DEMAND FORECASTING

ROLE

Forecasting = an N$ element of demand management.

It provides an estimate of future demand

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the basis for planning + sound business decisions

goal of a good forecasting technique = 2 minimize the deviation between actual demand + the forecast.

∴ timely + accurate ~~info~~ demand info = a critical component.

benefits of better forecasts

- lower inventories
- reduced stockouts
- smoother prodn plans
- reduced costs
- improved customer service.

Forecasting Techniques

FORECASTING TECHNIQUES.

QUALITATIVE

- Jury of executive opinion
- Delphi Method
- Sales force composite
- Consumer survey.

QUANTITATIVE

- Time series forecasting models
  - Naïve forecast.
  - Simple moving average forecasting model
  - Weighted moving average forecasting model
  - Exponential smoothing forecasting model
  - Trend-adjusted exponential smoothing model
  - Linear trend forecasting model
- Associative forecasting models Cause-and-Effect Models -
  - Simple regression
  - Multiple regression.

FORECASTING TECHNIQUES

QUANTITATIVE TECHNIQUES

Use mathematical models + relevant historical data to generate forecasts.

Time-Series Forecasting

= based on the assumption that the future = an extension of the past
∴ historical data can be used to predict future demand.

Components of time Series

① Trend Variation

Trend represent either increasing / decreasing movement over many years

are due to factors such as
- population growth
- population shifts
- cultural changes
- income shifts.

Common trend lines are linear, S-curves, exponential or asymptomatic.

② Cyclical Variation

Cyclical variations are wavelike movements that are longer than a year, & influenced by macroeconomic and political factors.

Example:

The business cycle (recession or expansion)

③ Seasonal Variations

Seasonal variations shows peaks & valleys that repeat over a consistent interval such as:
- hours
- days
- weeks
- months
- seasons
- years

Due to seasonality, many companies do well in certain months and not so well in other months.

④ Random Variations

Random variations are due to unexpected / unpredictable events such as:
- disasters (hurricanes)
- strikes
- wars.

FORECASTING TECHNIQUES

Based on opinions + intuition

QUALITATIVE TECHNIQUES

① Jury of executive opinion

- a group of senior management executives who are knowledgeable about the mrkt, their competitors and the business environment collectively develop the forecast.
- Technique = applicable for long-range planning + new product introductions.

② Delphi Method

- A group of internal + external experts are surveyed during several rounds (LTD future events + long-term forecasts of demand.
- Group members do not physically meet
- The answers from the experts r accummulated after each round of the survey + summarized
- Summary of responses = sent out to experts in the next round, where individual experts can modify their responses
- The process continues until consensus = reached.
- The process can be both time consumg + expensive.
- This approach = applicable to high-risk technology forecasting, large, expensive projects or major new product introductions.
- The quality of the forecast depends largely on the knowledge of the experts.

③ Sales Force Composite

- represents a good source of mrkt info
- Forecast = generated based on the sales forces (a) knowledge of the mrkt + estimates (b) of customer needs

④ Consumer Survey

- a questionnaire = developed that seeks input from customers on NB issues such as
  - future buying habits
  - new product ideas
  - opinions about existing prod(s).
- The survey = administered thrgh telephone, mail, internet or personal interviews.

FORECASTING TECHNIQUES

QUANTITATIVE FORECASTING TECHNIQUES

Time Series forecasting Models

(a) Naive forecast.	The estimate for the next period is = 2 the actual demand for the immediate period	$F_{t+1} = A_t$	- Method = inexpensive 2 develop, understand, store data & operate
(b) Simple Moving Average Forecast	Uses historical data 2 generate a forecast & works well when demand = fairly stable over time	$F_{t+1} = \frac{\sum_{i=t-n+1}^{t} A_i}{n} = \frac{\sum_{i=t-n+1}^{t} A_i}{n}$	- advantage → simple 2 use → easy 2 understand - weakness → do not respond quickly 2 trend changes
(c) Weighted Moving Average Forecast.	An n-period weighted moving average forecast = the weighted average of the n-period observations using equal weights. The only restriction = that the weights should be nonnegative and sum to one	$F_{t+1} = \frac{\sum_{i=t-n+1}^{t} w_i A_i}{n}$	- advantage → weight used level 2 b based on the experience of the forecaster - weakness → it lags demand because of the averaging effect.
(d) Exponential Smoothing Forecast	The forecast for the next period's demand = the current period's forecast adjusted by a fraction of the difference between the current period's actual demand & forecast.	$F_{t+1} = F_t + \alpha(A_t - F_t)$	- Method = simple 2 use & requires minimal data - most widely used forecasting technique.
(e) Linear Trend Forecast (Referred to as the simple trend model)	A linear trend forecast can be estimated using simple linear regression 2 fit a line 2 a series of data occurring over time	$\hat{y} = b_0 + b_1 x$	

FORECASTING TECHNIQUES.

QUANTITATIVE FORECASTING TECHNIQUES.

Cause & effect models: → assumes that 1 or more factors (independent variables) are related 2 demand and, therefore can be used 2 predict future demand

∴ cause-and-effect models have

- a cause (independent variable / variables)

&

- an effect (dependent variable).

(a) Simple Linear Regression Forecast	When there = only 1 explanatory variable, we have a simple regression forecast equivalent to the linear trend forecast. The difference = that the x variable is no longer time but instead an explanatory variable of demand	$\hat{y} = b_0 + b_1 x$
(b) Multiple Regression Forecast	When several explanatory variables are used to predict the dependent variable, a multiple regression forecast = applicable.	$\hat{y} = b_0 + b_1 x_1 + b_2 x_2 + \ldots + b_k x_k$.

COLLABORATIVE FORECASTING, PLANNING AND REPLENISHMENT ~~FORECAST~~.

CPFR MODEL

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4 key activities.

① Strategy + Planning

- Establish the grand rules for the collaborative relationship
- determine product mix & placement & develop contg plans for the period.

② Demand + Supply Management

Forecast:

- the consumer demand for the retailer (point of sale)
- order and shipment requirements for the manufacturer over the planning horizon.

③ Execution

- Place orders
- prepare + deliver shipments
- receive + stock prod(s) on retailer shelves
- record sales transactions
- make payments

④ Analysis.

- monitor planning + execution activ(s) for exception conditions
- aggregate the results + calculate key performance metrics
- share insights + adjust plans for continuously improved results.

COLLABORATIVE PLANNING, FORECASTING, AND REPLENISHMENT. (CPFR)

Definition

= a set of business processes that entities in a Supply Chain can use for collaboration on a number of retailer/manufacturer functions towards overall efficiency in a supply chain.

Benefits of CPFR.

- Strengthens partner relationships
- Allows collaboration on future requirements & plans.
- Uses joint planning + promotions management.
- Integrates planning, forecasting and logistics activities.
- Manages the demand chain & proactively eliminates problems before they appear.

Collaboration Tasks.

Task 1 : Collaboration arrangement
Task 2 : Joint Business Plan
Task 3 : Sales Forecasting
Task 4 : Order Planning/Forecasting
Task 5 : Order Generation
Task 6 : Order Fulfillment
Task 7 : Exception Management
Task 8 : Performance Assessment.

COLLABORATIVE PLANNING, FORECASTING AND REPLACEMENT

CPFR performance improvement steps.

1. Seek long-term, holistic solutions (not) quick / myopic fixes.
2. Reconcile conflicting goals & metrics
3. Pursue inclusive problem solving
   do not depend upon "experts" who don't have accountability to the business
4. Instill collaborative processes that encourage idea creation, shared problem solving & high adoption rates (across) organizational boundaries
5. Use a disciplined and iterative set of methodologies such as CPFR, SCOR or Six Sigma to help define issues, root causes & solutions
6. Develop a culture of continuous improvement, particularly @ the customer-facing level (because) those ~~at the~~ employees are most likely 2 know what's needed.
7. Create clear accountabilities + assign authority with a focus on core business processes (rather) than on traditional organisational "silos" or loyalties.
8. Commit to technology enablement for execution, communication, exception management and root-cause analysis
9. Reduce decision cycle times
10. Implement rapidly

COLLABORATIVE, PLANNING, FORECASTING AND REPLACEMENT.

Challenges facing CPFR implementation.

Difficulty of making internal changes, cost and trust

Comp(s) need to ~~educate~~ educate their employees on the benefits of the process changes + the disadvantages of maintaining the status quo

Comp(s) are @ a competitive disadvantage ~~if they do not~~ because non comp(s) implement CPFR

= a big hurdle to widespread CPFR implementation because many retailers are reluctant to share the type of proprietary info required by CPFR.