

# Bass Diffusion Analysis for OLED display phones

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## Bass Diffusion Model Terminology

Some of the terms used in the model are:

**N(t):** Total or cumulative number of consumers who have already adopted the new product through period t.

**N(t-1):** Cumulative number of adopters for the new product through the previous time period (i.e., t - 1).

**S(t):** Number of new adopters for the product during the time period t and can be expressed as  $N(t) - N(t - 1)$ .

Three key parameters used in the Bass Diffusion Model are:

**m:** Total market size, a terminal value of total adopters that will not exceed.

**p:** Coefficient of innovation, represents the probability that an innovator will adopt at time t.

**q:** Coefficient of imitation, represents the probability that an imitator will adopt at time t, through *word of mouth* or *social contagion* that result from interpersonal communications between adopters and non-adopters.

Some of the formulas used are:

$$S(t) = a + b * N(t-1) + c (N(t-1))^2$$

Parameters a, b, and c are estimated via Non-Linear regression or using any other statistical software package,

The parameters m, p, and q are then determined by:

$$m = (-b \pm (b^2 - 4ac)^{1/2}) / 2c$$

$$p = a/m$$

$$q = -mc$$

## Bass Model Equations:

### Basic equation of Bass Model:

$$S(t) = [p + (q/m) N(t - 1)] [m - N(t - 1)]$$

### Incorporating Marketing Mix variables:

$$S(t) = [p + (q/m) N(t - 1)] [m - N(t - 1)] * Z(t)$$

$$\text{where } Z(t) = 1 + \alpha [P(t) - P(t - 1)] / P(t - 1)$$

- $\alpha$  is a coefficient that indicates the percentage increase in the speed of diffusion that results from a 1% decrease in price
- $P(t)$  - price in period  $t$

Adoption curve for new product are generally called S-curves because of their shape.

## OLED Mobile Phone projections based on Analogous Products

### Estimation of Parameters

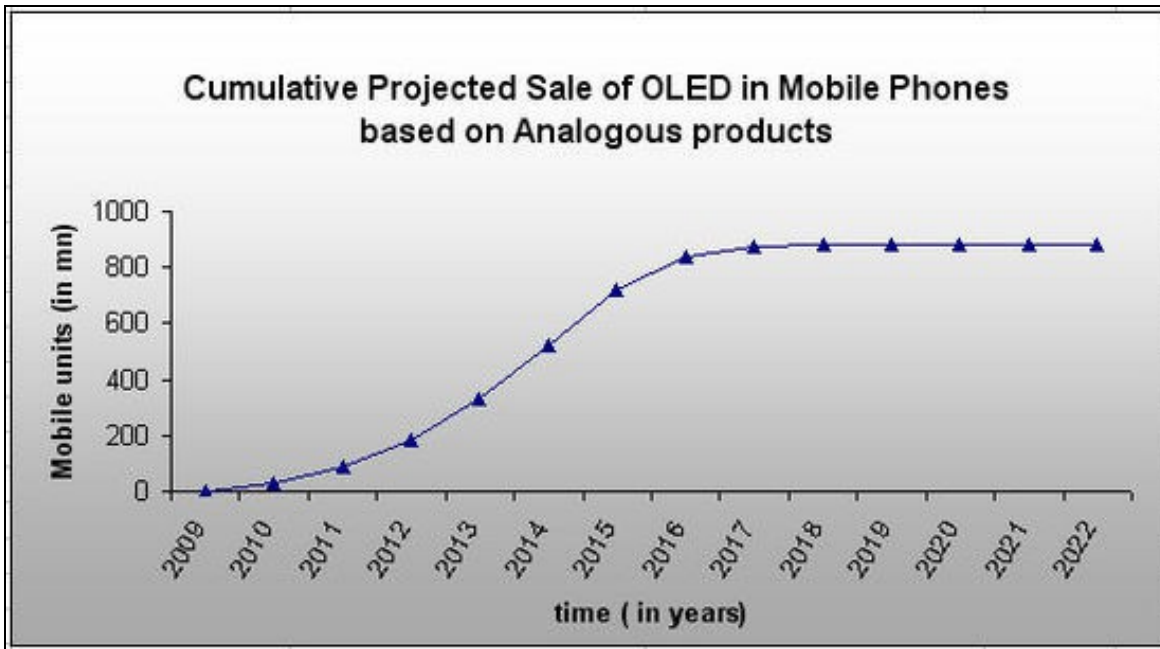
#### LCD TV

1. The historical sales data from 2002 to 2008 was obtained from secondary sources
2. The cumulative sales till last year for each year,  $N(t-1)$  was calculated
3. **Non-linear regression** was run to determine **a**, **b** and **c**
4. **m**, **p** and **q** values were calculated from the values of **a**, **b** and **c** by putting them in the aforementioned formulae

The same procedure was followed for Plasma Display TVs and LCD Monitors.

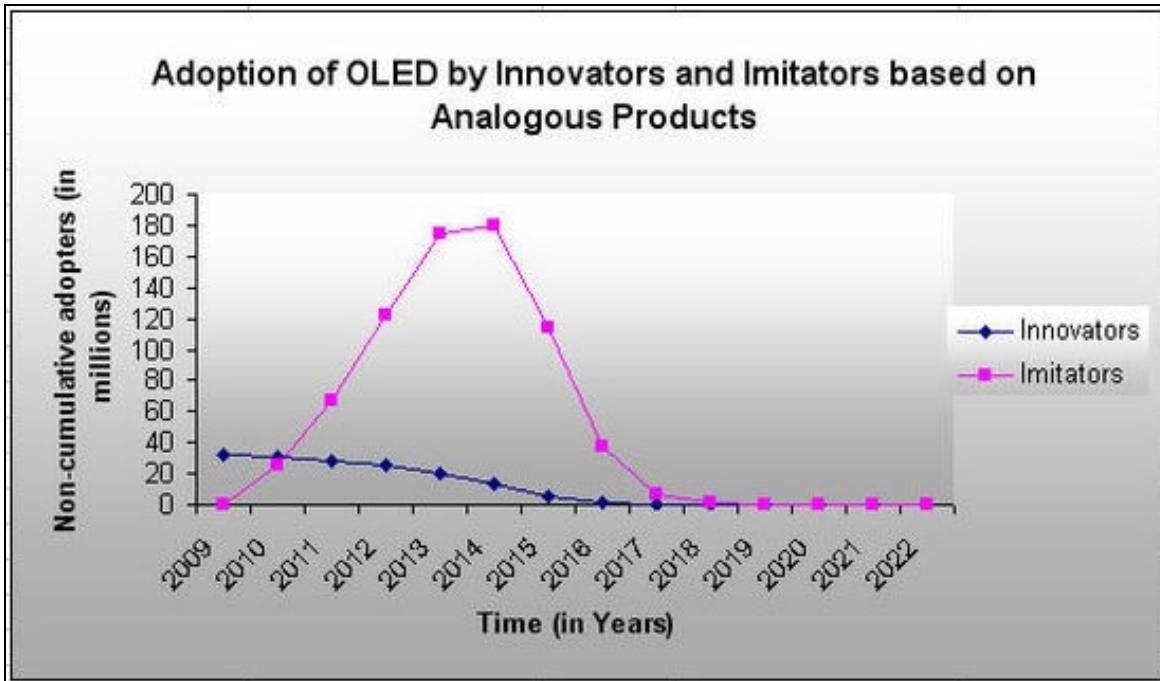
### Procedure for forecasting

1. Weighted **p** and **q** were calculated based on the analogous products such as LCD TVs, Plasma Display TVs and LCD monitors.
  - i. To judge the similarity of analogous products to OLED, the following two criteria were examined:
    - a. Market Structure
    - b. Product Characteristics
  - ii. Depending on the importance of the criteria, weights were assigned: 0.4 for Market Structure and 0.6 for Product Characteristics
  - iii. Based on the similarity of the analogous products numerical weights were assigned to them on a scale of 1 to 10 for each criterion.
  - iv. Weighted average for **p** and **q** were calculated based on the **p** and **q** values of analogous products and the corresponding weights assigned to them <<excel sheet with calculations>>
2. Market potential of OLED phones was taken as the **m** value of smart-phones segment, which is 884.07 million <<excel sheet with calculations>>
3. Then forecasted the adoption rate of OLED display phones using the basic equation of the Bass Model <<excel sheet with calculations>>



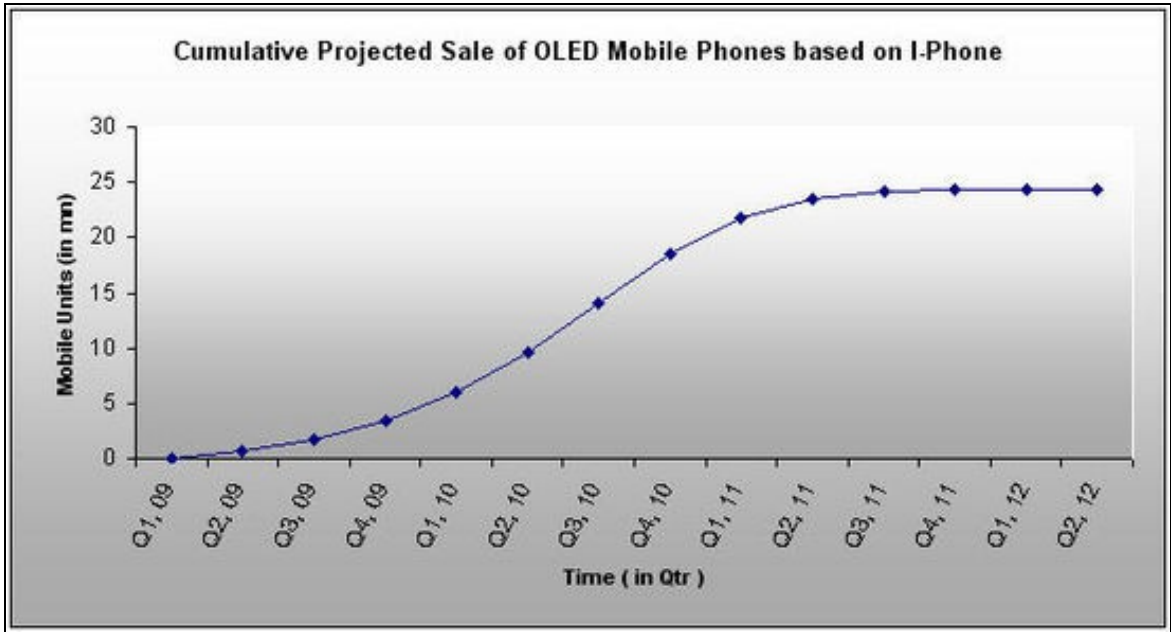
**Comparison of Adoption rate of Innovators with those of Imitators**

- ◇ Sales to innovators and imitators for each year was determined based on the values of **p, q** and **m**
- ◇ **m** for each year was taken as **m-N(t-1)** - it represents the number of consumers who have not previously adopted by the start of time *t*, this is the pool from which the new adoptions in the current period can occur <<excel sheet with calculations>>



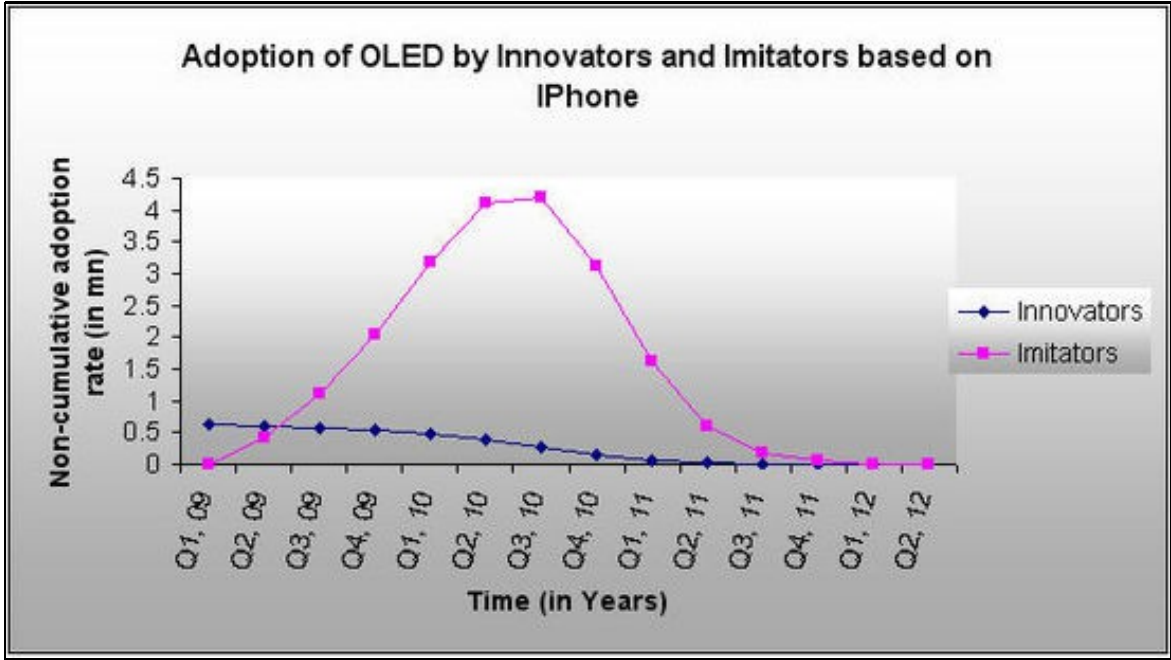
**OLED Mobile Phone Projections Based on I-Phone**

1. **p, q** and **m** values are calculated for I-Phone from historical data
2. Forecast of the cumulative sales or adoption rate of OLED display mobile phones was done based on the **p, q** and **m** values <<excel sheet with calculations>>



#### Comparison of Adoption rate of Innovators with those of Imitators

- ◊ Sales to innovators and imitators for each year was determined based on the values of  $p$ ,  $q$  and  $m$
- ◊  $m$  for each year was taken as  $m - N(t-1)$  - it represents the number of consumers who have not previously adopted by the start of time  $t$ , this is the pool from which the new adoptions in the current period can occur <<excel sheet with calculations>>



#### Comparing projections

Since disparate product categories had been used for the two forecasts, the two were compared to cross validate the results <<excel sheet with calculations>>

Cumulative Sales Forecast of OLED Screen Mobile Phones

