, ideas from the enquirer for resources to try, and constraints on budget and confidentiality. The initial study showed that enquirers often performed some searching themselves and sometimes relayed details in their enquiry (presumably to avoid duplication, but perhaps to also as evidence of effort). They also sometimes suggested resources (their problem might be one of access). Confidentiality requirements could limit the resources that could be consulted, especially where these were people outside of the organisation, and it was also important to know how much an enquirer was prepared to spend on an enquiry and any necessary charging reference.

The fact that these factors were considered only *sometimes* by the questionnaire respondents, could indicate that they were less important. However, it could also indicate that this information was harder to obtain. It is notable that the information types that were *frequently* considered were sourced from within the library environment, whereas information that is only *sometimes* considered was sourced from the enquirer. Further, the latter is only *sometimes* volunteered, and librarians often need to prompt. In the case of confidentiality and budget constraints this was *frequent*. This was also true of the initial setting. One librarian estimated that it was necessary to prompt for budget information in 80% of enquiries.

These results indicate that information obtained from the enquirer is important but harder to obtain. Prompting via an asynchronous medium and receiving a response takes time. As already noted, this represents an inefficiency. In relation to obtaining these elements of information, then, (resources already tried by the enquirer, ideas from the enquirer, and constraints on budget and confidentiality) the cost of prompting the enquirer represents a barrier to the librarian.

Deciding on search terms

In addition to good resource choices, successful online information seeking depends upon the use of effective search terms. Like resource decisions, the librarians in the initial setting consulted a number of sources for suggestions about effective search terms. These were used as the basis for a set of related questionnaire items.

The results of these items (shown in figure 4) are broadly similar to the results for resource decisions. *Frequently* used information included terms already used during an enquiry and those used in previous similar enquiries. Likewise, the librarians in the initial study maintained written search strategies and similarly consulted email records and personal notes within the limitations imposed by the need to recognise relevant similarities with previous enquiries.

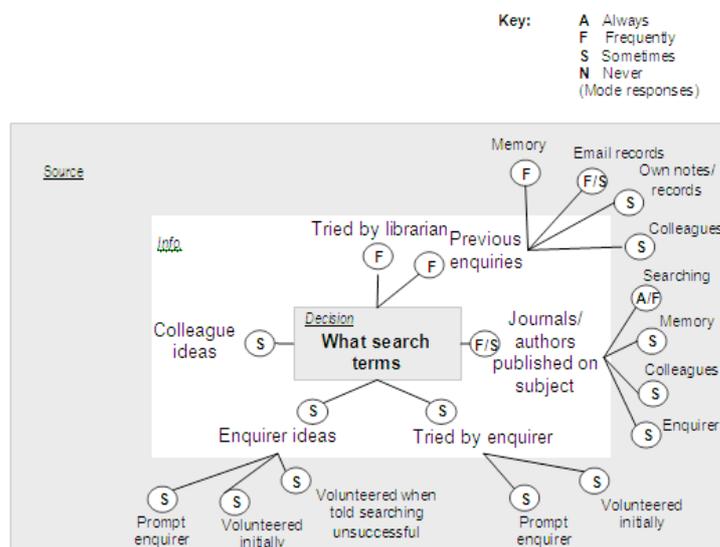


Figure 4. Results from questions about selecting terms.

An additional factor affecting term choices, which questionnaire respondents indicated as being significant, were authors or journals who had published on a particular subject. Some effort went into acquiring this information and the questionnaire reflected this.

The questionnaire results relating to search term choices also followed the pattern that information sourced from the enquirer (terms already tried by the enquirer and enquirer's ideas) was considered less frequently, and only *sometimes* volunteered. In these cases prompting was *sometimes* used. The initial setting, however, showed that enquirers' ideas for search terms, in particular, could be valuable to the librarian. Librarians in corporate law libraries are generally specialists in legal information work. Their clients are trained and often qualified lawyers. Consequently, they can offer knowledge of legal concepts and terminology which is typically used to index the information that they seek. Communicating such terms to the librarian often

contributed usefully to resolving their enquiries. Nevertheless, the questionnaire results show that this information was only *sometimes* volunteered, and in some cases only volunteered when the librarian reported that searching had been unsuccessful. This further strengthens the case that the need to prompt the enquirer for information represents a barrier to the librarians work.

5. Discussion

Decision-making is a complex matter. In any situation, multiple factors contribute to the flow of decisions in the realisation of goals and values. A unique human characteristic is the ability to adaptively access information within an environment as resources for decision-making. The current study is testament to this in the context of virtual enquiry services. Part of the expertise of the reference librarian in that context is their understanding of what kinds of information are likely to be of value to them in providing an effective service. However, the information that is useful is not necessarily easily available, and this is potentially exacerbated when an enquiry service operates online. Technology can nevertheless provide opportunities for ameliorating these barriers, but this must be predicated upon an understanding of what those barriers are.

In this paper we have reported on information and its sources in relation to three types of decision: enquiry prioritisation, choosing information resources and selecting search terms. The original study extended beyond this, but given limitations of space we have chosen to focus on these three here. Even so, the results demonstrate that virtual reference librarians use a wide variety of information derived from a number of contexts.

Included in these is the context of the enquirer. The librarians we studied use information from the enquirer in decisions about prioritisation, resources and search terms. However, enquirers do not necessarily volunteer the information that is wanted and prompting is often necessary. The need for prompting then presents a barrier to providing timely responses and can mean that this information is actually not sought. One solution to this is to provide appropriate prompts to the enquirer at the time of initial enquiry. Dedicated enquiry service systems such as QuestionPoint offer configurable enquiry forms. Our findings make the case for these and also how they might usefully be configured. Enquirers may have preferences against form filling, but the 'open' structure of email means that it is an inadequate communication medium for virtual reference services.

To complicate things further, social obstacles also present a barrier to prompting for some kinds of information. We found that librarians never prompted for information about the role of the enquirer and end-user, even though different roles carry with them different privileges and this is important for the level of response to offer. This information could also be initially prompted for, but where information is relatively stable (such as details of the enquirer and end-user) there is a case for storing and appending this information to enquiries automatically.

Another context which provides a valuable source of information is that of previous enquiries. Given the range of resource and query possibilities open to

librarians, strategies can require some consideration. Our results demonstrate the value of relating new enquiries to old to assist in this process. Some dedicated systems also support enquiry knowledge bases to help with this, and this study demonstrates that information about resources used and search terms or queries are particularly important to retain. However, the current study draws attention to the limitations of systems that do not support speculative matching. By this we mean matching all previous enquiries against each new enquiry, rather than matching certain recalled features of a previous enquiry against new enquiries, only where the previous similar enquiry happens to be recalled by the librarian on duty. Further, the matching process could be performed automatically, thus relying on a model of passive rather than active search on the part of the librarians. Both strategies are likely to increase recall and hence the value of stored enquiries.

Finally, our focus here has been on the virtual enquiry work of law librarians, for the most part based on data from large, private law firms. Some of the findings will generalise into other domains and some will not. Virtual enquiry services operate in many different contexts, and each will undoubtedly present their librarians with a different range of constraints and possibilities. Nevertheless, some virtual reference librarian needs may reoccur largely irrespective of domain. A worthwhile focus for further research would be to explore virtual reference librarian decision-making in organisational domains beyond a legal setting, such in news organisations, hospitals, wider health services and educational settings such as universities. Beyond organisational domains, such research might also consider problems faced by virtual reference librarians who operate virtual reference services associated with public access digital libraries.

We regard the framework we have used for understanding the needs of decision-making, however, as a generalisable tool that can be applied to any virtual reference service domain, and can assist in understanding the specifics of new situations. By decomposing issues involved in decision-making it offers a structured and practical approach to data-gathering and analysis that can help researches to converge rapidly on factors which are barriers to efficient and effective service. As such it is a tool for data-gathering and analysis specifically for informing virtual reference service design. The further evaluation of the framework rests on its relevance to new domains as a means of decomposing factors involved in decision making which are amenable to variations available to the system designer, and the extent to which it enables the analyst to focus in on these efficiently and effectively.

Acknowledgements

We thank Loyita Worley and her staff at Richards Butler, and also Lydia Craemer for the help they provided in enabling us to gather data for this study.

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