FORECASTING

GENERAL FORECAST CONSIDERATIONS

FORECASTDING DEFINED

Forecasting entails predicting the demand for each type of product (stock keeping unit or SKU) during a particular period or at a specific place

DEPENDENT DEMAND

- Describes items whose demand is related to the demand for other items
- Examples: subassemblies, raw materials, packaging materials
- Demand can be calculated and there is no need to forecast demand

INDEPENDENT DEMAND

- Exists when the demand for an items is not related to, or dependent on, the demand for any other item
- Examples: demand for finished goods (cans of beer) and maintenance spares
- Demand cannot be calculated and can only be estimated by means of a forecast

FORECASTING REQUIREMENTS

COLLABORATIVE PLANNING

- Collaborative forecast, jointly agreed to by supply chain partners, provides a common goal that can be the basis for developing effective operating plans.

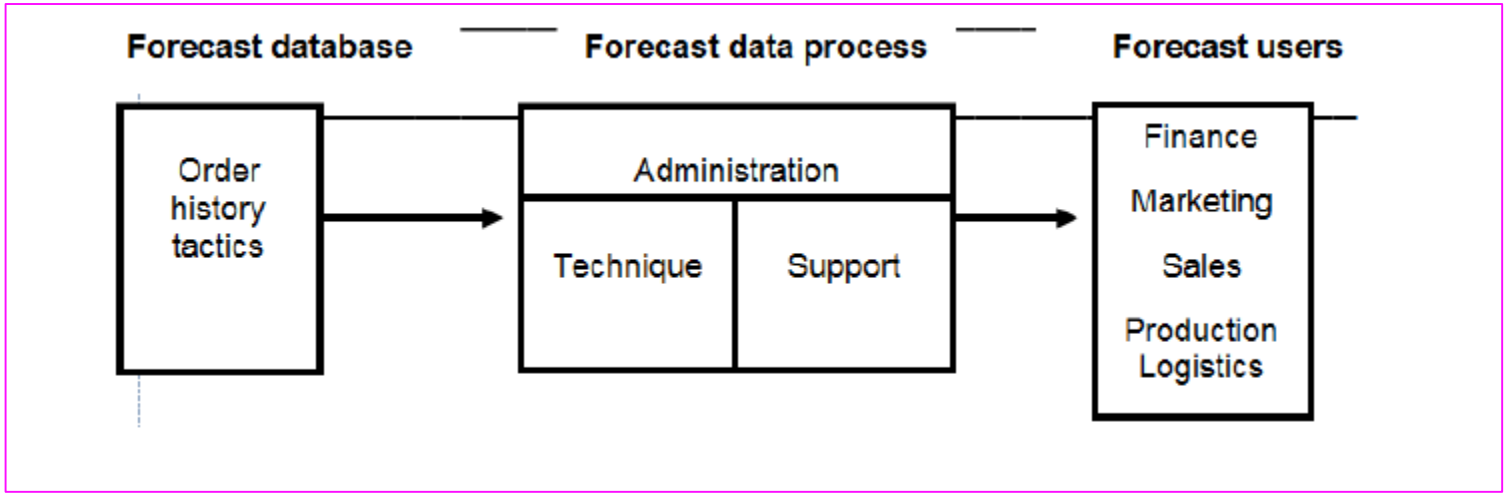
REQUIREMENTS PLANNING

- The requirements planning process operates collaboratively and interactively both internationally across the firm's operations
  And
  externally with supply chain partners to develop a common and consistent plan for each time period, location and item.

RESOURCE MANAGEMENT

- Once the plan is completed,
  it can be used to manage critical supply chain processes such as production, inventory and transportation
- Accurate forecasts collaboratively developed by supply chain partners
  along with a consistent definition of supply chain resources and constraints
  enable effective evaluation of trade-offs associated with supply chain decisions.

FORECAST MANAGEMENT PROCESS



FORECAST MODEL

$$F_t = (B_t \times S_t \times T \times C_t \times P_t) + I$$

F_t = forecast quantity for period *t*

B_t = base level demand for period *t*

S_t = seasonality factor for period *t*

T = trend component index reflecting increase or decrease per time period

C_t = cyclical factor for period *t*

P_t = promotional factor for period *t*

I = irregular/random quantity

FORECASTING COMPONENTS

- ***Base**:* long-term average demand, no seasonality, trend, cyclic or promotion components
- ***Seasonal**:* annually recurring upward and downward in demand
- ***Trend**:* long-range shift in periodic sales, may be positive, negative or neutral
- ***Cyclic**:* periodic shift in demand for more than 1 year, upward and downward
- ***Promotional**:* demand swings initiate by a firm's marketing activities, sales increase followed by sales declines, can be regular, timing and magnitude are controlled
- ***Irregular**:* random nature, impossible to predict, objective to minimise the magnitude of random components

FORECASTING COMPONENTS

CRITERIA FOR EVALUATING FORCASTING TECHNIQUES

- Accuracy
- Forecast time horizon
- Value of forecasting
- Data availability
- Type of data pattern
- Experience of the forecaster

CRITERIA FOR EVALUATING FORECASTING TECHNIQUES

QUALITATIVE TEHNIQUES

- Rely on expertise and are costly and time-consuming.
- Techniques are ideal for situations where little historical data and considerable managerial judgement are required.
- Qualitative methods are not appropriate for supply chain forecasting because of the time required to generate the detailed SKU forecasts necessary.
- Qualitative forecasts are developed by using surveys, panels and consensus meetings.

CASUAL TECHNIQUES

- Estimate variables on the basis of the values of other independent variables.
- Techniques are not suitable in instances where demand assumes an irregular pattern or is extremely erratic.
- Techniques are more appropriate for long-term forecasting (thus not for individual outlets).
- Are generally used to generate annual or national sales forecasts.

TIME-SERIES FORECAST TECHNIQUES

- Are statistical methods utilised when historical sales data containing relatively clear and stable relationships and trends are available.
- Using historical sales data, time series analysis is used to identify seasonality, cyclical patterns and trends.

- **Moving average**
  - Uses average of the most recent period's sales
  - May use any number of previous time periods
  - Time periods remain constant
  - Easy calculate
  - Unresponsive to change
  - Require much data to be maintained and updated
  - If sales variations are large, average value is not reliable

- **Exponential smoothing**
  - Weighted moving average where the forecast based on old forecast as well as actual sales, using an alpha factor to increment the old forecast with a fraction of the difference between old forecast and actual sales
  - Allows for a rapid calculation without substantial historical records and updating
  - Highly adaptable to computerized forecasting
  - Smoothing constant (alpha factor) can be adapted to provide for changing trends: High factor: quick responsiveness

- **Extended (exponential) smoothing**
  - Rapid calculation with minimum data. Also uses alpha factor
  - Incorporates trend and seasonality
  - Three components and three smoothing constants to represent base, trend and seasonality.

- **Adaptive smoothing**
  - Regular review of alpha factor fit
  - Alpha value is reviewed at the conclusion of each forecast period to determine the exact value that would have resulted in a perfect forecast for the previous period
  - Managerial judgement is partially replaced by a systematic and consistent method of updating alpha
  - If recent-period sales demonstrate substantial change, increased responsiveness should decrease forecast error
  - Weakness is that it sometimes overreact by interpreting random error as trend or seasonality

FORECAST ERRORS

- Any forecast remains a prediction of future events and is virtually impossible to make 100% accurate forecasts.
- The accuracy of forecasts can be improved by measuring & analysing errors.
- The higher the levels at which errors are measured, the smaller the forecast error will be.

  EXAMPLE:

  Assume that you have a logistics network with

  - a central factory
  - and warehouse
  - and countrywide distribution centres.

  If forecasts are made centrally, the error (expressed as a %) will be relatively small

  If forecasts are made at individual depots, the % of error will be relatively greater.

- The principal reason why errors are analysed is to improve the accuracy of forecasts.
- Hence the need for the final step, namely feedback.