

DESTINATION **excellence** INC.

Optimizing Customer Care Operations

**Applying Six Sigma to Contact Center
Forecasting and Staffing**



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FORECASTING AND STAFFING PROCESS IMPROVEMENT INTRODUCTION

Process improvement has gained attention in business over the last decade as it is seen as a necessity for improvements in efficiency, effectiveness and quality. Businesses feel compelled to improve their processes for fear that they will otherwise be at a competitive disadvantage within their industry relative to their continuously improving competitors. Six Sigma is perceived as a particularly promising approach within the discipline of continuous improvement as it is practical, methodical and mathematically robust.

This paper will discuss the application of Six Sigma to contact center forecasting and staffing.

APPLYING SIX SIGMA TO FORECASTING AND STAFFING EFFICIENCY

Six Sigma's five-step DMAIC process improvement model will be applied to the contact center forecasting and staffing. The elements of the DMAIC model as they apply to these processes are:

- Define the forecasting process.
- Measure the efficiency of the forecasting process.
- Analyze the performance of the forecasting process.
- Improve processes to improve efficiency in forecasting.
- Control the forecasting processes.

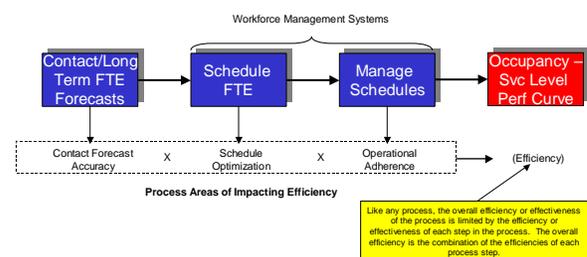
Define the Contact Center Forecasting and Staffing Process

Contact centers are defined as groups that utilize inbound and outbound technologies including telephone, e-mail and web chat to provide customer support, service, billing, collections, sales, and technical support. There are over 70,000 contact centers in the United States, representing more than 4.5 million jobs.

Contact centers outside the U.S. have been multiplying since the late 1990s and will continue to grow both to support the U.S. market as well as other markets.

The ability of contact centers to effectively manage these metrics has been the purview of the Forecasting and Staffing group, whose responsibilities including forecasting work load, forecasting staffing needs, scheduling staff and managing staff adherence to schedules.

The diagram to the right defines the forecasting and staffing process as consisting of three separate steps: long-term contact and FTE forecasting, scheduling FTEs and managing schedules. The execution of each of these steps determines the overall occupancy-service level performance for the group. Each step includes the following:



- Long-term contact and FTE forecasting – This step includes using historical data for analysis, running forecasting algorithms and overlaying forecasts with advertising, billing and other events to generate a contact forecast. The contact forecast is combined with productive and non-productive assumptions to determine staffing needs. Staffing needs are adjusted with turnover and a new hire



plan to balance planned staff against forecasted staffing requirements. The daily results of contact volumes, average handling time and unproductive time are input into the next step.

- Scheduling FTEs – Input from the long-term contact and FTE forecast is used along with scheduling parameters (type of shift, continuous days off, break times and the like) to generate schedules from a WFM system. This information is adjusted to optimize schedules that meet the week-to-week, daily and intra-day staffing requirements. Bids are provided to agents and assignments are made.
- Manage Schedules – Once schedules are assigned, adherence to schedules is managed and intra-day adjustments to schedules are made to accommodate fluctuations in contact volume and actual staffing. Overtime and undertime are implemented to optimize overall performance.

Measure - The Efficiency of the Process

Inbound contact centers, those that who respond to inquiries initiated by customers, utilize two key metrics to evaluate performance:

- Occupancy - % of time an agent is busy with a customer
- Service Level - % of contacts answered within the service goal time

These measures are used to measure the cost performance and service effectiveness of inbound contact centers, respectively.

Challenges in Measuring Forecasting and Staffing Effectiveness

Managers have attempted to manage the effectiveness of the Forecasting and Staffing group using the complementary metrics of occupancy and service level. Process improvements, including those incorporating Six Sigma, have attempted to do the same. However, there are significant issues in the use of occupancy and service level as metrics.

First, occupancy and service level have a non-linear relationship. This non-linear relationship makes the evaluation of results and quantification of improvements difficult. For example, in one month a contact center may achieve occupancy of 82% and a service level of 82% (for purposes of this article, service levels will be stated in terms of the percentage of contacts answered within a service goal of 20 seconds). The next month, occupancy may increase to 84% with service level decreasing to 79%. The following month, occupancy may drop to 78% while service level increases to 85%. How is the performance of each month compared to the other? If process improvements were implemented in one of the months, was an improvement seen in subsequent months? Just looking at these numbers, there is no clear conclusion.

Second, changes in operating parameters (e.g., contact volume, hours of operation, service goal and handling time) in a contact center changes the relationship between occupancy and service level. For example, contact volumes on Mondays are typically high and on Sundays typically low. The difference in contact volumes drives a much different occupancy-service level performance curve, making a direct comparison difficult and subjective. If both days attain the same service level, it is conceivable that Monday's occupancy of 82% could be considered poor performance while Sunday's occupancy of 70% could be considered very good performance.



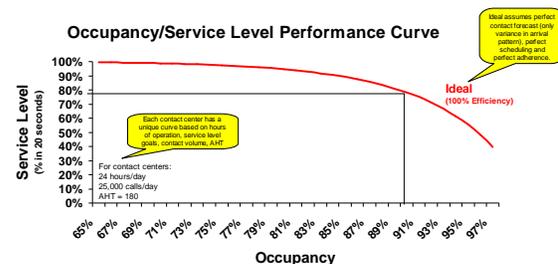
Third, benchmarking contact centers using occupancy and service level often proves dubious. Contact centers are generally not directly comparable in occupancy and service level performance since they normally have different operating factors. This makes benchmarking difficult, at best. Also, as pointed out previously, a contact center may not be comparable to itself from day to day, week to week, or even month to month, since these same factors change within a contact center over different time periods.

If the traditional measures of occupancy and service level are not the appropriate metrics for measuring performance, process improvements or benchmarking, what is the appropriate metric for the Forecasting and Staffing group? This paper will introduce a metric entitled the Forecasting and Staffing Efficiency Index, (FSE Index), which addresses the shortcomings outlined, and provides a basis by which Six Sigma process improvements can accurately be measured.

The Erlang Function

Before the FSE Index is introduced, a review is required of the Erlang function. Erlang defines the non-linear relationship between occupancy and service level through a set of Poisson (for small contact volumes) or Gaussian (for larger contact volumes) probability applications. Obviously, this relationship is a bit more complicated than just described, but this encapsulates the essence of the mathematics. Erlang calculators are in standard use within contact centers and are readily available on the Internet.

Erlang calculators require the input of operational parameters (i.e., contact volume, hours of operation, service goal, handling time) as a basis along with service level to provide an estimate for occupancy. As users enter service level data points (e.g., 78%, 79%, 80%) the Erlang calculator will provide the occupancy figure associated with the service level input (e.g., 84%, 82%, 80%). Entering a number of service level data points, an occupancy-service level performance curve can be developed that is unique to the contact center. This curve establishes a standard, or "ideal," performance curve for the group. A sample of such a curve is illustrated to the right. This performance curve will provide the basis for our calculation of the FSI Index.



The Erlang generated performance curve is referred to as ideal since Erlang makes a series of assumptions that provide an optimum, but not a realistic, performance curve. For example, Erlang assumes that contact volumes are known and certain. It also assumes that handling time is known, work schedules and assignments are perfectly aligned with staffing needs, and adherence to work schedules is 100%. Obviously, not all of these can be true, which brings us to our objective measure of the FSE Index.

Introducing the FSE Index

The FSE Index is the measure of how well a contact center performs on its occupancy-service level curve versus the ideal. It is the ratio of actual performance versus the ideal performance for a specified time.

Specifically, the FSE Index is the ratio of the achieved (actual) occupancy at a given service level divided by the ideal (Erlang calculated) occupancy at that same service level for a specified period of time. The FSE Index is the measure of the achieved occupancy versus what would be achieved under ideal conditions.



$$\text{FSE Index} = \frac{\text{Actual Occupancy at Actual Service Level}}{\text{Ideal Occupancy at Actual Service Level}}$$

For example, to determine the FSE Index for a given month, the actual occupancy for that month would be divided by the ideal (Erlang) occupancy calculated at the service level for that month. Assume that in given month 80.0% service level was achieved along with 85.0% occupancy. Using an Erlang calculator, the ideal occupancy is determined to 89.4%. The FSE Index for this month would be 95.1% (0.850/0.894). Said another way, the contact center was able to achieve an FSE Index of 95.1% for the month.

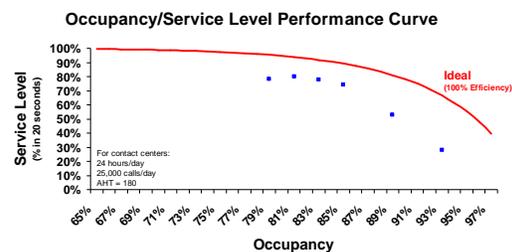
The FSE Index, then, can be used as an objective measure to evaluate contact center forecasting and staffing process and compare its performance against themselves and other groups, regardless of operational parameters. The FSE Index eliminates the complexities of current measurement systems and creates an objective, comparable, logical, and easy to use metric that is useful for operational performance assessments, benchmarking or Six Sigma process improvements.

The The FSE Index

Contact centers can calculate the FSE Index as part of their monthly forecasting and staffing dashboard process. For example, for the first six months in a year, a contact center would plot their performance on a table, and potentially graph those results. The table below complements this chart and calculates the FSE Index. For each month, the contact center enters the actual service level for each month, plugs those service levels into the Erlang calculator, and obtains the ideal occupancy for each month for their respective service levels. The actual occupancy is divided by the ideal occupancy for that month to calculate the FSE Index. The chronological order of the months is not relevant to the calculation of the FSE Index. (Note that integer values have been used for this example, but greater precision can be used if so desired.)

Service Level	Act. Occupancy	Ideal Occupancy	FSE Index
28%	93%	98%	95%
53%	89%	95%	94%
74%	85%	91%	93%
78%	79%	90%	92%
78%	83%	90%	91%
80%	81%	89%	93%

If desired, the contact center can also plot a graph to provide a visual depiction of their performance. The graph to the right includes both the ideal performance curve (across a wide range of service level points, as well as the six points represented by the six months for which the FSE Index was calculated.



If the FSE Index was to be calculated over the entire six-month period (rather than for each month individually), the same process would be used by entering the actual number of contacts, operating hours, handling time, service goal and service level for



the period to determine the ideal occupancy for those six months. The actual occupancy for the period would be then divided by the ideal occupancy to determine the FSE Index for the six-month period.

Some contact centers may prefer to use a monthly FSE Index figure and then create a weighted average based on workload (contact volume and handling time) for a given time period. This calculation will approximate the calculation of the FSE Index using the whole period, and should be considered a legitimate alternative. This may be a preferred method if monthly figures would likely align better with performance programs for forecasting and staffing groups and allow them to track their progress through the year.

The FSE Index performance will likely vary from month to month, and vary depending on where a contact center is on the occupancy-service level performance curve. Note that in the table provided, the FSE Index performance improves as service level declines. This is fairly typical in contact centers. When contact centers encounter dropping service levels, the focus of the group is to respond to work volume, unproductive time requirements diminish and adherence is more closely managed. These actions tend to increase the FSE Index measure.

Analyze - The Performance Of The Forecasting Process

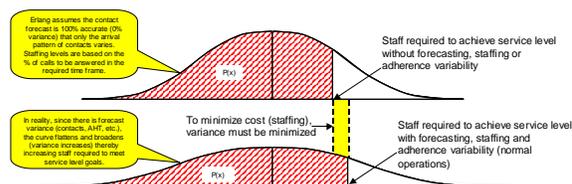
The FSE Index measures the overall effectiveness of long-term contact and FTE forecasting, scheduling and adherence functions of the forecasting and staffing process. The following sections will review the three parts of the forecasting and staffing process and highlight areas that have the greatest impact on the overall FSE Index.

Contact and Long-Term FTE Forecasting

Forecasts generate the *daily* contact volume, handling time, unproductive time and other assumptions that create the budget, or long-term plan for the operation. These daily assumptions are used to feed intra-day schedules in the Scheduling Staff stage. The FSE Index is impacted by the accuracy of contact and handling time forecasts. Each will be reviewed separately here.

Erlang assumes that the contact forecast is known with certainty, and does not account for forecast variances. In reality, the contact forecast for any given day (or hour, or half hour) varies due to a number of factors including the precision in which a forecast can be determined, changes in advertising plans, billing variations, and events that may occur outside the business. Anything less than a “perfect” forecast will potentially drive the FSE Index to less than 100%.

The graphic to the right illustrates the difference between what Erlang assumes to be true regarding volume forecasts (the top graphic) versus what happens when actual contact volumes vary from forecasts (the bottom graphic). The top (Normal) curve is the one used by Erlang to determine the staff required to answer 80% of contacts within the specified service time (e.g., 20 seconds). When you use an Erlang calculator, it is essentially simulating this curve behind the scenes to determine your FTE requirements. In reality, however, variances occur in contact forecasts, and these variations cause the curve to “flatten out” or create higher standard deviations in the normal curve. The practical effect is that the staff required to meet service goal is increased. The less accurate the forecast, the greater the flatter



the curve, the greater the standard deviation, the greater staffing required, the lower occupancy and therefore the lower the FSE Index. Accurate forecasts are key to attaining higher FSE Index scores.

In terms of workload, accurate handling time forecasts are as important as accurate contact volume forecasts. For example, having handling time 10% higher than forecasted has essentially the same effect on an operation as does actual contact volume being 10% higher than forecasted. Therefore, accurate handling time forecasts are as essential as accurate contact volume forecasts.

Handling time forecasts are often overlooked, as people tend to rely on historical data. This simplified approach is adequate if no changes in technology, processes or people are present. An area that is often missed is the impact new hires have on handling time. The following graphic illustrates what can happen to handling time when new hire classes are released to handle contacts.

It is not unusual for handling time to increase 10% or more during times when hiring is used to meet rising demand or attrition replacement. When learning curves are measured in weeks (normal learning curves are as long as 13 weeks) and new hire classes are released to the floor in three to four week intervals, the impact on handling time is significant. Such impacts must be taken into account to maintain high efficiencies.

Scheduling Staff

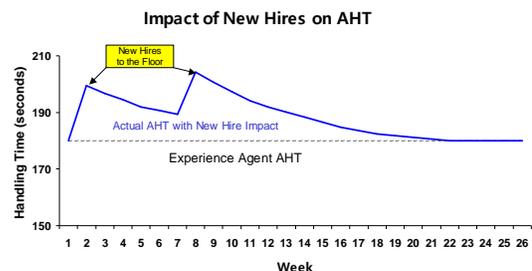
Workforce Management (WFM) systems, when introduced in the 1980s, helped bring tremendous gains in the FTE scheduling process. WFM systems not only replaced manual intensive processes (normally performed on spreadsheets), they also helped optimize FTE scheduling through algorithms.

As good as WFM system algorithms are, however, they cannot create a perfect scenario where the staff scheduled exactly matches the staffing requirement throughout the day. Real-world constraints such as scheduling parameters (continuous days off, amount of time between breaks, lengths of shifts) make it impossible to create the “perfect” schedule. There will always be intra-day gaps in half hours either providing too much staff or not enough staff. There will also likely be days that are either overstaffed or are understaffed, depending on schedules and business requirements. Even in small amounts, these overstaffing and understaffing gaps reduce overall FSE Index scores.

Staffing and forecasting groups are creative in the ways in which they attempt to optimize schedules. They time unproductive activities to staffing requirements, change routing plans and use overtime and undertime to adjust schedules to best fit operational requirements. These tools can continue to be used in conjunction with efforts to align schedules to operational needs to optimize the FSE Index.

Managing Adherence

Prior to the introduction of WFM adherence and similar systems, contact centers were left to manage agent's adherence to their schedule through monitoring and reports, be they through the day and/or at the end of the day. In the 1990's WFM systems added automated features to help contact centers manage adherence to schedules. Managing schedules is the third element in the overall forecasting and staffing process that impacts the measure of the FSE Index.



Adherence is a common measure within contact centers. Adherence measures the amount of time agents are where they are scheduled to be. Less than 100% adherence does not mean that you are not getting 100% of the paid time out of agents, it only means that they are not where you planned 100% of the time. One of the most frustrating areas for staffing and scheduling personnel is the diminished control they have over some events. People will call in sick, calls don't stop when it is time for break, meetings run over and people are pulled from their desk without authorization.

Adherence reduces the FSE Index when people are not where they are scheduled. At times, this may improve for operational FSE Index scores (in the case where an agent is handling a contact rather than being on break at that moment) or decrease FSE Index scores (in the case where an agent is on break rather than handling a call in queue). Regardless, managing adherence to schedules is key in optimizing FSE Index scores.

Improve - Processes to Improve FSE Index Scores

It should be noted at this point that the overall FSE Index is not a multiplication of contact forecast accuracy, schedule optimization and operational adherence. In fact, these three influences may at times work with one another to increase the FSE Index and work against one another at other times to decrease the FSE Index.

For example, I may be prepared in a day to be understaffed by 3% versus what I am forecasted to need. In this case, I would be coming into the day with a 97% schedule optimization (for example). At the same time, I could be 3% off in my forecast contact volume, which would be 97% in my contact forecast accuracy. Depending on if I were above or below forecast, I would either be (theoretically) on target for the day (100% FSE Index score, in this narrow example) or have a 94.2% FSE Index score (.97/1.03). From this we see that the individual components are not multiplicative.

It should also be noted that contact centers are excellent at mitigating the impact of inefficiencies through intra-day adjustments. So, while a drop in the FSE Index score may be expected in some cases due to varying volumes, gaps in schedules, or adherence issues, forecasting and staffing groups will shift unproductive time schedules, add overtime, add undertime or do what they need to in order to better align operational plans with operational needs.

So, what steps are necessary to improve forecasting and staffing efficiency (improve the score of the FSE Index)? Here are a few tips and some areas for companies to consider when optimizing their FSE Index as a performance measure.

1. Make long-term contact and FTE forecasting part of your normal operations planning cycle. Many companies spend time, justifiably, optimizing their intra-day performance. However, much of this work could be avoided if long-term plans were in place. For example, the timing of new hire classes should be planned months in advance, avoiding a scramble for overtime. Likewise, slow periods can be identified months in advance allowing additional vacation, training or other unproductive time to be scheduled in advance.
2. Utilize a contact forecasting system that accurately projects your contact volumes. What the 1980s were to the automation of scheduling and the 1990s were to the automation of managing



schedules (adherence), the first decade of the 2000s will be focused on automating forecasting. Most forecasting and staffing groups have home grown solutions that work well. Automated forecasting systems will provide a leap in productivity and performance similar to what earlier automated systems provided. Destination Excellence's ForeScite solution is such a system that provides accurate forecasts for contact groups, along with other features outlined here.

3. Anticipate changes in operating assumptions, such as handling time, to create a more accurate depiction of staffing needs. Changes in IVR usage, CRM platforms or just the introduction of new hires can change the handling time in a contact center substantially. Since handling time is one of the key elements in staffing to handle workload, accurate handling time forecasts are necessary to appropriately manage the FSE Index. Solutions like ForeScite automatically adjust your handling time estimates to include new hire impacts. When more accurate inputs are made to your WFM system, higher efficiencies result.
4. Work to align your WFM schedules with your staffing requirements. As good as WFM systems are, manual adjustments to schedules are required to optimize your staffing plan. Continue to rework your schedules until you reach your occupancy-service level target.
5. Establish adherence goals for the operation. If you have not already done so, purchase an adjunct to your WFM system that allows you to measure adherence, implement that system and utilize it to help you achieve a high level of adherence to your planned schedules.
6. Be aware, and be flexible. A common ingredient of high-performing centers is the awareness of the forecasting and staffing group throughout the day as to what is occurring in that day and in the days to come. They are proficient in making the necessary changes in plans to minimize disruption in the operation yet maintain an optimal FSE Index score.
7. Measure, monitor, and provide feedback. Key to managing performance is creating measures, making sure they are holistic and integrated, communicating about those measures and providing feedback in support of people's success (go to <http://destex.vertex.com/Articles.asp> and see our what paper entitled, "Performance Measures and Management" for additional information).

Control – Processes

The primary control process for managing forecasting and staffing process improvements is the continued monitoring of the FSE Index as part of the dashboard for the contact center. Given that the FSE Index (more specifically occupancy performance) impacts between 50% and 75% of the total cost of the group, the FSE Index should be a primary measure for the operations.

