The paradox of expertise: Is the Wikipedia Reference Desk as good as your library?

Abstract

Purpose:

This study aims to examine answers' quality on the Wikipedia Reference Desk, and to compare it with library reference services. It examines whether Wikipedia volunteers outperform expert reference librarians and exemplify the paradox of expertise.

Design/Methodology/Approach

The study applied content analysis to a sample of 434 messages (77 questions and 357 responses) from the Wikipedia Reference Desk and focused on three SERVQUAL quality variables: reliability (accuracy, completeness, verifiability), responsiveness, and assurance.

Findings

The study reports that on all three SERVQUAL measures quality of answers produced by the Wikipedia Reference Desk is comparable with that of library reference services.

Research limitations/Implications

The collaborative social reference model matched or outperformed the dyadic reference interview and should be further examined theoretically and empirically. The generalizability of the findings to other similar sites is questionable.

Practical implications

Librarians and library science educators should examine the implications of the social reference on the future role of reference services.

Originality value

This study is the first to: 1) examine the quality of the Wikipedia reference desk; 2) extend research on Wikipedia quality; 3) use SERVQUAL measures in evaluating Q&A sites; and 4) compare Q&A sites with traditional reference services.

Keywords

Reference services, Wikipedia, quality, reliability, social reference, Q&A sites.

Paper type

Research paper.

1. Introduction

The social web challenges the way information is created, organized, and disseminated. One of the most known achievements of the social web is the success of Wikipedia in producing content that is as good as traditional authoritative encyclopedias (Emigh and Herring, 2005; Giles, 2005; Rosenzweig, 2006; Stvilia et al., 2005; Willinski, 2007). It is perhaps the best example of how harnessing mass collaboration to create real value for participants works; in this environment individuals can participate in innovation, wealth creation, and social development more than ever before (Tapscott and Williams, 2007). The success of Wikipedia is attributed to the wisdom of the crowds; diversity, independence, and decentralization enable the Wikipedia crowd to be wise (Surowiecki, 2004). But the social web may also have a destructive impact on our economy, culture, and values (Keen, 2008); it creates a culture of mediocrity, where everything is miscellaneous (Weinberger, 2007). It is unclear if the participatory model of the social web and the mass collaborative knowledge creation sites are sustainable over time, or if they will collapse in the near future. Keen (2008, p. 2) in *the cult of the amateur* caution of "the consequences of a flattening of culture that is blurring the lines between traditional audience and author, creator and consumer, expert and amateur." The social web challenges the need for traditional institutions in our society (Keen, 2008), including libraries. Further, the social web exemplifies and capitalizes on the paradox of expertise (Johnson, 1983) and challenges the role of professionals, as well as the role of librarians. At times, experts' ability to make a judgment is distorted (Tetlock, 2005), and a group of diverse non-experts can make a better judgment (Johnson, 2003). The impacts of the social web on processes of information creation, organization, and

dissemination have implications for libraries and librarians. One specific area of the social web that should not be overlooked by libraries and librarians is the flourishing of Q&A sites, which may challenge the role of reference services.

Since the advent of Web 2.0, many online question and answer (Q&A) boards have formed around communities of volunteers. Under the assumption that "everyone knows something," users answer requests made by visitors to these sites (Noguchi, 2006, p. A01). Examples of these Q&A sites include Yahoo! Answers (the largest question-answering service), Wiki Answers (a user-driven component of Answers.com), Askville (Amazon's question-answering service), and the Wikipedia Reference Desk (where Wikipedia volunteers answer questions). Yahoo! Answers, which is the largest Q&A service, has approximately 23 million resolved questions and over 100 million users[1] (Dom and Paranjpe, 2008). These Q&A sites capitalize on the wisdom of the crowd to handle thousands of questions per day and to provide amateur reference services.

These Q&A sites present a new model of collaborative reference service, social reference. The social reference is participatory and open to anyone; it differs from the traditional library reference interview. Social reference relies on amateur volunteers while libraries employ professional librarians to address their user's information needs. Because of these differences, answers on Q&A sites may differ in quality from those that librarians provide. Answers may be as good, or even better than those provided by librarians, but it is possible that they are mostly unreliable (inaccurate, incomplete, and biased). Research on the quality of Q&A boards is in its infancy and mostly focuses on. What is the quality of the answers on Q&A boards? Who asks and who answers? Which

1 To ask and answer questions on Yahoo! Answers one must be a registered user, who is assigned a unique id and is counted as a single user.

user behaviors enhance or hinder answer quality? How does social reference service compared with traditional library reference services?

Through an examination of reference transactions[2] from the Wikipedia Reference Desk and content analysis of 77 requests and 357 responses, this study extends the research on the quality of answers on Q&A sites. It compares the quality of the Wikipedia Reference Desk with conventional library reference services and explains the similarities in light of the paradox of expertise. The study informs researchers and librarians of the potential of the social reference model; it also emphasizes the need for theoretical and empirical research on the social reference.

2. Background

Although many researchers have focused attention on the quality of Wikipedia articles (Emigh and Herring, 2005; Giles, 2005; Korfiatis et al., 2006; Rosenzweig, 2006; Stvilia et al., 2005; Viegas et al., 2004; Viegas et al., 2007; Willinski, 2007), no one has addressed the question of answer quality at the Wikipedia Reference Desk. Research on answer quality of Q&A boards is still in its infancy. Most of the studies focus on Yahoo! Answers (Adamic et al., 2008; Agichtein et al., 2008; Bian et al., 2008; Dom and Paranjpe, 2008), a few focus on the Answerbag community (Gazan, 2006; 2008) or compare select Q&A sites (Cahill, 2007; O'Neill, 2007; Harper et al., 2008).

These studies are problematic because they work under the assumption that users ranking reflect answers' quality. On Yahoo! Answers, the best answer is determined by a community vote or by the user who posted the question. Voting and ranking systems can

[2] A transaction includes a request and all related responses; on the Wikipedia Reference Desk a transaction include on average 4.5 responses.

yield useful results if enough community members vote, but vested interest, armies of voters, or individual voters who vote many times are not easy to track and can skew the results (Richman, 2007). While user rankings of answer quality are useful, reference research has revealed that they are subjective, influenced by users' gratitude toward the responders, based on socio-emotional value (Kim et al., 2008), and do not correlate with answer accuracy (Saxton and Richardson, 2002). Users evaluate the quality of information received whether or not they are sufficiently knowledgeable about it.

One approach to evaluate answer quality is through user reputation (Chen et al., 2006), responder's credibility (based on the number of best answers the user had previously made [Dom and Paranjpe, 2008)]), responder efforts (Harper et al., 2008), or ranking of authoritative responders (using link analysis [Jurczyk and Agichtein, 2007a; 2007b]). Users who are active on specific topics provide better answers than those who participate on multiple categories (Adamic et al., 2008). These studies try to identify authoritative users, while there is a shift from authority to reliability in assessing credibility on the Internet (Lankes, 2008).

Another method to identify high quality answers is based on analysis of the content (Agichtein et al., 2008; Gazan, 2006) and length of the answers (Adamic et al., 2008; Harper et al. 2008). Better answers are longer (Adamic et al., 2008; Harper et al. 2008) or include references to external sources (Gazan, 2006). In addition, responsiveness, percent of questions answered, and number of answers per question were used to compare the quality of services that various Q&A sites provide (Harper et al., 2008). The quality of Yahoo! Answers service was compared with similar Q&A sites (Harper et al., 2008; O'Neill, 2007; Shah et al., 2008). These include sites such as All

Experts (Harper et al., 2008), Askville, (O'Neill, 2007), ChaCha (O'Neill, 2007), Google Answers (Harper et al., 2008; Shah, Oh, and Oh, 2008), and live QnA (Harper et al., 2008). Harper et al. (2008) report that Google Answers[3] outperformed the others on all quality measures; Yahoo! Answers was second on most of their measures. O'Neill (2007) distinguishes between responses based on question difficulty and argues that Yahoo! Answers outperforms the others on easy and moderate questions. She claims that "Responders at Yahoo! Answers and Askville could find it difficult to handle questions that really require an old fashioned reference interview and/or some knowledge of resources not easily uncovered by simple search" (O'Neill, 2007, p. 10).

Existing research on the quality of Q&A sites ignores previous findings from reference research and does not use objective measures such as response accuracy and completeness to evaluate services' quality.

3. Procedure

This study evaluates transactions from the Wikipedia Reference Desk. The Wikipedia community maintains two help desks. One supports the creation and maintenance of the encyclopedia; the other is the reference desk, which works like a library virtual reference desk and uses wiki to process reference transactions. Users leave questions on the reference desk, and Wikipedia volunteers work to help them find the information they need. The reference desk is organized under seven topical categories: Computing, Entertainment, Humanities, Language, Mathematics, Miscellaneous, and Science.

[3] Google Answers was a paid site on which users would state the amount ($2 - $200) they would pay for an answer. Harper et al., (2008) studied it at three different price-points – $3, $10, and $30. Google answers 30$ outperformed the others on all measures, except for number of answers that were higher on Yahoo! Answers.

3.1 Data Collection

The Wikipedia Reference Desk maintains an open archive of old transactions that are grouped by topics and organized chronologically. In September 2007, all the data from April 2007 in the Wikipedia Reference Desk archive was saved and examined. During April 2007, the Wikipedia Reference Desk received 2,095 requests and provided 9,637 responses (more than 11,000 messages) on the seven topical desks (Table 1). On average, the Wikipedia Reference Desk received 70 requests per day and users provided an average of 4.6 responses for each request.

Insert Table 1 approximately here

A sample that includes 210 transactions from all of the April 2007 archive was collected. The first transaction from each day of this month and from all seven desks was chosen, and content analysis of eleven days out of this data set was conducted. This included 434 messages, 77 requests and 357 responses (examples of queries are included in Appendix I).

Data about each user who contributed by asking or responding to the 77 transactions were also collected. One hundred and seventy unique users sent responses; they posted between 1 and 17 messages each. Among them, there were 122 expert users and 48 novice users (expert users were defined as users who have modified their Wikipedia user page, and novice were not). Seventy (41%) of these users posted multiple messages on the Wikipedia Reference Desk during the eleven days that were analyzed and 34 (20%) of them participated in more than one reference desk.

Insert Table 2 approximately here

Table 2 shows that the majority of the users who provide information on their country of residency are from the US (23), Canada (11), and Australia (8). The information about country of residency, gender, education, or occupation of Wikipedia volunteers is based on voluntary self-report data and may be biased. Most of these users are male (23) and only a few are female (3); this reflects the gender profile of the larger Wikipedia community. Almost half of the expert users have been active Wikipedia users for over two years (since 2007 – 16 users; since 2006 – 46 users; since 2005 – 33 users; since 2004 – 21 users; since 2003 – 6 users). Most of them hold a college degree (Figure 1) and work in the IT or publishing industries (Figure 2).

Insert Figures 1 and 2 approximately here

Experts were more active than novices at the reference desk; they mostly answered, while novice users mostly asked questions. Novices were more likely to ask questions (70%) compared to experts (29%) and they submitted most of the questions (57%). Experts submitted most of the responses (85%) and 92% of them answered questions compared to only 54% of the novice users. Experts asked a significant number of questions, and many of the experts answered multiple questions on multiple reference desks. Role separation between the few highly active users who only answer questions and do not ask is characteristic of Yahoo! Answers (Adamic et al., 2008) and of a Java forum (Zhang et al., 2007). About one fifth (18%) of the Wikipedia reference desk users asked and responded to questions; echoing the findings from Yahoo! Answers, where 22% of the users served in dual roles (Adamic et al., 2008).

3.2 Data analysis

Once all the transactions were uploaded into Nvivo 7, data analysis began. Nvivo 7 is a QSR software that facilitates qualitative data analysis. Content analysis of 77 transactions was conducted, assigning codes to sections of each transaction. Content analysis of answers is used to evaluate quality of answers from Q&A sites (e.g., Harper et al., 2008) and virtual reference (e.g., Radford and Connaway, 2008). The coding scheme (Table 3) was based mainly on SERVQUAL measures (Parasuraman et al., 1988), and focused on three measures: 1) Reliability – a response that is accurate, complete, and verifiable; 2) Responsiveness – promptness of response; and 3) Assurance – a courteous signed response that uses information sources.

The SERVQUAL measures have been utilized in evaluation of the quality library services and digital reference services (Hernon and Calvert, 2002; O'Neill et al., 2001; Shachaf et al., 2008; Yu, et al., 2008). These measures have been developed based on studies that identified the important dimensions of perceived service quality (e.g., Parasuraman, 1985) and e-services quality (e.g., Parasuraman et al., 1988; Yang et al., 2004). The SERVQUAL measures are the most widely used scales for measuring consumer perceptions of service quality (Voss, 2003); these measures include tangibles, reliability, responsiveness assurance, and empathy (Parasuraman et al., 1988). Other measures that have been used in reference research and which informed the development of the coding scheme include, for example, accuracy, responsiveness, completeness, assurance, reliability, adherence to guidelines, and usage of sources (e.g., Arnold and Kaske, 2005; Kaske and Arnold, 2002; Pomerantz, 2007; Shachaf and Horowitz, 2008; Shachaf and Shaw, 2008; Ward, 2005). Specifically the development of the coding

scheme was supported by the Wikipedia Reference Desk guidelines,[4] and the types of sources used were elaborated based on sources used in library digital reference services (Shachaf and Shaw, 2008).

Insert Table 3 approximately here

Content analysis of the 77 transactions involved 27 codes that were assigned to sections in the answers. Analysis was done at the transaction level, which include a request and an answer with 4.5 responses on average (examples of a requests with answers that are composed of multiple responses are available in Appendix II). Frequencies of codes are reported for individual messages and transactions (aggregated answers). To assure the reliability, a second coder coded 10% of the transactions; the inter-coder reliability was 92%.

3.3 Limitations

The major limitation of this study has to do with the generalizability of the findings from the Wikipedia Reference Desk to similar sites. The study used three quality measures and it is possible that other measures, such as user satisfaction or user perception of answer usefulness, could yield different results. Further, the study did not differentiate quality based on query type and difficulty (examples of queries are available in Appendix I).

4. Findings

Table 4 provides the frequency of codes on the three SERVQUAL measures.

[4] The guidelines page, was accessed on September 3, 2007 to develop the codes, but like many other Wikipedia pages has since changed.

Insert Table 4 approximately here

4.1 Reliability

Reliability of the answer is determined by whether it is complete, accurate, and verifiable. Most of the requests received a response message (96%, n=77) and the vast majority of these messages included a partial or complete answer (92%, n=77); sixty three percent of the transactions were answered completely (n=52). A little over half (55%) of the answers[5] (n=27) were accurate, 26% were not accurate, and in 18% of the cases, there was no consensus among the responders. Seventy six percent of the transactions (n=77) linked to online sources that support the answer, but only 10% of the answers made full reference to the sources they mentioned.

4.2 Responsiveness

For 77 transactions average response time per question was calculated as a measure of responsiveness. The first response was posed on average after 4 hours *(M=4.004, SD=11.33, Mdn=1.192),* and the last response after 35 hours *(M=34.764, SD=60.96, Mdn=14.197)*.

4.3 Assurance

Assurance is operationalized as a courteous signed response that uses information sources. Users signed their Wikipedia user names on 75 of the 77 transactions (97%), but only 136 messages out of the 434 messages were signed (31%).

The sources that have been used by the responders in 210 transactions were listed and analyzed. Eighty eight percent of the transactions were answered using sources. Wikipedia was used most frequently; it accounted for 44% of the references, in 93%

[5] Due to the variety of question types and topics, it was possible to determine level of accuracy for only 27 (factual) questions.

percent of the transactions. On average 4.5 sources were used per transaction, but at least 9 out of 10 messages in the responses did not mention any source. Traditional information sources were rarely used; journals, databases and indexes, and books were cited once each, and only 18 responders referred to books in 12 transactions (.01% of the sources cited in the replies were books, .001% newspapers, .001% databases and indexes, and .001% journals).

5. Discussion

The quality of the Wikipedia Reference Desk is examined in light of reference research because this virtual reference desk is modeled after library reference services,[6] and because the body of knowledge about Q&A boards does not provide enough comparable data. This examination reveals that the quality of the Wikipedia Reference Desk is similar to library reference services; a few possible explanations for this similarity are discussed.

5.1 Comparison with library reference services

The Wikipedia Reference Desk provides answers that are as accurate as those that traditional (and digital) reference librarians provide. Both provide reference services at a 55% accuracy level (for comparison see, for example, Hernon and McClure's [1986] classic study). In reference research, "The 55% rule was established after a series of reference accuracy studies consistently indicated that just over half of the test questions were answered correctly" (Saxton and Richardson, 2002, p. 35), and studies of digital reference services reported similar results (for example, Kaske and Arnold, 2002).

[6] On the Wikipedia Reference Desk the following statement is made: "Wikipedia reference desk works like a library reference desk" ("Reference Desk," 2008, "Wikipedia Reference Desk," para. 1)

Answer completeness rate at the Wikipedia reference desk is better than library reference services' completeness rate. Wikipedia volunteers provide complete answers for 63% of transactions and librarians completeness rate in virtual reference services is lower; for example, Ward (2005) report 47% completeness rate and Arnold and Kaske (2005) report that only 38% were complete, accurate, and verifiable.

Further, the Wikipedia reference desk and library reference services receive the same amount of unsolicited thank you messages. Thank you messages were submitted on 19% of the transactions at the Wikipedia reference desk. In libraries (including the virtual reference desk), the percentage of unsolicited thank you emails ranged from 16% to 20% (Carter and Janes, 2000; Janes and Mon, 2006; Mon and Janes, 2008).

The Wikipedia Reference Desk is somewhat quicker to respond to user requests than library (asynchronous) reference services.[7] Response time at the Wikipedia Reference Desk is 4 hours on average for the first response. Email requests are likely to be answered by Association for Research Libraries (ARL) libraries within two business days (Stacy-Bates, 2004), by academic libraries in 21 hours, and by public libraries 18 hours (Shachaf et al., 2008). Answers at the Wikipedia Reference Desk are posted quicker than libraries respond to email requests.

Assurance measures (signature patterns and source usage) by Wikipedia volunteers are similar to those found in library reference services. For example, Signatures appeared in one third of the Wikipedia reference desk messages and on one third of the librarians' responses to e-mail reference requests (Shachaf and Horowitz, 2008).

[7] In synchronous reference services, responsiveness is significantly different. For example, Radford and Connaway (2008) analyzed 850 Question Point chat transactions and report that a user wait for virtual reference service one minute most of the time (or 1.87 minutes on average).

The use of sources by Wikipedia volunteers and librarians follows a skewed bibliometric distribution with a few sources that are heavily cited and a long tail of other little cited sources. However, the distribution of sources from the Wikipedia Reference Desk is more skewed; only one source (Wikipedia) is heavily used, followed by sources that are rarely used. Given the fact that the Wikipedia Reference Desk guidelines recommend using Wikipedia pages to answer requests ("Guidelines," 2007), the high use of Wikipedia (44% of the sources mentioned) is not surprising. The major difference between librarians and Wikipedia volunteers is that 53% of the librarians' responses mentioned sources (Shachaf and Shaw, 2008), while Wikipedia volunteers mentioned them in only one out of ten messages.

As the comparison between library reference services and the Wikipedia Reference Desk shows, both provide the same level of answer quality with minor variations and except for use of sources, the Wikipedia Reference Desk outperforms librarians. The comparison between the two services is summarized in Table 3. The similarity in outcome measures between the Wikipedia Reference Desk and libraries is striking, because unlike library reference services, the Wikipedia reference desk is run and staffed by volunteers who are amateur, do not hold a professional degree, and who are unremunerated for their work.

Insert Table 3 approximately here

5.2 Four explanations

Four possible explanations are discussed here addressing the question: Why does the quality of the Wikipedia Reference Desk match that of library reference services? First, it is possible that the wiki, on which the Wikipedia Reference Desk is based, has

advantages over other asynchronous technologies used for digital reference. Second, the experience that Wikipedia volunteers gain over time may equal that of professional librarians. Third, the results may reflect differences in type of questions that are being asked at the library and at the Wikipedia Reference Desk. Finally, it is likely that the collaborative group effort in answering questions on Wikipedia is beneficial compared with the dyadic interactions at the library.

Because prior research did not focus on the use of wiki in reference services, the first explanation cannot be supported or rejected without further evidence. Prior reference research has not yet shown that levels of answer accuracy or completeness vary based on mode of interaction, nor that the level of user satisfaction does (e.g., Arnold and Kaske, 2005; Kaske and Arnold, 2002; Ward, 2005). Future studies may compare wiki based reference service with other modes of interactions to support or reject this possible explanation.

The second possible explanation is that the volunteers' experience of answering questions equals the skills, knowledge, and abilities of librarians. Saxton and Richardson (2002) argue that as experience at answering questions increases, the importance of formal education for achieving high performance in answering questions at the reference desk decreases. On the Wikipedia Reference Desk, seasoned users (expert) draw upon their "amateur" experience and are able to provide quality answers even without formal library education. However, it is important to caution here that while the amalgamated (group) answer on the Wikipedia Reference Desk was as good as a librarian's answer, an amateur did not answer at the same level as an expert librarian. Answering requests in this amateur manner creates a forest of mediocrity, and, at times, the "wisdom" of the

crowd, not of individuals, reaches a higher level. For a user whose request received more than four answers, sorting out the best answer becomes a time consuming task (see for example the reference transactions in Appendix II). When people tend to exert the least amount of effort, and choose the first satisficing answer (Agosto, 2002; Mansourian and Ford, 2007; Zipf, 1949), they are provided with an answer at a lower quality than that provided by librarians. Keen (2008. P. 2), in the cult of amateur, cautions about "the consequences of a flattening of culture that is blurring the lines between traditional audience and author, creator and consumer, expert and amateur." He argues that the participatory nature of Web 2.0 has a destructive impact on our economy, culture, and values. The explanation that Wikipedia amateurs are as good as librarians cannot be supported unless research that would compare responses of individuals to the same requests from each group is done.

Another possible explanation is that the similarity in the quality level of both modes of reference service is a result of a significant variation between the types of questions that are asked at each of them. Different queries may require different skills, knowledge, and abilities to answer; some queries are more difficult than others, take longer to answer, or may require the use of a wider range of sources (Saxton and Richardson, 2002). This study did not differentiate among types of queries, did not compare them with queries that librarians answer, and cannot support or reject this explanation (examples of queries are available in Appendix I). Future research should examine the similarities and differences in type of queries asked at the Wikipedia reference desk, or other Q&A sites, and compare these with the type of questions asked at libraries.

It is more likely, however, that the high quality of the answers at the Wikipedia Reference Desk is due to its unique collaborative nature; this collaborative group effort is probably advantageous compared to the dyadic reference interview in libraries. The collaborative effort improved and enhanced the quality of the answer on the Wikipedia reference desk. In an amalgamated answer, responses can be improved, refined, verified, expanded, discussed, and challenged; in fact, many of the responses included elaborations on the first response. The quality of an individual message did not provide answers at the same level as individual librarians do, but an aggregated answer made it as accurate as a librarian's answer. This explanation of why Wikipedia volunteers and librarians perform at the same level is a reflection of the paradox of expertise. "As individuals master more and more knowledge in order to do a task efficiently as well as accurately, they also lose awareness of what they know" (Johnson, 1983. p. 79). As a result, experts are unable to articulate their knowledge in a way that a layman can understand; at times, their ability to make a judgment is distorted (Tetlock, 2005) and a group of non-experts is able to outperform the expert. Wikipedia volunteers may exemplify this paradox, and outperform the expert reference librarians. Future research should compare the traditional dyadic reference interview model with the collaborative social reference model.

6. Conclusion

The quality of answers on the Wikipedia Reference Desk is similar to that of traditional reference service. Wikipedia volunteers outperformed librarians or performed at the same level on most quality measures. The similarity in quality levels between the two services instantiates the paradox of expertise; the amateur crowds provide answers

that are as good and even better than librarians do. Before concluding that libraries and librarians can be replaced, there is a dire need for further research on answer quality on Q&A sites. It is still unclear, whether the Wikipedia Reference Desk and other Q&A sites will be able to provide a reliable service over time. If not, we might still need to train librarians and maintain institutional library services. Perhaps social reference is one of the "Web 2.0 world [that] can and should appear as a part of formal library and information science courses" (Bawden, 2007, para. 11).

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Table 1. Number of transactions, responses, and words

	Number of transactions per month	**Average transactions per day**	**Average # of responses per transaction**	**Average # of words per day**
Computing	371	12.3	4.8	3,613.4
Entertainment	128	4.2	0.2	745.0
Humanities	356	11.8	4.5	5,452.5
Language	180	6	5.3	1,915.9
Mathematics	119	3.9	6.1	1,691.9
Miscellaneous	473	15.7	3.7	4,707.8
Science	468	15.6	5.4	6,376.8
Total	**2095**	**69.5**	**32.4**	**24,503.3**
Average per desk	299.2	9.9	4.6	3,500.5

Table 2. Users' country of residency

Country	**Number of users**
Australia	8
Austria	1
Canada	11
England	3
Germany	1
Japan	1
New Zealand	2
Norway	1
South Africa	1
Spain	1
UK	4
USA	23

Table 3. Coding scheme

SERVQUAL Variable	Code	Sub-Code	Wikipedia Guidelines ("Guidelines," 2007)	Code Description
Responsiveness	**Response time**			The time that passed from the submission of the request until the response is posted (number of hours until first response and number of hours until last response)
	Complete*		Be thorough. Provide as much of the answer as you are able to.	Complete response to all aspects of the question
	Accurate			Response is correct
	Within scope*		Keep your answer within the scope of the question as stated.	Response within question scope
		Links*	Provide links when available, such as wikilinks to related articles, or links to the information that you used to find your answer.	Response is supported by references/ links to the information
		Verifiable	Our standards on verifiability… should be kept in mind on the Reference Desk... Answering questions by referring to articles or even reliable original sources is	Use a citation (see also "links")
		Verifiable	Our standards on verifiability… should be kept in mind on the Reference Desk...	Use a citation (see also "links")

Assurance	**Politeness***	**Politeness (direct)***	Be polite and assume good faith, especially with users new to Wikipedia.	Response is written in a direct polite manner, using words such as thanks, please, dear
		Politeness (impolite)*		Response is written in an impolite manner
		Requester thanks after reading responses		Follow up message that is sent by the requester in which the requester thanks the responder/s
	Signed		so please remember to sign your responses (with ~~~~). Signing your replies adds a 'personal touch' and also allows questioners to follow up responses privately, for in-depth discussions or debates that may not be appropriate for the Reference Desk itself.	Response is signed
	Source	**Title****		The title of the source used. If the source is linked to but no title is provided for it (i.e. a link to an article is anchored to the text "click here"), the anchor text is coded as a title
		Databases & Indexes		Cites or links to a database or index

	Census	Cites or links to a census
	Encyclopedia	Cites or links to an encyclopedia (but not Wikipedia)
	Wikipedia	Cites or links to Wikipedia, or a page within Wikipedia
	Library Sources	Cites or links to a library source
	University URL	Links to a web page hosted by a college/university
	Book	Cites a book
	Journal	Cites or links to a scholarly journal or a work published in a scholarly journal
	Newspaper	Cites or links to a newspaper or an item from a newspaper
	Non US gov't Website	Links to a page in the domain of a government other than the US (anything in the .uk or .fr domains, for example)

	Outside URL	Links to a non-University, non-governmental, non-Wikipedia web page
	Other	Cites or links to a source not covered in any other code
	US gov't Website	Links to a page in the .gov domain
	Google	Mentions or links to Google
	Website (no Link)	Mentions a website by name or URL but does not provide a hyperlink to the website
	None	The question/response *as a whole* has not cited any sources

* These codes are based on the disclaimer that precedes the guidelines page. The disclaimer appears under the heading "how to answer a question," which appears on each of the reference desks, for example: http://en.wikipedia.org/wiki/Wikipedia:Reference_desk/Miscellaneous

** Title is the only code applied to words within a question or response, but not to the question or response as a whole.

Table 4. Frequency of codes

Code *[SERVQUAL variables]* (N=77 transactions)		**Frequency**	**Number of transactions coded**
Accurate *[Reliability]*		13 yes; 7 no; 5 no consensus; 50 unable to assess	
Addressing another user		23	16
Apology		5	5
Comment about missing Wikipedia info		9	7
Complete (thorough) response *[Reliability]*		33 yes; 19 no	
Links *[Reliability]*		92	59
Politeness – Direct *[Assurance]*		12	11
Politeness – Impolite *[Assurance]*		5	4
Requester – Thanks after reading responses		16	15
Response time *[Responsiveness]*		Ranges from 4hrs to the first response to 35hrs to the last response	
Signed *[Assurance]*		136	75
Sources *[Assurance]* (N=210 transactions)	**Book**	18	12
	Census	0	0
	Databases & Indexes	1	1
	Encyclopedia	0	0
	Google	22	20
	Journal	1	1
	Library Sources	0	0
	Newspaper	1	1
	Non US gov't Website	3	3
	None	673	194
	Other	9	9
	Outside URL	91	69
	Title	946	185
	University URL	3	3
	US gov't Website	7	7
	Website (no Link)	7	6
	Wikipedia	421	172
Verifiable *[Reliability]*		10	8
Within scope *[Reliability]*		130	73

Table 5. Comparison between Wikipedia and Libraries

Quality Measure	**Wikipedia vs. Librarains**
Accuracy	Wikipedia = Librarians
Completeness	Wikipedia > Librarians
Unsolicited thank you emails	Wikipedia = Librarians
Responsiveness	Wikipedia > Librarians
Signature patterns	Wikipedia = Librarians
Sources used	Wikipedia < Librarians

Figure 1. User's academic credentials

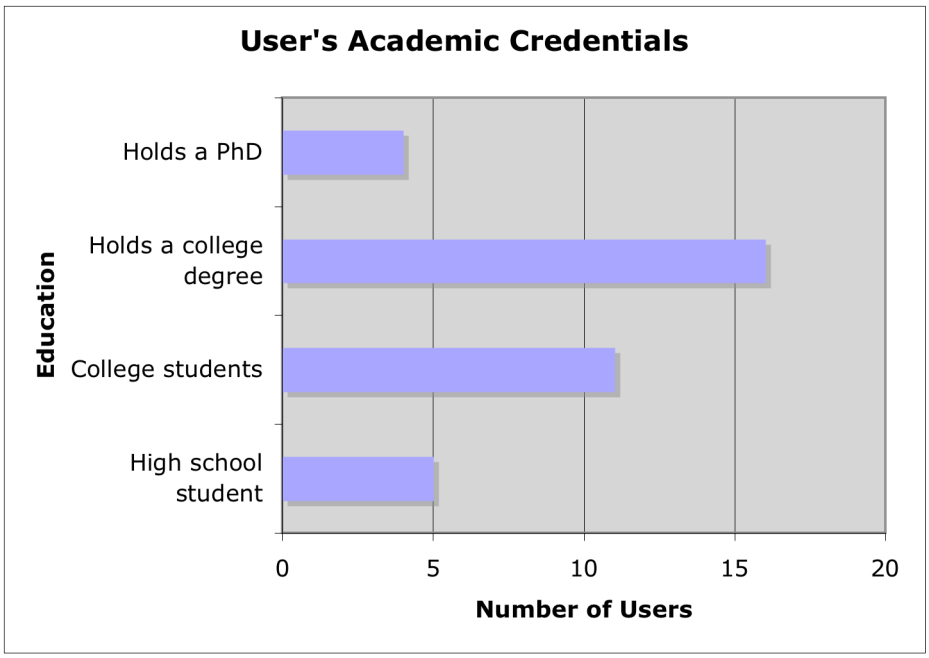
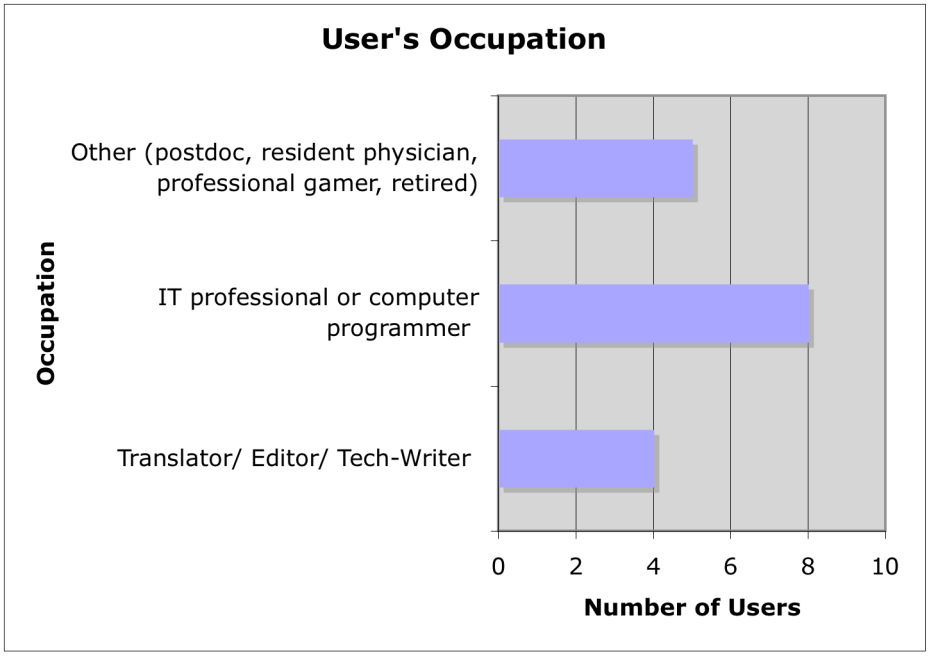


Figure 2. User's occupation



Appendix I

Queries posted on the Wikipedia Reference Desk

1. What Beethoven piece is this?: I can't seem to recall and it's really bother me. It begins at around the 1:26 mark in this video.

2. HONG KONG FILM AWARDS: WHEN WILL THE RESULTS OF THE HONG KONG FILM AWARDS BE ANNOUNCED?

3. Solving Murder Cases: A Statistics Source?: Where could one find a reliable source of stats regarding solving murder cases by major cities?

4. Northern Alliance: In Afghanistan, why they call the group Northern Alliance? Is it because they were formed in northern part of Afghanistan?

5. Japanese Translation Question: Does anyone have any idea what this means: **坪効** ? I am in the middle of a translation, and it keeps coming up, but I can't find it on any of my other resources. At first I thought it was a misprint, but it's coming up regularly, so it can't be. I believe it must be an abbreviation for something, but I can't for the life of me work out what for. All I know is that the context is financial. Any help, appreciated as always.

6. Grammatical Tense Checking Site?: I'm curious if there's a site where one can copy and paste text into a box to check grammatical tense the same way this site works with word count. I've already done quite a bit of internet searching myself, and I have yet to find one that's free.

7. Stuck in your head: Is there a word for getting songs stuck in your head?

8. the number of cows in great Britain: plz

9. Operations on PowerSeries: Can someone help explain how to do this.

$$f(x) = \frac{x}{(1+x)^2}$$

Find the power series representation for f(x) and specify the radius of convergence.

Thanks in advance!

10. motorola razor v3: hi! how can I download a song to my motorola razor v3 (which is not an mp3 player) from the internet? and set it as a ringtone?

11. HIV tests -- false negative/positive statistics: There are now several HIV tests in use in the UK and USA.

Depending on the time since an infection incident (if any), there will be a gradual decrease in "false negatives" for each test, such that after about 6 months in the standard test, the odds of a false negative are considered quite small.

(Ie, a person who gets a negative result 6 months after an incident, is usually advised they probably did not become infected. But a person who gets a negative result 1 month after an incident is advised there is still considerable chance they are infected but the test returned a negative result due to insufficiency/lack of antibodies).

For a person not infected with HIV, there will likewise be a small chance of a false positive with each of the standard tests.

What I'm looking for is test data on this. For each of the 4-5 tests in common usage (UK pinprick, etc), and a single point event test, I'm looking for the following:

For a person who became infected at a given date, the odds of a false negative under that test at N days after infection, for a range of values of N ($0 < N < 270$ days). Especial emphasis placed on the shape of the graph for smaller N (< 90 days).

For an HIV negative person in good/reasonable health, the odds of a false positive.

Obviously the more authoritative the better. As an aside are the tests used in the UK and US identical? If not how are they called and distinguished (to avoid confusion).

Many thanks.

12. Clear browser cache from JavaScript: For the Wikipedia in-browser editor wikEd I am looking for a an automatic updating mechanism. Since MediaWiki user scripts are updated by flushing the browser cache, my question is: Is it possible to clear the browser's cache from within a JavaScript (this is different from clearing the Wikipedia server page cache).

13. 14 inch widescreen or 14" ordinary resolution: I mostly use the laptop for reading only. should I go for a 14" widescreen laptop or should I go for ordinary resolution (1024 * 768) 14" laptop? which would be convenient for me?

14. Course Management Software use in high schools: What percentage of high schools use course management software?: Any help on this is greatly appreciated. I'm having significant difficulty locating any data on this topic. Vendors such as Blackboard and Edline tend to keep a tight hold on their data, while open source projects like Moodle provide inflated values. Does anyone have any keen ideas on where to find information on this topic? Thanks

15. Weight/ sleep: was recently reading two articles-insomnia, and fatal familial insomnia. In the insomnia article, it said that one of the symptoms of prolonged insomnia is weight gain. However, under the stages of fatal familial insomnia, stage three is as follows. 3. Complete inability to sleep is followed by rapid loss of weight. This lasts about three months.

So, which is true? Does lack of sleep cause weight gain or weight loss? If it is different for the two diseases, then why?

Appendix 2

Examples of full transactions

Language Reference Desk:

User 1: Hello. I'm new here, but I just stumbled across this reference desk stuff, and I must say, I'm freakin' ecstatic! Here's my question: the difference between "might" and "may", and if you could, please provide proof, (sorry; I don't want to be a skeptical jerk, but I like proof is all...). Thank you very much for your time!

User 2: This has come up before, see here [link], although that discussion went a bit off topic. I think the general consensus is that they're pretty interchangeable, but it would depend on the context. Can you provide an example of a sentence in which you want to use them? Basically, they both refer to a possible future event. If there's a difference, it's that 'may' implies that the event is more likely to happen than 'might'.

User 1: Hmm... You're right; that discussion's ending isn't really satisfying. Nevertheless, I enjoyed it. I can't remember the exact sentence I was wondering about, except that it started like so: "Be that as it might..." I've always heard that transitional clause... thing (correct me if that's not what it is please) as "Be that as it may". I'm not sure if context matters here though, (sorry). If context is not an issue, are both these examples acceptable? (And you can go into trivial details if you want to/can... I love the subtleties of grammar and linguistics, although I'm a total novice with these disciplines at the moment.)

User 1: Oh! This has been bugging me for some time too... My favorite band is They Might Be Giants [link]. Is this use of "might" correct? Shouldn't it be "They May Be Giants" (technically, from a grammarian's POV)? (Although I love their name as is, and wouldn't want them to change it for all the grammatically correctness of the world!)

User3: I can't imagine why "They might be giants" would be prescriptively "bad grammar", but if it is, don't blame it on the band, blame it on James Goldman [link], whose 1961 play is the origin of the band's name.

User 1: (Ya, I knew about them getting their name from that play, so I wouldn't blame them anyway) I was just wondering because, as they (the windmills from the play) are still "alive" or "being" (if you go along the same mind-tract of the character who thought the windmills were really giants), the present tense of that verb would be more acceptable. And if you go along with the popular belief that They Might Be Giants is referring to the two Johns of the band, wouldn't "may" make even more sense?

User 4: Note that there is a separate issue of may/might confusion: as well as having its own sense as seen here, "might" is also the past tense of "may" -- or at least that's the

standard usage, but today (at least in North America) we often see people using "may" in the past tense as well. In the standard usage, "Pat may have crashed the car" would be said if we know the was a crash and we're guessing who was driving; if we know Pat was driving and don't know whether there was a crash, it would have to be "Pat might have crashed the car". But today many people use the first sentence with both meanings.

User 5: There are some distinctions between "may" and "might". "Might" is not only the past tense of "may", it is the conditional mood of "may" as well. For example, you can say "If you might lend me a hand, we could move the wagon." You can't really say "If you may lend me a hand..." You can say "Might you be so kind as to...", but you can't say "May you be so kind as to..." unless you mean that you want the person to be kind in the future. There are also past-tense usages such as "Try as hard as he might, he could not move the boulder." "Try as hard as he may," would not work with the succeeding past-tense clause.

Science Reference Desk:

User 1: Whites of eyes: is it true that humans are the only animals to have whites eyes (outside of the iris)?

User 2: Sclera, [link] the white part of the eye, does not say! I think other animals definitely have a sclera, but I don't know if it's white. I can't get a good image of many animal eyes to check...

User 3: Nope - first pic I found [link].

User 4: While many other animals have sclera, the sclera in humans typically take up a much larger portion of the visible eye than in other animals. At least one biologist has suggested that having larger sclera was evolutionarily advantagious to humans as it made emotions easier to read (pretty speculative though).

User 5: I don't know about reading emotion - but it does make it a lot easier to see what direction other people are looking.

User 6: Every dog I've seen has a white sclera. However the iris and pupil take up almost all the space in the visible eye socket, so you can't see it unless the animal diverts its eyes.

User 7: I have seen dogs, etc. move their eyes just enough so that you can see a little bit like [user 6] said.

User 5: You can see it in this image Image:Staffordshire Bull Terrier - Labrador Cross.JPG [link].

User 8: cute !

User 6: What horrible bloodshot eyes, obviously from too much drinking and paranoia.