DEMAND FORECASTING

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INTRODUCTION

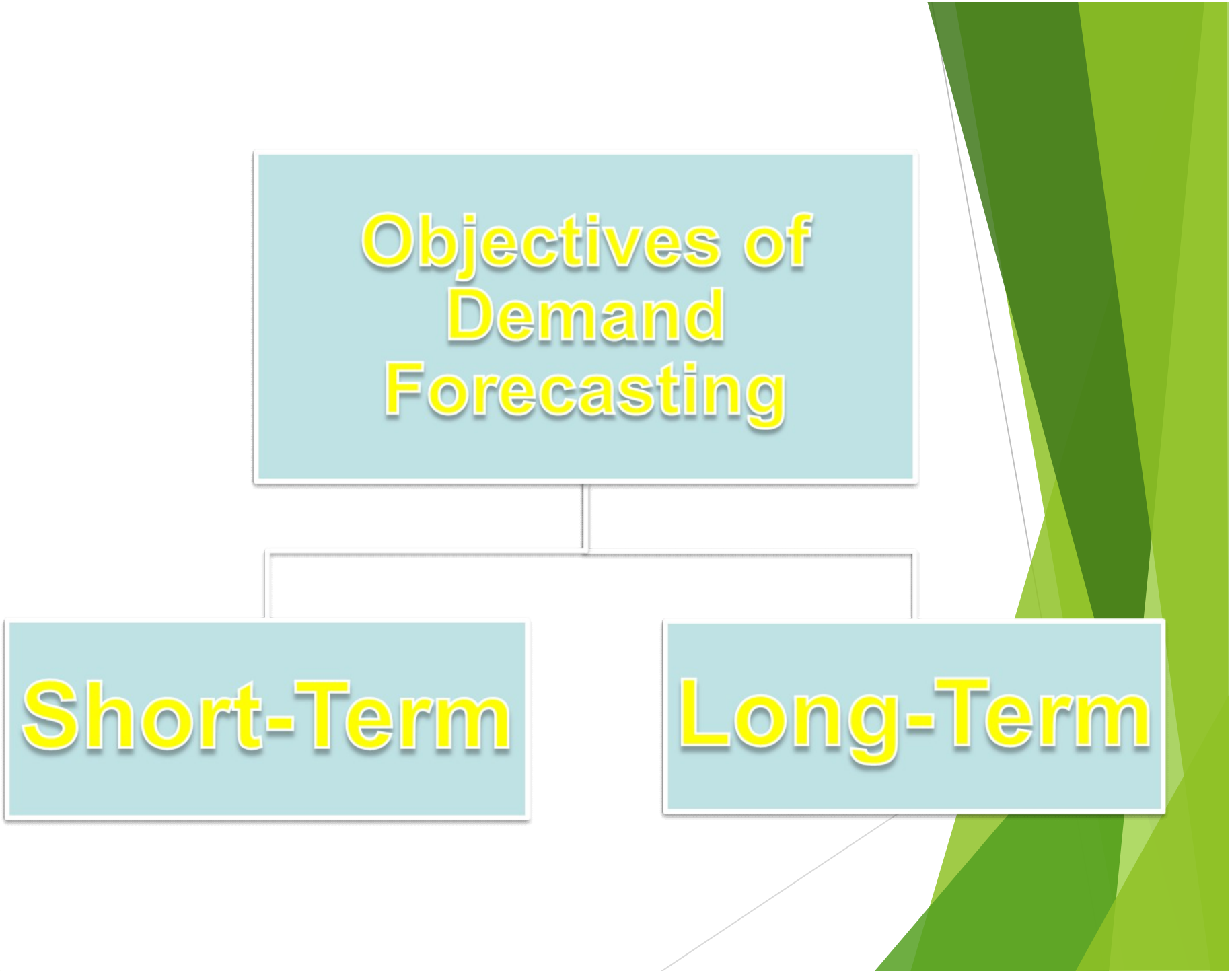
- Our life is full of uncertainties and so is the business. Changes are even seen in the behaviour of consumer depending on his tastes and preferences over time .
- In short all calculations and speculations of a firm regarding the details of his product depends on demand.

MEANING

- A forecast is a guess or anticipation or a prediction about any event which is likely to happen in the future.

- For example : An individual may forecast his job prospects, a consumer may forecast an increase in his income and therefore purchases, similarly a firm may forecast the sales of its product.

- ***Demand Forecasting means predicting or estimating the future demand for a firm's product or products.***
- Important aid in effective and efficient planning.
- It is backbone of any business

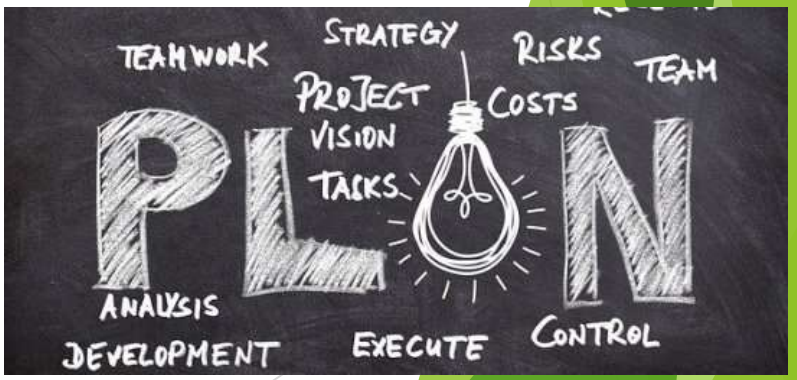

Objectives of Demand Forecasting
Short-Term
Long-Term

The short term objectives are as follows :

1. **Formulation of Production policy** : helps to overcome the problem of over production and under production.
2. **Regular Availability of Labour** : helps to properly arrange skilled and unskilled labour.
3. **Regular supply of Raw Material** : helps in predicting requirement of raw material in future .
4. **Arrangement of funds** : enables to estimate the financial requirements .

Here are a few examples of short-term business goals:

- Increase product prices by 3% over the next three months.
- Hire three new marketing employees over the next five months.
- Implement monthly giveaways for customers on social media.
- Begin an "Employee of the Month" award program.
- Create a profile on a new social media channel.
- Increase social media posting to three times a week.



If the period of forecasting is more than one year then it is termed as **long term forecasting** .

- The long term objectives are as follows :

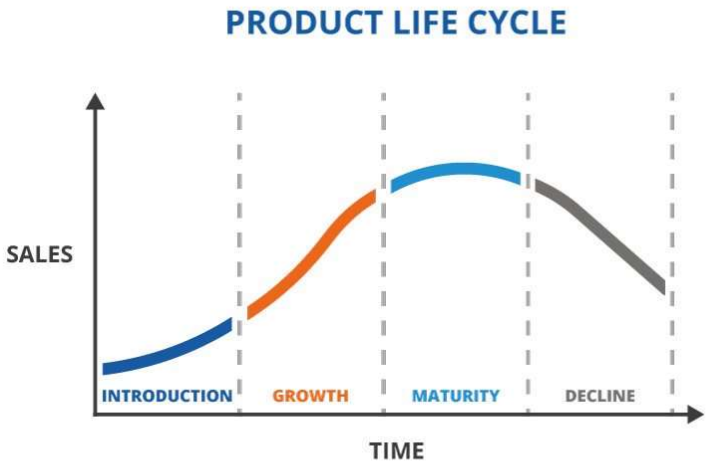
1. **Labour requirements** : helps in arranging skilled labour .
2. **Arrangement of funds** : enables to arrange long term finances on reasonable conditions.
3. **To decide about Expansion** :enables to plan for a new project as well as expansion and modernisation of existing unit .

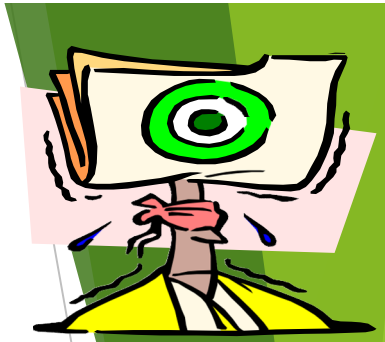
NEED AND SIGNIFICANCE

- It is necessary to forecast demand in buisness because :

1. **Effective planning** : provides scientific and reliable basis for anticipating future operations
2. **Reduction of uncertainty** : aims at reducing the area of uncertainty that surrounds mangerial decision making with respect to costs , production, sales , profit etc .
3. **Investment decision** : investments are made keeping in mind the the returns and returns depend on market demand.
4. **Resource allocation** : efficient allocation of resources when future estimates are available .

5. **Competitive strategy :** the level of demand for a product will influence decisions , which the firm will take regarding the non-price factors .
6. **Managerial control** : forecasting discloses the areas where control is lacking . It is must in order to control costs of production .





Step 5 estimating future events

Step 4 Gather and analyze data

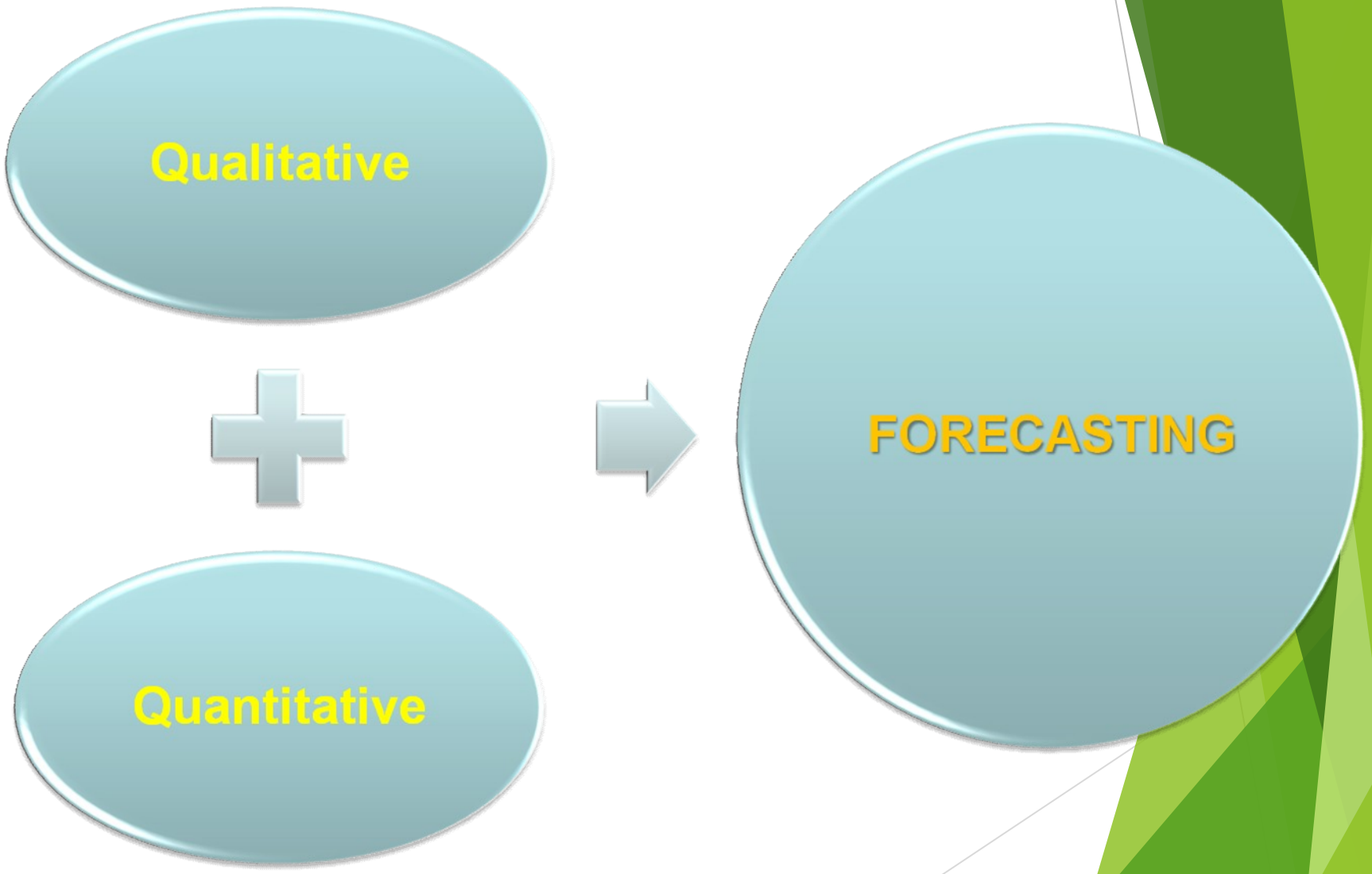
Step 3 Select a forecasting technique

Step 2 Selection of products

Step 1 Determine purpose of forecast

SO ,WE KNOW WHAT IT'S ALL ABOUT!!!

NOW LETS ANALYSE THE METHODS OF DEMAND FORECASTING.


Qualitative
Quantitative
FORECASTING

QUALITATIVE TECHNIQUES

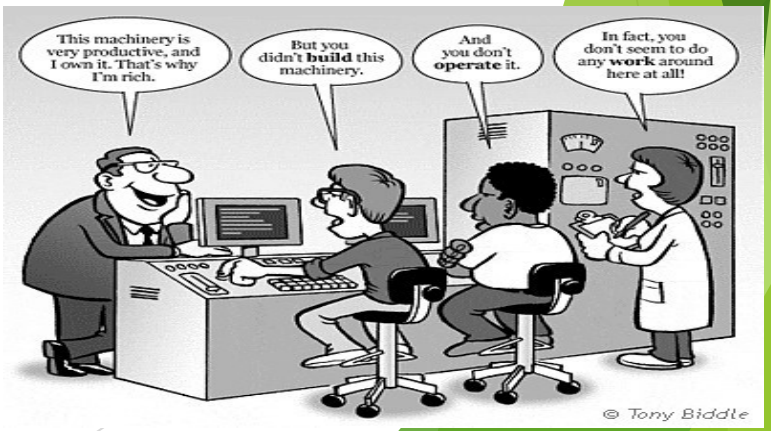
They mainly employ human judgement to predict future events .

This involves :

1) Expert opinion methods
2) Survey methods :
   a. Sample survey
   b. Sales force opinion

Kindly learn to elaborate on the methods. Also learn the advantages and disadvantages.

- ***Expert Opinion Method :*** **This technique of forecasting demand seeks the views of experts on the likely level of demand in the future**. They have a rich experience of the behaviour of demand.
- If the forecasting is based on the opinion of several experts, then it is known **panel consensus.**
- A specialized form of panel opinion is the **Delphi Method**. This method seeks the opinion of a group of experts through mail about the expected level of demand.
- **The responses so received are analyzed by an independent body.**



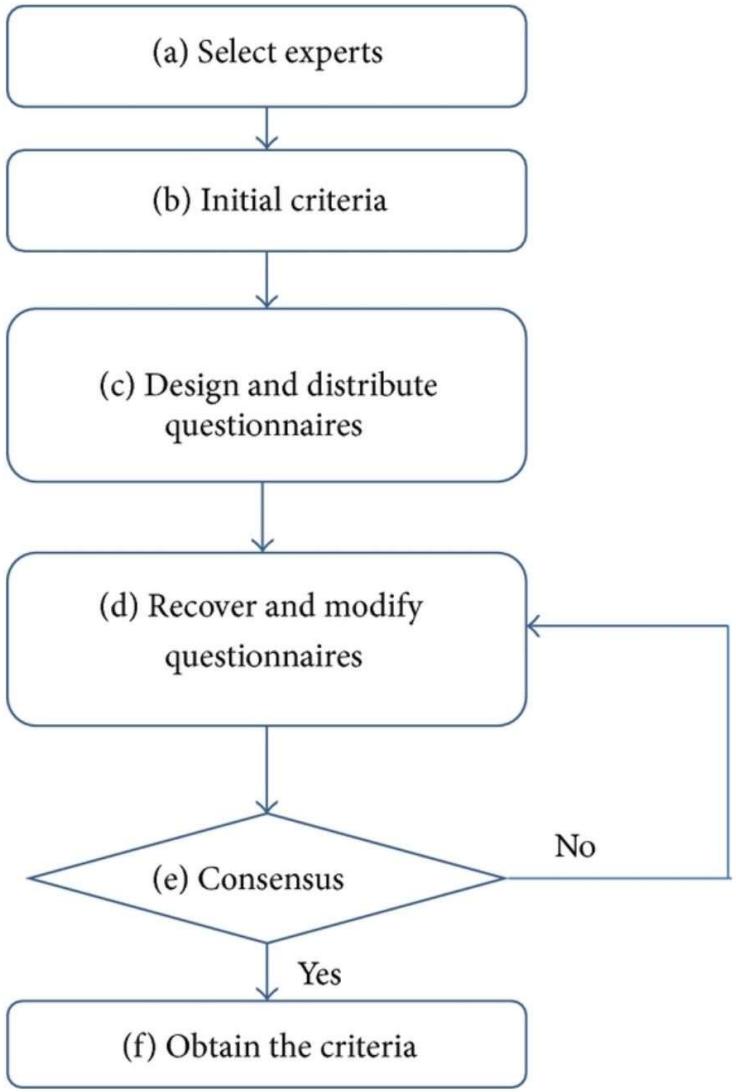


Figure 2: Delphi method operation flowchart.

- ***Survey Methods :***

Consumers Sample Survey :

- Only a few consumers are selected and their views on the probable demand are collected.
- The sample is considered to be a true representation of the entire population.
- This method is simple and cheaper.
- The results of survey can be obtained quickly and results are good.

Restaurant Survey

Please help us learn what we're doing right and what we need more work on by filling out this card

How many in your party? _____ Date _____

☐ Dine in ☐ Take out ☐ Breakfast ☐ Lunch ☐ Dinner

The name of your server: _____

What did you order? _____

_____

_____

Quality of food:	☐ Excellent	☐ Good	☐ Fair	☐ Poor
Portion size:	☐ Excellent	☐ Good	☐ Fair	☐ Poor
Ease of Ordering:	☐ Excellent	☐ Good	☐ Fair	☐ Poor
Service:	☐ Excellent	☐ Good	☐ Fair	☐ Poor
Cleanliness:	☐ Excellent	☐ Good	☐ Fair	☐ Poor
Overall Value:	☐ Excellent	☐ Good	☐ Fair	☐ Poor

Comments? _____

_____

_____

Age? ☐ Under 18 ☐ 19-34 ☐ 35-54 ☐ 55+ ☐ Male ☐ Female

How did you learn about us?

☐ Newspaper ☐ TV ☐ Radio ☐ Friend ☐ Other: _____

Sales Force Opinion Survey :

- In this method sales persons are expected to estimate expected sales in their respective territories.
- The sales force, which has been selling the product to wholesalers / retailers / consumers over a period of time, is considered to know the product and the demand pattern very well.
- This method is based on the first hand knowledge of the salesman.
- It is useful to forecast the sales of new products.

QUANTATIVE TECHNIQUES

- This method involves various statistical tools to data for predicting future events.
- Involves the prediction of activity of particular firms, branded products, commodities, markets, and industries.
- They are much more reliable.

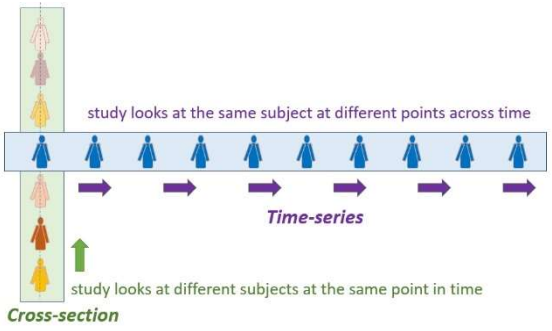
1. TIME – SERIES ANALYSIS

- This analysis is a statistical technique that deals with time series data.
- Time series data are a sequence of observation.

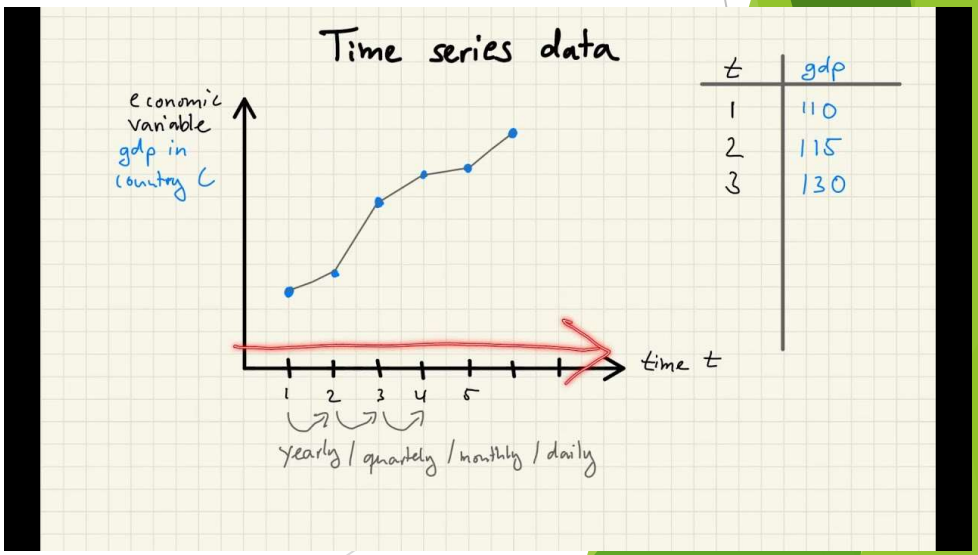
a) Trend (T) :

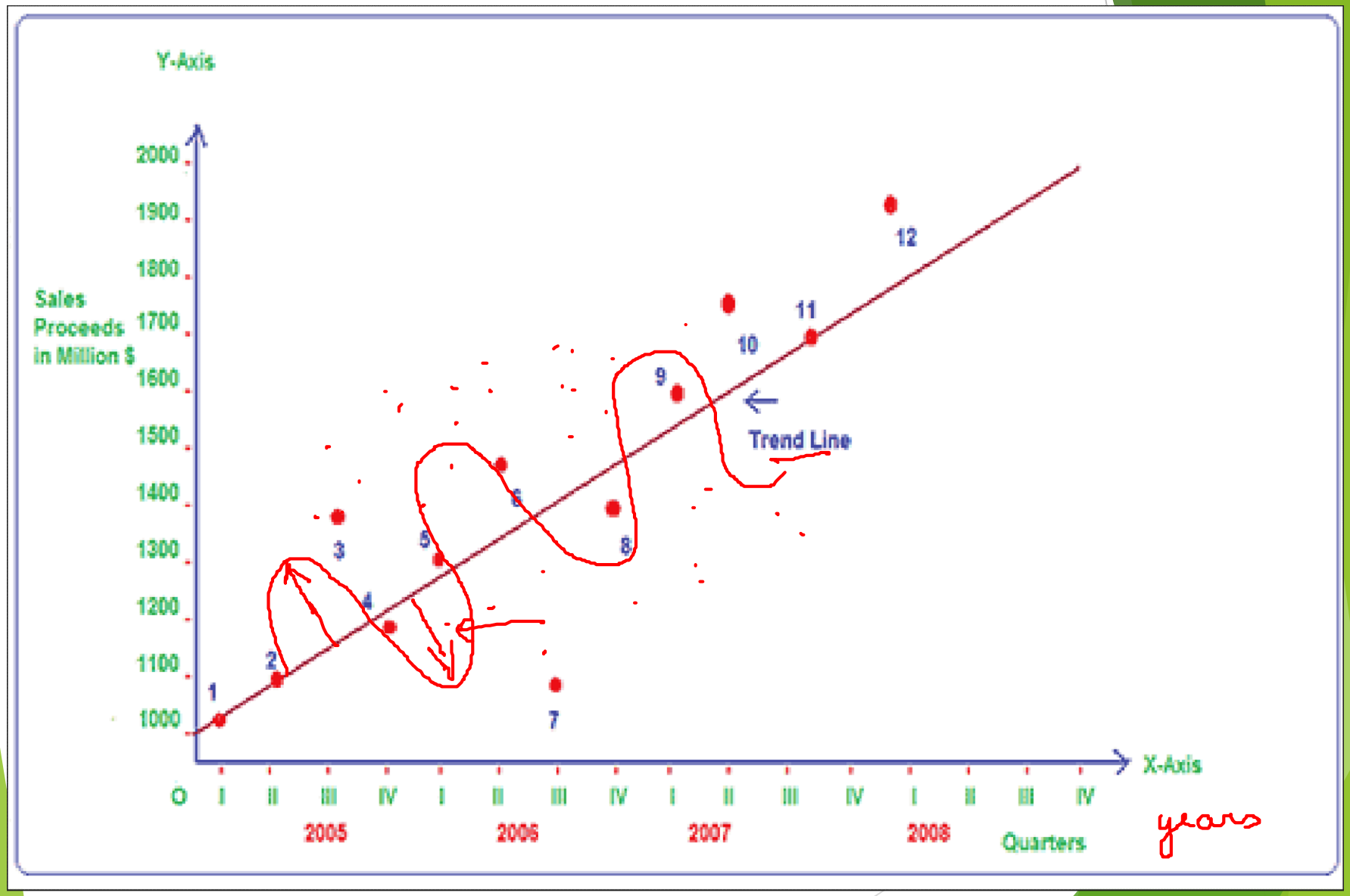
- This method is used when a detailed estimate has to be made.
- Time plays an important role in this method .

This technique assumes that whatever has been the pattern of demand in the past, will continue to hold good in the future as well.



- In this method data is arranged chronologically which yields a ‘time series’.
- The time series represent the past pattern of effective demand for a particular product and is used to project the trend of the time series.




Y-Axis
Sales Proceeds in Million $
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
1
2
3
4
5
6
7
8
9
10
11
12
Trend Line
X-Axis
O
I
II
III
IV
2005
2006
2007
2008
Quarters
years

b) Cyclical fluctuations :

- These are oscillating patterns of increase or decrease around the trend
- No fixed pattern
- Long-term

c) Seasonal Variations :

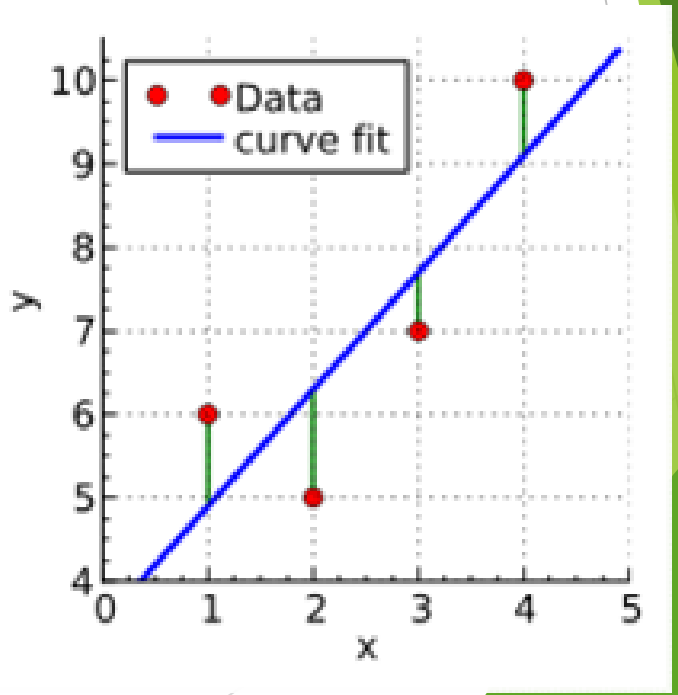
- These occur with some degree of regularity in a span of one year and is annually repetitive.
- Fixed pattern
- Short-term

2. REGRESSION METHOD

- Linear regression analysis establishes a relationship between a dependent variable and one or more independent variables.
- In simple linear regression analysis there is only one independent variable.
- If the data is a time series, the independent variable is the time period.
- The dependent variable is whatever we wish to forecast.

Least Square Method :

- It is a mathematical procedure for fitting a line to a set of observed data points in a manner that the sum of the squared differences between the calculated and observed value is minimised.



- Y= a + b x

- Where
  - Y- value to be determined
  - X – value used to determine ‘Y’
  - a – intercept on the Y-axis (value of Y when X=0)
  - b – slope of the line

$$a = \overline{Y} - b\overline{X}$$

where

$$\overline{x} = \frac{\Sigma x}{n} = \text{mean of the } x \text{ data}$$

$$\overline{y} = \frac{\Sigma y}{n} = \text{mean of the } y \text{ data}$$

$$b = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

- n – number of observations

Problem 1.

Given below is the cost and the corresponding output. What will be the cost to company to produce an output of 30 units? Use the regression analysis method.

Cost (Rs.)	Output (in units)
100	0
150	5
160	8
240	10
230	15
370	23
410	25

Problem 2.

Y	X
240	120
180	200
250	100
201	180
110	280
245	90
175	190
95	300

3. EXPONENTIAL SMOOTHING METHOD

Exponential smoothing *is a forecasting technique that can be applied to time series, either to produce smoothed data or to make forecasts.*

This method assigns exponentially decreasing weights as the observation get older.

The procedure gives heaviest weight to more recent information and smaller weights to observations in the more distant past.

The reason for this is that the future is more dependent upon the recent past than on the distant past.

Forecast based on exponential smoothing is calculated by the formula:

$$\hat{y}_{ES} = \alpha \cdot y_{t-1} + (1-\alpha) \cdot \hat{y}_{t-1},$$

where $\hat{y}_{ES}$ - is the forecast based on exponential smoothing for the next period t;

α (alpha) - is the smoothing factor between 0 and 1 ($0<\alpha\leq 1$);

Smoothing factor is the factor used to smooth or filter the data from the most recent period.

y_{t-1} - is the actual data for the period before current time period t (i.e. actual value of the time-series for the previous period (i.e. statistical data);

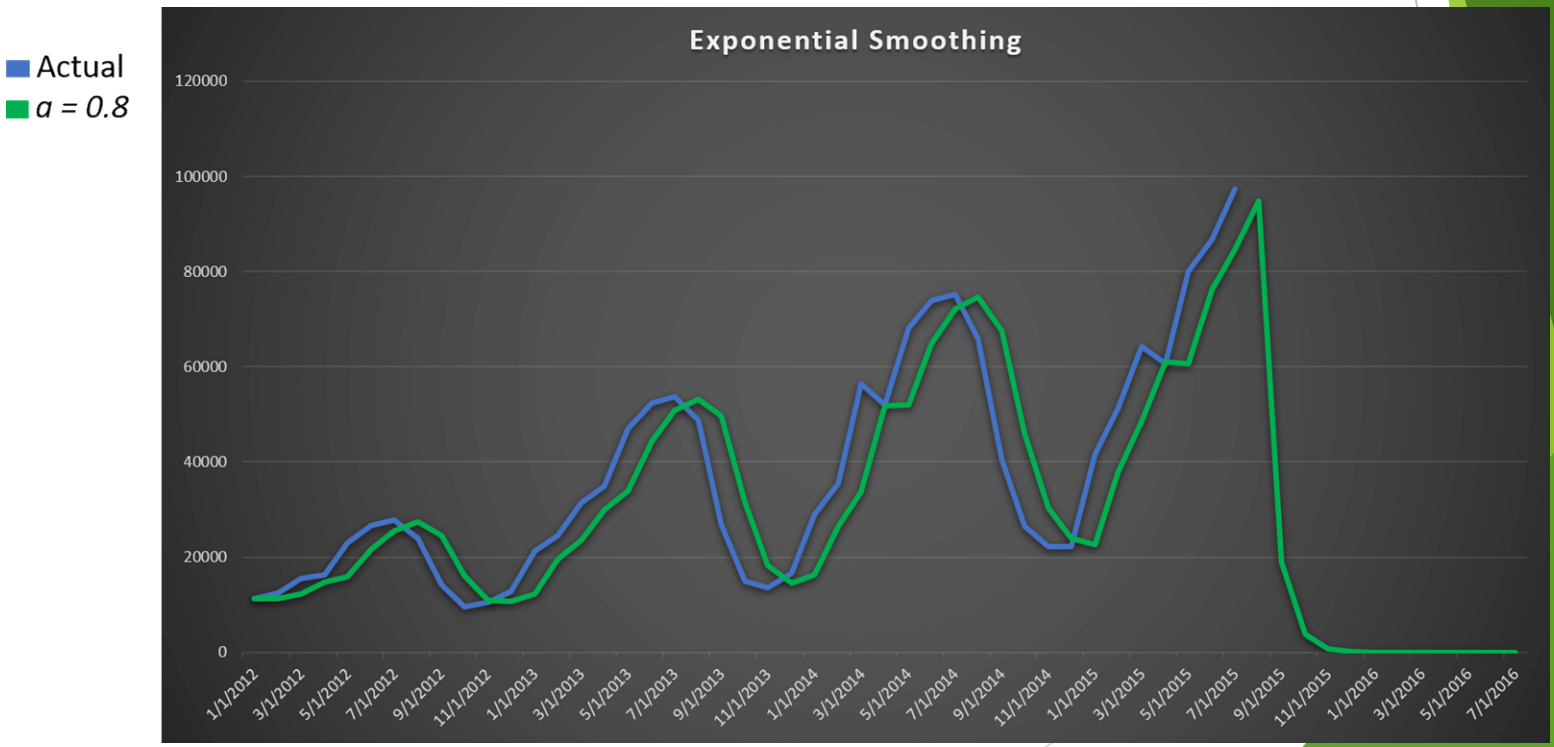
$\hat{y}_{t-1}$ - is the forecast for the period before current time period t (i.e smoothed forecast made for the previous period). How *initial smoothed forecast* you need to use the *first value of time series*.

The value of smoothing factor α determines the degree of smoothing and how responsive the model is to fluctuation in the time-series data.

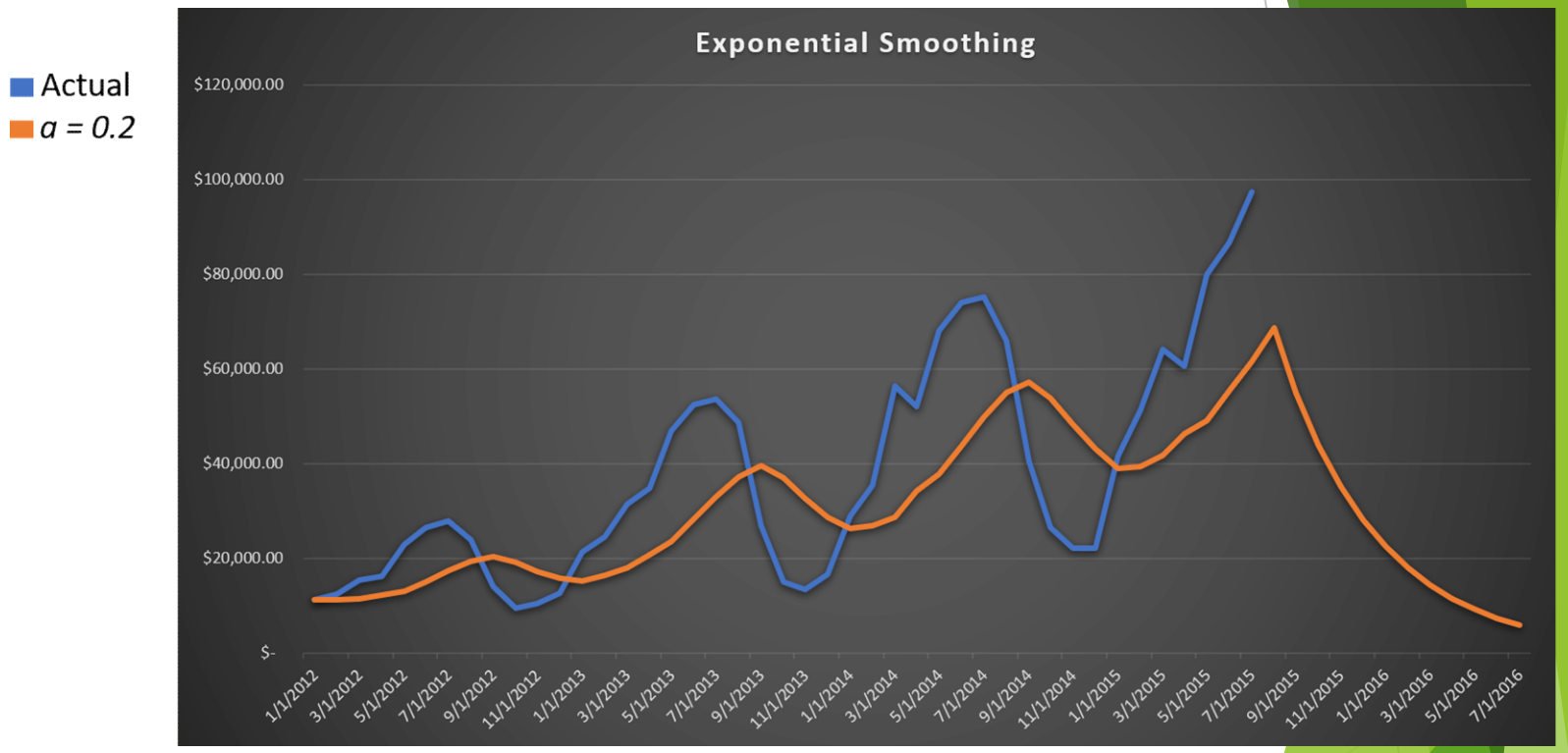
Smoothing factor close to 0 means small influence of past data (adaptability to most recent data).

Smoothing factor close to 1 means large influence of past data (rigidity of forecast).

- The best way to identify your smoothing constant is by understand the difference between a high decimal and low decimal. The smoothing constant is going to be a number between 0 and 1.
- The higher a smoothing constant, the more sensitive your demand forecast. This means you will see large spikes of data. This is what a smoothing constant of 0.8 would look like with our data:



- The lower a smoothing constant, the less sensitive the forecast and thus the less spikes in demand the forecast will have. This is what a smoothing constant of 0.2 would look like with our data:



Knowing what smoothing constant to use is an important part of demand planning. You need to know your company, know your products, and know your inventory.

Exponential Smoothing Formula:

$$F_t = \alpha A_{t-1} + (1 - \alpha)F_{t-1}$$

Where:

- F_t is the forecast demand for week t
- α is the smoothing constant
- A_{t-1} is the previous period's actual demand
- F_{t-1} is the previous period's forecast demand


THANK
YOU