

Seven Keys to Better Forecasting

Mark A. Moon, John T. Mentzer, Carlo D. Smith, and Michael S. Garver

Excellence in sales forecasting can boost a firm's financial health and gratify customers and employees alike,

Sales forecasting is a management function that companies often fail to recognize as a key contributor to corporate success. From a top-line perspective, accurate sales forecasts allow a company to provide

high levels of customer service. When demand can be predicted accurately, it can be met in a timely and efficient manner, keeping both channel partners and final customers satisfied. Accurate forecasts help a company avoid lost sales or stock-out situations, and prevent customers from going to competitors.

At the bottom line, the effect of accurate forecasts can be profound. Raw materials and component parts can be purchased much more cost-effectively when last minute, spot market purchases can be avoided. Such expenses can be eliminated by accurately forecasting production needs. Similarly, logistical services can be obtained at a much lower cost through long-term contracts rather than through spot market arrangements. However, these contracts can only work when demand can be predicted accurately. Perhaps most important, accurate forecasting can have a profound impact on a company's inventory levels. In a sense, inventory exists to provide a buffer for inaccurate forecasts. Thus, the more accurate the forecasts, the less inventory that needs to be carried, with all the well-understood cost savings that brings.

The ultimate effects of sales forecasting excellence can be dramatic. Mentzer and Schroeter (1993) describe how Brake Parts, Inc., a manufacturer of automotive aftermarket parts, improved its bottom line by \$6 million per month after

launching a company-wide effort to improve sales forecasting effectiveness. Nevertheless, firms often fail to recognize the importance of this critical management function. Our objective here is to take what we've learned about sales forecasting from working with hundreds of companies, and summarize that learning into seven key focus points (summarized in **Figure 1**) that will help any company improve its forecasting performance. Although no management function can be reduced to seven keys, or 70 keys for that matter, our hope is that the ideas presented here will inspire senior management to look closely at their own sales forecasting practices and recognize opportunities for improvement.

Key #1: Understand What Forecasting Is, and What It Is Not

The first and perhaps most important key to better forecasting is a complete understanding of what it actually is and-of equal importance-what it is not. Sales forecasting is a management process, not a computer program. This distinction is important because it affects so many areas across an organization. Regardless of whether a company sells goods or services, it must have a clear picture of how many of those goods or services it can sell, in both the short and long terms. That way, it can plan to have an adequate supply to meet customer demand.

Forecasting is critical to a company's production or operations department. Adequate materials must be obtained at the lowest possible price; adequate production facilities must be provided at the lowest possible cost; adequate labor must be hired and trained at the lowest possible cost; and adequate logistics services must be used to avoid bottlenecks in moving products from producers to consumers. None of these fundamental business functions can be performed effectively without accurate sales forecasts.

Many companies consider the most important decisions about forecasting to revolve around the selection or development of computer software for preparing the forecasts. They have adopted the overly simplistic belief that "If we've got good software, we'll have good forecasting." Our research team, however, has observed numerous instances of sophisticated computer systems put into place, costing enormous amounts of time and money, that have failed to deliver accurate

forecasts. This is because system implementation has not been accompanied by effective management to monitor and control the forecasting process.

One company we worked with has an excellent computer system with impressive capabilities of performing sophisticated statistical modeling of seasonality and other trends. However, the salespeople, who are the originators of the forecast, use none of these tools because they do not un-

Figure 1
The Seven Keys to Better Forecasting

<i>Keys</i>	<i>Issues and Symptoms</i>	<i>Actions</i>	<i>Results</i>
<i>Understand what forecasting is and is not.</i>	<ul style="list-style-type: none"> • Computer system as focus, rather than management processes and controls • Blurring of the distinction between forecasts, plans, and goals 	<ul style="list-style-type: none"> • Establish forecasting group • Implement management control systems before selecting forecasting software • Derive plans from forecasts • Distinguish between forecasts and goals 	<ul style="list-style-type: none"> • An environment in which forecasting is acknowledged as a critical business function • Accuracy emphasized and game-playing minimized
<i>Forecast demand, plan supply.</i>	<ul style="list-style-type: none"> • Shipment history as the basis for forecasting demand • "Too accurate" forecasts 	<ul style="list-style-type: none"> • Identify sources of information • Build systems to capture key demand data 	<ul style="list-style-type: none"> • Improved capital planning and customer service
<i>Communicate, cooperate, collaborate.</i>	<ul style="list-style-type: none"> • Duplication of forecasting effort • Mistrust of the "official" forecast • Little understanding of the impact throughout the firm 	<ul style="list-style-type: none"> • Establish cross-functional approach to forecasting • Establish independent forecast group that sponsors cross-functional collaboration 	<ul style="list-style-type: none"> • All relevant information used to generate forecasts • Forecasts trusted by users • Islands of analysis eliminated • More accurate and relevant forecasts
<i>Eliminate islands of analysis.</i>	<ul style="list-style-type: none"> • Mistrust and inadequate information leading different users to create their own forecasts 	<ul style="list-style-type: none"> • Build a single "forecasting infrastructure" • Provide training for both users and developers of forecasts 	<ul style="list-style-type: none"> • More accurate, relevant, and credible forecasts • Optimized investments in information/communication systems.
<i>Use tools wisely.</i>	<ul style="list-style-type: none"> • Relying solely on qualitative or quantitative methods • Cost/benefit of additional information 	<ul style="list-style-type: none"> • Integrate quantitative and qualitative methods • Identify sources of improved accuracy and increased error • Provide instruction 	<ul style="list-style-type: none"> • Process improvement in efficiency and effectiveness
<i>Make it important.</i>	<ul style="list-style-type: none"> • No accountability for poor forecasts • Developers not understanding how forecasts are used 	<ul style="list-style-type: none"> • Training developers to understand implications of poor forecasts • Include forecast performance in individual performance plans and reward systems 	<ul style="list-style-type: none"> • Developers taking forecasts seriously • A striving for accuracy • More accuracy and credibility
<i>Measure, measure, measure.</i>	<ul style="list-style-type: none"> • Not knowing if the firm is getting better • Accuracy not measured at relevant levels of aggregation • Inability to isolate sources of forecast error 	<ul style="list-style-type: none"> • Establish multidimensional metrics • Incorporate multilevel measures • Measure accuracy whenever and wherever forecasts are adjusted 	<ul style="list-style-type: none"> • Forecast performance can be included in individual performance plans • Sources of errors can be isolated and targeted for improvement • Greater confidence in forecast process

derstand them and have no confidence in the numbers generated. As a result, their forecasts are based solely on qualitative factors and are often very inaccurate. A similar case is a technology-based company that has created another highly sophisticated forecasting tool, yet the salespeople continue to underforecast significantly because their forecasts have a direct effect on their sales quotas. Both of these examples show how some companies focus on forecasting systems rather than forecasting *management*.

On the other hand, some companies have been more successful in their efforts by recognizing the importance of forecasting as a management process. Some have organized independent groups or departments that are responsible for the entire forecasting process, both short- and long-term. One large chemical company has formed a forecasting group not associated with either marketing or production. It has ownership and accountability for all aspects of forecasting management, with responsibility not only for the systems used to forecast but also for the numbers themselves. The group accomplishes its mission in several ways: providing training in the methods and processes throughout the company; designing compensation systems that reward forecast accuracy; and facilitating communication among sales, marketing, finance, and production

departments, thereby improving overall forecasting effectiveness. Recognizing the importance of forecasting, this firm has put an organization in place to manage the process, not just to choose and manage a system.

Another way in which companies confuse what forecasts are and what they are not is by failing to understand the relationship between forecasting, planning, and goal setting. A sales forecast should be viewed as an estimate of what future sales might be, given certain environmental conditions. A sales plan should be seen as a management decision or commitment to what the company will do during the planning period. A sales goal should be a target that everyone in the organization strives to attain and exceed.

Each of these numbers serves a different purpose. The primary purpose of the sales forecast is to help management formulate its sales plan and other related business plans—its commitment to future activity. The sales plan's purpose is to drive numerous tactical and strategic management decisions (raw material purchases, human resource planning, logistics planning, and so on), realistically factoring in the constraints of the firm's resources, procedures, and systems. The sales goal is primarily designed to provide motivation for people throughout the organization in meeting and exceeding corporate targets.

Whereas the sales forecast and the sales plan should be closely linked (the former should precede and influence the latter), the sales goal may be quite independent. The objective of those who receive a sales goal should be to beat that goal. It can be developed based on a sales forecast, plan, and motivation levels. However, because forecasters should strive for accuracy, it is not appropriate for a forecast to be confused with the firm's motivational strategy.

It is particularly problematic when sales forecasts and sales goals are intertwined, because this mixture leads to considerable game playing, especially involving the sales force. If salespeople believe that long-term forecasts will affect the size of the next year's quota, they will be strongly motivated to underforecast, hoping to influence those quotas to be low and attainable. Alternatively, as one salesman at a parts supply company put it, "It would be suicide for me to submit a forecast that was under my targets." In both cases, because goals and forecasts are so intertwined, salespeople are motivated to "play games" with their forecasts. There is a built-in disincentive to strive for accuracy.

Some companies have expressed a reluctance to "manage to different numbers," suggesting that when the forecast and the goals differ, it creates confusion and lack of focus. The reaction to such perceived confusion is to develop inaccurate forecasts that can affect performance throughout

REs

The ideas presented in this article are drawn from a program of research that has spanned more than 15 years. **Phase 1** began in 1982 with a mail survey of 157 companies that explored the techniques they used to forecast. Ten years later, under the sponsorship of AT&T Network Systems, the survey was replicated and expanded in **Phase 2** to explore not only techniques but also the systems and management processes used by 200 companies. **Phase 3**, conducted between 1994 and 1996, was sponsored by a consortium of companies consisting of AT&T Network Systems, Andersen, Consulting, Anheuser-Busch, and Pillsbury. It took the form of a benchmarking study that consisted of in-depth analysis of 20 companies: Anheuser-Busch, Becton-Dickinson, Coca-Cola, Colgate-Palmolive, Federal Express, Kimberly Clark, Lykes Pasco, Nabisco, JCPenney, Pillsbury, ProSource, Reckitt Colman, Red Lobster, RJR Tobacco, Sandoz, Schering Plough, Sysco, Tropicana, Warner Lambert, and Westwood Squibb. Finally, **Phase 4** has been conducted since 1996 and consists of a series of forecast audits: The forecasting practices of seven companies—Allied Signal, Du Pont Agricultural Products Canada, Eastman Chemical, Hershey Foods USA, Lucent Technologies, Michelin North America, and Union Pacific Railroad have been studied so far in this phase and compared to those of the 20 benchmarked companies. The references to this research are listed at the end of this article.

In addition to these formal studies, the learning presented here is augmented by more than 20 years of experience consulting with a large number of major corporations. On their forecasting systems and processes. Our ideas are drawn from firsthand observation of what actually works in sales forecasting in companies, large and small that sell products and services and that are manufacturers, distributors, or retailers.



the company. We believe the sales forecast and the sales goal must be distinct, because the behaviors they are meant to influence can conflict.

Key #2: Forecast Demand, Plan Supply

One mistake many companies make is forecasting their ability to supply goods or services rather than actual customer demand. At the beginning of the forecast cycle, it is important to create predictions that are not constrained by the firm's capacity to produce. Consider the forecaster for a certain product who questions the company's sales force and learns they could sell 1,500 units per month. At the same time, current manufacturing capacity for that product is 1,000 units per month. If the forecaster takes that production capacity into account when creating initial forecasts, and predicts 1,000 units, there is no record of the unmet demand of 500 units per month, and the information on where to expand manufacturing capacity is lost.

This problem often occurs when historical shipments are used as the basis for generating forecasts. Forecasting shipments will only predict a company's previous ability to meet demand. Suppose demand for a particular product in the past had been 10,000 units per month, but the supplier could only ship 7,500. Corporate history would show shipments at 7,500 units per month, thus causing this amount to be projected and produced again the following month. The result is twofold: the impression of an accurate forecasting system, but an actually recurring unfulfilled monthly demand of 2,500 units. Forecasting based on shipping history only leads a company to repeat its former mistakes of not satisfying customer demand. Predicting actual demand allows measurement of the disparity between demand and supply so it can be reduced in future periods through plans for capacity expansion.

Often the symptom of this key is the attitude, "We do a great job of forecasting. We are very accurate, always selling close to what we forecast." Notice in the previous example that the forecast accuracy would appear very good because both the forecast and the actual sales were 7,500 units each month. The key, however, is the failure to realize the 2,500 units in sales lost each month because of an inability to meet demand. In fact, the "true" demand forecasting accuracy was not 100 percent, but only 75 percent. Forecasting by shipments and obtaining accurate results are often symptomatic of chronic underforecasting of demand.

Unfortunately, determining actual customer demand is more difficult than predicting a company's ability to supply. Systems and processes are needed to capture this elusive demand that

was not fulfilled. Mechanisms are needed to allow salespeople to provide valuable information about customers who would order more if they could. In addition, records of orders accepted but not filled in the period demanded adds to the demand versus supply level of information. Finally, such electronic data interchange (EDI) information as point-of-sale (POS) demand, retail inventory levels, and retailer forecasts are all valuable sources of information that help a company move toward demand forecasting.

Although it is more difficult, forecasting true demand will help a company make sensible, long-term decisions that can profoundly affect its market position. By identifying where capacity does not meet demand forecasts, the company has valuable information on where to expand capacity through capital planning. Such a long-term program of matching capacity planning to forecasts will reduce the incidence of chronic underforecasting and result in higher levels of customer satisfaction.

Key #3: Communicate, Cooperate, Collaborate

Companies that forecast most effectively consider it critical to obtain input from people in different functional areas, each of whom contributes relevant information and insights that can improve overall accuracy. But employees are often unable or unwilling to work across functions to achieve high levels of forecasting performance. To do so requires a great deal of communication across department boundaries, and not all communicating is equal; some companies are simply better at it than others.

When it comes to cross-functional forecasting, we distinguish among three levels: communication, cooperation, and collaboration. Companies at lower levels of sophistication merely *communicate*. This can take the form of one-way reports, in which one department responsible for forecasting informs other functional areas of the results of its efforts. With *coordination*, representatives from different functional groups meet to discuss the forecast. Often, however, one area usually the one that "owns" the forecast will dominate the discussions and work to persuade the other functions to accept the forecast it has created.

Coordination is superior to one-way communication, because at least there is opportunity for some dialogue. But it does not promote as effective a forecasting process as when different constituencies in a company *collaborate*. Here, the views of each functional area receive equal consideration, and no one department dominates. Such collaboration is most likely to occur when management of the forecasting process resides in

an independent department instead of being part of marketing, finance, logistics, or production. Each area, with its unique biases and agendas, can contribute equally to a true consensus forecast.

In several companies we have worked with, the functional area responsible for generating forecasts—usually marketing—makes little effort to obtain input from other affected areas, such as production planning, operations, or logistics. A number of negative consequences result. First, critical information about production lead times or capacity constraints are not taken into account when the forecast is finalized. Because this information is missing, forecast users have little trust in projections they did not help develop. This lack of trust leads to duplicated forecasting efforts. In one company, the production scheduling department was so distrustful of the forecasts developed by marketing that it completely ignored them and created a whole "black market" forecasting system. Had a consensus-based approach been used, such nonproductive duplication of efforts could have been avoided.

A further consequence of not working cross-functionally is a lack of understanding of the

assumptions that go into forecasts, which leads to further distrust. In another company, a production scheduler would adjust the forecasts to take into account the seasonality she believed was present in the marketplace. However, she was not aware that the marketing department had already accounted for that seasonality in the information they gave her. Had production planning been involved in a consensus-based forecasting process, the scheduler's adjustments—which skewed the

forecasts—would not have been made.

It is most important in effective forecasting to establish a mechanism that brings people from multiple organizational areas together in a spirit of collaboration. Such a mechanism, often organized by an independent forecasting group, ensures that all relevant information is considered before forecasts are created. One such mechanism is in place at a national consumer products firm, in which the forecasting group organizes and holds regularly scheduled, half-day meetings that bring together representatives from National Accounts (sales), product management (marketing), production planning, logistics, and finance. Each participant comes to the meeting prepared to

discuss upcoming issues that will affect sales and demand over the forecast period. Formal minutes are kept to document the reasons for making adjustments. The end product is a consensus forecast, with numbers that its users have helped develop. Duplicate forecasting efforts are eliminated and all the parties can trust the final result: a more accurate and relevant forecast.

Key #4: Eliminate Islands of Analysis

Islands of analysis are distinct areas within a firm that perform similar functions. Each area maintains a separate process, thereby performing redundant tasks and often having the same responsibilities. Because islands of analysis are often supported by independent computer systems (which often are not electronically linked to other systems within the firm), information contained within the different islands is not shared between them.

In our research, we have identified forecasting islands in logistics, production planning, finance, and marketing. They have usually emerged because of a lack of interfunctional collaboration between units, which leads to a lack of credibility associated with the forecast. Because the "official" forecast generated in a particular department may not be credible to forecast users, the latter often take steps to implement processes and systems to create their own forecast.

Islands of analysis are detrimental to corporate performance. Forecasts developed in this manner are often inaccurate and inconsistent. Because each area maintains its own forecasting process and often its own computer system, data—if shared at all—are shared only through manual transfers, which are prone to human errors. When completely separate systems are used, the assumptions that underlie the forecasts, such as pricing levels and marketing programs, tend to differ from one system to the next. Moreover, each area forecasts with a unique bias, making separate predictions inconsistent and unusable by other areas. Redundancies generated by separate systems cost the firm both money and valuable personnel time and energy. Employee frustration builds up, along with an overall lack of confidence in the forecasting process.

To solve this problem, management must devote attention to eliminating the factors that encourage the development of islands of analysis. Such a goal can be reached by establishing a single process supported by a "forecasting infrastructure." This process should consist of software that communicates seamlessly with other information systems in the firm. Appropriate tools should include a suite of statistical techniques, graphical programs, and an ability to capture and report performance metrics over time. Historical

"In one company, the production scheduling department was so distrustful of the forecasts developed by marketing that it completely ignored them and created a whole... lack market forecasting system."

sales data can be accessed from a centrally maintained "data warehouse" that is electronically available to all functional areas and provides real-time data.

Once this forecasting infrastructure is in place, effective training aimed at a common understanding of the process and its system should be implemented for both users and developers. Employees should be trained to comprehend the overall process, each individual's role in the process, and the importance of accurate forecasting. They must be able to use the system effectively and efficiently.

Once islands of analysis are eliminated, the company can expect improved forecasting performance and significant cost savings. Forecasts will be more precise, more credible, and better able to meet the needs of various departments. When systems are electronically linked, the errors that result from manual data transfers can be avoided, and the necessary information can be accessible to all functional areas. From a cost perspective, a single forecasting process eliminates redundant efforts within the firm, thus saving valuable employee time and other resources. And because accuracy will be improved, all the well-documented cost savings in areas such as purchasing, inventory control, and logistics planning can be tracked and realized.

Key #5: Use Tools Wisely

Many companies tend to rely solely on qualitative tools—the opinions of experienced managers and/or salespeople—to derive forecasts, ignoring such quantitative tools as regression and time-series analysis. Alternatively, many companies expect the application of quantitative tools, or the computer packages that make use of them, to "solve the forecasting problem." The key is that both quantitative and qualitative tools are integral to effective sales forecasting. To be effective, however, they must be understood and used wisely within the context of the firm's unique business environment. Without understanding where qualitative techniques, time series, and regression do and do not work effectively, it is impossible to analyze the costs and achieve the benefits of implementing new forecasting tools.

One common symptom of a failure to realize this key is the existence of detailed sales forecasting processes that, when examined, reveal the subjective judgments of managers or salespeople as the only input used in the forecast. In other words, the company has a quantitative sales forecasting process that supports only qualitative forecasts. It relies too much on the ability of experienced personnel to translate what they know into a forecast number, without taking into account the myriad of quantitative techniques and

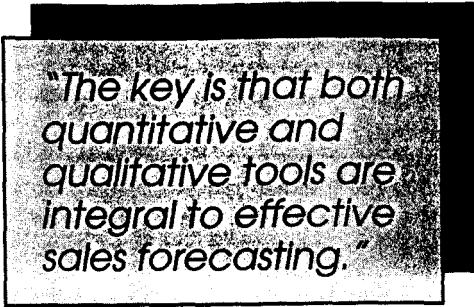
their ability to analyze patterns in the history of demand.

The opposite symptom is a sales forecasting process that performs intensive numerical analysis of demand history and the factors that relate statistically to changes in demand, but with no qualitative information on the nature of the market and what causes demand to change. The company depends too much on the ability of these techniques to determine estimates of future demand without taking experience into account.

A variation on these symptoms is relying on a "black box" forecasting system. This occurs when a company has a sales forecasting computer package, or "box," into which historical sales data are fed and the forecasts come out, but no one seems to know how it comes up with them, or even what techniques it uses. The company abrogates its responsibility by turning the important job of sales forecasting over to a computer package that nobody understands.

Using forecasting tools wisely requires knowing where each type of tool works well and where it does not, then putting together a process that uses the advantages of each in the unique context of the firm. Salespeople who do a poor job of turning their experience into an initial forecast may be good at taking an initial quantitative forecast and qualitatively adjusting it to improve overall accuracy. Time series models work well in companies that experience changing trends and seasonal patterns, but they are of no use in determining the relationship between demand and such external factors as price changes, economic activity, or marketing efforts by the company and its competitors. On the other hand, regression analysis is quite effective at assessing these relationships, but not very useful in forecasting changes in trend and seasonality.

To apply this key, a process should be implemented that uses time series to forecast trend and seasonality, regression analysis to forecast demand relationships with external factors, and qualitative input from salespeople, marketing, and general management to adjust these initial quantitative forecasts. This general recommendation must be refined for each individual company by finding the specific techniques that provide the most improved accuracy. Finally, key personnel involved in either the quantitative or the qualitative aspects of the forecasting process need training in using the techniques, determining where they work and do not work, and incorporating qualitative adjustments in the overall forecasting process.



"The key is that both quantitative and qualitative tools are integral to effective sales forecasting."

Key #6: Make it important

What gets measured gets rewarded, and what gets rewarded gets done, say Mentzer and Bienstock (1998). This management truism is the driver behind our final two keys. Sales forecasting is often described by senior management as an important function. But although this assessment may be shared by individuals throughout the firm, few organizations institute policies and

practices reinforcing the notion that forecasting is important for business success. There is often a gap between management's words and their actions. Companies frequently tell those who develop forecasts that "forecasting is important," but then fail to reward them for doing the job well or punish them for doing it poorly.

Forecast users become

frustrated by a perceived lack of interest and accountability for accuracy among forecasters. Such frustration often leads them to manipulate existing forecasts or, in the extreme case, develop islands of analysis that duplicate forecasting efforts and ignore valuable ideas.

One way to gauge how important forecasting is to a firm is to determine how familiar users and developers are with the entire process. Without such familiarity, individuals involved in forecasting throughout the firm have little appreciation of the impact of their inaccuracies and are therefore unlikely to spend the time and attention needed to do the job well. As a result, users perceive that forecasters are not taking the task seriously and thus discount the value of what they produce.

A number of actions can be taken to address this gap in forecasting importance. One way is to give all individuals involved adequate training. Forecast creators and users must know where and how forecasts are used throughout the firm. When forecasters become aware of all the downstream ramifications of sloppy work, the task takes on more relevance to them. Marketing and salespeople who typically are concerned about forecasting only at the product or product line level should understand that this does not provide the necessary detail for operations to plan stock-keeping unit (SKU) production or for logistics to make SKUL (by location) shipment plans. Similarly, forecast users should be more aware of the needs and capabilities of forecast developers.

Another action management can take is to incorporate forecasting performance measures into job performance evaluation criteria. Clearly,

salespeople, product managers, and other forecasters will see the importance of the task if salient rewards follow as a result of forecasting excellence. Even senior managers become interested when the metrics of accuracy are worked into their personal performance evaluations and bonus plans.

But focusing on senior management is not enough. One company includes forecast accuracy as a meaningful part of the performance plans of its senior executives, but not of those on the "front line" who work with forecasts on a daily basis. The job has not been made to seem important to those who do it, with the effect that it is still not done very well.

This is particularly true of the people who are typically responsible for initial forecast input—the sales force. At nearly all the benchmark and audit companies, salespeople are critically important pieces of the forecasting puzzle. Yet in almost all cases, the ones who develop forecasts receive neither feedback on how well they forecast nor any type of reward for doing it well. Many agree with a salesman for a high-tech manufacturer, who said, "My job is to sell, not forecast." Similarly, product managers, who also provide critical input to the forecasting process at many companies, often consider forecasting an extra burden that takes them away from their "real jobs."

Key #7: Measure, Measure, Measure

Obviously, before forecasters can be rewarded for excellence, a company must first develop systems for measuring performance, tools for providing feedback, and standards and targets for what constitutes forecasting excellence. Without the ability to effectively measure and track performance, there is little opportunity to identify whether changes in the development and application of forecasts are contributing to, or hindering, business success. This key may be intuitive for most business managers, yet our research has identified surprisingly few companies that systematically measure forecasting management performance. In cases where measures have been implemented, they are infrequently used for performance assessment or to identify opportunities for improvement.

A primary symptom indicating a lack of performance measurement can be gleaned from conversations with individuals involved in the forecasting process. Simply asking for a measure of forecasting accuracy typically elicits a response of "pretty good," "lousy," or other general descriptors. In some cases, the answer may include a number considered to be a measure of accuracy, such as "75 percent," or error, such as "25 percent." Further inquiry may indicate that the

"Salespeople product managers; and other forecasters will see the importance of the task if salient rewards follow as a result' of forecasting excellence.

source of the measure is based on a general "feeling," estimate, or a second- or third-hand source of information, and the respondent is unsure of how such measures were calculated or what level of aggregation was used.

In cases where measures are collected and documented, there may still be insufficient detail or little realization as to how they can help identify opportunities for forecasting improvement. Generally we have found that even when accuracy has been measured over time, few individuals who contribute to forecast development review the history and can determine whether their performance has improved, remained constant, or deteriorated. This reflects a complacency toward performance measures when such measures are not used to evaluate a person's job performance, or do not provide support for identifying sources of forecasting error.

Effective measures evaluate accuracy at different levels of aggregation. Logistics operations are interested in forecast performance at the SKUL level; sales managers may be more interested in a forecast stated in dollars and at the territory or product line level of aggregation. Performance metrics should support these various units of measure as well as the aggregation of demand at different levels.

It is also important to track accuracy at each point at which forecasts may be adjusted. As an illustration, the forecasting task of the sales force of one company is to examine "machine-generated" forecasts for their customers and make adjustments. Those adjustments are then measured against actual sales to determine whether the salesperson's adjustment improved the forecast or not. Similarly, the product manager's job is to take the machine-generated forecast, which has been adjusted by the sales force, and make further adjustments based on a knowledge of market conditions or upcoming promotional events. Once again, these adjustments are measured against actual sales to determine whether they improved the forecast. In both cases, the salespeople and the product manager gain feedback that helps them improve their efforts.

Finally, companies should assess forecasting accuracy in terms of its impact on business performance. Accurate forecasts should not be an end in themselves, but rather a means to achieving the end, which is business success. Improvements in accuracy require expenditures of resources, both human and financial, and should be approached in a return-on-investment framework. For example, in a distribution environment, maintaining or improving customer service may be a worthy corporate objective. Investment in more accurate forecasts may be one way to achieve that objective. However, if the investment required to improve accuracy significantly is very

high, then alternative approaches to improving customer service, such as carrying higher inventory levels, should be considered. The resulting strategy for improving customer service will then be based on sound business analysis.

Measuring and tracking accuracy will ultimately help build confidence in the forecasting process. As the users realize mechanisms are in place to identify and eliminate sources of error, they will probably use the primary forecast developed to support all operations in the company. Islands of analysis will begin to disappear, and the organization will be able to assess the financial return from forecasting management improvements.

As we work with companies, many of them come to realize what a profound impact these seven keys can have on their sales forecasting practices. As they improve those practices, they experience reductions in costs and increases in customer and employee satisfaction. Costs decline in inventory levels, raw materials, production, logistics, and transportation. Greater customer satisfaction accrues from more accurately anticipating demand and, subsequently, fulfilling that demand more often. Greater employee satisfaction comes from a more understandable process, easier information access and transfer, and explicit rewards tied to performance. But the first step any company must take before realizing these benefits is to recognize the importance of sales forecasting as a management function. With this recognition comes a willingness to commit the necessary resources to improving this critical process. **O**

References

Kenneth B. Kahn and John T. Mentzer, "The Impact of Team-Based Forecasting," *Journal of Business Forecasting*, Summer 1994, pp. 18-21.

Kenneth B. Kahn and John T. Mentzer, "Forecasting in Consumer and Business Markets," *Journal of Business Forecasting*, Summer 1995, pp. 21-28.

John T. Mentzer and Carol C. Bienstock, *Sales Forecasting Management* (Thousand Oaks, CA: Sage Publications, 1998).

John T. Mentzer and James E. Cox, Jr., "A Model of the Determinants of Achieved Forecast Accuracy," *Journal of Business Logistics*, 5, 2 (1984a): 143-155.

John T. Mentzer and James E. Cox, Jr., "Familiarity, Application, and Performance of Sales Forecasting Techniques," *Journal of Forecasting*, 3 (1984b): 27-36.

John T. Mentzer and Kenneth B. Kahn, "Forecasting Technique Familiarity, Satisfaction, Usage, and Application," *Journal of Forecasting*, 14, 5 (1995): 465-476.

John T. Mentzer and Kenneth B. Kahn, "The State of Sales Forecasting Systems in Corporate America," *Journal of Business Forecasting*, Spring 1997, pp. 6-13.

John T. Mentzer, Kenneth B. Kahn, and Carol C. Bienstock, "Sales Forecasting Benchmarking Study," Research Report No. 3560 - ROI-1445-99-004-96, University of Tennessee, Knoxville. 1996.

John T. Mentzer and Jon Schroeter, "Multiple Forecasting System at Brake Parts, Inc.," *Journal of Business Forecasting*, Fall 1993, pp. 5-9.

Mark A. Moon is an assistant professor of marketing at the University of Tennessee, Knoxville, where **John T. Mentzer** holds the Harry J. and Vivienne R. Bruce Chair of Excellence in Business Policy and **Carlo D. Smith** is a research associate and doctoral candidate. **Michael S. Garver** is an assistant professor of marketing at Western Carolina University, Cullowhee, North Carolina.