

**Title:** Staffing by Design: A Methodology for Staffing Reference

**Shortened Title:** Staffing by Design

**Abstract:**

The growth in number and kind of online reference services has resulted in both new users consulting library research services as well as new patterns of service use. Staffing in person and virtual reference services adequately requires a systematic analysis of patterns of use across service points in order to successfully meet fluctuating patron needs. This article examines an assessment methodology for examining patron use of in person and virtual reference services, and designing variable staffing models which balance the observed needs of each mode of communication and patron type.

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## **Introduction**

Contemporary student research styles, with their emphasis on self-sufficiency, and the growth in options for online reference services have combined to produce distinct new patterns of library use. This use is typically characterized by a drop in activity for traditional walk-up reference services and increased use of the library web site as a first (and often only) contact point for research activity. The availability of Instant Messaging (IM)/chat and other online research help often results in expanded service use outside of traditional business hours. In the authors' own environment, a large academic research library, all reference services to date have been offered simultaneously at a traditional walk-up reference desk. While this arrangement has worked during certain times of the day and week, at others the increasing volume of online reference questions has been overwhelming, signaling a need for an assessment of usage trends to inform new staffing models.

The observed variations across service modes require reallocation of library staff to keep pace with where and when patron activity is peaking. These changes in staffing need to be grounded in reliable assessment data utilizing multiple service measures if a robust and responsive staffing model is to be developed. Data-driven decisions, based on metrics that address the many facets of modern reference services, need to be combined to create an accurate picture of service use that staffing decisions can be reliably based on. Management data also needs to provide sufficient input to account for individual library reference missions – such as making sure that librarians have face-time with teaching faculty at academic institutions.

This study's first research question is to determine whether a methodology can be devised that uses regularly (and easily) collected reference management data to produce new and flexible staffing models that more accurately match observed patron usage of library research services. For the purposes of the study, management data refers to information that can be quickly recorded on a ticksheet-like

interface for each interaction – such as length of interaction, patron type, type of question, time of day, etc. Question difficulty was also measured using the Reference Effort Assessment Data scale (READ) (Gerlich and Berard, 2010).

The second research question is to determine whether an in person desk can be removed either partially or entirely based on this management data. The authors' hypothesis is that the data will show that many traditional approaches to staffing (where staff is allocated primarily during business hours, and a scheduling emphasis is placed on face-to-face interactions), can be replaced with more flexible, non-linear models of staffing, where the location and services staffed by library personnel vary throughout the day to match actual, observed patron peak times of usage. This new model should allow for a reduction in total staff hours by separating and balancing the staffing of different modes of communication and accounting for the level of difficulty and training required to meet individual patron needs at each service point.

## **Literature Review**

The library research literature reveals various assessment methodologies and staffing models, and the question of the reference desk's future has elicited much thoughtful and varied study. In her analysis of a large sample of medium-sized academic libraries, Brunsting (2008) provides a useful overview of both how reference desks are currently staffed and what factors reference managers consider in devising staffing models. The majority of desk models she examined (43.5%) are still single librarian, single desk models. Of these libraries, 57.1% had a virtual service, with the favored model of staffing being a separate, non-public desk (31.8%) as opposed to an integrated desk offering all modes of communication (25%). One type of measure she used, which was also used in our study, "Length or Complexity of Question," was rated by Brunsting as an important consideration when determining staffing hours (4 out of 5 on a Likert scale) by 27% of respondents, and "very important" (5 out of 5) by 13.3% of respondents.

Gerlich and Whatley (2009) also examined the use of question difficulty as a tool for scheduling reference services using the READ scale. They found that the number of questions requiring some sort of professional librarian/reference training (level 3 and above on the READ scale) led to changes in staffing during certain time periods, particularly during late night and weekend hours.

The debate over the role of the traditional reference desk and the future of reference staffing models is perhaps best represented in the literal debate held at the 2007 Columbia University Research Symposium, and the debaters' follow-up article analyzing the arguments on either side of the issue (Watstein and Bell, 2008). On one side of the debate is the value of traditional walk-up desks as symbols of the library service ethic, and the need for highly trained, personalized interactions with patrons to fully meet their information needs. On the other side, arguments for changing the presentation of reference services to a more decentralized model include the decline in use of traditional face-to-face services (as measured by ARL and other statistics), and user preferences for the convenience of services delivered directly to the desktop. Additionally, many different models have been developed that involve either re-conceptualizing/enhancing the traditional desk while maintaining a librarian presence (Heikkila-Furrey et al, 2008), or moving towards some version of consultative services which may or may not retain a traditional desk. Tiered reference service models, developed along the lines of the Brandeis University Model (Massey-Burzio, 1992), typically feature a service point staffed by personnel with training in basic directional, policy, and informational knowledge answering lower level questions that refers higher level questions to professional librarians, either at another desk/location simultaneously staffed in the library (e.g. Bugg and Odom, 2009) or to a scheduled consultation (Meyer et al, 2009). In perhaps a sign of things to come, the University of California Merced, a new library which had the opportunity to design reference without any pre-existing services to consider, chose to go directly to a desk-free model that incorporated student assistants fielding initial questions and referring difficult questions to higher level

consultation services (Davidson and Mikkelsen, 2009).

## **Methodology**

Reference desks examined as part of this study are staffed by a combination of graduate students, paraprofessional staff, and professional librarians. Patrons ask questions using one of five different modes of communication: IM/chat, in person, telephone, email, and SMS text message. To track the details of these interactions, some of the University's many libraries choose to use Desk Tracker software (<http://www.desktracker.com/>) for year-round data collection. After a question is answered, staff enter details into Desk Tracker, including mode of communication, interaction duration, the patron's relation to the University, the type of the question, and an open-ended description to provide additional information on the nature of the interaction. In the spring semester of 2011, data points for question difficulty using the READ scale were added to supplement the time-based metrics.

For the present study, Desk Tracker data from the Fall 2010 semester was used to analyze peak service usage times. The analysis focused on the months of September and October. Desk Tracker reports were used from two service points in separate buildings which provide comparable in person and IM/chat services and track a common set of service measures. While data was collected about several patron types and all five modes of communication, the present study focuses only on data sets which directly relate to the University's mission. Being a research university, the library system supports teaching at both the undergraduate and postgraduate levels as well as faculty research. Thus, for patron type, we chose to investigate only faculty/staff, undergraduate, and graduate students since those are the primary populations for which services are developed, as opposed to non-affiliated patrons and local community members. For reference modes, only synchronous modes were considered, since those have the most pertinence for staffing models. SMS/text messaging reference was omitted due to the low totals (23

interactions over the two months studied) of this newly implemented service.

Data on question length was analyzed by converting categorical data (e.g. “In Person reference 5-15 minutes”) into weighted totals to produce an estimate of the total minutes spent performing reference service. The conversions were done in Excel as follows:

- Less than five minute interaction => 3 minutes
- Five to fifteen minute interaction => 10 minutes
- Fifteen to thirty minute interaction => 22 minutes
- Thirty plus minute interaction => 30 minutes

By summing across these different durational categories, we created a measure that represented the full activity (in terms of time commitment) of a given mode of communication. Total number of interactions cannot, in itself, dictate a desired number of staff: a time period which is filled with shorter interactions would be skewed versus time periods with fewer total interactions but greater aggregate length.

Nonetheless, total number of interactions was an important measure as well, since times with numerous short interactions (which come from disparate modes of communication) are best handled by staff adept at multitasking and with a solid knowledge base of local institutional practices. Thus we examined both aggregate length and total interactions per hour to develop a balanced picture of how busy service points were.

With a more functional set of figures in hand, we had numerous ways in which to view the data. Since the purpose of our investigation was to develop staffing models, the obvious choice for an independent variable was time of day. In essence, we sought to answer the questions “what is the nature of reference queries during X period of time?” and “what type of staffing best matches the demand for reference during X?” First, we graphed total questions by hour-of-day, which affects the number of staff present at service locations. Next, we graphed patron affiliation by hour-of-day, which affects the desired skill level of staff. Finally, the last of our three initial data comparisons charted mode of communication by

hour, which affects *where* staff should be placed.

Once we had a picture of each time period in these two respects (patron type and communication mode), it was easier to narrow our investigation and look into other features of the data. By studying both specific patron groups and question types, we were able to piece together not only quantitative sums of reference usage but also the distinct features of different times, such as which modes are used and by whom. Once a useful set of visualizations was created, we were able to step through the day at the data's most granular level (hourly) to determine how staffing should be adjusted to match the nature of patrons' questions.

The READ six-point scale was added as a follow up analysis in the Spring of 2011 to assess the degree of difficulty for questions and examine the correlation between times of high usage and high difficulty for staffing. The scale rates questions from a 1 (basic informational/directional) through a 6 (high difficulty, subject expertise required, multiple days to answer). Questions at a level of 3 and above require specific reference training to answer, and for the service points in the study questions that would rate a 5 or 6 were typically referred to a subject specialist outside the unit for follow up. Hence, most questions recorded in the study fell within the 1-4 difficulty levels of the READ scale.

## **Findings**

The first notable finding was that IM/chat is now the dominant mode of reference, whether or not one counts total number of interactions, measures total interaction length, or examines where higher difficulty questions are received. By the two usage measures (number and duration), chat takes up 59% and 57% of all reference interactions respectively [Figure 1]. In Person reference only accounted for approximately a third (33%-34%) of all inquiries during the survey period. Looking at the three synchronous modes over time of day, it is evident that the dominance of chat is amplified later in the day,

taking up greater than 50% of reference minutes at 5:00pm and reaching its highest proportion at more than three-fourths of all minutes at 11:00pm [Figure 2]. These results both point to the increasing patron use of chat for reference service, as well as the need to examine staffing models that adequately address these trends, particularly during evening hours.

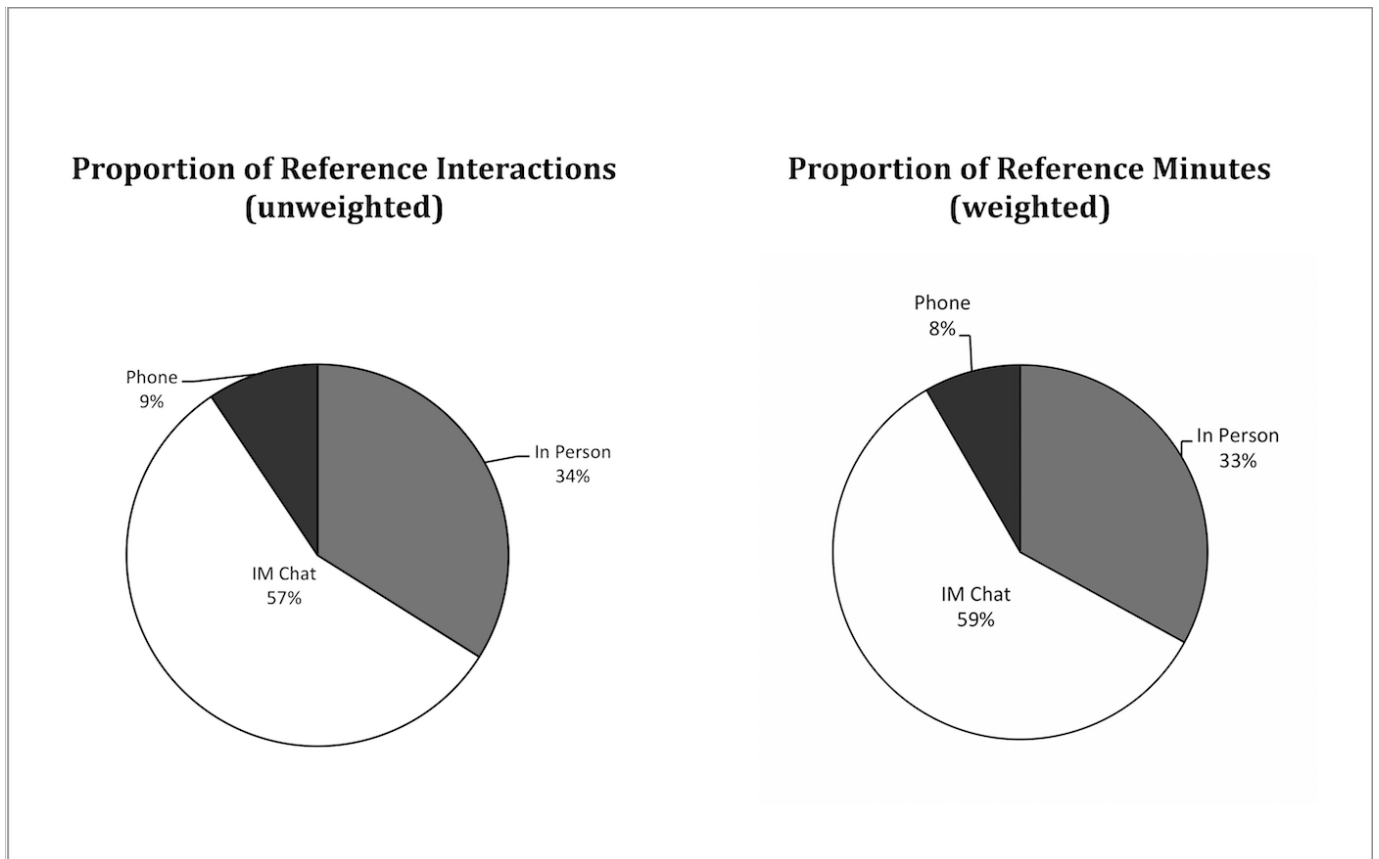


Figure 1: Proportion Of Greater Than Five Minute Long Reference Interactions By Mode Of Communication

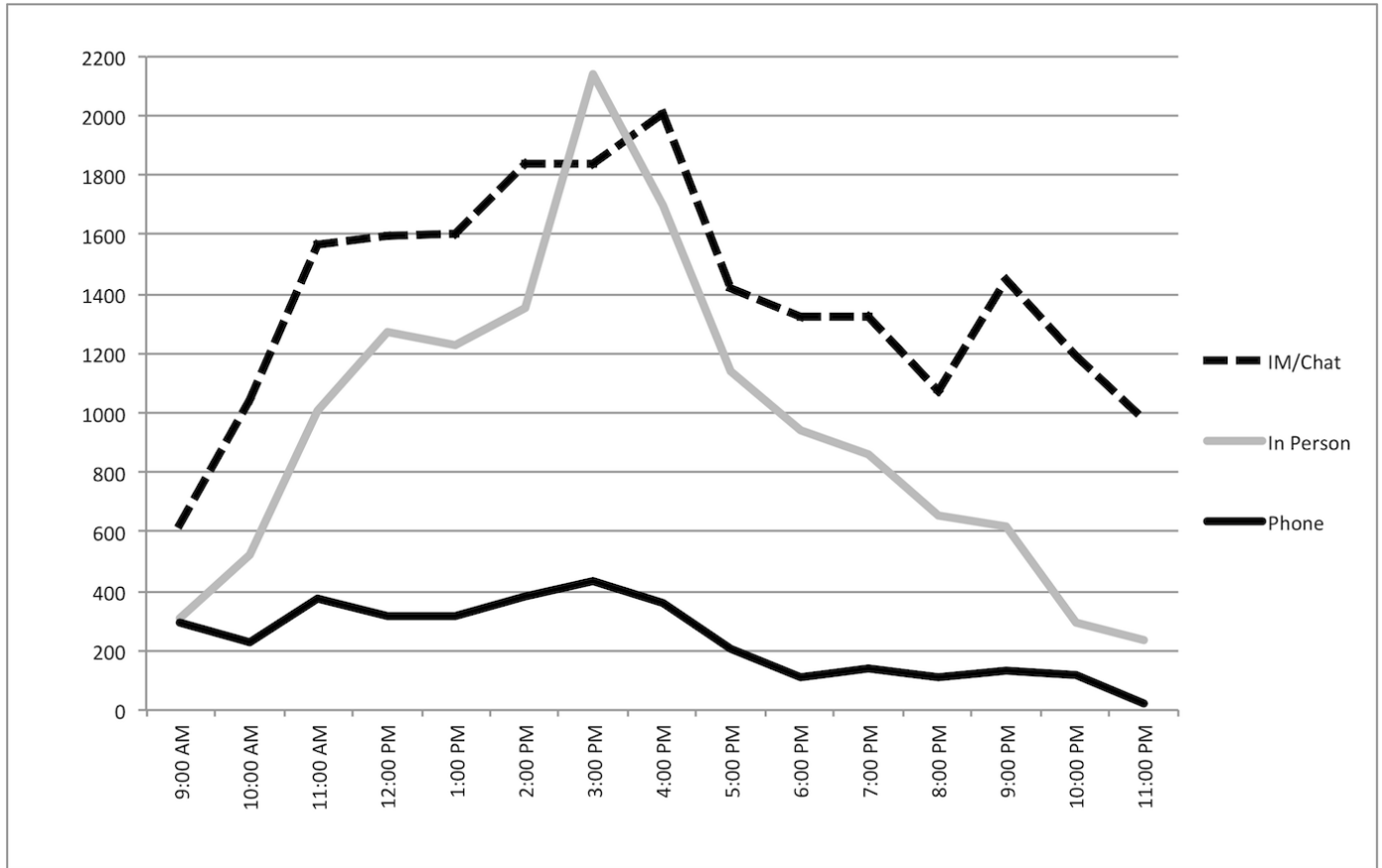


Figure 2: Reference Minutes In Synchronous Modes Of Communication By Time Of Day

The increasing proportion of chats as the day progresses could be due to the convenience afforded during late night research sessions, when patrons are likely to be at home and may prefer not to venture to the library to receive an answer. Analysis shows that undergraduate students, predictably, are the primary users of reference services past business hours. Additionally, faculty tend to come in the morning (they form their highest proportion of total users at 11:00am) and afternoon, while the proportion of undergraduates starts off in the morning at its lowest point and steadily climbs until undergraduates make up four out of every five interactions in the early evening [Figure 3]. This conclusion is only solidified when one looks at what modes of communication different types of people use [Figure 4 and Table A]: undergraduates heavily prefer chat reference. Conversely, faculty rarely use chat but are the most likely

to phone a service location.

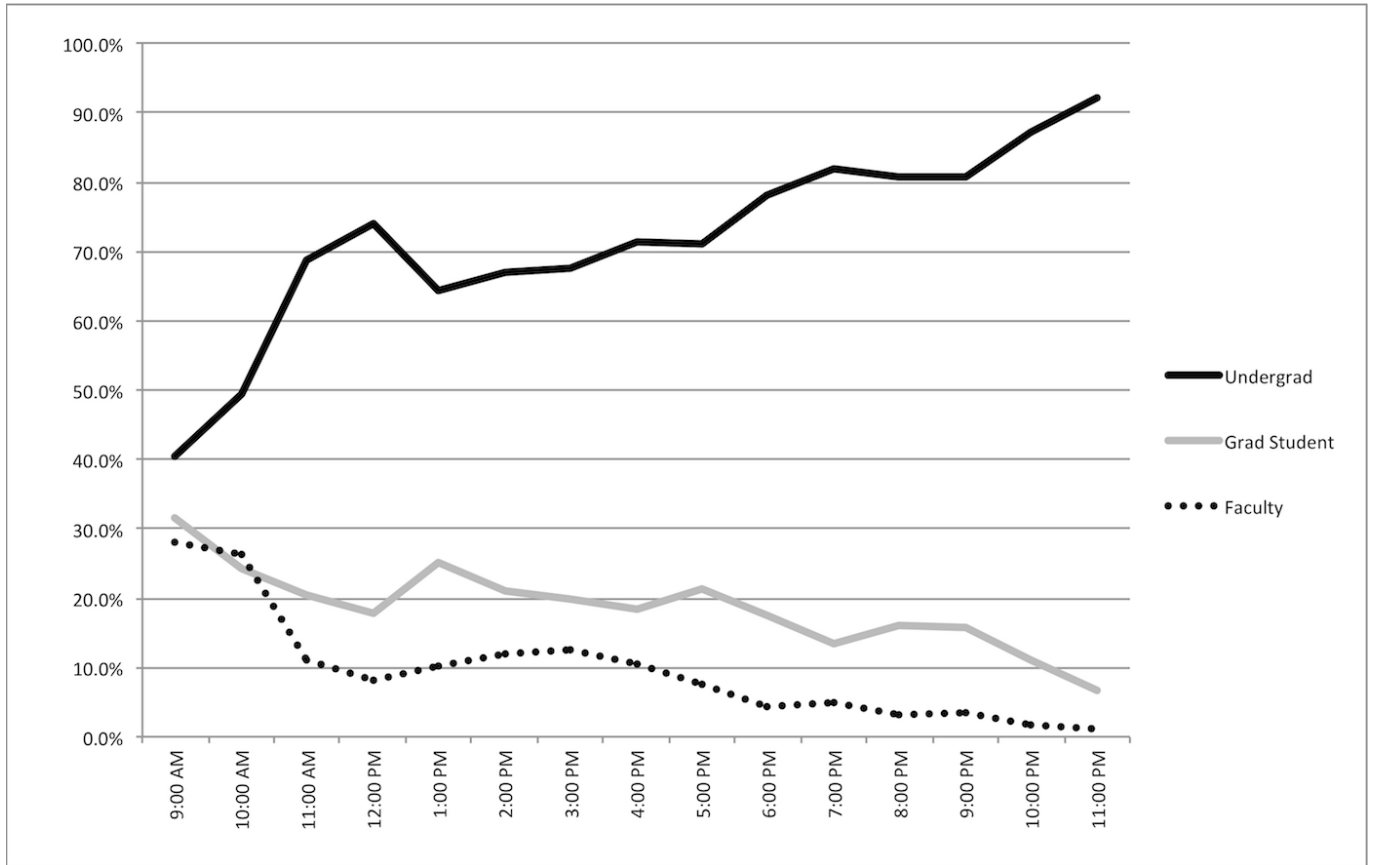


Figure 3: Patron Types' Proportion Of Interactions By Time Of Day

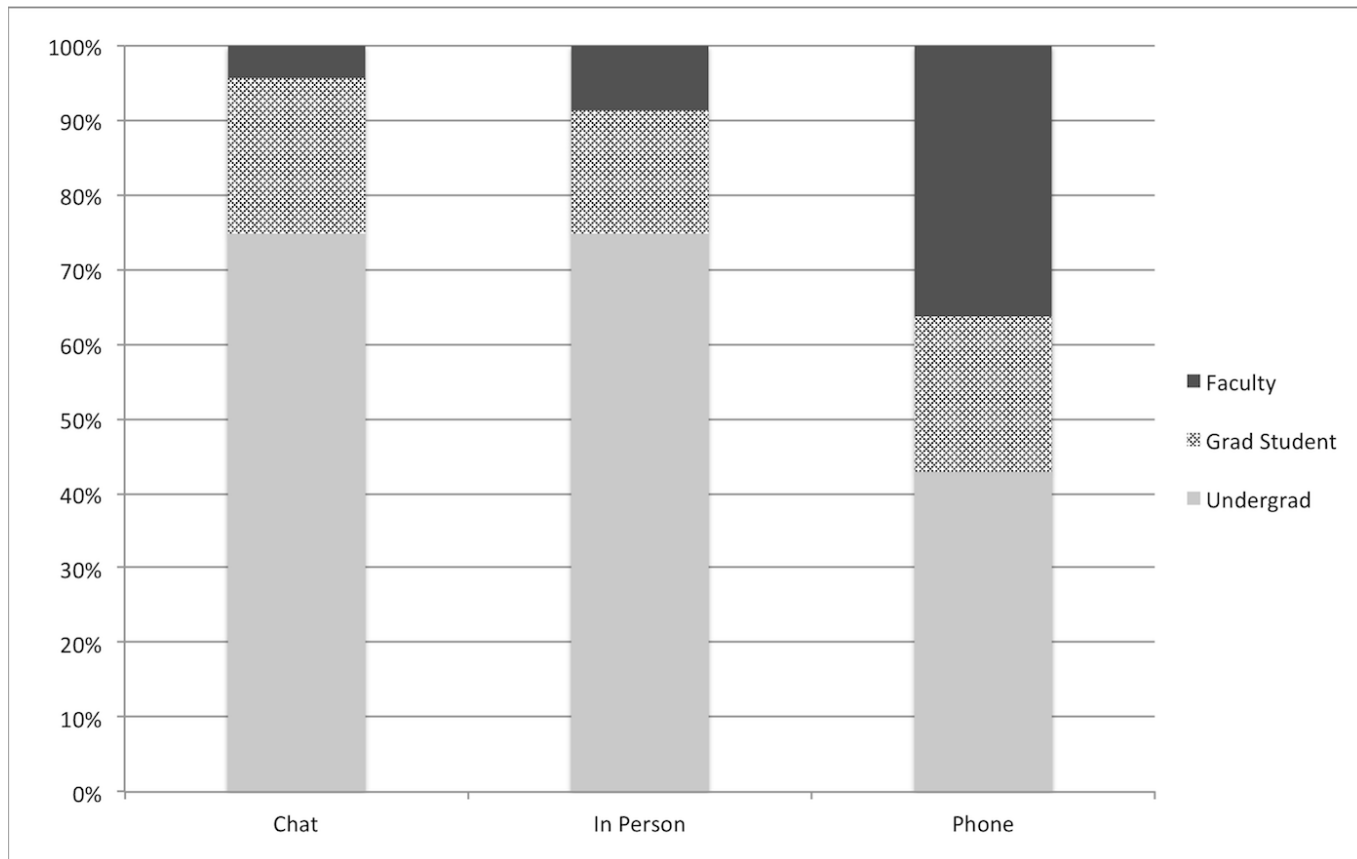


Figure 4: Modes Of Communication By The Patron Types Which Use Them Most

An analysis of READ data shows similar peaks in service use (Figure 5). In particular, questions requiring specific reference training (READ levels 3 and 4) peak between 3pm and 5pm, similar to the peak in total usage of the service measured in minutes (Table B). However, READ also reaffirms the importance of late-night staffing – level 3 questions, which require some reference skills, are actually more common overall than the less complicated 1 and 2 level questions after 9pm. This indicates that users at this time, who are likely to be Undergraduates and likely to use chat, are focusing more on research questions than general library information or directional needs, and it is a prime time for an academic library to engage students in its primary mission of research support.

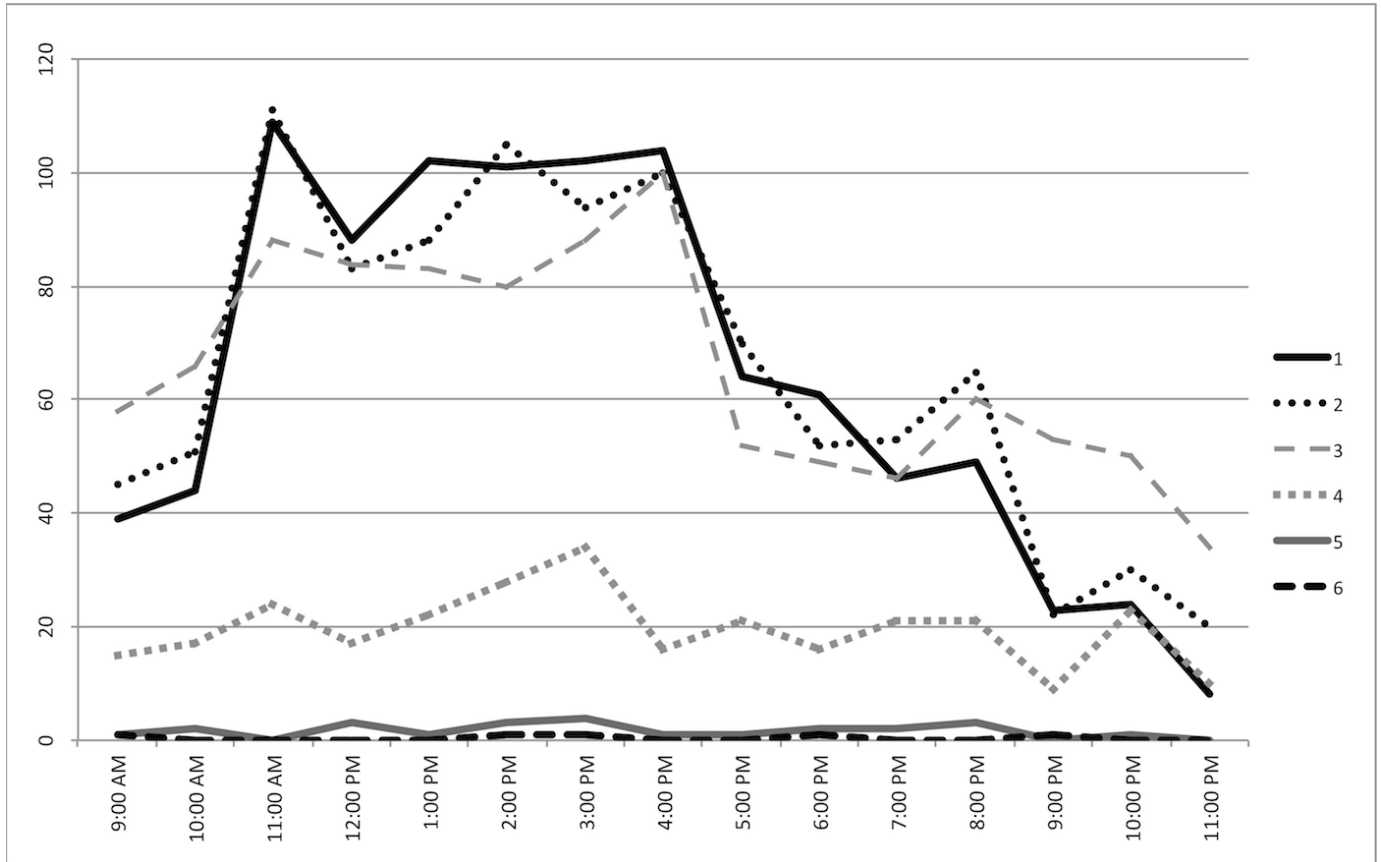


Figure 5: Total Questions In Each READ Category By Hour Of Day

Hour	IM/Chat	In Person	Phone	Total
9:00 AM	622	308	292	1222
10:00 AM	1044	519	231	1794
11:00 AM	1570	1008	374	2952

12:00 PM	1594	1275	319	3188
1:00 PM	1601	1230	316	3147
2:00 PM	1842	1355	383	3580
3:00 PM	1842	2138	432	4412
4:00 PM	2007	1697	364	4068
5:00 PM	1417	1140	205	2762
6:00 PM	1324	940	108	2372
7:00 PM	1325	857	142	2324
8:00 PM	1077	651	114	1842
9:00 PM	1449	621	129	2199
10:00 PM	1193	292	117	1602
11:00 PM	978	232	20	1230

Table A: Total Minutes By Format

<b>Durational Category</b>	<b>Undergraduate</b>		
	<b>Student</b>	<b>Graduate Student</b>	<b>Faculty/Staff</b>
Chat Reference <5 Minutes	15.2%	11.1%	6.9%
Chat Reference 5-15 Minutes	32.3%	38.5%	23.4%
Chat Reference >15 Minutes	9.3%	11.8%	4.8%
In Person <5 Minutes	32.8%	16.6%	22.1%
In Person Reference 5-15 Minutes	21.5%	28.5%	42.8%
In Person Reference >15 Minutes	4.2%	4.5%	6.9%
Phone Reference <5 Minutes	2.7%	3.0%	15.9%
Phone Reference 5-15	2.4%	5.5%	26.2%

Minutes			
Phone Reference >15 Minutes	0.0%	1.0%	3.4%

Table B: Percentage Of Questions Asked Within Each Patron Group (Columns May Not Total To 100% Due To Rounding).

**Discussion and Staffing Plan**

The data suggests that multiple models of staffing are needed to meet changing use patterns throughout the day. The current staffing model, where all modes of communication (in person, chat, etc.) are answered from the same desk, does not match the observed usage patterns, which show distinct variations throughout the day in both the volume of use for each service, as well as when specific types of patron are asking questions. These variations suggest staffing multiple service locations based on predominance of preferred patron mode of communication, and varying the amount and experience level of staffing at each service point accordingly. The resulting staffing model is best presented through grouping the findings by discrete times of day, and analyzing patron use patterns within those individual periods.

	<b>Undergraduate</b>	<b>Graduate</b>		
<b>Hour</b>	<b>Student</b>	<b>Student</b>	<b>Faculty/Staff</b>	<b>Total</b>

9:00 AM	36	28	25	89
10:00 AM	51	25	27	103
11:00 AM	118	35	19	172
12:00 PM	171	41	19	231
1:00 PM	125	49	20	194
2:00 PM	168	53	30	251
3:00 PM	223	66	41	330
4:00 PM	213	55	31	299
5:00 PM	140	42	15	197
6:00 PM	107	24	6	137
7:00 PM	135	22	8	165
8:00 PM	125	25	5	155
9:00 PM	113	22	5	140

10:00 PM	95	12	2	109
11:00 PM	83	6	1	90

Table C: Total Questions Asked By Hour

*Morning (9am-11am)*

The morning hours are characterized by low overall usage, with the 9am-10am totals for reference minutes for all modes of communication being the lowest point (Figure 2) until later in the evening, and 10-11am being the lowest point until the “dinner break” at 5pm. This is also one of the times of day when faculty are more likely to be asking questions (Table C) - faculty questions are at their highest point prior to the extended “rush hour” that occurs from 2-4pm for all patron types. IM/Chat have a greater proportion of overall reference minutes during this period (as they do for most of the day), although both in person and chat show growth. While reference minutes are low during this time, there are a larger proportion of READ level 3 questions – this likely relates to the relatively higher proportion of faculty interactions during this time relative to undergraduate student queries, which are at their lowest level of the day.

The low overall volume relative to other time periods suggests that both chat and in person could be staffed from one service point from 9am-11am. The high faculty use indicates at least one librarian should be on duty, both to meet the library mission of creating connections between librarians and teaching faculty, as well as to deal with more involved or subject specific questions. The rise in longer in person questions from 10-11am makes this a good time to consider increasing the overall number of staff, including possibly staffing at least one person at a separate chat-only desk.

### *Early Afternoon (11am-2pm)*

11am brings the first sharp rise in both total minutes (more than doubling the 9am totals) and in more difficult questions (with both READ level 3 and 4 questions rising). Undergraduate and graduate student use of reference services increases during this time, while faculty use tails off. This is also reflected in the chat statistics, where chat questions (a heavily undergraduate dominated mode of communication) show a sharp increase at 11am, rising by slightly over 50% in total minutes (Table B). The rise in chat usage coupled with increasingly higher difficulty level questions indicate 11am as an ideal time to staff chat separately from the in person desk.

### *Mid-late afternoon (2pm-5pm)*

This time period is the busiest one of the day, with sharp spikes across all services beginning at 2pm. This is also the one time of day (from 3pm-4pm) where in person usage is actually larger than virtual traffic (see Figure 2). All patron types peak between 3pm and 5pm, as do the higher difficulty questions (READ levels 3 and 4), and then fall steadily until 7pm, when Undergraduate Students start a brief evening surge. Faculty questions in particular taper off precipitously beginning at 5pm, and, while undergraduate and graduate students rally in the evening, this time slot represents the last time that an appreciable amount of faculty reference queries are seen. Longer questions dominate during this time period, with questions over 5 minutes in length varying between 63% and 67% of all questions.

Staffing should be at its peak during this time period, both in terms of number of staff as well as expertise level. The high volume of questions requiring reference expertise (Level 3 and above on the READ scale) also makes this an ideal time for mentoring and training of paraprofessionals and less experienced reference staff by pairing them with more experienced librarians. Total minutes for in person services actually peaks first (during the 3-4pm hour), with chat peaking during the 4-5pm hour. This

suggests placing an extra person at in person service points until 4pm, and then shifting them to chat at 4pm – or alternately having a “rover” position shifts locations based on need.

#### *Early Evening (5pm-9pm)*

Starting at 5pm, a steady, continual drop for in person traffic indicates virtual services becoming the primary service point to staff. Indeed, as noted above 5pm is a likely cut off point for having in person services staffed at an equal or greater number than virtual services, and the beginning of virtual services being the primary mode of patron communication and, hence, “location” for staffing. From 5-7pm, the questions at READ levels of 1 and 2 predominate, suggesting that paraprofessionals can staff chat and reference from a combined desk, with minimal in person staffing. During the 7-8pm hour, while faculty have all but disappeared, Undergraduate students actually rise in use, when they have a larger total (135 questions) than they do at 11am (118 questions). Graduate students are consistent during this time (between 22 and 25 questions), but in general below the 9-10am (28 questions) and 10-11am (25 questions) totals. Beginning at 7pm, READ level 3 questions increase, although chat minutes drop until 9pm. Overall, this time period represents the last time when a separately staffed in person desk is needed. The hours of 7-9pm are a prime opportunity to begin staffing chat more heavily.

#### *Late Evening (9pm-midnight)*

While the number of evening questions peaks during the 7-9pm hours (between 155 and 165 total questions), the number of evening chat reference minutes actually increases 57% from 1077 during the 8-9pm hour to 1449 during the 9-10pm hour. Questions at READ levels 3 and 4 also predominate, particularly beginning at 10pm. This data, coupled with the dramatic drop in in person minutes (from 651 at 8pm to 292 by the 10-11pm hour) suggests that shutting down physical service points should occur by 9pm, to allow time to focus on the longer, more difficult questions coming in through chat. This time also

opens the opportunity for staffing outside the office, which is helped by the fact that the software used for chat reference can be used in any web browser. These time periods are combined in Table D, which presents an overall staffing plan based on the data analysis.

<b>Time of day</b>	<b>In Person Service Staff</b>	<b>Virtual Service Staff</b>	<b>Total Staff</b>
Morning (9am-Noon)	2	0+	2
Early Afternoon (Noon-2pm)	2	2	4
Mid-Late Afternoon (2pm-5pm)	3	2	5  (one can be flexed between desks)
Early Evening (5pm-9pm)	1-2	2	3-4
Late Evening (9pm-Midnight)	0	2	2  (one can be flexed between desks)

Table D: Staffing Plan

## Conclusion

Analysis of the data in this study showed a clear need to reassess current staffing models and design a flexible plan for reference service points which meet the changing needs and communicative preferences of our users. While a consolidated service point was effective for the past decade that in person and chat services have both been offered, the steady increase in virtual services (which have grown an average of 15% a year since inception, and over 25% in the last year alone) coupled with a drop in walk-up services indicated the time had arrived for a diversification in staffing points. Additionally, the increased time and difficulty that staff anecdotally felt chat took, borne out in the assessment of overall reference minutes across all communication types, had produced a higher stress level, particularly during the peak afternoon usage hours. The staffing plan in Table D was implemented in the Spring of 2011.

The study showed that a physical reference location for walk up questions is still necessary, although for a reduced amount of time and with a different kind and level of staffing. Indeed, if the observed decline in walk-up reference service use continues, staffing for these services, and the veneration of the in person desk as the symbolic representation of reference, will eventually be replaced with a new paradigm which meets users in the new spaces they are choosing as their library contact points. The use of READ data as a measure of question difficulty also addresses another common librarian concern – that more time is spent on in person desks indicating where the bathroom is (READ level 1) or how to print a pdf file (READ level 2) and less on questions requiring professional reference skills (READ level 3 and above). This study’s findings indicate the best times to allocate higher trained staff, and when paraprofessionals can meet service demands by themselves.

<b>Duration</b>	<b>READ 1</b>	<b>READ 2</b>	<b>READ 3</b>	<b>READ 4</b>	<b>READ 5</b>	<b>READ 6</b>
Info/Directi	77.5%	21%	1.4%	0%	0%	0%

onal						
<5 Minutes	10.9%	57.9%	29.6%	1.6%	0%	0%
5-15 Minutes	0.7%	22.3%	64.2%	12.5%	0.3%	0%
15-30 Minutes	0%	2.8%	37.5%	55.1%	4.2%	0.5%
>30 Minutes	0%	0%	9.5%	68.3%	17.5%	4.8%

Table E: Percentage Of Different Duration Categories By READ Level

The addition of preliminary READ scale data also provided an opportunity to evaluate the correlation between length category of questions and their degree of difficulty. Table E reveals both some predictable and some unexpected results of this comparison. Predictably, the two shortest time categories feature mostly questions at the lower end of the READ scale (levels 1 and 2) while questions at the two highest time categories are predominately at the higher end of the READ scale. However, questions in the 5-15 minute range are more varied – while more than three-quarters of these questions are at READ level 3 and above, 23% are still at a lower level where any staff person (including non-reference personnel) might be able to answer them. Additionally, an analysis of READ level 4 questions shows that equal amounts occur between 5-15 minutes (40.5%) and 15-30 minutes (40.5%) (Table F). The conclusion drawn from this data is that separate length and complexity measures are best used in combination with each other to design a staffing plan, as neither in isolation provides a complete picture of the busyness of reference service or what level of staff is required to answer the questions being received.

<b>Duration</b>	<b>READ 1</b>	<b>READ 2</b>	<b>READ 3</b>	<b>READ 4</b>	<b>READ 5</b>	<b>READ 6</b>
Info/Directional	91.1%	27.7%	1.9%	0%	0%	0%
<5 Minutes	8.3%	49.3%	25%	4.4%	0%	0%
5-15 Minutes	0.7%	22.4%	64%	40.5%	13%	0%

15-30 Minutes	0%	0.6%	8.5%	40.5%	39.1%	25%
>30 Minutes	0%	0%	0.6%	14.6%	47.8%	75%

Table F: Percentage Of Different READ Levels By Duration Category

**Future Directions**

While a wealth of information was uncovered during this study, the library’s data collection could stand to be improved in two dimensions: breadth and consistency. Not all library units currently utilize Desk Tracker on a year-round basis, or collect comparable data points. When all units do, it will be possible to construct a more accurate picture of varied reference service uses across the entire university. Additionally, individual subject disciplines will be able to more specifically distinguish the nature and character of their questions from the larger, multidisciplinary units such as the two in this study, and make strategic decisions based on their own discipline specific data. Secondly, centralized training and documentation could make data entry easier and more accurate. Several training documents outlining the definitions of concepts such as referrals, or standardized question categories, have been written and can function as an authoritative measure when ambiguities arise.

A final area for study is the disconnect between undergraduate and graduate use of chat in relation to walk-up services, which as noted above runs mostly in parallel, and faculty use of chat, which is significantly lower than their use of in person services. In particular, if trends in in person service use continue to decline, connections between new reference service models need to be made across all primary user populations. This topic is a good marketing opportunity for reference itself – if the students a faculty member is teaching and mentoring have shown a preference for online forms of reference assistance, then assignments which have a significant research component should integrate this service. Developing faculty familiarity with virtual reference services, both through in class instructional workshops

as well as marketing materials, can help raise awareness of the potential benefits of this service to faculty instructional and research activities.

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