LIFE-CYCLE APPROACH TO NEW PRODUCT FORECASTING

By Jeffrey S. Morrison

Forecast of a new product can be made by establishing overall potential sales of a product, how long it will take to reach its half potential, and how long it will remain in the introductory stage ... describes in detail the process of making such a forecast ... the lower the pent-up demand, the slower will be the introduction phase.

Sometimes modeling the demand for a new product or service needs to account for phases of the product life cycle: Introduction, Growth, and Maturity. The **Introduction Phase** is often characterized by slower growth because not enough advertising budget is allocated, distribution channels are not well established and people who sell the product are not yet fully trained. It is also impacted by the amount of pent-up demand already existing in the market. Other things being equal, the lower the pent-up demand, the slower will be the introduction phase. The **Growth Phase** reflects the highest rate of consumer acceptance where the product is being purchased at its most rapid pace. The **Maturity Phase** implies that the market saturation level for the product has been reached and most potential buyers have already purchased. These phases of the product life cycle can generate an S-shaped market diffusion over time. Here we will describe how to use the life-cycle approach to new product forecasting when there is no historical data.

When a truly new product is introduced, there exists no historical data. Standard time series and regression models are impossible to use under these conditions. As a result, the forecast process is typically ad-hoc and distorted by a lack of consensus among individuals generating the forecasts. Penetration levels may vary across geographic regions simply because the primary assumptions have not been adequately identified and standardized. Forecasts, using the life-cycle approach, can be prepared by answering three basic questions:

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1. What is the maximum level of saturation?
2. What is the inflection point or half life of the product?
3. What is the delay factor (time spent in Introduction)?

The Maximum Level of Saturation: is the maximum number of units your firm can sell of a product at some distant point in time. This kind of information can usually be obtained from intent to purchase surveys along with primary market research. It is simply the maximum number of units the market will bear for your company's product. For example, let's say your firm is marketing a new type of golf ball designed to travel 20% further than any ball on the market. Industry research shows that there are about 100,000 active players in your sales territory buying an average of three dozen golf balls a year. That puts the market demand for golf balls at 3,600,000. Your company sends out an intent to purchase survey. The result indicates that your new ball can capture 16.67% (about 600,000) of the overall market at some point in the future. If we assume no growth in the golf ball market, then the long run saturation level would be estimated at 600,000 balls per year or 50,000 per month. Chart 1 depicts how different long run saturation values change the shape of the S-curve.

The Inflection Point of Product: represents that point in time where the product is selling at its fastest rate. After this point, the rate begins to diminish and forms the second half of the S-curve. It is assumed at this point in time sales will reach exactly one-half of the long-run penetration level of the product. The lower the inflection point, the quicker the product is projected to reach half of its sales potential.

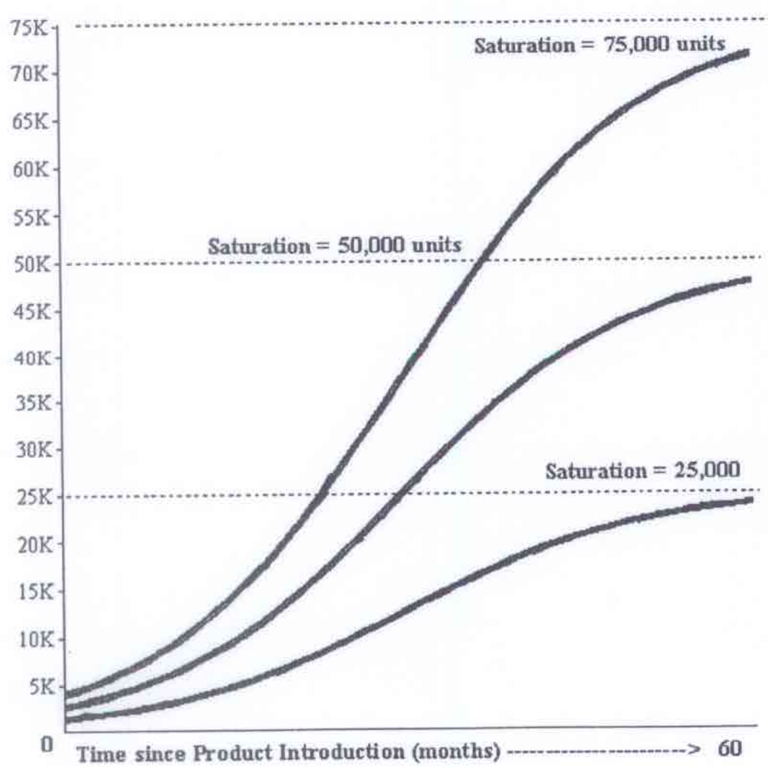
TABLE 1

FORECASTS BY MONTHS

Month	Forecast	Month	Forecast	Month	Forecast
1	2,607	13	7,723	25	18,877
2	2,866	14	8,399	26	20,065
3	3,148	15	9,121	27	21,277
4	3,456	16	9,890	28	22,508
5	3,792	17	10,708	29	23,751
6	4,158	18	11,573	30	25,000
7	4,556	19	12,486	31	26,248
8	4,987	20	13,447	32	27,491
9	5,454	21	14,452	33	28,722
10	5,960	22	15,501	34	29,934
11	6,505	23	16,590	35	31,122
12	7,092	24	17,717	36	32,282

Note: Above forecasts assume: S = 50,000, T = 1 ... 36, and A = .10.

CHART 1
THE LONG RUN SATURATION LEVEL



In our golf ball example, let's say the inflection point is expected at month 30 or exactly two and a half years after the product is introduced. This implies the level of sales at the end of month 30 will be 25,000 or one half the long run saturation level of 50,000. A greater inflection point of 40 implies that the 25,000 unit sales will not be reached until 40 months after the product is introduced. Likewise, an inflection point of 20 implies the half life of the product will be reached as soon as 20 months. Chart 2 shows how different inflection points change the shape of the S-curve and the half-life of the product.

The Delay Factor: is the most subjective assumption of the process. It describes how long the product is expected to remain in the Introductory phase of the product life cycle. This factor is not measured in months, but assumes a value usually between zero and one, depending on how soon the product is expected to reach its half-life. A factor closer to zero (.05) implies that there is a substantial amount of pent-up demand in the market. In other words, as soon as the product is introduced, immediate sales are anticipated. As shown in Chart 3, specifying a low delay factor (.05) causes sales to approach the saturation level at a slower rate towards the end of the product life cycle. Although not applicable in every circumstance, this slowdown toward the end of the life cycle could reflect that the bulk of the advertising budget was spent earlier during the introduction phase for competitive reasons. If such a slowdown appears unreasonable, a practical adjustment may be made by reducing the inflection point so that the saturation level is reached a little sooner. Motivations for assuming greater delay factors could come from cuts in corporate advertising budgets or restrictions in marketing or distribution channels. Chart 3 shows how different delay factors can change the shape of the product life cycle.

Under these conditions, forecast of a new product can be made by the following formula:

$$\text{New Product Forecast} = \frac{S}{1 + Be^{-AT}} \quad ...(1)$$

CHART 2
THE INFLECTION POINT

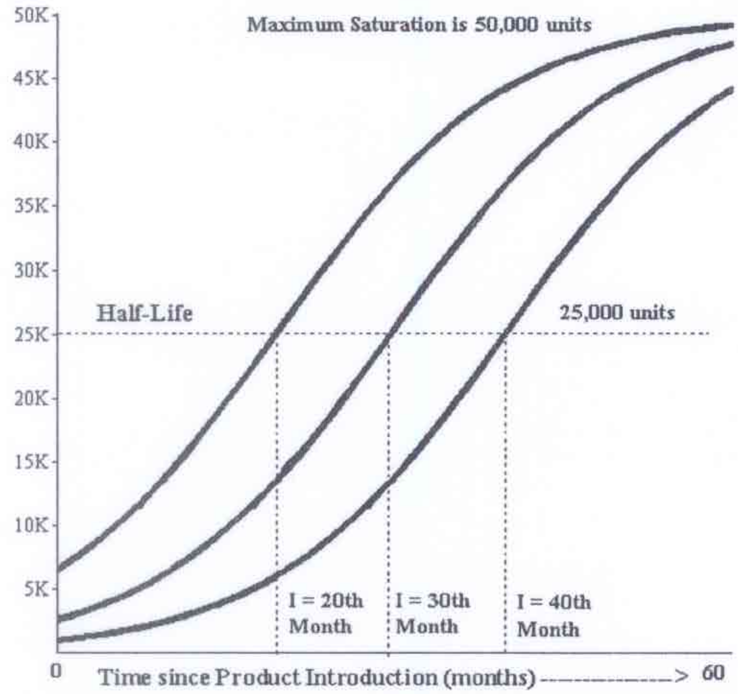
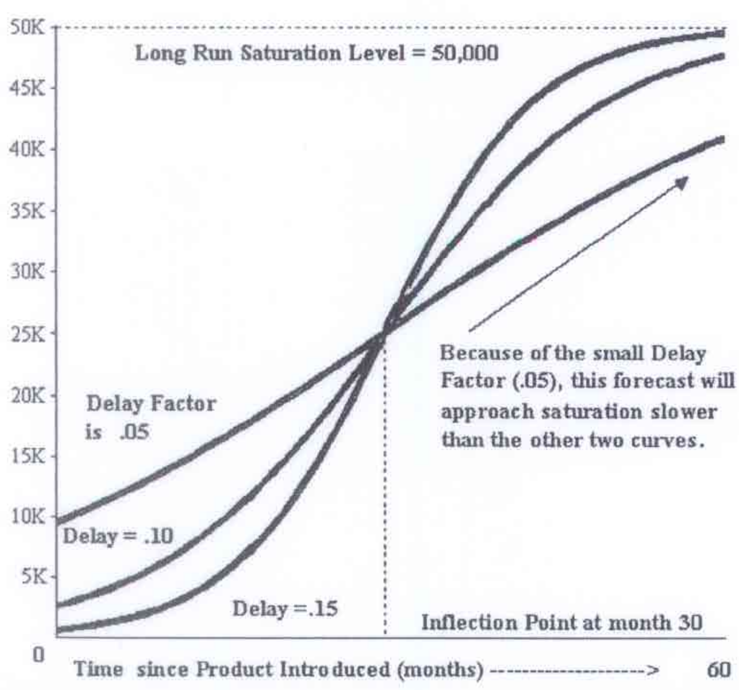


CHART 3
THE DELAY FACTOR



where,

- S = Long Run Saturation Level of the New Product
- T = Time Index (1,2,3,4,5,...)
- A = Delay Factor (0-1)
- I = Inflection Point (the point in time where 1/2 of the saturation is reached)
- $B = e^{IA}$ (where e = 2.718282)

In practice, the planner might want to place the forecast equation in a spreadsheet that spans the entire forecast horizon with cell references to the three key primary variables. Next, values for the maximum saturation level and the point of inflection could be specified. Since the Delay factor is less concrete, repeated graphical evaluations could be made to determine the range of values best reflecting what might occur when the product is first introduced. Let us say:

$S = 50{,}000$
$T = 1$ (month 1 forecast)
$A = .1$
$I = 30$ months

Then B will be:

$B = e^{IA}$
$B = 2.718282^{(30)(.1)}$
$B = 20.09$

By plugging the above values in equation (1), we get:

$$\text{Forecast (Month 1)} = \frac{50{,}000}{1 + 20.09 \times 2.718282^{-(.1)(1)}}$$

Forecast (Month 1) = 2,607 units

Similarly, we can compute the forecasts of other months. Table 1 gives the forecasts of 36 months with the same assumptions.

Lotus based template is available for $10 where one can prepare forecasts of 120 months by plugging the three values: (1) Input 1, maximum penetration level (S); (2) input 2, inflection time period (I); and (3) input 3, delay factor (A). ■