The Math of Call Center Staffing

Calculating Resource Requirements and Understanding Staff and Service Tradeoffs

Sharpen your pencils. Dust off the calculator. It's time for a math lesson.

Running a successful call center operation means managing by the numbers. And the most important number of all is the number of bodies in seats each hour to respond to customer contacts. Since over two-thirds of call center operating costs are related to personnel, getting the "just right" number of staff in place is critical in terms of both service and cost. This article outlines the step-by-step process to calculate call center resource requirements and evaluate the most important service and cost tradeoffs.

Calculating Workload

In the previous article on Forecasting Fundamentals, we explained the process of forecasting calls – taking historical data and analyzing trends and seasonal patterns to arrive at monthly estimates, then using day-of-week and time-of-day patterns to break down the numbers into hourly or half-hourly forecasts.

With these call volume forecasts and some assumptions about average handle time (AHT), we're ready to perform a simple calculation to arrive at staff workload. It's simply the number of forecast calls for an hour multiplied by the average handle time of a call. The average handle time (AHT) is made up of two components: actual conversation or talk time plus any after call wrap-up time associated with the call. The wrap up time can include almost anything – filling out a form, updating the customer database, etc.

This handle time will likely vary by time of day as well as by day of week. For example, you may find that AHT is higher during the evening shift since you may have newer staff working the undesirable hours, or simply have callers that like to talk a little longer during the wee hours of the morning! Most call centers simply use an average number for handle time across the board, which may be a dangerous assumption if there's significant variance. Imprecise numbers can contribute to the understaffing or overstaffing, so it's best to use numbers that actually reflect time-of-day or day-of-week patterns.

The workload number is then used to determine how many base staff are needed to handle the calls. The part that makes staffing for a call center different than any other kind of staffing situation is that this workload doesn't represent typical work patterns. Let's compare an incoming call center to a group of clerical workers processing mail in the same company. Between 8:00 and 9:00am, the clerical staff has 400 pieces of mail to process and each piece takes 3 minutes to handle. That's 1200 minutes or 20 hours of workload. How many people need to be working to accomplish all the work by 9:00?

Ok, this isn't the tough math part yet. To process 20 hours of workload, 20 staff would be needed. The reason for the 1:1 ratio is that the mail tasks represent sequential workload. In other words, the staff can process the work as back-to-back tasks and each person can accomplish one hour of work in an hour timeframe.

Determining Call Center Staff Requirements

Now it's time to staff for the call center. These employees are getting 400 calls and each one takes an average of three minutes to handle – 2 minutes of conversation and another minute of after-call work. Again, we have 1200 minutes or 20 hours of workload. How many people are needed?

Unfortunately, we can't handle the calls with only 20 people. At 8:05, there may be 22 calls arriving, meaning all 20 agents are busy, with another 2 calls in queue. Then at 8:15, there may only be 16 calls in progress, meaning 4 of our staff are idle. Those 4 people won't be able to accomplish a full hour's work, simply because of the way the calls have arrived. In an incoming call center, the work doesn't arrive in a back-to-back fashion. Rather, the work arrives whenever our customers decide to place calls. So we have random workload instead of sequential work. This brings us to the first math rule of call center staffing**:** ***You must have more staff hours in place than hours of actual work to do.***

So how many extra do we need? For 20 hours of workload, will we need 21 staff? 24? 30? The number of staff needed depends on the level of service we wish to deliver. Obviously, the more staff we have, the shorter the delay. The fewer the staff, the longer the caller will wait.

Determining what happens with a given number of resources in place to accomplish a defined amount of workload requires a mathematical model that replicates the situation at hand. There are several telephone traffic engineering models available and one of these in particular is well-suited to the world of incoming call centers. We use a model called Erlang C that takes into account the randomness of the arriving workload as well as the queuing behavior (holding for the first available rep) of the calls.

An Example of Erlang C

Let's take a look at Erlang C predictions based on the 20 hours of workload we defined earlier. The table below shows what would happen with anywhere from 21 to 28 staff (Column 1) in place to handle the 20 hours of incoming call workload.

Number of Staff	Delayed Portion	Delay of Delayed Callers	Average Delay (ASA)	Service Level (in 20 sec)
21	76 %	180 sec	137 sec	32%
22	57%	90 sec	51 sec	55%
23	42%	60 sec	25 sec	70%
24	30%	45 sec	13 sec	81%
25	21%	36 sec	8 sec	88%
26	14%	30 sec	4 sec	93%
27	9%	26 sec	2 sec	96%
28	6%	23 sec	1 sec	97%

Let's take a look at each of the columns and measures of service. The second column shows the portion of calls that would find no agent available and go into queue and the third column shows how long those delayed callers would wait on average. So, with 24 staff in place, the Erlang C model predicts that 30% of callers would be delayed and that they would wait an average of 45 seconds in queue.

The third column represents the average delay of *all* calls, including the ones that are answered immediately. So, with 24 staff in place, 30 % of calls would go to the queue and wait there 45 seconds, while the other 70% would be answered immediately. The average delay, or average speed of answer (ASA) is the weighted average of both these groups [(45 x .30) + (0 x .70)] = 13 seconds. It's important to understand that this ASA number is not the average queue experience for the callers. Either they wait (and do so for an average of 45 seconds), or they don't wait at all. The ASA isn't a "real life" number – it's a statistic to represent the average of the two other numbers.

The fourth column represents service level. Service level represents X% of callers that are handled in a specified Y seconds of delay time. This table shows the percentage that are handled within a specified 20 seconds of wait time. A common call center service goal is 80% of the calls handled in 20 seconds or less. To meet this goal, we'd need 24 staff in place, yielding a service level of 81% in 20 seconds.

Staffing to Service Goals

So what should your service goal be? While there are some common goals seen often in call centers, there's really no such thing as an "industry standard" for what a service goal should be. Setting a speed of answer goal depends upon many different factors. Call centers need to consider enterprise goals and marketing strategies, competitor standards, and most importantly the expectations of customers. We often find that call center management marches toward the same service goal year after year without ever considering if the goal should be higher or lower based on the business environment or customer demands.

Customer expectations have certainly risen when it comes to speed of answer expectations. More and more callers are basing their expectations and judging your service on their last, best service experience. Taking a look at your call center's ACD reports and looking at when callers begin to abandon calls will give you some idea about a "worst case" delay scenario. But setting the "best case" goal should involve getting feedback from senior management, customers, competitors, and other centers – and then evaluating cost and service trade-offs to determine the impact on cost and on service of raising or lowering the goal.

Relationship of Staffing and Service

Let's take one more look at our staffing table and review the impact on service as staff numbers change. Obviously, delay times increase as agents are subtracted, and service improves as staff are added. But service is not affected to the same degree each way, and this is a terribly important phenomenon to understand about call center staffing.

Let's say we've decided we need to have 24 staff in place to handle the 20 hours of telephone workload in order to meet an 80% in 20 seconds service level goal. If we adjust the staff numbers up or down, there are two very different impacts. First, if we add a person or two, the average speed of answer (ASA) improves from 13 seconds to 8 seconds with 25 staff, and then to 4 seconds with 26 staff. The first person added yielded a 5-second improvement, with the next person gaining us only a 4-second improvement, and a third person would result in an ASA of 2 seconds, a 2-second improvement. Adding staff results in diminishing returns, with less and less impact as the staff numbers get higher.

Now let's look at the effect of subtracting staff from our 24 person requirement. When we subtract one, two, and three persons our ASA increases to 25 seconds, 51 seconds, and 137 seconds respectively. The first person out resulted in an increase of 12 seconds, the second in another 26-second decline, and the third in a jump another 86 seconds! By taking staff away, service worsens and it does so dramatically at some point. There are especially big jumps as our staff number gets closer and closer to the hours of workload.

You can view this as both good news and bad news. The good news is that if you're delivering poor service in your call center, you can improve it dramatically by adding just one more person. On the other hand, when service levels are mediocre to bad, one more person dropping out can send service into such a downhill slide that it's nearly impossible to recover.

Calculating Shrinkage and Schedule Requirements

The numbers we've discussed so far are purely "bodies in chairs" numbers. These numbers assume that all agents are always available to handle call workload.
But we all know that agents aren't available much of the time. And we have to factor in this unavailability into our schedule requirements so we end up with enough staff to man the phones.

In calculating staff requirements, a final adjustment needs to be made to factor in all the activities and situations that make staff "unproductive". We refer to this unproductive time as staff shrinkage and define it as any time for which staff are being paid but not available to handle calls. We include such activities as breaks, meetings, training sessions, off-phone work, and general unproductive or "where the heck are they?" time.

In most centers, staff shrinkage ranges from 20 – 35%. We account for this shrinkage factor in our staff requirement by dividing the Erlang staff requirement by the productive staff percentage (or 1 minus the shrinkage percentage). In our example, if 24 staff are needed and our shrinkage factor is 30%, then 24/.7 yields a requirement of 34 schedules.

Next Steps

In the next article in this series, we'll help you understand a few more of the numbers associated with call center staffing including the effect of arrival rate, calculations of staff occupancy, and impact of size on call center efficiencies. We'll also discuss how workload calculations and staffing models are different when planning resources for handling other channels of communications such as outbound calls or emails.

About the Author….

Penny Reynolds is a Founding Partner of **The Call Center School**, a company that provides a wide range of educational offerings for call center professionals. Penny is a popular industry speaker and is the author of numerous call center management books, including *Call Center Staffing: The Complete, Practical Guide to Workforce Management* and *Call Center Supervision: The Complete Guide for Managing Frontline Staff*. She can be reached at 615-812-8410 or by email at: penny.reynolds@thecallcenterschool.com.