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Matthew Marsteller
Carnegie Mellon University, matthewm@andrew.cmu.edu

Susan A. Ware
Pennsylvania State University

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Models for Measuring and Evaluating Reference Costs

Matthew R. Marsteller, MSLS
Physics and Math Librarian
Carnegie Mellon University
Pittsburgh, PA
matthewm@andrew.cmu.edu

Susan Ware, MSLS
Reference and Instruction Librarian
Pennsylvania State University, Delaware County
Media, PA
saw4@psu.edu

Abstract

This paper uses case studies and two web-based digital reference cost calculators to illustrate the choices and challenges involved in measuring the cost of offering a digital reference service. The models are interactive and reusable for any number of cost formulations. Case studies provide practical scenarios designed to show the strengths and limitations of the cost models. Exercises are included to clarify concepts and challenge students to think critically about service issues. This paper ends with an appendix of selected references to important research on measuring reference service benefits and effectiveness.

Introduction

As library collections become more digital, the need to develop, staff, and maintain web-based reference service points increases. Many libraries have expanded reference services to online users by experimenting with service delivery through chat, email, instant messaging, and mobile phone text messaging. In addition, with fiscal responsibilities in mind, academic libraries may be faced with shrinking reference budgets or a demand for greater accountability from their funding sources. In pursuit of

both cost savings and improved service, libraries may change service hours and staffing patterns, enter into consortial staffing agreements, outsource services, and monitor the success of their transactions. A widely used technique for reference transaction cost studies is described below, followed by case studies that illustrate how overall costs change as software costs, service hours, staffing, and quality are adjusted.

Reference Service Cost Studies

Reference cost studies conducted by academic libraries frequently seek to measure the costs and efficiencies of staffing reference service points. Managers often use this data to make decisions about the number and placement of service points, the hours of service, and the level of staffing. One approach to measuring service cost is to calculate a unit cost, and then multiply that cost by the number of times the unit is performed. The typical unit cost measured is the cost of a single reference transaction. By multiplying the unit cost of an average reference transaction by the number of reference transactions handled in one month (or one year or whatever time span is desired), the cost of reference transactions per unit time is measured. The key is to determine the average length of time taken to complete a reference transaction. This has proven to be rather difficult to do in face-to-face reference, telephone reference, and email reference. The major difficulty has been the ability of the reference librarian to measure the length of the transaction accurately. What happens during a busy period at the reference desk? What happens when a librarian gets one patron started on their quest for information, starts with a second patron, and then checks up on the progress of both patrons? How do you measure transaction length when the librarian spends parts of several days answering a difficult reference question? How is transaction length measured when one is interrupted

frequently while working on a reference question? In these cases the librarian must estimate the time devoted to the questions or an independent observer must be employed to time the transactions. In addition, conducting an accurate daily count with measurement of transaction lengths is so labor-intensive that, most often, the best that can be achieved is a representative sample.

With sophisticated synchronous chat reference software, reference transaction logs can be generated to maintain a record of the duration of each transaction and a verbatim transcript. For the first time in reference service, very accurate measurements can be made under controlled conditions. However, one shortcoming of today's software packages is their inability to report when a librarian handles questions from more than one patron at a time. During high traffic times, one librarian may toggle between two or three patrons who may ask for help in rapid succession.

Let us suppose that fairly accurate measurements can be made of the duration of each reference transaction. There might be a temptation to compare librarians for efficiency. This would be quite unfair and could lead to poor service if librarians, worried about keeping their transactions short, conduct less than adequate reference interviews in an attempt to appear more efficient. If a librarian encounters a patron who is text messaging through a cell phone / has limited typing skills / is using a slow modem, delays are inevitable. These delays could be identified as environmental challenges. Reference managers must never overlook environmental challenges in their pursuit of cost efficiencies.

Interactive Digital Reference Cost Models

To illustrate the dynamic nature of a reference cost study, interactive digital reference service cost calculators are offered below. Many of the variables used in the calculators are also relevant to a traditional reference desk setting. The models are web pages that contain a spreadsheet that will recalculate when the user changes the number in one of the blue cells. Upon entering a new number, simply click anywhere on the page and the spreadsheet will recalculate.

The first model is available at:

<http://www.andrew.cmu.edu/user/matthewm/vrd2003/DigRefCostModel.html>.

In addition to calculating labor costs, the model attempts to account for other costs involved with digital reference such as software costs, meeting costs, and indirect costs owing to administration of services and facilities maintenance. Footnotes are provided at the bottom of the model's web page in order to explain the underlying details of the calculations.

Case Study I: Hours Expansion and Increased Software Costs

Carnegie Mellon has recently expanded its chat reference service from twenty to thirty-two hours per week. It's estimated that the service will receive eighty-eight questions per month (up from an actual average of fifty-five questions per month). At the same time, the software costs for Carnegie Mellon increased from $4,200 per year to $5,040 per year. The default settings of the Synchronous Digital Reference Cost Calculator represent the old service parameter measurements for the service. Figure 1 shows the default settings for the calculator.

[Insert Figure 1]

Figure 1 Caption – Default Settings of the Synchronous Digital Reference Cost Calculator

Figure 2 shows the Synchronous Digital Reference Cost Calculator with the service parameters and software costs changed. The numbers of hours of service per week, the average number of reference transactions per month, and the cost of software per year per seat have been altered as indicated above. Note that the maximum reference transactions per month that the model can handle have gone up to 832 questions per month. This is due to the expanded hours. In retrospect, it is unlikely that the heavy traffic model would ever be used – the number of service points would typically be increased before the traffic level approached the caution level. The cost of software per minute of service may be surprising. The increase in software costs had less of an impact on the per minute cost than the increased use of the software from twenty to thirty-two hours per week – thus, the cost of software per minute of service went down. Very simply: If you're going to invest in the software – use it! Carnegie Mellon was increasing the availability of service by sixty percent. It's not guaranteed, but the university would hope for a sixty percent increase in the use of the service. In actuality, Carnegie Mellon would be thrilled if the usage increased even further. Note that this drives up the cost of providing the service, but Carnegie Mellon University Libraries is more concerned with making its services available to its user community at the point and time of need.

[Insert Figure 2]

Figure 2 Caption – Estimate of New Costs for Carnegie Mellon

The use of the model for the situation at Carnegie Mellon does not provide an illustration of the entire situation. While the service was expanded by twelve hours, the

new hours are being provided by librarians that are also covering the other types of reference service. The original twenty hours of chat reference service is still being provided by librarians that are not handling other reference service. At the same time, other types of reference service were curtailed by four hours per week at three service points (a total of twelve hours). It is legitimate to calculate the increased costs of providing synchronous digital reference service, but one should realize that overall reference service costs aren't much different. The goal of the shift for Carnegie Mellon was to provide service hours that would receive more reference traffic. More traffic at any type of reference desk, when one measures with a cost per transaction approach, drives up the cost of the service. But, is that a bad thing?

Case Study II: Cost Estimate for a Small Academic Library

The true test of a model comes from its use in an entirely new situation. Let's take the hypothetical case of synchronous digital reference at a small college library. The small college library might use an hourly pay rate that is somewhat above or below the national average – let's assume twenty dollars per hour. The model is able to accommodate the use of the lower rate. Let's also assume that the small college library had lighter traffic (forty questions per month) and a different length of time per transaction (fifteen minutes) – all would be successfully accounted for with the model. The model would also handle a different annual software cost easily. However, let's suppose that the small college used an after hours service to provide 24/7 service. Here we find a situation that the model cannot handle easily. The typical arrangement calls for a set amount of cost per reference transaction provided by the after hours service. The cost could be included with the software cost, but it would be more useful to improve the

model. Figure 3 shows the model being used for a cost estimate for the small college library.

[Insert Figure 3]

Figure 3 Caption – Cost Estimate for a Small College Library

Case Study III: Cost of Failed Transactions

As a measure of quality control, transcripts of digital reference sessions can be assessed against locally determined criteria for success. The success of a transaction might be judged by the accuracy of the answer, the thoroughness of the reference interview, or the quality of the interpersonal interaction. Success might also be judged by the availability of needed resources or the technical quality of software. In addition, an arbitrary monetary cost can be assigned to failed transactions to represent the level of concern for ineffective service that might result in a patron's frustration, time wasted, or academic failure. With this in mind, a revised "Synchronous Digital Reference Cost Effectiveness Calculator" has been created to include entries for the average number of failed transactions and a penalty fee for failed transactions. The revised model is available at: <http://www.andrew.cmu.edu/user/matthewm/DigRefCostEffModel.html>.

[Insert Figure 4]

Figure 4 Caption – The Revised "Synchronous Digital Reference Cost Effectiveness Calculator"

Consider the hypothetical case of synchronous digital reference at a university that offers online degree programs to students worldwide. Enrollments are high and the research demands in most courses are rigorous. Quality digital reference service is very important to these programs because most of the students enrolled in them do not have

access to the physical facilities of the main library. To maintain quality control, the library staff reviews a sample of the session transcripts each month and makes three assessments: one for the quality of the transaction, one for the availability of needed resources, and one for the technical stability of the software. They also set their performance goal high (eighty percent) and set the penalty fee for a failed transaction at twice the cost of a successful transaction. The library's goal is to keep the total labor cost for failed transactions per year to a maximum of twenty percent of the cost of successful transactions per year.

The Synchronous Digital Reference Cost Effectiveness Calculator is able to accommodate the three assessments. First, let's establish the service parameters and calculate the cost of a successful transaction when all questions are answered successfully. In Figure 5, note that the cost of a successful transaction is determined with the following service parameters: sixty hours of service per week, one service point, average length of transaction is ten minutes, average number of transactions per month is 300, there are no failed transactions, software cost per year is $5,000.00, and mean salary for librarians per hour is $26.96. The estimated total labor cost per successful transaction per year is $6.35 and the estimated total labor cost per year is $21,529.34.

[Insert Figure 5]

Figure 5 Caption – Estimated Cost per Successful Transaction with No Failed Transactions

However, let's suppose that the average number of failed reference transactions per month is twenty (6.67 percent of the average number of reference transactions per month). The penalty fee charge for each failed transaction is $12.70 (2 X $6.35),

according to the local performance standard. In Figure 6, note that the estimated total labor cost of failed transactions per year is $ 4,307.44. This amount is more than twenty percent of the estimated total labor cost of successful transactions per year ($20,094.05), so the library's goal has been narrowly missed. Notice that the changes for the estimated total labor cost for failed transactions per year (with penalty fee, if applied) occur only in that cell, they don't affect real costs. Inspired by this challenge to meet or surpass their goal, the library staff can work to improve their performance by enhancing their reference skills, adding resources to the collection to meet the demonstrated need, or troubleshooting software problems more efficiently.

[Insert Figure 6]

Figure 6 Caption – Estimated Cost for Failed Transactions per Year

Conclusion

Note that other simple improvements have been incorporated into the "Synchronous Digital Reference Cost Effectiveness Calculator." The revised model accounts for the cost of an after hours service and a consortium fee while accounting for the consortium member providing the labor for questions that only their library answers.

The use of an interactive model by multiple types of libraries can provide improved and readily available cost estimates for synchronous digital reference services. At the same time, it can make a useful educational tool by enhancing the understanding of the challenges faced by practicing librarians.

It is hoped that use of the Synchronous Digital Reference Cost Effectiveness Calculator, coupled with feedback on its successes and shortcomings, will result in ideas for improvement. Some feedback has already been received. Allocated costs for funds

spent on the collections, office supplies, or for the time spent on the development of web based user guides, are examples of problems proving difficult to incorporate into the model. Why should we stop at just analyzing costs? Perhaps an estimation of the benefits of a service could be added in the future. Persistence, creativity, and participation of the library community in the improvement of the model should garner further success.

Exercises for the Students

1. Use the "Synchronous Digital Reference Cost Model" <http://www.andrew.cmu.edu/user/matthewm/vrd2003/DigRefCostModel.html> to quadruple the number of reference transactions per month to 220. Observe the changes in the rest of the spreadsheet and comment on their implications.

2. If you were a manager of a reference service, how concerned would you be with the expenditures on reference service with respect to your overall budget?

3. What if certain questions are often asked? Is it possible that the questions could be dealt with by something other than reference service – perhaps better signage or the inclusion of an FAQ? What other actions might you take?

4. One major argument in the management of synchronous digital reference services is whether to use a full featured software package or to use free instant messaging software to provide the service. The model will always provide the salary of the librarian per minute and the software cost per minute. When you compare the relative amount of each cost, what can you conclude?

Appendix

Selected Bibliography – Measuring and Evaluating Reference Costs

Reviews of the Literature

Abels, Eileen, G. "Improving Reference Service Cost Studies," *Library & Information Science Research* 19 (1997): 135-152.

Murfin, Majorie E. "Cost Analysis of Library Reference Services," *Advances in Library Administration and Organization* 11(1993): 1-36.

The Reference Assessment Manual, compiled and edited by the Evaluation of Reference and Adult Services Committee, Management and Operation of Public Services Section, Reference and Adult Services Division (RASD), American Library Association. Ann Arbor, Mich.: Pierian Press, 1995.

Measuring Benefits and Effectiveness

Braunstein, Yale M. "Costs and Benefits of Library Information: The Users Point of View.," *Library Trends* 28 (1979): 79-87.

Harless, David. W. and Allen, Frank. R. "Using the Contingent Valuation Method to Measure Patron Benefits of Reference Desk Service in an Academic Library," *College & Research Libraries* 60 (January 1999): 56-69.

Kuhlman, James R. "On the Economics of Reference Service: Toward a Heuristic Model for an Uncertain World," *Reference Librarian* 49/50 (1995): 25-43.

McClure, Charles. "Output Measures, Unobtrusive Testing, and Assessing the Quality of Reference Services," *Reference Librarian* 11 (1984): 215-333.

Orr, R.H. "Measuring the Goodness of Library Services: A General Framework for Considering Quantitative Measures," *Journal of Documentation* 29 (1973): 315-332.

Powell, Ronald R. "Impact Assessment of University Libraries: A Consideration of Issues and Research Methodologies," *Library & Information Science Research* 14 (July/September 1992): 245-57.

Saracevic, Tefko and Kantor, Paul B. "Studying the Value of Library and Information Services. Part II. Methodology and Taxonomy," *Journal of the American Society for Information Science* 48 (1997): 543-563.

Radcliff, Carolyn J. and Barbara F. Schloman. "Using the Wisconsin-Ohio Reference Evaluation Program." (Case Study 3.1). In *Library Evaluation: A Casebook and Can-Do Guide,* edited by Danny P. Wallace and Connie Van Fleet. Englewood, CO: Libraries Unlimited, Inc., 2001.

Measuring Digital Reference Cost and Quality

Gross, Melissa, McClure, Charles R., and Lankes, R. David. *Assessing Quality in Digital Reference Services: Overview of Key Literature on Digital Reference.* Information Institute of Syracuse, School of Information Studies; School of Information Studies, Information Use Management and Policy Institute, Florida State University, 2001.

Lankes, R. David, Gross, Melissa, and McClure, Charles. "Cost, Statistics, Measures, and Standards for Digital Reference Services: A Preliminary View," *Library Trends* 51 (Winter 2003): 401-413.

McClure, Charles R., Lankes, R.David, Gross, Melissa and Choltco-Devlin, Beverly. *Statistics, Measures, and Quality Standards for Assessing Digital Reference Library Services: Guidelines and Procedures.* Information Institute of Syracuse, School of Information Studies; School of Information Studies, Information Use Management and Policy Institute, Florida State University, 2002.

Radford, Marie L. “In Synch: Evaluating Chat Reference Transcripts,” *Virtual Reference Desk Conference Proceedings* (2003). Available: <http://www.vrd2003.org/proceedings/presentation.cfm?PID=231>. Accessed: March 20, 2005.

White, Marilyn D., Abels, Eileen G. and Kaske, Neal. “Evaluation of Chat Reference Service Quality, Pilot Study,” *D-Lib Magazine* 9, no. 2 (February 2003). Available: <http://www.dlib.org/dlib/february03/white/02white.html>. Accessed: March 20, 2005.