Critical Skills for the Business Forecaster

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PREVIEW Sujit Singh details the knowledge and proficiencies essential for today’s business forecasters and planners. His list is long – perhaps even a bit intimidating – and serves as a virtual job description for organizational candidates. If you’ve earned the title of “successful forecaster,” take gratification in the skills you’ve learned and brought to the job.

FORECASTING TOOLS vs. SKILLS
A sound forecast – a projection of expected demand in future time periods – is the first and most critical step in running a company’s supply chain effectively. A good forecast provides the basis for the company’s production, inventory, and, ultimately, overall supply chain costs. A poor forecast forces all the downstream decisions in the wrong direction. A forecaster in any business can be seen as the leader of the entire forecasting process (Borneman, 2007); indeed, the job requires a mix of technical, business, and leadership skills.

As more forecasting tools become available, it might seem that fewer skills are required for a forecaster’s job. But forecasting tools, a must-have in this day and age, are decision-support systems; that is, they do not make decisions on their own but instead provide better information on which a person can base decisions. Tools with lots of bells and whistles can actually make forecasting more complicated unless the forecaster truly understands how to use those tools to the best advantage of the business. More importantly, forecasters must understand the entire breadth of what forecasting entails.

Successful forecasters need a wide range of skills. They need a thorough understanding of the business for which they forecast. Because they must be able to interact with customers, managers, sales reps, marketers, and supply chain colleagues, they need the people skills to speak to each group in terms that make sense to them, to negotiate agreements, and to reach compromises. In addition, they need a number of very specific skills pertaining to demand planning and monitoring. If the business is international, they need to know about particular events in a country or region that may affect demand. Finally, they must know when the macroeconomic conditions require a whole new approach to generating the “default” forecast.

UNDERSTANDING THE BUSINESS
Of all the personnel roles along the supply chain, the forecaster probably needs the broadest business knowledge. He must understand how marketing activities (such as promotions), loss leaders, or price increases will affect demand. He must know what new products are being introduced and when, as well as which products are dying and how fast. Either situation requires special treatment, both in forecasting and in monitoring demand versus plan.

As one might expect, a forecaster must have a detailed knowledge of customers, especially which ones need particular attention in forecasting and why. He must also know what products are commodities for which demand can be turned away, if necessary, because customers have alternative sources of supply. Conversely, he must know which customers and/or products are “single sourced,” requiring the business to do everything in its power to meet that demand.

If the business is international, he needs to know country- or region-specific events that will affect demand patterns (e.g., Chinese New Year, August vacations in Europe). Lastly, he must be knowledgeable enough about production to know which products are hardest to “catch up on” if the forecast is too low, perhaps because they require unique raw materials, are produced on long cycles, or require lengthy transitions or setups.
Key Points

■ As more forecasting tools become available, it might seem that fewer skills are required for a forecaster’s job. Forecasting tools, however, are decision support systems: they do not make decisions on their own, but instead provide better information on which a person can base decisions. Tools with lots of bells and whistles can actually make forecasting more complicated unless the forecaster truly understands how to use those tools to the best advantage of the business.

■ It is not a requirement for forecasters to understand the different forecasting methods at an expert level. It is very important, however, that they know the levers they can use to control the output from the software package they use for forecasting. Proper analysis by the forecaster will often show a clear separation between situations that should be forecast statistically and those that require manual input.

■ Successful forecasters must possess a wide range of business knowledge and interpersonal skills, including a thorough understanding of the business for which they forecast, skills to negotiate agreements and reach compromises with others, clarity around when and how to educate colleagues – including the executive suite – about forecasting and demand planning… and so much more.

■ The bottom line is that, when it comes to choosing a forecaster, it is critical to have an individual who learns quickly and is able to think outside the box. A forecaster should by nature be an analytical, detail-oriented person who can also keep the big picture in mind, and who is eager to take on new challenges that require creative approaches.

UNDERSTANDING DATA
Forecasting in general and statistical forecasting in particular is driven by the data that is fed into it. Frequently, products replace other products, customers buy out other customers, and other alignment of the data takes place. While the system that records the past transactions should not reflect this change, a forecasting system needs to be made aware of these in a timely manner. This will allow the forecasting system to combine these data streams and take advantage of the aggregations in the data. (Typically, though not always, the aggregated data leads to a better forecast.) Sometimes, this process is called realigning the data.

In a similar vein, a good forecaster would also keep the data current by updating the forecasting system with life-cycle changes (for example, a mature product entering the extinction phase, or a new product entering the stable demand phase). A good forecaster also invests time and effort into analysis of the historical data to understand where the demand is coming from, whether something should be considered as an outlier or not, etc. A good forecaster must understand the data and spend time every month to ensure the past data is appropriately aligned and represented in the forecasting system.

UNDERSTANDING AGGREGATION
A good forecaster recognizes that forecasts are used for multiple purposes, and that different levels of aggregation are appropriate for different uses.

It is well known that the higher the level of aggregation, the more accurate a forecast will likely be. This is why, for example, a forecast for total volume at the sales and operations planning (S&OP) family level is probably closer to being accurate than the sum of individual forecasts for each customer/stock-keeping unit (SKU) within the family.

Unfortunately, a forecast at the total S&OP family level is less meaningful for production planning in the sense that the plant needs to know the product/plant-level forecast in order to do anything with it. To get from the high level to the detailed, a knowledgeable forecaster using appropriate tools might, for one, use a statistical forecast generated at a most coherent level, and then aggregated or
disaggregated as needed for the S&OP family forecast and the individual-item forecasts respectively.

A good forecaster knows the highest level of aggregation that is still useful for the organization for downstream planning, and will forecast at that level. For example, if a business has enough flexibility on the packaging side, they might have a business policy to keep all inventories at the bulk level. This in turn allows the forecaster to take advantage of the aggregation and do the forecast at this aggregate (bulk product) level.

**UNDERSTANDING LAGS**

A good forecaster understands that it takes time to react to forecast changes. This idea is represented by the lag (or the lead time) of the forecast. For example, a forecast generated for the current period (week/month/quarter) during the most recent period is the lag-1 forecast, forecast generated in the period before the most recent period is the lag-2 forecast, and so on. If a product is coming to North America from China and the only way to transport it takes two months, then a two-month lag forecast is a must for it to be actionable. A good forecaster understands this, and pushes back on the tendency of the forecast being changed when it is too late for it to be actionable.

**USING STATISTICAL FORECAST ENGINES**

Statistical forecasting engines, if used properly, can make the forecast significantly better than the forecast generated by “experts” in the company using gut feelings and other time-honored methods of forecasting albeit of questionable value. A good statistical engine, while no panacea, at least guarantees an unbiased review and projection based on the actual data. The gold standard for a statistical forecasting engine is that it should beat the simpler methods of forecasting such as same-as-last-month or same-as-same-period-last-year or an average based on a certain number of past periods. A very good way of measuring the net value impact of a forecasting technique (statistical or otherwise) is Forecast Value Added (FVA) analysis (Gilliland, 2012).

**TUNING THE STATISTICAL FORECAST ENGINE**

It is not a requirement for forecasters to understand the different forecasting methods at an expert level. It is, however, very important that they know the levers they can use to control the output from the software package they use for forecasting. Very often it has been observed that in a poorly run forecasting process, the same forecast method may be used across all combinations. Perhaps it is to strive for consistency, or perhaps it is so because of system limitations. Or, when appropriate methods are assigned, they will not be reviewed at regular intervals. There really is no excuse for this today, as the latest forecasting packages will automatically assign a method based on the data characteristics and will change the method assigned as data conditions change. A good forecaster will not rest on past laurels, and will look for improving the forecast accuracy of the engine.

Another example of tuning the engine could be when the market changes direction significantly, as it did during the recession of 2007-09. A knowledgeable forecaster with the proper tools will know which parameters to tweak in the various statistical methods to give greater weight to recent history.

A slightly advanced (but not complex) tuning of the forecasting engine requires using the aggregated indexes to improve the forecast quality of the individual products. For example, research (Mohammadipour & colleagues, 2012) has shown that the not-so-strong seasonal indexes of the individual products can be improved by applying group-level indexes to them (assuming group-level indexes are indeed stronger). A good forecaster will use these aggregation schemes to improve the quality of the forecast (or at least make the appropriate technical staff aware of the possibilities to use these indexes to improve the forecast).

**KNOWING WHEN – AND WHEN NOT – TO USE STATISTICAL FORECASTING**

There are many reasons why products and/or specific product/ship-to combinations might require manual input. It has been shown in other forecasting fields that users can provide significant improvement in forecast
accuracy over the computer-generated forecasts. For example, when it comes to predicting the amount of rainfall over the next day, the Hydrometeorological Prediction Center (HPC, aka “the humans”) at the National Weather Service improves the forecast accuracy by 20% over the forecast generated via the Global Forecast System (GFS) model, and by 30% over the North America Meso-scale (NAM) model (Brennan, 2007).

Proper analysis by the forecaster will often show a clear separation between combinations that should be forecast statistically and those that require manual input. A typical downfall of a collaborative forecasting process is that too many overrides are made across the data set (Fildes & Goodwin, 2007). A skilled forecaster needs to be able to recognize these and deal with them. Here are a few possible scenarios:

- **Identify potential sources of statistical forecast error:** A variety of statistical tools are available that try to capture the overall forecastability of a time series. One commonly used is the Coefficient of Variation (Standard Deviation/Mean). However, it is probably more useful to look at product attributes that might point to a time series being particularly error prone in forecasting. Sean Schubert calls these attributes forecastability DNA (2012). Examples include:
  - Intermittence and erraticness (Syntetos & colleagues, 2011)
  - Unique customer count per period (very small customer counts can mean sudden trouble if they change order patterns; also, trends coming from more data points are more statistically significant, hence more reliable)
  - Average order count per period (small count of large volume orders can be more hit-and-miss compared to a large number of orders)
  - New products or combinations
  - Dying products or combinations

- **Identify actual sources of statistical forecast error:** All the analysis above notwithstanding, if a particular combination has historically been a source of high forecast error, then it deserves to be on a list requiring extra scrutiny.

- **Isolate causes of variability:** The old adage “one bad apple can spoil the barrel” is often true for forecasts. For example, a product-level demand may appear to be highly variable, but breaking out the data at the ship-to customer level may indicate that most customers for the product are very predictable. One or two customers with a large demand that varies widely may be the entire cause of the product variability. The ability to perform this analysis and to forecast the “problem” customers separately allows the forecaster to create a much better product-level forecast.

- **Eliminate sources of bias:** Bias can be defined as a tendency to consistently forecast either too high or too low. While it is possible to see bias as a result of personality, often it is organizational metrics, reward systems, and pressures that create bias. A classic example: rewarding the sales team for exceeding forecast will introduce a bias for forecasting too low. A bias toward over-forecasting in the later months of the year is introduced if “catching up to the budget” is allowed to influence the forecast. In addition, behavioral scientists have reported bias being introduced by environmental factors such as anchoring (Tversky and Kahneman, 1974).

- **Collaborate with multiple sources:** A forecast is only as accurate as the data that go into it. Often, the data required for developing a forecast are in multiple places. Sales may have some information, customer service may have additional pieces, and so forth. A robust system to collect and reconcile the different inputs is critical to arriving at an accurate forecast. Often, this requires a combination of a good software tool and a nudge from management, as well as a tactful forecaster who coaxes the best information out of the teams in the field.

- **Make sense of the various forecasting inputs:** With forecasting input from various sources, combining them into a final number is a key task. A good forecaster will rely on past forecast accuracy when assigning weights to the different inputs.
Research has shown that when forecasts from various sources are collected together and aggregated (averaged), the result (often and certainly in the long run) is better than all individual inputs as long as the inputs were created independent of each other (Silver, 2012).

**Recognize bias from the collective:**

Often, even when everyone is using the best estimate, the sum of the parts is too big for the whole. If each of 20 sales reps forecasts just a bit too optimistically at the product/ship-to level, the result at the product level is a number that is not even in the ballpark. The forecaster should be able to recognize this (whether on the high or low side) and go to the appropriate people for a reality check.

An experienced forecaster understands that all these inputs are important and will work with different areas of the organization, making data available to them at the appropriate level. For example, Sales may want to look at it by product/ship-to; Marketing might want it by product family. Based on forecast-accuracy metrics, the forecaster defines a way of combining these inputs into a final number and gaining consensus for the final forecast.

**PICKING THE RIGHT METRICS FOR THE RIGHT AUDIENCE**

Too often, an organization tries to reduce its measurement of forecast accuracy to a single number or even one number per product family. This is meaningless, because it allows the “too lows” to wash out the “too highs.” Naturally, high-level executives shouldn’t have to look at the same detailed forecast-accuracy metrics that a sales rep should look at. It is a key skill for the forecaster to recognize this and to present the right metrics for each audience. Executives, for example, need at least three metrics: one to show directional trend (getting better or worse), one to show bias (consistently too high or too low), and one to show magnitude. This last metric should be able to appropriately weight the important versus not-so-important: a 40 percent forecast error on a $10,000 product line is not nearly as significant as a 20 percent error on a $1 million dollar product line. Weighted Mean Absolute Percent Error (WMAPE) is a good metric for this high-level calculation. The weighting can be done by volume, margin, holding costs (Hoover, 2009), or other criteria.

Sales, of course, needs to see forecast accuracy at the level at which they give input. This is the only way they can improve on their inputs. The same is true for any other source of collaborative input.

The accuracy of the statistical forecast should also be measured at the level at which it is generated. The forecaster is responsible for examining these accuracy measurements and determining whether a given product has reached the level of maturity and stability at which a statistical forecast is adequate, minimizing the need for manual inputs. As mentioned earlier, FVA provides a very good way to measure the impact of each forecast stream.

**FIGHTING FOR A SINGLE SET OF FORECASTS**

It is also the job of the forecaster to fight for a single set of numbers. Since the forecaster is the gatekeeper of the forecast, she needs to lead the fight for that forecast to drive all downstream planning. It is meaningless to have a forecaster and multiple collaborators putting dozens of hours into generating a forecast if production planning or execution is going to ignore it anyway. It takes diplomacy as well as determination – and, most of all, producing a believable forecast – to ensure that multiple spreadsheets with their own forecasts don’t sprout like weeds.

**FROM FORECASTING TO DEMAND PLANNING**

Forecasting, as a field of endeavor, deals with the future, and therefore deals with all the uncertainty that is inherent in the future. In the early parts of a forecasting career, a forecaster might believe that more data and better techniques will eventually make the future more known (this idea has sometimes been called Laplace’s demon); however, experience tells us that while advances are made every day enabling improvements in predictions, a good forecaster realizes that there is only so far you can go in predicting something that is truly unknown.
A wise person (or was it a partisan?) once said, “If you cannot win the game, change the rules.” Going from forecasting to demand planning is akin to changing the aim of the game from better prediction to better planning. In this sense, a forecaster bows to the uncertainty in the future and tries to look for ways to actively monitor, manage, and plan for the future uncertain demand. The forecaster generates the best possible forecast that he can under the circumstances, and then immediately turns his attention to the task of preparing for unpredictable situations that are a given in the uncertain world of future forecasting. Such a forecaster is able to convince his organization that the aim of the whole enterprise is to go beyond the prediction and also focus on preparing the organization for deviations from the forecast. A good demand planner deploys the strategy of what-if scenario planning (Singh & Lee, 2013) and is prepared to change the future forecast and plans as the market conditions change. Typically, this evolution also sees the job title go from “forecaster” to “demand planner,” although the two titles are often used interchangeably. This paper continues to use the title of forecaster in the following paragraphs.

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**KNOWING HOW, WHY, AND WHAT DEMAND NEEDS TO BE MONITORED**

A key skill for a forecaster is the recognition that her responsibility does not end with generating a monthly forecast. On the contrary, monitoring actual demand versus the forecast throughout the month is equally critical in order to better serve key customers as well as to recognize when a change of plan is needed. This is an area in which new analytical tools and dashboards can indeed provide great benefit – but it still takes a skilled forecaster to interpret what she sees and to act accordingly.

In addition to keeping an eye on demand as a whole, the forecaster must know which demand needs special attention as the month progresses:

- **All forecasts are not created equal.** Forecasts for key customers who regularly order at the end of the month, for example, need to be “protected” when supply is short. Customer segmentation and some sort of “forecast entitlement” check by customer-service reps before an order is accepted need to be implemented and updated frequently to ensure that the best customers get the best customer service. In addition, high-volume, high-variability customers must be monitored closely, since their forecasts are, by definition, less accurate than others and a large, unexpected order may upset production plans.

- **A forecast is not just a number; it’s also a range.** A skillful forecaster recognizes that there is an implicit tolerance range around a forecast. He looks at the big picture and avoids knee-jerk reactions to deviations that are normal noise and require no change in plan. Conversely, he also needs to know when a deviation is large enough to be significant and to necessitate replanning in conjunction with the production planner.

- **How is the month going to end?** Increasingly, management wants to know earlier and earlier in the month whether or not the forecast will be met. A skilled demand planner will have an “order progression” system to allow her to project early in the month, based on historical and current month order and shipment rates, what the final monthly demand will be. A forecast will never be perfect, but with proper analysis and the right enabling tools, a good forecaster can come closer – closer than ever before – to predicting at least a few weeks into the future.

**KNOWING WHEN TO CHANGE HORSES**

A final skill essential for a forecaster is the ability to recognize when macroeconomic changes require an entirely new approach to forecasting. In severe downturns, businesses are generally slow to reduce their forecasts. At best, they may reduce next month’s forecast but leave the outer months at unrealistically high levels. Inevitably, this results in inventories being far too high.
It is the forecaster’s responsibility to recognize this situation and take a different approach to generating her baseline forecast. There are many ways of going about this. For example, the demand planner might take an average of the percentage difference between sales over the last six months and the same period from the previous year. Obviously, this must be done at an appropriate level – perhaps by product or by some product grouping. This percentage reduction (or a fraction of it, if appropriate) could then be applied to the forecasts generated by the normal processes, whether statistical or collaborative. This new, reduced forecast could become the new baseline.

Forecasters must use effective communication and persuasion skills to explain to everyone what has been done, and why, and to generate buy-in to this approach. The advantage of this method is that sales and other collaborators must be proactive in raising individual forecasts if they have hard knowledge of higher demand for a given customer – but inertia is now on the side of the new, reduced, more realistic forecast.

THE BOTTOM LINE

When it comes to choosing a forecaster, it is critical to have an individual who learns quickly and is able to think outside the box. A forecaster should by nature be an analytical, detail-oriented person who can also keep the big picture in mind. There will always be new challenges that require creative approaches.

One other responsibility an outstanding forecaster accepts is educating the appropriate executives on what they need to know about demand planning. Primarily, executives should know how to select a forecaster with the above characteristics and skills, and then trust that individual to do his job. Executives should also understand the value of a single-set-of-numbers supply chain and insist that one forecast be used throughout the organization. Finally, executives must understand the limitation of high-level forecast accuracy numbers and the impossibility of reducing this to one number.

With a powerhouse team of forecasters and supportive executives in place, a business is well on its way to a robust process to optimize its supply chain. As long as the team approaches its charge with a mind-set of a long-term improvement process, as opposed to a “once and done” project, it will achieve much success.

REFERENCES


Sujit Singh, CFPIM, CSCP, Chief Operating Officer of Arkieva (www.arkieva.com), is responsible for managing the delivery of software and implementation services, customer relationships, and the day-to-day operations of the corporation.

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Forecaster in the Field

Interview with Sujit Singh

How did you get started in forecasting?
In the late 1990s, as I was finishing up my master’s at UMass Amherst, I was getting interested in the job market. One of my professors introduced me to a visiting CEO from a company called Supply Chain Consultants (now Arkieva), who interviewed me in his hotel lobby for 15 minutes. An informal site visit later, and I was offered a job as a supply chain consultant. Though the company did work across all facets of supply chain planning, the luck of the draw meant my first few projects were about forecasting and demand planning for large manufacturing companies. That’s how I got started in the field – and 15+ years later, I’m still here.

"In a seemingly cruel twist of fate, the more successful forecasters are, the more invisible they become."

How has being at Arkieva for over 15 years shaped your views about forecasting?
I’ve worked throughout those years with many clients across many industries in their forecasting process. One thing that I’ve learned is that the future is all about uncertainty, and there is a limit to the capabilities of prediction or forecasting. This has made me a strong believer in the value of collaboration, wherein you use the statistics as the baseline forecast, but collect inputs from various people in the organization to fine-tune the forecast. The lack of a “silver bullet” and the amazing fact that openness in collecting, reconciling, and processing numerous inputs over time can improve the forecast is something I came to realize only with experience.

What other areas of forecasting interest you?
I have always been fascinated by the “people side” of forecasting. As a group, forecasters and planners are very much underappreciated. I strongly believe that they do a yeoman’s work in balancing the tension that exists between what are arguably the two most powerful organizations in the company: sales and operations. And yet, for all their efforts, they hardly – if ever – get the recognition they deserve. In a seemingly cruel twist of fate, the more successful forecasters are, the more invisible they become. I have seen entire forecasting and planning processes dismantled as their stupendous success was translated to a lack of need in the future! I’m also perplexed with how the forecasting community reacts to these threats to their future. On average, forecasters will typically downplay their success as just plain luck. We need to realize that if we forecasters ourselves don’t advertise our successes, no one else will.

Do you have any pet peeves about forecasting?
My pet peeve is from the area of business forecasting, a field I’ve worked in for a long time. I see too much focus on the definitions or technicalities – which method is better, for example, or what’s the right formula for calculating forecast error – and too little focus on the core business issues such as return on investment and where the savings come from. I think there is plenty of directional input, but I wish that an impartial party or academia would create a body of work that could strengthen the hand of forecasters who have to get project approval from management. As a software vendor, I see a great need for just such a body of knowledge.

How about your other interests?
I used to be an avid runner and into sports, but for the last few years all my other interests revolve around my 4-year-old son. Reading nonfiction and listening to Indian classical music are also activities that I enjoy.