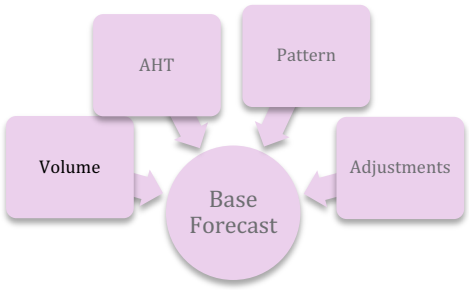
Preparing to Forecast: Decisions and Data for the Planning Process

This article will examine some of the elements of a successful forecast and what you can do in the preparation process to ensure that good data feeds into the planning cycle. Since the main source of information for predicting workload in a call center is the historical data from the telephone system or ACD (automatic call distributor), the link between this system and the planning system is key to the accuracy and usefulness of this data. Similar data feeds may be in place for other work types such as emails, webchats, and other processes performed by the frontline staff.

The diagram below provides an overview of the elements that make up an accurate forecast. While many WFM professionals spend a great deal of effort on predicting work volume, there is less energy typically spent on ensuring the accuracy of the average handle time (AHT) and the pattern of arrivals. Likewise, the actual historical data fed into the planning process may be historically accurate but may not have good predictive value for a future planning period.



- Call Volume: One of the primary components of a future forecast will be the volume of calls expected broken down by month, week, day, and interval.
- AHT: A critical component of future workload is how long the calls take to handle, including talk time and after-call work.
- Pattern: Forecasting future workload involves pinpointing calling trends, as well as seasonal, day-of-week, and time-of-day patterns.
- Adjustments: An unusually high or low volume can represent a data aberration that needs to be adjusted to better reflect future workload. Some patterns represent repeatable events such as a holiday week, billing cycle, or a marketing campaign. These can be kept as separate files to predict the impact of each type of event, but this data should not be averaged into the "normal" week patterns.

Contact center workload must be calculated for every interval of every day.
The calculation for workload is simply call volume multiplied by average handle time (AHT). Accuracy of both of these components is equally important to the planning process.

For example, assume that 250 calls have arrived during a quarter hour. The average handle time for that 15-minute interval was 420 seconds per call. Multiplying 250

calls by a 420 second handle time yields 105,000 seconds of work to be done in this interval. To reduce this to workload or hourly density of work, divide by the number of seconds in a quarter hour (900 seconds) to yield the equivalent hourly workload of 116.7 hours or erlangs of workload.

NOTE: An erlang is the amount of workload in hours in a one-hour period of time and is the most common way to denote contact center workload. It will be used later in the workforce planning process to calculate staff requirements. It is named after Dr. Agner Erlang who created many of the formulas used today to plan telephone systems and call center resources.

In order to achieve an accurate forecast, there must be an accurate record of call volume. It is important to measure past call volumes at the most accurate point in the call delivery network. For example, some organizations have multiple contact centers, including some internal centers spread over several sites and possible additional outsourcing partners handling calls.

It's not enough to know the call volume handled by each site for a selected interval. For forecasting purposes, it is important to note where the calls were *originally* offered, even though some of the data may actually show where the call was ultimately *handled* if first-choice call-handling resources were not available.

For example, a person calling about a sales ad may be routed to an agent with primary service skills when the sales team is unavailable to handle the call. However, counting this call as a sales call and not a service call for future predictions will help ensure enough sales associates are available next time. For situations like these, it may be appropriate to capture data at the network call routing system rather than the automatic call distributor (ACD) since the network router records the original type of call, even if the call was delivered into a secondary skill at the ACD.

Any time that an unusually high or low call volume is experienced, it is important to seek the cause. It could be that the volume was normal but there was a breakdown in the recording process, a marketing campaign prediction was significantly off, an announcement has many people calling for more information, or some event is distracting people who might otherwise have called.

It is also appropriate to check regularly to ensure that all calls are reaching the systems and are not blocked in the telephone network. Calls that reach a busy signal will not be counted as "offered" calls since they never reach the ACD or router. This can understate the requirements for future planning.

AHT Data

Average handle time (AHT) is the other basic element and it is made up of talk time, after-call work (ACW) and time the agent may put a caller on hold. (In some ACDs,

the hold time is reported separately but in others it is combined with talk time.) Even though a single team of agents may handle multiple types of calls and skills, it is appropriate to forecast for each type separately before merging them for scheduling. This allows each to be adjusted for any events that may only affect one of the skills. For example, a marketing campaign is likely to affect the sales skill more heavily than the customer service skill.

As an example of calculating AHT, consider a half-hour interval with 245 calls with 72,480 seconds of talk time, 8,360 seconds of on-hold time, 12,460 seconds of ACW to be done immediately following all and 52,890 seconds of ACW of research and follow-up work that can be deferred to a later time. The correct calculation is to combine the talk, on-hold time, and attached ACW seconds (72,480 + 8,360 + 12,460 = 93,300) and divide by the number of calls (245) to arrive at the 381 seconds per call.

In order to get accurate AHT data, it is critical that frontline staff use the proper phone or computer buttons to indicate actual work states throughout the day. When an agent uses the ACW work state when he is actually logged off working on another project or taking a break, the ACW time and the overall AHT numbers will be inflated. This is a common problem in contact centers and it is important to continually educate and remind the staff about proper button usage and to track this usage on a regular basis to ensure the data fed into the forecasting process is accurate.

In order to arrive at valid AHT data, it is important to define the use of each work state and how it is to be applied. For example, in some centers there is after-call work attached to the call where the work must be completed before the agent is ready for the next one. Other ACW may be deferred to a later time when call workload subsides. It is important to separate these so that the portion that is attached to the calls and immediately after them is part of AHT, while the deferrable portion is included in the shrinkage that can be done whenever time permits. (Shrinkage is time lost from direct call handling and will be explained in more detail in future courses on scheduling.)

With the right definitions in place, it is then critical to educate staff and supervisors on proper work state usage. Supervisors and managers need to understand the importance of this accuracy and the intraday chaos that can result from an inaccurate forecast so that they support the effort to ensure proper work state usage. It is a team effort in which everyone wins.

The WFM team should continually monitor reports for work state usage outside of normal parameters. It may be necessary to do refresher training for staff and supervisors so proper work state usage is maintained.

Data Aberrations

Historical data is used to predict future call volumes and patterns. However, past data often contains aberrant or abnormal data that can skew the forecast. Therefore, it is important to identify anything out of the ordinary about the data.

First, look for extremes or flat patterns. Very high peaks or low valleys can indicate an abnormal situation. A calling peak may have occurred due to a random, one-time event that will not occur in the future. Likewise, a one-time event can cause an abnormally low volume or it may be caused by a bad data feed or calls not getting in during peak times due to capacity limits. In either case, look for data that represents a significant variation from normal.

As you review the data, identify the root cause of each aberration so you can determine if it is a repeatable situation or simply a one-time anomaly. If a cause for the change cannot be determined, it may be that the data is just bad due to some kind of system failure.

There are several techniques that can be applied to analyze data for aberrations. The simplest approach is to just "eyeball" or look at the data. If it is a relatively small sample, any numbers that are out of range will generally catch your eye.

For larger sets of data, standard deviation analysis can help to determine how much variation is present in the data set so that even if an average seems reasonable, the highs and lows may be quite pronounced.

Correlation coefficient analysis is useful in looking at whether the pattern in a set of data matches the pattern in another set. This can help identify intervals that are out of the normal range, or weeks of the month that receive more calls than others. It is also helpful in analyzing historical data to find a pattern that matches a certain type of event such as a weather pattern, marketing campaign, etc.

In the following example, use the simple eyeballing approach to identify the data aberrations in this monthly sample of data from the month of September.

S	**M**	**T**	**W**	**T**	**F**	**S**
			1 5481	2 4212	3 3610	4 743
5 209	6 0	7 6531	8 5407	9 5488	10 5420	11 1110

12 910	13 5892	14 5587	15 3921	16 5512	17 5536	18 1212
19 951	20 5932	21 5590	22 5484	23 5541	24 5598	25 1231
26 993	27 6073	28 5712	29 5533	30 5591		

For this United States based contact center, there are several obvious data aberrations. Some are easily explained as holiday factors, while others are less obvious. What data aberrations can you find in this sample?

Here are the obvious anomalies:

•September 6 is Labor Day in the US and a national holiday. The center was closed on that day and no calls were received.
•September 2-5 show lower call volumes that other matching days of the week across the month.
•September 7 has a higher call volume that other Tuesdays in the month.

All of the dates from September 2 – 7 are affected by the Monday holiday of Labor Day. While there are some high and some low days, this is likely to be a repeatable Labor Day holiday pattern and while it will not predict a normal upcoming week, it will be a good pattern to save to predict a Monday holiday pattern.

In addition, September 15 has a lower call volume than other Wednesdays and is lower than both the Tuesday before it and the Thursday after it. This might be a one-day aberration due to a data recording problem or actual low volume caused by a news event, weather, or other business factor. On the other hand, it could be a regularly occurring event that happens on the third Wednesday of the month.

Making the best choice for adjusting data is somewhat driven by the method your WFM system uses to record and use historical data. In most cases, the system takes in new data and averages it with prior data to determine averages. Many WFM systems maintain this information by calculating the percentage of a week's volume that occurs on each day in that week. It uses the same percentage technique to record the percentage of each day's volume that occurs in that interval (quarter-hour). Maintaining the accuracy of these percentages is key to having a base, normal pattern of call distribution that can be used regardless of the total volume of calls anticipated. It is also important to remember that any significant change in the

processing of calls that will affect the volume or AHT may make the historical data inaccurate as a future predictor. For example, a change in hours of operation or activation of additional self-service options can change both the pattern and handle time of the calls handled by frontline staff.

In this example, the first decision to make surrounds the Labor Day holiday. One choice is to leave the data as it is with no adjustment. After all, Labor Day will happen on the first Monday in September in future years. However, there are challenges because the date of the first Monday will be different each year and the data being fed into the WFM system is used to calculate the average normal periods unless it is marked as a "special day".

In this case, not only is September 6 a "special day" with zero calls, but the distribution patterns by day of week are skewed for both the week before and the week after the holiday. It is best to remove these two weeks from the "normal" database and store them separately so that you can use them in the future to predict not only Labor Day, but perhaps other Monday holidays too. In place of these actual call volume numbers, you will want to substitute average daily call volumes for each of the days from Sept 2 – 7 that can be averaged into the normal patterns.

It is important to remember that not all holidays fall on Monday. Some are associated with date of the month such as July 4 in the US (or July 1 in Canada) and Christmas Day. These occur on different days of the week each year and the patterns vary accordingly. Gathering data for the pattern of calls around these holidays is also important but it may be several years before the holiday falls on the same day of week. Some "art" in the forecasting is often needed to account for these moving holidays.

When looking at a single-day aberration that is not a holiday (like the third Wednesday in the sample data), the first step is to figure out why the aberration occurred and then decide what to do about the data that will feed into the forecasting process.

If the data aberration is due to a one-time glitch, like a weather interruption, a news announcement, or some other out of the ordinary event, the most likely strategy is to adjust the day's volume to an average for the other Wednesdays in the month. This will serve as a reasonable substitute for the recorded number and account for the calls that were missed.

However, there is another possibility. What if the dip on the third Wednesday was caused by an event that happens every third Wednesday? For example, if this data came from a company's internal help desk call center and there is an all-employee meeting for two hours each month, there would be no calls to the help desk during that period. Now what should be done with this data? In this case, the volume is correct and should not be overridden with an average Wednesday. But the pattern of arrivals is different from other Wednesdays with the zeros in the periods of the

meeting. So once again, this week must be separated from the others. The day of week pattern is different as is the interval pattern on Wednesday. Each third week of the month will require a separate forecast to ensure that it reflects these expectations.

The same type of thought process needs to be applied to AHT data too. If you note a week where there are higher AHTs for a few hours on one day, there are many explanations. One likely cause is a computer outage or slowdown. While a computer downtime or slow speed can be experienced again, the likelihood that it will happen on the same day and last for the same amount of time is low. Therefore, this data needs to be overridden in the file with an average for that period so that the forecast is not skewed to a higher workload than normal.

Another possible cause for an AHT anomaly could be a new hire class that is coming out to the floor to take some calls. If this happens at the same time every week, you may want to leave this data in as recorded to reflect this regular practice. However, in most cases, the nesting periods are not the same every week so it is best to adjust the data to the average for these periods and then manually add the extra time when the nesting period is scheduled.

Another common cause is a new complex process or a new event like a marketing campaign. Once again, there will be more marketing campaigns but the timing and effects are likely to be different so adjustment to average is a reasonable option. However, in this case, you will also want to store this pattern of data as a good predictor of the impact of such a campaign if you think it is likely to happen again.

AHT variation can also be the difference seen in AHT by time of day. While some centers use an average to represent AHT across the board, it's important to realize that there might be legitimate time-of-day differences.

One of the reasons for late day AHT increases might be newer, less experienced agents on the phones during these less attractive periods. It may also be that there are fewer team leaders to handle escalated calls during later hours. In some cases, centers find that the customer save up their complex queries until after they get home from work and call in the late afternoon and evening. This is another case where no adjustment is needed but the variance in AHT should be part of the plan.

All these are valid reasons for a different AHT pattern and if these are likely to continue, the longer AHT is also likely to remain so a longer AHT pattern should be used. This illustrates the importance of using an appropriate AHT for each interval rather than using the same one for all periods across a day or week. Just as call volume changes by interval, AHT changes as well and since both are equal partners in the calculation of the workload, each should be accurately recorded.

As you can see, making the right choice about an adjustment is not easy. The cause of the anomaly must be determined before the right choice can be made. But failure

to review the data regularly and make the appropriate adjustment will result in skewed patterns being predicted by the WFM system in the forecast and schedules that do not match the true arrival patterns of the work.