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NICE Special Edition

Workforce Management AI-Based Forecasting

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**by NICE WFM team
with Ulrika Jägare**

**for
dummies**[®]
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Workforce Management AI-Based Forecasting For Dummies®, NICE Special Edition

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Introduction

When forecasting demand in a contact center, back office, or branch or retail organization, you can draw on a number of techniques from mathematics and statistics. While today's forecasting methods are amazing, it's still not possible to define the perfect forecasting formula that will account for all possible scenarios. Instead, the challenge is to have the right expertise and capability at the right time to understand which forecasting model will generate the most accurate results in any given situation.

In today's society with complex and rapidly changing contexts, these challenges are tackled by predictive forecasting technologies that use data to revolutionize businesses well beyond the contact center. The key is more accurate projections, and it's enabled by using techniques such as machine learning (ML) and artificial intelligence (AI).

Although the concept is simple, the execution is anything but. This book aims to explain as well as exemplify the value of workforce management (WFM) AI-based forecasting.

About This Book

In this book, you discover the basics of forecasting and find out what the most common challenges are in WFM, as well as how to tackle those challenges. You study how forecasting accuracy generates more value and drives business results up, and you also gain an understanding about the cost that can be incurred due to inaccurate forecasts.

The book walks you through a selected set of forecasting models and explains how to assess the value of a model. Furthermore, *Workforce Management AI-Based Forecasting For Dummies*, NICE Special Edition, puts forecasting in the context of AI and describes how, through a number of customer stories, the NICE solution is utilizing these techniques to augment WFM.

Icons Used in This Book

I occasionally use special icons to focus attention on important items. Here's what you'll find:



REMEMBER

This icon with the proverbial string around the finger reminds you about information that's worth recalling.



TIP

Expect to find something useful or helpful by way of suggestions, advice, or observations here.



WARNING

Warning icons are meant to get your attention to steer you clear of potholes, money pits, and other hazards. Soft clouds can deliver hard knocks.



TECHNICAL
STUFF

This icon may be taken in one of two ways: Techies will zero in on the juicy and significant details that follow; others will happily skip ahead to the next paragraph.

Beyond This Book

This book can help you generate more value out of your forecasts in WFM. If you want more deep dives into resources beyond what's offered in this book, additional reading that's chock-full of useful info can be found at the following links:

- » www.nice.com/wfm: All about the NICE solution
- » www.nice.com/engage/workforce-optimization/workforce-management: NICE's intelligent WFM solutions suite
- » www.nice.com/WFMVideoHub/index.html: A video series where experts in WFM and employee engagement discuss how you can efficiently empower and engage your teams

IN THIS CHAPTER

- » Sorting out the fundamentals of forecasting
- » Describing common obstacles in work force management
- » Explaining why accuracy is key in forecasting
- » Detailing how forecast inaccuracies impacts the company cost structure

Chapter 1

Explaining the Importance of Forecasting Accuracy

Traditionally contact centers have been called *call centers*. The name *contact center* reflects that call centers have evolved over the years to handle more than just phone calls. Some companies even adjust their organizational settings to this and set up separate departments to handle different types of communication mediums, such as inbound and outbound calls, emails, chats, SMS, and social media.

A contact center can also be internal or external. Small companies usually develop their own capabilities internally, while larger companies tend to outsource their contact center functions or spin off these functions to a separate company.

Today's contact center stands face to face with increasing challenges: new contact channels, complex skill set requirements, and elevated customer expectations. Traffic rises and falls, customer preferences shift, and new technologies disrupt day-to-day life. Amid all this change, you demand increasingly

higher performance from your employees, and they may expect more from your company.

To manage this in a successful way, you need to get proper *workforce management* (WFM) in place. WFM refers to an integrated set of processes that a company uses to secure the right number of people, with the right skills, at the right time. WFM involves accurately forecasting labor requirements and creating and managing staff schedules to meet the demand at the interval level, daily or hourly.

WFM systems help organizations gain insights into business requirements, such as the exact number of employees needed to handle a number of interactions at a given time of the day, week, or month. For example, in a contact center, you need to handle the expected volume of interactions on a detailed level. WFM helps maximize the use of labor by forecasting the volume of transactions like calls, messages, or emails as well as scheduling the correct number of agents with the proper skills based on previous performance.



REMEMBER

In forecasting, the main objective is to produce an accurate forecast of your interaction volume and then determine the number of staff required. The solution then optimizes and schedules weeks or months in advance — a forecast that you can truly rely on for staffing and hiring. However, in order to achieve that type of reliability, you must be ready to work on your forecasting accuracy. What this means and how to do that efficiently are some of the interesting parts addressed in this chapter.

Explaining the Basics of Forecasting

The basis of any good staffing plan is an accurate workload forecast. Without a precise forecast of the work to be expected, the effort to calculate staff numbers and create detailed schedules could be wasted. The old saying “garbage in, garbage out” is especially true when applied to contact center workforce management. A precise and accurate forecast is a vital beginning step in the process.

As you might understand, the purpose of the forecast is to predict workload so you can get the right number of staff in place to handle it. The most common scenario for forecasting is normal,

day-to-day operations. But given the need for skills-based routing to handle calls with properly skilled agents, the forecasts need to be built at the skill or contact type level as well as the daily and interval level in order to properly meet the need. This use of skills greatly complicates the forecast and scheduling process because agents normally have multiple skillsets and handle different types of interactions, as well.

You may also require a forecast for special situations, such as planning for new call type(s), opening a new center, a company merger or acquisition, or a change in operating hours. Another scenario could be that you may be implementing a new technology that will affect your call volume or support pattern and need to determine what the resulting change means to staff workload.



REMEMBER

Whatever the reason, you need to understand the basic principles behind workload forecasting and how to apply them to accurately plan your resources. The steps involved are described in this section.

Capturing data

Because the assumption is that history is the best predictor of the future, gathering data that represents the history of what you are aiming to predict is the first task. An example of data source in the context of a call center could therefore be historical daily reports and data feeds with the number of calls offered and the call duration, usually referred to as average handling time, divided into number of half hours.

The number of calls offered should correspond to the workload for which you need to staff in the call center example. This assumption is valid as long as all calls are getting in and that none are blocked due to insufficient capacity. Remember to validate this assumption by requesting data on particularly busy periods from your telco carriers.



TECHNICAL
STUFF

The traditional probability distribution function used for predicting the required staffing to meet the specific service levels of the forecasted demand is Erlang C, and it doesn't take abandoned calls into consideration. Erlang C is also not designed to handle multi-skill complexity or deferred work.



TIP

When capturing your historical data, collect at least two years of data if it's available and has enough quality. Less than two years may be sufficient depending on the algorithm you intend to use it for but usually won't give you the most accurate tracking of trends and monthly/seasonal patterns that you would get from at least 24 months of historical data.

When it comes to data quality, it's absolutely critical that you analyze the data properly to make sure there are no data irregularities. You should look for any abnormally low or high numbers, so called outliers, as well as missing data. When you identify something out of the ordinary, first determine the reason for the anomaly and then decide if it needs to be adjusted or removed.

The key in dealing with data abnormalities is to first determine the reason it occurred. Then, if it's a one-time incident, or an event that might occur again but you can't predict when it will happen (like a storm), you want to cleanse the data and normalize the numbers up or down to reflect realistic volumes. On the other hand, if it's a repeatable, predictable event, these numbers need to stay in the data, so the forecast reflects the event in the future.

Predicting workload

Time to predict how the workload will look in the coming months. Various methodologies can get you to this future forecast, but there are three basic types:

- » **Time series:** This approach focuses on pattern recognition and pattern changes and relies solely on historical data. Call volume is influenced by a variety of factors over time, and each of the factors can be isolated and used to predict the future. The time-series method performs best when trends or cycles are evident and stable.
- » **Causal methods:** Causal methods rely on established cause-and-effect relationships between the data to be forecasted and other factors that might influence the data and hence the forecast. These activities can affect the reliability and accuracy of a forecast and how it is distributed across a day, week, or month.
- » **Qualitative methods:** Qualitative methods are used when data is scarce. These methods use judgment to turn qualitative insights into quantitative estimates.

Detailing the forecast

Detailing the forecast involves breaking down the monthly forecast into a daily prediction, then further down into an hourly or half-hourly predictions. To predict daily workload, you must first calculate day-of-week factors. For example, in a call center, Mondays are usually busier than other days of the week, and it's important to know what percentage of the week's workload Mondays and others represent.

The good news is that it's not necessary to go back and analyze two years' worth of data to determine these specific factors. Typically evaluating the last few weeks' worth of daily call volume data is enough to identify daily patterns. Select several representative weeks of data, meaning those without holidays or other major events that might skew the proportions. Then you can see what the total Monday volume is compared to the weekly total. Repeat the procedure for the other days of the week. These percentages reflect your day-of-week patterns.

After the daily forecast is in place, repeat the process for time-of-day patterns. If calls came in evenly throughout the day, scheduling would be easy, but because that's not reality, you need to know when the peaks, valleys, and average times are.



REMEMBER

Keep in mind that the detailed workload forecast in a call center example should include not only call volume predictions but also a prediction about average handling time.



TIP

Using a WFM solution for automating the process of detailing the forecast is highly recommended. However, although automation improves forecast speed and potentially also your forecast accuracy, you still need to think through your forecast and make sure to set the right contextual parameters.

Considering other factors

Other potential factors that could fall outside of the historical data and impact your forecast could be things such as the following:

- » A new format is suddenly introduced by the billing department.
- » A new process for packaging and shipping is launched with little or no forewarning.

- » Marketing launches a new promotion campaign without telling the contact center.
- » The sales department comes out with a new sales forecast.

Communicate regularly with all these influencers on the workload as you prepare and fine-tune your forecast.

Identifying Challenges in WFM

While forecasting in the context of WFM refers to forecasting labor requirements and creating and managing staff schedules, budgeting in WFM is knowing how much staff a company can afford to have on hand. WFM allows companies to use calculated forecasts to optimize staff deployment and balance workload as labor demands change. This process is typically referred to as *Service Level Objectives* and is measured as handling a certain number of calls within a certain time frame — for example, 80 percent of the calls are handled within 20 seconds.

In any organization that has multiple departments with multiple employees, a certain amount of difficulty and complexity will exist in managing these employees.



WARNING

As part of your forecasting efforts, consider the following WFM challenges and possible mitigations:

- » **Time tracking:** The main issue in time tracking results from paper-based time and attendance tracking, with employees manually signing in and out. This process is time consuming and costly and open to inaccuracies and potential dishonesty from employees.

This is many times the case in a back-office environment in a contact center, where it's often not possible to get details on interaction volume and handle time per transaction.

Capturing that requires a technology solution to monitor desktop activity automatically.

- » **Scheduling:** Any company can have different scheduling paradigms that require employees to be scheduled for different parts of the day. Staff levels can also depend on projected demand during busy or quiet periods.

To manage this, applications are now available that help with things such as automatic employee and pattern assignment based on preferences and multiple optimization controls. See Chapter 4 for more information.

» **Managing employee absence (or managing exceptions):**

Planned and unplanned absences or exceptions can strain the business. Unplanned absences generate extra costs of covering the absences and the losses incurred while the absent employees are being replaced. Planned absences are simpler to deal with but could still present obstacles.

By utilizing adherence and occupancy standards in the industry, you prepare for, and minimize the impact of, these situations.

» **Shrinkage:** Shrinkage is a reality within the contact center and refers to the percentage of time for which people are paid to work, but they aren't available to handle interactions. Shrinkage can also change during certain intervals — for example, shrinkage could be higher on Mondays after a long holiday.

» **Employee self-service:** The request for transparency around employee data is difficult to comply with for employers who don't have this information stored digitally.

» **Holiday tracking:** Employees are going to want vacations during the summer months when the weather is typically nicer. You may not be able to accommodate everyone's vacation requests for the same time, and it's often necessary to stagger these requests to ensure that the company will still function.

Understanding Why Forecasting Accuracy Is So Important

Accurate forecasting is critical to successfully managing your workforce and meet demand without under-staffing or over-staffing. You need methods that precisely predict how many people are needed to run your business. However, predicting the future isn't an easy task.



WARNING

WFM presents a few forecasting challenges:

- » Constantly changing business needs contradict the usefulness of historical data.
- » The demand is driven by external events and not controlled by the company.
- » Volume is seasonal dependent and varies greatly.
- » Volume patterns change frequently, making projections difficult.

Common for all these forecasting challenges is that they all show the need for using multiple forecasting methods and algorithms to handle the data.



REMEMBER

The objective of generating forecasts is for them to be as precise and unbiased as possible. A forecast bias occurs when consistent differences exist between actual outcomes and previously generated forecasts. Forecasts have a general tendency to be too high or too low. Forecast accuracy should be used to determine effectiveness, not to punish demand planners.

To improve forecast accuracy and trust in the forecast, consider input and participation from relevant company functions, including Sales, Marketing, Finance, and Senior Management. Also take into account statistical input.



TIP

Measuring the entire process helps you determine which assumptions are more accurate, focusing on the process that led to the final demand plan, as well as to the source of any errors. A highly accurate forecast will not only generate satisfied customers for you but also engage your employees and make sure your bottom line stays healthy.

Exemplifying Cost Impact of Inaccuracies in the Forecast

Achieving the service level targets in operational performance is directly related to achieving more accurate staffing. Both over- and under-staffing carry unnecessary costs, such as direct labor expenses and opportunity costs from activities sacrificed because staffing wasn't optimal.



TIP

A major benefit with artificial intelligence (AI)-based forecasting is that it helps users achieve greater cost efficiencies. A composite analysis with customer contact types (CTs) estimates that a 4.5 percent gain is achievable even under fairly traditional assumptions. While individual results may vary, the consistent trend is sizable gains that yield a highly favorable return on investment (ROI).

In Figure 1-1, you see an example of potential savings that assumes the following conditions:

- » 7.5 FTE hours
- » 24-hour operation
- » 80 percent of the calls with an average handling time of 20 seconds (a good service level)
- » 20 percent shrinkage, where staff was paid to work but not able to take calls (this includes time for training, for example)
- » Loaded hourly rate of \$15 per hour (\$31,200 annual for salary, benefits, and onboarding)

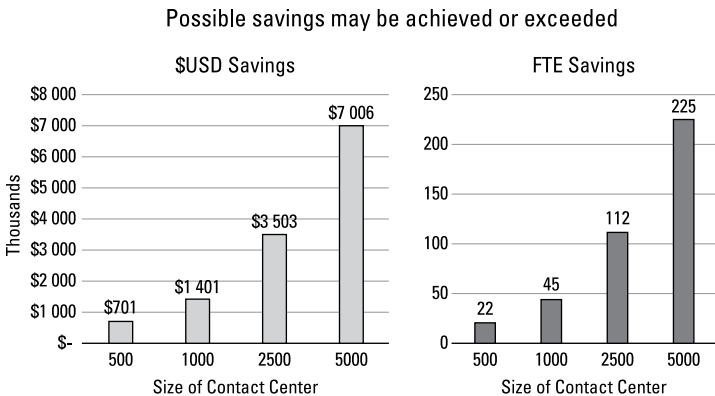


FIGURE 1-1: Merged CTs between various customers to estimate potential savings.

A more specific example of how forecast inaccuracies are impacting business results is a customer that's interested in sharpening its interval accuracy. This U.S.-based existing customer handles hundreds of thousands of calls annually and needs a solution to address the increasing complexity of cases and to improve its interval accuracy.

After making significant improvements in volume, the forecast by interval resulted in nearly 13 percent more intervals within their accuracy goals of ± 10 percent. Getting to interval accuracy is critical in understanding what staffing levels are required and in controlling associated costs.



REMEMBER

It is one thing to measure monthly accuracy of a forecast, but this number can hide real problems of staffing at the interval level. Overstaffing in one interval may average out an understaffing, but at the interval level the company will see wasted salaries and missed service levels.

IN THIS CHAPTER

- » Diving into the specifics of relevant forecasting models
- » Exploring forecasting model value rating
- » Avoiding constraints in your forecast work

Chapter 2

Detailing a Selected Set of Forecasting Models

The more you know about the general principles of forecasting, what forecasting can and can't do for you currently, and which techniques are suited to your current needs, the better equipped you are to meet the unknown future. Just by enhancing your understanding of the different models and their applicability, you have laid a good foundation for improving the accuracy of the forecasts, ultimately reducing costs and improving customer service for the entire organization.

To handle the increasing complexity of contact center forecasting problems, you have various forecasting methods to choose from. Each has its special use, and this chapter walks you through some of the most relevant forecasting models in use for workforce management (WFM).



REMEMBER

Forecasting isn't the easiest topic, but we give you the different forecasting models, along with equations for determining forecasts. We want to stress that you need a solution that does all the processing and iterative steps, through the use of artificial intelligence (AI) — we cover AI's role in Chapter 4. We hope your ah-ha moment in this chapter is getting to better forecasts requires some complex models. But with the right solution that

guides you through the steps based on AI and automation, you can be comfortable in trusting the system and not just using the simple models that you may have been using for a long time.

The Weighted Moving Average Model

The weighted moving average (WMA) model is usually well-suited for stable historical data. The weightings allow a certain degree of control over the influence that unstable historical data may have on the model. This model has demonstrated the best accuracy for determining intraday distributions (event distributions during a day) in the near future.

The WMA model combines three distinct techniques:

- » **Interval-specific:** Is generated based on each interval's unique history instead of a daily or weekly value allocated to each interval, which results in improved intraday curve fitting that requires no user intervention
- » **Weighted:** Uses weekly weights that are typically decreasing for older weeks, thereby reducing the influence of older data; allows the user to influence the outcome by adjusting weights applied to the historical data
- » **Moving average:** Creates a series of averages over time by using a different subset of the full data set and removes data that's older and less reliable by constantly moving the subset of historical data forward



REMEMBER

The WMA model is applicable when the historical data has stationary patterns with or without trends or seasonality, or when you can assume the past will continue to influence and represent the future in a good way.

AWMA model puts more weight on recent data and less on past data by multiplying each demand number by a weighting factor. In Figure 2-1, you see how more weight is given to the data for Week 1 than Week 3, and these weighted values are then used in the forecast.

Week	Demand	Weighting	Forecast
1	450	.5	
2	378	.3	
3	520	.2	
4			442.4
TOTAL	1,348	1.00	

Basic Forecast: $(450 \times .5) + (378 \times .3) + (520 \times .2) = 442.4$

FIGURE 2-1: A forecast created by using a WMA model.



TIP

The benefits of using the WMA model include the following:

- » Easy to understand and implement
- » Simple to calculate
- » Provides stable forecasts
- » Smooths out short-term anomalies and can highlight long-term trends



WARNING

The constraints related to using the WMA model are that forecasts may lag behind changes in trend if seasonal factors and other variables aren't applied after the calculation, and complex relationships in data have a tendency to be ignored. The difference in forecasting accuracy compared to other models could be as much as 5 to 10 percent, which is an important factor to consider.

When selecting a WFM solution, make sure it supports leveraging several different forecasting models, not just the most common one, which is the WMA model.

The Box-Jenkins ARIMA Model

The Box-Jenkins AutoRegressive Integrated Moving Average (ARIMA) model is a time-series based methodology that uses past values (the autoregressive model), past errors (the moving average model), or combinations of the past values and past errors. The Box-Jenkins method is well suited to handle complex time series forecasting situations in which the basic pattern isn't clearly apparent. (See Chapter 1 for more info on time-series forecasting.) This model uses an iterative approach to identify a useful model from a general class of models.



The Box-Jenkins methodology is regarded as one of the more powerful techniques for generating accurate and reliable forecasts. Its strength lies in the fact that it generates information to guide the selection of a particular model. This is significantly different from other time-series models, where an individual assumes a specific mathematical model and then proceeds to estimate the parameters that provide a good fit. The Box-Jenkins model doesn't require an initial description of the data patterns because it systematically eliminates inappropriate models and selects the most suitable one for the data being evaluated. The chosen model is then checked against the actual (historical) data to see if it accurately describes the history. If the model doesn't fit well, the process is automatically repeated until the most accurate model is found. This process is shown in Figure 2-2.

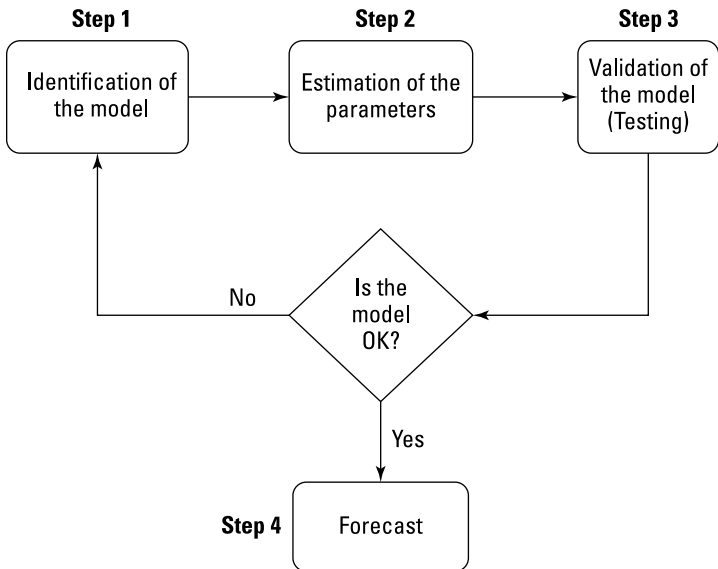


FIGURE 2-2: The steps to help you arrive at the appropriate forecasting model.

Identification

The first step in the methodology of getting the right model is to identify a tentative model based on an analysis of the historical observations of the time series. In this phase, you need to understand the following concepts:

- » **Stationary and non-stationary time series:** Stationary refers to lack of trend (direction and variance) and exhibits a random pattern in the data series. Non-stationary refers to a trend and pattern in the data series.
- » **Differencing:** Differencing is the process of transforming a non-stationary series into a stationary series by doing either first order and second order differences (subtracting sequential time period values from the series).
- » **Autocorrelation coefficients:** This measures the correlation of two values in the same data set series at different time lags.

In Figure 2-3, you see a visual representation of different data sets that exhibit stationary versus non-stationary, trending versus non-trending, and seasonality versus non-seasonality. Seasonality is in (d), (h), and (i). Trends and changing levels are in (a), (c), (e), (f), and (i). There is also an increasing variance in (i). The two that are stationary are (b) and (g).

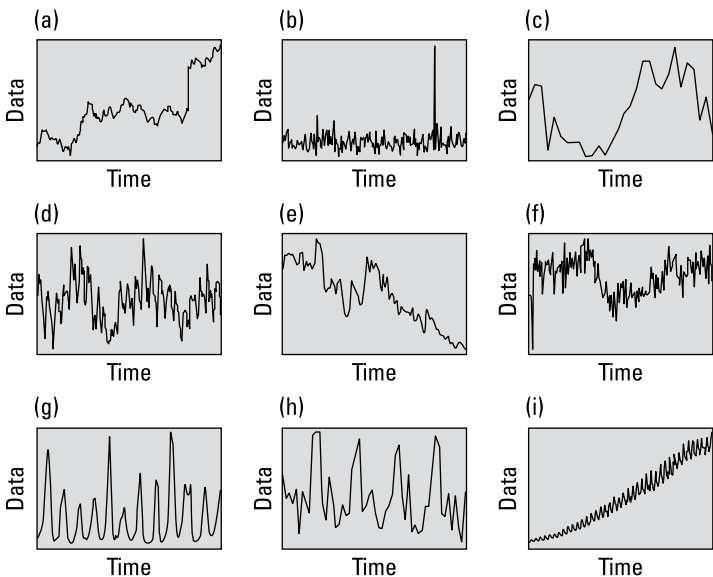


FIGURE 2-3: Examples of time-series patterns.

You begin identification by first considering the autocorrelation coefficients of the various time lags. You can frequently determine the underlying data pattern. If the coefficients approach zero slowly, this implies that the data is non-stationary and has a pattern. If you look at an alternative data pattern that exhibits the presence of seasonality, the autocorrelation coefficients for a 12-month period lag with monthly data would be high. If the autocorrelation coefficients are relatively low for all time lags, the data would be stationary (no underlying pattern).

The usefulness of the autocorrelation coefficients depends on identifying the stationary and non-stationary patterns in the data:

- » If a time series is *stationary*, the observations fluctuate around a constant mean (non-stationary time series fluctuate around a trend path). The Box-Jenkins methodology assumes that the evaluated data is stationary. The patterns of the autocorrelation coefficients of various time lags can be evaluated to check the validity of the assumption.
- » If the autocorrelation coefficients indicate that the data is *non-stationary*, the data must be transformed. Whenever the pattern indicates the presence of a linear trend, you take the first differences of the original times series data and transform the data into a stationary series. To do that, you use this formula:

$$y'_t = y_t - y_{t-1}$$

In most cases, the first difference generates a stationary time series. But sometimes (and in rare cases), second differences can be applied to transform the data into stationary. In that instance, use the following formula:

$$y''_t = y'_t - y'_{t-1}$$

These steps help you decide which time lags to include in the model. The specification of the time lags implies that the initial model is estimated.

THE BOX-JENKINS AR AND MA MODELS

One of the more popular Box-Jenkins models is the autoregressive model (AR), along with the moving average (MA) component.

An AR model of order p can be written as follows:

$$y_t = c + \phi_1 y_{t-1} + \phi_2 y_{t-2} + \dots + \phi_p y_{t-p} + \varepsilon_t$$

ε_t stands for white noise and is like multiple regression but with *lagged values* of y_t as predictors. This example is referred to as the **AR(p) model**, an AR model of order p . Rather than using past values of the forecast variable in a regression, a MA model uses past forecast errors in a regression-like model.

$$y_t = c + \varepsilon_t + \Theta_1 \varepsilon_{t-1} + \Theta_2 \varepsilon_{t-2} + \dots + \Theta_q \varepsilon_{t-q}$$

ε_t is still white noise, and this model is called an **MA(q) model**, a moving average model of order q . You don't *observe* the values of ε_t , so it isn't really a regression in the usual sense.

When you combine differencing, autoregression, and a moving average model, we obtain an Autoregressive Integrated Moving Average (ARIMA) model, which is one of the more popular Box-Jenkins models. The notation for the ARIMA models contains (p, d, q) , where

p = order of the autoregressive part

d = degree of the differencing

q = order of the moving average part

Estimation and testing

The iterative process is accomplished by applying the least squares methodology and starting with preliminary estimates based on the relationships between the autocorrelation coefficients and the model parameters, the solution is run through a series of iterative steps in which revisions are occurring and final estimates of the model parameters are determined.

After you have a final estimation, it must be checked for accuracy. This check is made through an analysis of the error terms. The Box-Jenkins methodology depends on the Box-Pierce Chi Square statistic to indicate the adequacy of the model. The statistic focuses on the autocorrelations of the model residuals and in general indicates whether the model estimations account for the observed relationship between the data. If the model is inadequate, it must be re-estimated by returning to the analysis of the autocorrelation coefficients. If the model is valid and reliable, it can be used to generate forecasts.

So, when is it recommended to use the Box-Jenkins ARIMA model? Well, one situation is when there's stable data with regular recurring patterns. Another is when the data patterns are complicated with a combination of trend, seasonal, cyclical, and random fluctuations.



TIP

The main benefits of Box-Jenkins ARIMA model are

- » Flexibility to handle stationary and non-stationary data patterns
- » Automatic determination of valid forecasting parameters
- » Handles any data series with or without seasonal changes in the data
- » Works well for forecasts of 18 months or less with large data sets



WARNING

So, are there any constraints? Yes, like most models there are constraints. Box-Jenkins models can be sophisticated and may be difficult to explain for non-statistical experts.

The Exponential Smoothing Model

Exponential smoothing is a time-series based model that provides a means to automatically calculate weights on all past data based on a determined smoothing factor. This approach is more than the WMA model because it uses more variables in its configuration.

Exponential smoothing was proposed in the late 1950s and has motivated some of the successful forecasting methods. Forecasts produced using exponential methods are weighed averages of

the historical data, with the weights decaying exponentially as the observed data gets older. In other words, the more recent the observed data, the higher the associated weight. This framework generates reliable forecasts quickly and for a wide range of time series, which is an advantage for the contact center market.

Exponential smoothing is useful when the historical data has stationary patterns with or without trends or seasonality and when you can assume that the past will continue to influence and represent the future. Exponential smoothing is also a good model to use when a linear trend is present in the data.



TIP

Other benefits of the exponential smoothing model include the following:

- » It offers good accuracy for short-term forecasts, which are typically 6 to 18 months.
- » Recent data is given more weight in the model.
- » The model easily adapts to changing patterns by automatically increasing or decreasing forecasts based on history and by putting greater emphasis on the most recent data relevant to the time period in question.



WARNING

And the constraints include

- » It can be less accurate for long-term forecasts because it may lag behind in capturing changes in trends.
- » If there is bad data (with anomalies) in the most recent periods of the data, it can negatively impact the forecast result, but this is also true of any forecasting model.

In its seasonal version, the exponential smoothing model uses three related equations for level, trend, and seasonality as the basis for a forecast.

Level

The simplest of the exponentially smoothing methods is called simple exponential smoothing (SES). Easy enough, right? This method is ideal for forecasting data without any visible trend or seasonal pattern. SES begins with one of its forms — the weighted average form. Under this form, the forecast at time $T+1$ is equal to

a weighed average between the most recent observations y_t and the previous forecast $y'_{t/T-1}$. There are two equations to consider:

» The forecast equation: $y'_{t+1/2} = \alpha y_t + (1-\alpha) y'_{t/T-1}$

» The level equation (SES): $y'_{t+1/2} = \alpha y_t + (1-\alpha) y'_{t/t-1}$

$0 < \alpha < 1$ is the smoothing parameter. The fitted values are $t = 1, \dots, T$, represents time periods, up to the last time period of available data at T .

In this process, you start with the first fitted value of time 1, which is estimated. After you expand the equations, the last term becomes tiny for large T .



REMEMBER

SES is only applicable for a time series that doesn't have a trend or seasonal component. The application of every exponential smoothing method requires that the smoothing parameters and the initial values be chosen. In particular for the SES, select the values for α and the initial estimate. The initial values can be estimated by minimizing the sum of squared errors (SSE), which turns into a non-linear minimization problem. All forecasts can be computed from the data after you have those values.

Trend

Extending SES to allow forecasting of data with a trend requires a second smoothing equation:

Trend equation = $b_t = \beta'$ (level equation at time t – level equation at time $t-1$) + $(1-\beta')$ b_{t-1}

This equation has its own smoothing parameter, defined as beta prime (β'), where $0 < \beta' < 1$. It also carries its own initial estimate for the trend. The forecast equation therefore becomes the following:

$y'_{t+1/t}$ = level equation (SES form) + h * trend equation



TECHNICAL STUFF

This forecast function is trending. The h step ahead forecast is equal to the last estimated value plus h times the last estimated trended value, which makes it a linear function of h .

Forecasts generated with the trend method end up increasing or decreasing an indefinite trend into the future. In many instances, this process ends in overforecasting, especially for longer

horizons. As a result, an additional parameter has been introduced that dampens the trend to a flat trajectory. Methods that include a dampened trend are proven to be successful and widely accepted. Without doing any derivations, a dampening parameter is between 0 and 1 and is included in the forecast equation, the level equation, and the trend equation. The trend is dampened so it approaches a constant at some point in the future — short-run forecasts are trended while the long runs are constant.

Seasonality

The final extension of the exponential smoothing method involves capturing the seasonality component. The seasonal method includes the forecast equation and three smoothing equations:

- » One for the level
- » One for the trend
- » One for the seasonal component with the parameter γ

A frequency parameter (denoted as m) also accommodates the seasonality. $m=4$ for quarterly data, $m=12$ for monthly data, or $m=64$ for weekly data.

Two variations to this method differ in the seasonal component:

- » **The additive method:** This method is preferred when seasonal variations are roughly constant through the series. The seasonal component is expressed in absolute terms in the scale of the observed series data. In the level equation, you adjust the series by subtracting the seasonal component. Within each year, the seasonal component adds up to approximately zero.
- » **The multiplicative method:** This method is preferred when the seasonal variations change proportionally to the level of the series. With this method, the seasonal component is expressed in relative terms (in percentages), and the series is seasonally adjusted by dividing by the seasonal component. Within each year, the seasonal component adds up to approximately the frequency parameter (m).

SUMMARY OF THE EXPONENTIAL SMOOTHING METHODS

Exponential smoothing can have different configurations: multiplicative, additive, and no seasonality together with linear, damped, and no trend. The matrices shown in this sidebar provide you with a quick summary of the combinations available, along with associated names of the methods.

Trend Component	Seasonal Component		
	N	A	M
	(None)	(Additive)	(Multiplicative)
N (None)	(N,N)	(N,A)	(N,M)
A (Additive)	(A,N)	(A,A)	(A,M)
A_d (Additive damped)	(A_d,N)	(A_d,A)	(A_d,M)

Short hand	Method
(N,N)	Simple exponential smoothing
(A,N)	Holt's linear method
(A_d,N)	Additive damped trend method
(A,A)	Additive Holt-Winters' method
(A,M)	Multiplicative Holt-Winters' method
(A_d,M)	Holt-Winters' damped method

The Multilinear Seasonal Regression Model

Unlike time-series models, multilinear seasonal regression is an associative causal model that's generally used to model the trend and seasonality in a data set. An associative causal model focuses on cause and effect, meaning that it assumes that the variable (like the effect of call agents needed) being forecasted is related to other known variables (like the cause of call volume) in the environment.

Therefore, the forecasted variable is based on the associations to the known variables. If the known variables are actually impossible to foresee, further assumptions are made to populate the variables with estimates so the forecast can be determined.

You can also use multilinear seasonal regression models to analyze seasonal effects by using indicator variables in a multiple linear regression model. The indicator variables have two possible values, 0 or 1, depending on whether the interval to which the variable applies is within the season that the variable indicates. Therefore, multilinear seasonal regression treats seasonal effects as additives rather than multiplicative.



TIP

Benefits of this model include

- » It's useful when cyclical patterns exist without too much fluctuation.
- » It has the ability to investigate the relationship between one or more variables to the criterion value of data and that it is good for medium to long-term forecasts.



WARNING

Typical constraints with this model are

- » Incomplete data or limited historical data can lead to false correlations.
- » High forecasting complexity makes it difficult to interpret or determine the best model.

- » Studying model accuracy for forecasts
- » Avoiding limiting your forecast applicability

Chapter 3

Choosing the Right Forecasting Model

Forecasting accuracy is becoming increasingly important for executives in today's market. There's simply too much risk and potential cost involved not to do it. Sound predictions of demands and trends are no longer luxury items; they're a necessity. If managers are to cope with seasonality, sudden changes in demand levels, price-cutting maneuvers of the competition, potential strikes, and large swings of the economy, then forecasting can help you deal with these difficulties, but it can help you with more than that.

In this chapter, we compare forecasting model accuracy (we cover the models in Chapter 2) that helps you choose a model, and we give you the possible limitations of forecasting applicability.

Comparing Forecasting Model Accuracy

As you might understand, forecasting accuracy isn't just about understanding how different models work and finding the right forecasting model for the right purpose. You need to be aware of the overall strengths and weaknesses in the different models when it comes to forecasting accuracy.

In Figure 3-1, you see a comparison of forecasting model accuracy.

	Time Series			Causal
	Weighted Moving Average	Box-Jenkins ARIMA	Exponential Smoothing	Multilinear Seasonal Regression
Short Term (0-6 months)	★★★★ (4)	★★★★★ (5)	★★★★★ (5)	★★★★ (4)
Medium Term (6-18 months)	★★★ (3)	★★★★★ (4)	★★★★★ (4)	★★★★★ (5)
Long Term (+18 months)	★★★ (3)	★★★ (3)	★★★ (3)	★★★ (3)
Identification of Turning Points	Poor	Good	Fair	Very Good
Captures Seasonality	No	Yes (in NICE WFM 7.0 based on pattern recognition)	Yes (in NICE WFM 7.0 based on structural analysis)	Yes (in NICE WFM 7.0 based on cause and effect relationship)

FIGURE 3-1: Comparing forecasting model accuracy.

Figure 3-1 shows a summary of the strengths and weaknesses when studying model accuracy for forecasts ranging between short, medium, and long term. For example, you can see that in the short term, the difference between models aren't that significant, but for medium-term forecasts, there's a huge difference in forecasting accuracy. Using the weighted moving average (WMA) model only gives you an accuracy rating of 3 (out of 5) for medium-term forecasts (6 to 18 months), while the multilinear seasonal regression model gives you a rating of 5 (out of 5) for the same forecast range. We cover these models in detail in Chapter 2.



REMEMBER

Another important aspect to consider when selecting forecasting model includes the ability to include turning points in the forecast outcome. *Turning points* refer to where a trend or seasonal affect shifts direction, which may be of importance because it could be of greatest consequence to the manager, depending of course on the type of forecast you're doing.



REMEMBER

The ability to identify these turning points varies between different models, where the WMA has the weakest support for this. Funny enough, the WMA model is one of the most frequently used forecasting methods in the market. Another interesting difference is the ability to capture seasonality in the forecast, which is an important factor impacting level of accuracy. Again, it is the WMA model (we cover this in Chapter 2) that lacks support for that.

Avoiding Limitations in Forecasting Applicability

The identification of the most suitable forecasting method is a crucial task in time-series forecasting. Therefore, you should have solutions that do all the heavy lifting on analyzing and choosing the best model for forecasting to avoid limiting your forecast applicability.



REMEMBER

Forecasting is a key activity for any business to operate efficiently, and the rapid advances in computing technologies have now enabled businesses to keep track of large numbers of time series. Therefore, it's becoming increasingly common to have to regularly forecast, using different models for the different time periods that you may try to predict, whether it may be for different days of the week or different weeks of the month. It becomes just about impossible to do this manually or through spreadsheets which require time and extremely astute analysts with strong backgrounds in statistics.

Technology companies such as Google, which are in a different type of data collection than the contact centers, collect millions of daily data observations indexed to time. This process generates a variety of different time-series data, such as web-click logs, web search counts, queries, revenues, number of users for different services, and more. Such large collections of time series require fast automated procedures generating accurate forecasts. The scale of these tasks has raised the priority around using artificial intelligence (AI) to meet the computational challenges in model selection for time-series forecasting.

Traditionally, two alternative strategies for generating such a large number of forecasts include

- » Using a single forecasting method across all the different time series
- » Selecting an appropriate forecasting method for each time series individually



TIP

Because a single forecasting method is unlikely to consistently outperform carefully chosen competitor methods across all various types of time series, focus on an approach that helps you select an individual forecasting method for each different type of time series included in your forecasting scope.

To achieve this within your time and budget constraints, don't rely on just automation but also introduce machine learning and AI capabilities. How this is done and the benefits of using AI are further explored in Chapter 4.

IN THIS CHAPTER

- » Exploring AI fundamentals
- » Explaining how AI makes a difference in WFM
- » Demonstrating how WFM is augmented by AI
- » Choosing a forecasting model using AI

Chapter 4

Understanding How AI Makes a Difference

Computing power and data analytics have advanced to where it is possible to utilize artificial intelligence (AI) and machine learning (ML) to make workforce management (WFM) solutions more accurate and provide greater returns to the organization.

But what is AI, really? There are many definitions, some complex, and some too simplistic, and still little or no standardization in the area to really rely on. Despite that, this chapter gives you a short overview of AI before focusing on explaining what AI means in the context of forecasting in workforce management.

Describing the Basics of AI

AI has become a technology that more and more people in general are talking about, both with a curiosity of how it can augment existing technical solutions and how it can enable completely new groundbreaking solutions in society. However, there are also those who fear the evolution of machines and what it means to

humans. But as with most technological development, it all comes down to what humans will do with this opportunity — turning it into something positive or not.



REMEMBER

AI isn't magic; it's a scientific area (data science), and it's built up like other scientific areas. The difference with AI is how complex and sophisticated techniques enable this area to learn and evolve with the use of machines, rather than humans.

AI as a science could be explained as the theory and development of computer systems that are able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision making, and translation between languages.

In short you could summarize AI as

- » A machine that can work and react similar to a human, where the machines use data to learn (train) a certain behavior needed to achieve a desired output. A machine's behavior doesn't just appear out of nowhere.
- » A system, consisting of a series of algorithms, that can learn from constant data input, where an algorithm could be explained as a set of instructions (focused on what, rather than how) that a computer can execute. A complex algorithm is often built on top of other, simpler, algorithms. An important role of humans in this context is to make sure that the data input is representative for the task at hand, avoiding biased output from the AI system as it learns from the data.
- » A system that can learn and develop on its own, where the development is constrained through boundaries (policies) setup by humans.

AI was founded as an academic discipline in 1956, and in the years since, it has experienced several waves of attention, followed by disappointment and the loss of funding, again followed by new approaches, success, and renewed funding. In the 21st century, AI techniques experienced a rebirth mainly enabled by the major advances in computing power that has happened at the same time as access to large amounts of data has been made available as part of the digitalization in society.

The theoretical understanding of the data science area itself has also been significantly enhanced lately. Although, it's only in the last five years or so that AI techniques have started to become an

essential part of the technology industry, helping to solve many challenging problems in closely related, but more established areas such as computer science and software engineering.

Understanding the Role of AI in WFM

The single greatest business opportunity emerging in the global marketplace is the ability to analyze digital log data to trace digital actions and from those traces to develop algorithms that can predict future outcomes with greater accuracy. Computing power and data analytics have advanced to where it's possible to utilize AI and ML to make WFM solutions more accurate and provide greater returns to the organization.

Managing labor demands

If you've ever worked in the service industry, you know operational managers typically schedule employees on historical practices or by the day of the week. For example, if they typically schedule 30 agents every Monday, they'll keep scheduling 30 agents every Monday until the end of time. But when unforeseen circumstances arise, such as a severe weather across regions, a power loss affecting several service areas, or similar, the manager inevitably ends up having to make some changes.

Keeping employees engaged

Efficient scheduling is also crucial for company morale. A recent study showed that about 18 percent of staff members are actively engaged, and 50 percent aren't engaged; they're just doing the work. Another 32 percent are actively disengaged.

Every day, the demands of the business and liquidity of resources make it difficult to manage a balance of efficiency of operation and employee preferences. Employee preference and availability have been voted the biggest challenges in scheduling staff. If an employee travels 30 minutes to work with the expectation that he's going to make several hundred dollars and work a certain number of hours and then is sent home because interaction volume is low, he's going to be annoyed.

In fact, some states have a legal requirement that employees be paid for a portion of hours they're scheduled to work, when

they're sent home before the end of their shift. So, in the scenario where the employee is asked to go home early, the business loses money in addition to letting down the employee.

On the flipside, if you've only scheduled a few people to work one day and your contact center becomes unexpectedly busy, your employees will be stressed and irritated. Employees called to come in on short-notice will also be frustrated.



REMEMBER

Intelligent automation can reduce staffing variances, also known as *net staffing variances*, by targeting the right agents to either take additional hours or take some voluntary time off. The system would be adjusting the staffing in conjunction with potential changes that could be introduced in real time by the agents, with respect to potential schedule changes or swaps. The solution allows there to be a fair balance between the operation needs and ensures that the employees feel like they're more in control of their lives. They're vastly happier and more productive at work.

Exemplifying How AI and ML Enhance WFM Performance

So, how are AI and ML actually transforming and improving WFM in practice? The examples in this section should give you an idea.

Using intelligent skill assessment

Determining schedules for multi-skilled employees without losing efficiency depends on the ability to estimate when and to what extent an employee needs to be shared across different work streams.



REMEMBER

To achieve successful scheduling in these cases, the skill usage assessment has to be based on predictive analysis embedded in a discrete event simulator. The result is a highly accurate assessment of skill usage, which is the foundation for determining multi-skill efficiencies and optimal schedules.

Leveraging skills efficiently and intelligently

One challenge in WFM is understanding the impact of multi-skilled employees on “required lines,” meaning the number of full-time equivalent (FTE) workers needed to meet service level objectives. Many systems rely on a method called Erlang, which has two assumptions that aren’t valid in today’s modern work center: that all employees share a homogenous skill assignment and that work items queue to a single skill profile.



TECHNICAL
STUFF

This FTE over- or understatement can be addressed by instead adding intelligence directly to the required line calculation. This simulation process then provides the intelligence to artificially assign a reduced value to the Erlang-derived FTE that is more correct and therefore trustworthy. This can be done automatically with no human interaction required.

Optimizing closed-loop scheduling

A well-known challenge related to optimizing scheduling is when a company is faced with several unknown characteristics in an omni-channel environment. The objective is to be able to start optimizing schedules in a closed-loop without knowing the exact skill usage estimates or required efficiencies.

An application with the ability to perform closed-loop scheduling optimization leverages a form of ML in which the machine learns (trains) by being fed large amounts of data, where initial decisions are “guessed” by the machine. These initial “guesses” are then fine-tuned through a process of comparison to the expected outcome from which it can learn and improve the algorithm further.

Increasing the overall value of forecasting

Forecasting with AI has the following overall value:

- » **Picks the best model in any given scenario:** Compares all forecast models in a single generation and then the AI picks the best performing model for the specific objective relative to its environment.

- » **Adapts to changing conditions:** As historical data changes, forecasts need to identify the best algorithm to use for future forecasts. An AI-driven approach easily selects the appropriate forecast model automatically.
- » **Improves forecasting accuracy:** Accuracy is important as forecast inaccuracies impact cost as well as both customer and employee satisfaction. A data-driven and unbiased AI-based forecasting increases the accuracy of the staffing plan by 8 to 10 percent.
- » **Enhances your operational efficiency:** Relying on data input and automated, proven algorithms rather than subjective, human calculated estimations increases operational efficiency.

Selecting the Right Forecasting Model

As you might understand, picking the right forecasting model for the right problem isn't easy. A good forecast depends on using a good method for creating a capable model to meet your forecast needs. So, what can you do about this?

Manually choosing the appropriate forecasting technique to use is a challenging issue and requires a comprehensive analysis of empirical results. Recent research findings also reveal that the performance evaluation of forecasting models depends heavily on the accuracy measures that are adopted. In other words, to manually evaluate what forecasting method to apply on your data, you need to consider using different accuracy measures. For example, some methods indicate superior performance when error-based metrics are used, while others perform better when precision values are adopted as accuracy measures.

The selection of a method and model depends on many factors:

- » **The context of the forecast:** Forecasts that simply sketch what the future will be like if a company makes no significant changes in tactics and strategy are usually not good enough for planning purposes. On the other hand, if management wants a forecast that takes into account a certain marketing strategy, the technique you choose must be sophisticated enough to take explicit account of the special actions and events the strategy entails.

- » **The relevance and availability of historical data:** Sometimes it is just not possible to get hold of the historical data needed. Different methods are more or less sensitive to the lack of long periods of data.
- » **The degree of accuracy desirable:** The type of forecast you're doing and what it will be used for directly impacts the needed accuracy level. If the alternative cost for a poor forecast is high, you need to choose a model with high forecast accuracy rating.
- » **The time period to be forecasted:** Different methods and models are more or less good at keeping the accuracy level up depending on the time period being forecasted. For example, most methods have a higher accuracy for short-term forecasts than long-term forecasts, but there are differences.
- » **The benefit (value) of the forecast to the company:** Depending on the purpose and intended usage of the forecast, a more accurate forecast could increase company revenue, as well as improving workplace satisfaction.
- » **The time available for making the analysis:** The factor of how much time you have available for making the forecast is also important. Avoid going for the most complicated technique, or make sure to have a highly automated and AI-based solution supporting you.

Introducing the Best Pick Method

Customers contact your company all the time, via many different channels. You need to make each customer feel valued and understood, no matter how many thousands of interactions take place every day. But how do you ensure that? Make sure you understand the customer demand in detail and have a solid and reliable forecast in place to execute on. But how do you get to that reliable forecast when time is of the essence and conditions continue to change?

The challenge in picking the right forecasting model for the right forecast is not new and has existed for quite some time in the industry. However, as our society is now in a state of constant change due to things like the rapid technology evolution and how

this is impacting society at large, this problem is becoming more urgent to solve. The nature of our contemporary society is making forecasting much more difficult and results less reliable.



WARNING

Consider the time and effort it takes to evaluate and identify which way to go. It's a cumbersome and iterative process of manually generating and reviewing output of different models to find the best one to use. Then, unfortunately, the choices made could also be short lived because they're constantly challenged by changes in the data sets due to rapid changes in the market and reforecasting is needed on a continuous basis. Don't underestimate the effort needed in addressing reforecasting on a continual basis for the forecast to stay relevant. It can pose a substantial workload for a company when it's done without sufficient system support — resulting in time spent developing forecasts that either overstaff or understaff the contact center.

By using the Best Pick option from NICE, you gain the capability to generate your forecast automatically. The purpose being to identify the one that most closely matched historical data and therefore increasing the likelihood of meeting the overall objective with your forecast.



TECHNICAL
STUFF

Selecting a model is done through a backcasting validation of historical data to find the minimum residual. Backcasting is a method of planning that begins by defining a future outcome that you want. After that, you work backwards to identify policies and programs that connect that specified future outcome to the present. You may be wondering how backcasting and forecasting are different. Well, forecasting involves the prediction of future unknown values based on known values, while backcasting involves the prediction of unknown values that *might* have existed.

The Best Pick option evaluates each of the models with regards to

- »» The structure and parameters for each of the models
- »» Comparing the forecast accuracy of each model
- »» Selecting the model that has the highest accuracy

Using techniques such as automation and AI also reduces the amount of manual work for the forecaster and allows for automatic comparison of multiple forecast models in a single generation with the best model selected as a result of the generation, saving time and increasing precision in the model selection process.

Many companies may think they don't need an automated solution, or even less an AI-based forecasting solution. But at the end of the day, it matters more than you think whether your forecast is accurate, and with less manual work for the forecaster, the more time the forecaster can spend on other value adding activities.



TECHNICAL
STUFF

Using an automated Best Pick option is simple, but it requires companies to be ready to trust the system. If you're willing to do that, to trust the techniques behind AI-based forecasting, your company will be able to speed up the forecasting process significantly, as well as increase forecasting accuracy while reducing extra workload and cost.

IN THIS CHAPTER

- » Diving into the fundamentals of the NICE forecasting solutions
- » Explaining long-term forecasting
- » Improving the hiring process
- » Defining the tactical forecasting solution
- » Exploring capabilities of the scheduling application
- » Managing intraday changes
- » Describing examples of AI-based forecasting in action

Chapter 5

Introducing the NICE Solution for WFM



REMEMBER

Workforce management (WFM) can unlock a huge amount of value in your organization by helping to manage the most expensive resource in the contact center — your employees. This chapter guides you through the various parts of the WFM platform offered by NICE to help you achieve successful artificial intelligence (AI)-based forecasting for WFM in your company.

Presenting NICE WFM

The NICE WFM solution is all about staying in control. The application enables you to forecast customer demand across channels and ensure that the right employees are ready at all times. Using WFM software offers benefits such as long-term and short-term planning; and scheduling that satisfies business requirements,

employee needs, schedule changes, time off, and real-time monitoring of staffing, including adherence to the schedule. It includes support for management scenarios such as

- » Over- and understaffing gaps to remove operational inefficiencies
- » Managing specific skilled agents, availability, and associated preferences for additional hours
- » Applying business rules (via an intelligent engine) to current staffing conditions
- » Supplying alert agents, supervisors, and administrators with relevant information in real time
- » Ensuring up-to-date intraday coverage to support the best customer service levels

The NICE WFM solution covers five main application areas: planning, hiring, forecasting, scheduling, and intraday management. Each of these areas are explained in detail in this section.

Pinpointing the usefulness of long-term forecasts

Often strategic planning is handled with complicated, manual spreadsheets. Therefore, the full return on investment (ROI) that could be achieved with forward-looking planning isn't realized, even though the payoff from these investments is substantial.



Recent research from McKinsey indicates that companies that focus on long-term forecasting outperformed their industry peers in most financial measures with average revenue being 47 percent higher and earnings growth being 36 percent higher.

NICE Enhanced Strategic Planner (ESP) helps contact centers capitalize on the full potential of long-term strategic planning by intelligently predicting how anticipated or potential staffing scenarios will impact the ability to meet performance goals. This results in accuracy improvements of 8 to 10 percent on average over traditional means of forecasting long-term requirements. The AI-driven solution considers a range of variables pertaining to their organization such as staff and channel needs as well as business parameters to make precise, customized predictions.

Other benefits with ESP include

- » Support for detailed shrinkage planning by category
- » Ability to set performance targets for service level, average speed of answer, and abandon rates
- » Functionality supporting reverse solve for key metrics
- » “What-if” capability for modeling



REMEMBER

What-if long-term enables future strategic planning and budgeting through scenarios in day, week, or month increments.

Introducing predictive hiring

Delivering on the promise of an exceptional customer experience requires the right mix of people, process, and technologies. Customers are more informed about their choices, making their interactions with your employees more complex. Your employees need to possess the communication, language, and critical thinking skills needed to represent your brand.

NICE predictive analytics and virtual interviewing solutions for hiring make it much easier to quickly attract, select, and retain candidates with these exceptional qualities. You can efficiently engage the candidates who are most likely to perform better and stay longer. And you control your recruitment, training, and retention costs at the same time.



WARNING

Forty percent of new hires in United States-based customer service contact centers leave within the first year. The cost: roughly \$6,500 to source, hire, and train each replacement. Industry wide: nearly \$15 billion per year to replace lost talent. Holding on to superior talent is the best way to produce great customer experiences because excellence is difficult to create in the chaos of employee churn.

Some of the operational key performance indicators (KPIs) benefits of NICE hiring solutions are

- » More than 80 percent reduction in time-to-fill open positions
- » Sixty percent improvement in employee retention

- » Above 55 percent efficiency increase in first contact resolution
- » Thirty percent and more in reduction in transfer rate

Diving into tactical forecasting

The goal of tactical forecasting is to estimate demand in the relatively short term (a few weeks or months). They're used to ensure that customer lead time expectations and other criteria related to the availability of products and services are met.



REMEMBER

With the infusion of AI and 46 algorithms in the NICE forecasting solution, it can automatically evaluate all the forecasting algorithms and determine the model with the best accuracy for any given data set. The solution has the ability to handle diverse historical data patterns, such as seasonality, reduces the amount of time otherwise spent manually manipulating the forecast. It offers the following capabilities:

- » Multi-tier forecasting and backlog management for deferrable work
- » Outbound campaign support
- » Multi-skill capabilities
- » Omni-channel routing platforms

Explaining the advantage of intelligent scheduling

Delivering a better customer experience is always the bottom line, but the path to higher client satisfaction lies in the ability to engage and empower your agents. It is all about using intelligent scheduling when assigning schedules that are based on agent availability and preferences as well business rules.



REMEMBER

At the end of the day, you want to forecast accurately and manage your workforce more effectively to eliminate overstaffing and understaffing. How is this done? You utilize machine learning, which optimizes scheduling and determines the best model to use daily.

Intelligent scheduling using machine learning comes with many benefits:

- »» Fewer administration hours
- »» Reduced schedule shrinkage
- »» Increased forecasting accuracy
- »» Lower abandon rates
- »» Fewer overtime hours
- »» Higher occupancy rates

Machine learning-based schedule generation shown in Figure 5-1 uses a closed-loop, discrete event simulation model and includes the functional capability to manage many constraints. These include agent availability and exact routing rules of any automatic call distributor (ACD). It also includes the ability to account for skill use assessment and skill use efficiency. The solution can manage up to 30,000 business rules specific to your company, including things such as time off and vacations.

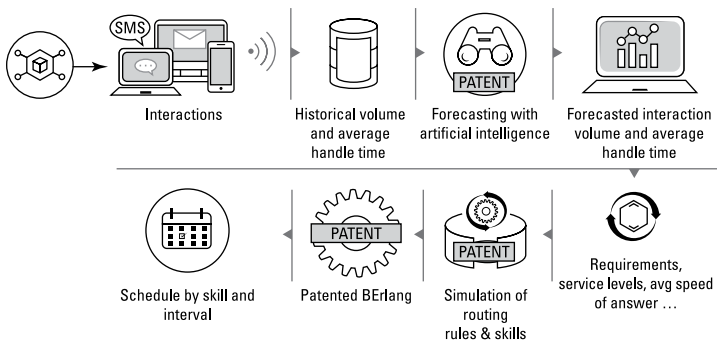


FIGURE 5-1: The machine learning-based WFM forecasting flow.

The NICE scheduling solution also supports many scheduling philosophies:

- »» Automatic employee assignment, using preferences
- »» Automatic pattern assignment, using preferences
- »» Schedule pattern bidding
- »» Team scheduling

- » Weekly/multi-week hours, date range scheduling
- » Shift policies (sequences and limits)
- » Schedule overhead
- » Seat limits
- » Weekend fairness
- » Day of week fairness
- » Holiday fairness

Seeing the benefits of intraday management



REMEMBER

Happier agents lead to happier customers. But are you aware of how schedules impact things like agent morale, job satisfaction, and employee turnover? Scheduling flexibility is a primary driver of your agents' work/life balance, but trying to accommodate everyone's personal needs while maintaining optimal staffing is no easy task. Agents need real-time tools to manage their schedules.

The NICE Employee Engagement Manager (EEM) for agents is a system that empowers agents to view or change schedules anywhere, at any time via any browser or a smartphone app. The intelligent user interface is continually updated to reflect projected demand and agent availability. Schedule-change options are matched to individual agents based on skills, preferences, and availability, and enables agents to manage communication preferences.



REMEMBER

Supervisors are responsible for managing the performance of their teams. Unfortunately, it becomes challenging and unproductive when they have to be in the middle of workforce analysts and the agents for all changes, urgent to non-urgent, and take multiple steps to fulfill staffing needs. Supervisors need rules-based automation to alleviate this burden, which allows them to focus on leadership, coaching, and development of staff. It also gives supervisors real-time visibility into communications between agents and members of WFM administration and enables supervisors to manage agent overtime and their eligibility to voluntary time off.



REMEMBER

Contact centers are dynamic environments where real-time decisions impact business results. The ability to respond quickly to changing conditions impacts customers, agents, and the bottom line.

EEM for real-time coordinators enables analyzing performance indicators and staffing level variances in real-time and recommends changes to adjust staffing on the fly. It makes use of multi-channel agent communication and updates any schedule changes in the correct system.

Some of the schedule changes that WFM with EEM can handle on an intraday basis are

- »» Automatic reforecasting and re-simulation
 - »» Graphical net staffing analysis
 - »» Improvements to real-time adherence reporting and alerts
 - »» Time off management and robust vacation planning
 - »» Time board with web-based agent shift trading platform
 - »» Mobile app that offers schedule visibility, swaps, trades, voluntary time off, and extra hour availability
 - »» Schedule change opportunities on an agent by agent basis, according to each unique agent profile
 - »» Personalized (push) offers with the capability to automatically alert agents to diverse schedule change opportunities, which are aligned both with operational needs and individual agent preferences and skill profiles
 - »» Personalized real-time alerts with personalized real-time notifications and alerts to agents, supervisors, and administrators through any channel
- These real-time notifications and alerts are easily and flexibly configured to be prompted by complex, multi-dimensional rules.
- »» Real-time task reassignment automating personalized alerts to agents, directing them to switch over to a variety of offline activities, such as training or back-office activities
 - »» Shift currency, ensuring that “hard to fill” time slots are automatically designated as “premium for extra wages or points”

- » Best agent recommendation rules engine that analyzes WFM data to automatically generate calls-to-actions, enabling notifications to WFM administrators and supervisors in order to recommend the agents that are best suited to filling any staffing gaps

Explaining Benefits for the Back-Office Function

An effective back office is a key component of any coherent, enterprise-wide effort to improve processes and create the perfect customer experience. And for a healthy and productive back office, a best-of-breed WFM system is becoming increasingly recognized as a necessity. Integrated with desktop analytics, such a back-office solution also provides actionable insight into changing work volumes and actual employee productivity — and the capability to forecast accordingly.

The back office environment is different from the front office (contact center), with several unique challenges, so the NICE WFM solution adapts accordingly and offers the following support:

- » **Forecasting and capacity planning:** Support for forecasting your work volume accurately, by measuring work received and handled by each employee. Long-term forecasts are displayed and edited in an enhanced personnel planner. By using the planner function, forecast-based capacity plans can be created for all your different work groups and work types, and you can create plans that meet FTE requirements by incorporating overtime and its added cost. You can also create plans that include non-forecasted project hours that must be handled in specific months, and their associated costs.
- » **Scheduling:** Scheduling gives you flexible tools that support any scheduling environment to reduce staffing cost — from a back office staffed with full-time employees working 8 to 5 each day, to a mix of full- and part-time staff, including work-at-home employees. Scheduling tools take into account the fact that back office work is deferred and can be handled in a number of days, while it is not necessary to schedule every half-hour, every break and every seat (unlike in the



REMEMBER

front office). Employee time off can be easily coordinated to ensure service levels are met. You can optimize resource allocations by identifying and defining specific work types and loan out employees across groups and cross train as needed, while tracking and adapting all schedules and staffing accordingly.

Correctly managed staffing and scheduling can mean an FTE cost savings of 10 to 40 percent.

- » **Managing backlogs and reducing overtime:** Identify actual and projected backlogs, using work volume and scheduled open capacity data. You can optimize resource allocations to ensure effectively reduced overtime costs. And with accurate forward-looking and current data, service level agreements (SLAs) are easily managed.
- » **Strengthening employee productivity and empowerment:** Employees and managers alike have greater visibility into their actual productivity data, increasing motivation and improving performance across the back office. The NICE WFM solution gives employees ownership of their schedule changes, trades, and time-off requests, which creates more responsible and engaged employees.
- » **Increasing customer satisfaction:** With accurate and comprehensive productivity data, as well as better time allocation, coaching and training are far more effective. The result is a more efficient back office. When service levels are consistently met, thanks to a more efficient back office, customer loyalty is increased.

Running Your NICE WFM Solution in the Cloud

The cloud isn't new. Companies have been touting the benefits for a decade, but only now has it hit the contact center and business operations sectors full force. In order to get the full benefit of the latest customer engagement technology, your contact center has to be prepared to handle it.



WARNING

An on-premise setup, rather than a cloud solution, can mean a hefty investment in proprietary hardware, more powerful servers, rack space, enhanced security, greater power consumption, and more. It also adds to your IT staff's workload, with increased maintenance and frequent upgrading, which can turn into a business continuity liability.

To avoid these headaches and costs, you can choose to run your solution using NICE Cloud Solutions. For contact centers, there is already a special model prepared to facilitate and speed up deployment. In NICE contact center-as-a-service (CCaaS) model, NICE handles all the technology deployment, software integration, updating and upscaling, and system maintenance. NICE Cloud Contact Center Solutions automatically adapt, add, or change capacity and resources as needed for hassle-free updates. This also supports business growth, quickly and securely scaling up without disrupting business continuity.

Data search and retrieval is faster in the cloud, with efficient processes in place for any size organization, and you can migrate to the cloud at a pace most suitable for your enterprise, with seamless integration of on-premises and cloud-based applications.



TIP

The CCaaS model eliminates upfront capital expenditures on deployment, while slashing the cost of ongoing maintenance and upgrades, for the low total cost of ownership. Running WFM in the cloud comes with other benefits:

- »» Ability to pay per usage with minimum contract
- »» Pre-production staging included in the pricing
- »» More than 30 percent faster deployment and upgrades than for on-premise solutions
- »» Pre-production staging included in the pricing
- »» High availability built in with the cloud offering
- »» Upgrades in the cloud included as part of the new contracts
- »» 99.9 percent guaranteed SLA with proactive monitoring
- »» Disaster recovery as a service as an optional add on for guaranteed continuity of service for any event

Showing Examples of NICE AI-Based Forecasting

So, what does it mean to realize all these forecasting opportunities in the WFM area? And what benefits do customers actually see when using NICE WFM solutions?

Some improvements that customers list include

- » Time spent on forecast administration reduced by 9 percent on average
- » Schedule shrinkage down 7 percent
- » Occupancy rates up 9 percent
- » Number of needed overtime hours reduced by 6 percent
- » Abandon rates down 5 percent
- » Overall forecast accuracy up 8 percent

To further exemplify these results, you see two scenarios in this section that use the NICE solution.

The travel company example

In the competitive world of online booking, customer support directly impacts revenue as new customers have little patience for long hold times and will frequently abandon to call a competitor.



WARNING

The challenge of accurately forecasting the future interaction volume is significantly complicated by both known and unknown peaks. Many patterns aren't easily identifiable without sophisticated mathematics, and having inaccurate volume forecasts means that you can't accurately determine the number of resources that are needed to handle the real volume.

In this travel company scenario, the scope includes bus companies, airlines, and hotels. Overall the company has shown year over year growth, but the analysis of the forecasting trend analysis shows room for improvement in WFM efforts. The travel business has to deal with seasonal dependencies with peak weeks and months around holidays and summer (school's out).

In this example, a pattern in the data is connected to these seasonal peaks that tells you that the average handle times (AHT) of the online booking increase about four weeks prior to each seasonal peak as new hire agents are trained and placed on the phones, emails, and chats. The learning curve is about four to six weeks until the agent's average falls in line with the rest of the agents.

This problem could be relieved with AHT by developing separate forecasting models — one for each use case. The problem with that approach is that the patterns aren't always easily identifiable and could also be subject to change. The forecaster would need to pull the forecast into a spreadsheet and manually run the data against dozens of models each day (and skill group them) to determine which model would handle the data set most accurately.

But instead, you manage this situation with an automated and AI-driven way — the NICE AI-based forecasting Best Pick solution. This solution looks at the data, skill group by skill group, day by day, and determines not only which model would be the best one to use, but also which variation of the model would be most accurate one. The NICE solution also allows for business parameters and options to be applied to the forecasts to ensure that it meets the organizational needs.

The insurance company example

Health insurance enrollment is understandably the busiest season of the year, and often contracts are won or lost depending on how well the insurance company manages to service its customers. Having the right number of service agents for the peak (as well as non-peak) is critical to running a profitable center. Too many agents would be spending excessive resources on staff. On the other hand, too few agents would impact customer service and contract service level agreements in some cases.

For an insurance company, the planning for enrollment often begins as soon as the previous enrollment season ends so the need for accuracy is paramount for long-term planning as well as short-term planning. This long-range plan also impacts hiring and recruitment that begins months before the peak arrives.

The data in this example shows year over year exponential growth as new business is brought on (for example, through relationships with companies to supply insurance to their employees). Overall the base volumes are pretty consistent, but in the last quarter of the year the volume goes up three to four times as employees are enrolling and are reaching out due to questions on coverage and enrollment questions.

As in the travel scenario (see the preceding section) where there was a need to leverage as many math models as possible (when approached manually) to determine the most accurate forecast, the same applies for long-range planning. However, on top of determining which model should be selected, the planners also spend considerable time determining the impact of the forecast on metrics such as average speed of answer and service levels.



REMEMBER

By using the automated and intelligent solution from NICE, you can leverage the AI-based forecasting with the capability to show the influence the forecast will have on the business. This results in savings in time for preparing the forecast for the insurance company but also ensuring it's an accurate forecast. You also are able to quantify how the business will actually be impacted going forward.

IN THIS CHAPTER

- » Improving your forecasting accuracy
- » Introducing more flexibility in your scheduling
- » Using intelligent simulation techniques
- » Managing your workforce more effectively
- » Predicting your long-term resource need

Chapter 6

Ten Reasons a WFM AI-Based Solution Can Help

Each *For Dummies* book ends with a Part of Tens chapter. This one is no exception. Here, you find ten reasons how a workforce management (WFM) solution with artificial intelligence (AI)-based forecasting capabilities can help you. An AI-based forecasting solution for WFM can

- » **Forecast more accurately and manage your workforce more effectively.** It allows you to greatly reduce overstaffing and understaffing by using AI.
- » **Select the most appropriate forecast model.** You no longer have to manually analyze the changing conditions and pick the right model.
- » **Simulate real-world scenarios.** It does this with relevant prioritization, routing and skill assignments to determine work allocation expectations, deferrable work propagation and multi-site/multi-skill efficiencies. Use robust new algorithms that support the forecast parameters and simulation to generate extremely accurate staffing requirements.

- » **Schedule more flexibly.** It greatly reduces understaffing and overstaffing for any scheduling methodology or work rule environment by applying different approaches for different departments, locations, and individuals. AI and machine learning (ML) capabilities ensure that coverage is provided and automatically assign schedules based on agent preferences or allow them to bid on preferred times.
- » **Integrate with any solution.** You need systems that are API-friendly, easily integrate with all leading automatic call distributions (ACDs) and can integrate with other solutions such as payroll and HR solutions, reducing manual processes, data entry and risk, as well as cost.
- » **Manage your system with ease through real-time diagnostics and high availability to ensure maximum uptime.** Automated alarms and alerts allow you to minimize downtime by catching system issues before they become critical.
- » **Respond to change in real-time.** Monitor and proactively respond to changing conditions with intuitive intraday change management tools.
- » **Harness the power of the cloud.** Instead of using up your precious scarce resources to manage complex IT infrastructures and technologies, you can use the cloud. You can choose from cloud models that fit your business needs and scale, expand, or contract instantaneously. Simple. Flexible. Efficient.
- » **Determine appropriate number of people to hire.** By leveraging an AI-based forecasting solution for long-range forecast and planning, you'll also be able to predict your long-term hiring need.
- » **One solution for the front office and back office.** Forecast with AI and manage the different teams on the same platform, and gain efficiencies by leveraging their skill sets, as appropriate, across the two sides of the operation.

Intelligent WFM in the cloud

The first step in managing the workforce is understanding how much work needs to be handled. Predicting future workloads can be challenging and requires understanding historical patterns that are often complex and hard to identify. Workforce management (WFM), with AI, addresses this challenge and saves considerable time for the forecaster while increasing the forecast accuracy. This book guides you to understand the advanced models used for forecasting and how they should be used.

Inside...

- The importance of an accurate forecast
- Forecast methods and models
- WFM and AI
- The NICE solution for WFM
- Ten ways WFM AI-based forecasting can help you

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