A PERSPECTIVE MODEL FOR HI-TECH MARKETING IN FORECASTING OPTIMAL LAUNCHING TIME

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ABSTRACT

Keen market competition made PLM, the most critical issue of hi-tech industries. As a mater of fact, almost of the emerging hi-tech companies such as information technology, semiconductor, photo-electronics and aerospace industries are sensitive to PLM issues. Obviously, their operations are sensitive to timing strategy in corresponding to stages transition to lead to a precise control over PLM. The primary concern of this study is to analyze the relationship between timing strategy and each stage of product life cycle, and then develop an analytical model to identify the optimal timing against stages transition leads to a methodology to form this model in timing aspects. This proactive model is verified by an illustrative example.

Keywords: Perspective Model, PLM, Stage Transition; Hi-Tech Marketing

I. INTRODUCTION

The origin concept of PLC can be traced back to earlier 1950 by Dean, j. (1950), while discussing the price policies for new products. He realized that product life cycle just like human being who starting from infant, child, adult and ended in old age. Likewise, the pricing policies depend upon the stages variations of PLC.

Rogers (1962) proposed that the product life cycle coming from the diffusion and adoption theories which is the process by which an innovation is communicated through certain channels over time among the members of social system.

Rink & Swan (1979) assessed that the PLC can be categorized into four stages as bellowed:

1. Introduction stage
2. Growth stage
3. Maturity stage
4. Decline stage

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Please refer to Figure1, the four stages model is the most popular one till now. In practice, this model simplify the real cases then conceptualize the actual situations into some acceptable interpretations for managers to grasp the dynamic marketing situations then lead to a sound decision-making.

PLC is a critical issue for managers to take serious considerations. How to control the price-setting and choice of timing to launch a new product are the most important topics for companies to handle with.

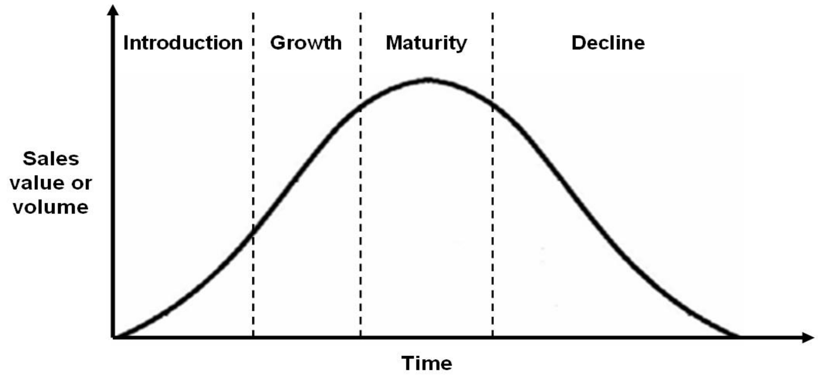

Figure 1：stages of product life cycle

Day (1981), Harrell and Taylor (1981), (1988) and Bass (1995) realized that the PLC offered a solid foundation both in theory and practice. The rigid definitions and concept is helpful for the real applications of enterprises.

Clifford (1977) pointed that PLC is essential to enterprises under situational principles; the different strategies should be considered in the different stages of PLC then it yields the greatest benefits.

PLM is sensitive to various operations of modern enterprises no matter what in manufacturing or service industry. These major tasks included productivity, R&D capability, HRM, financial management, marketing management and so forth. Sometimes, those tasks were called “core competencies”.

Actually, the marketing management initiated the operations of most companies; marketing decided the revenue and profit then production activities considered then HRM and financial activities are settled.

A sound PLM is coming from the precise control over both of timing of launching a new product (or phase-out of on-going product) and actual pricing strategy. The marketing status is dynamic and critical to operations which leaded to the success or failure of the company. In practice, most companies needed a proactive tool to control the PLM to certain preset level to avoid the operation risk.

Presently, even the big companies from both UK and U.S, they do not set any alert mechanism to PLM in routine operations. Some studies from G. (1994) and J. Saunders D. Jobber (1994) offered the evident results to support the mentioned argument. For this reason, an analytical model to handle the PLM issues is advantageous and necessary.

This research focuses on the development of an analytical model to handle the pricing issue and enables the pricing strategy under most advantageous status.

II. FORMULATION OF MODEL

As to the formulation of the mentioned model, the figure-3 of the product life cycle of product combination is introduced first to identify the interpretations of the analytical model.

Please refer to Figure2, as it shows, the left hand-sided curve represented the cycle of the on-going product which is going through its fixed routine. The right hand-sided curve is a new product life cycle which is in searching of the best timing to launch the market to maximize overall profit.

Before constructing this model, some assumptions should be clarified as follows:

The product life cycle fully comply with normal distribution; a typical normal distribution.

Both of the starting and ending side intersect the time axis instead of approaching.

As to Figure2, let’s consider the algorithm of this curve of combinations to form the framework of this working model.

Obviously, the total revenue can be derived by the multiplication of each price in corresponding to its sales quantity. And each sales quantity can be calculated by the integration of each part under the curve. Actually, the total sales amount is the sum of the total integration of all parts under the curve.

As to the pricing strategy issues, some of them should be considered in advance. Those issues included some marketing strategies such as marketing share, profit, and the rollover policies of marketing trends.

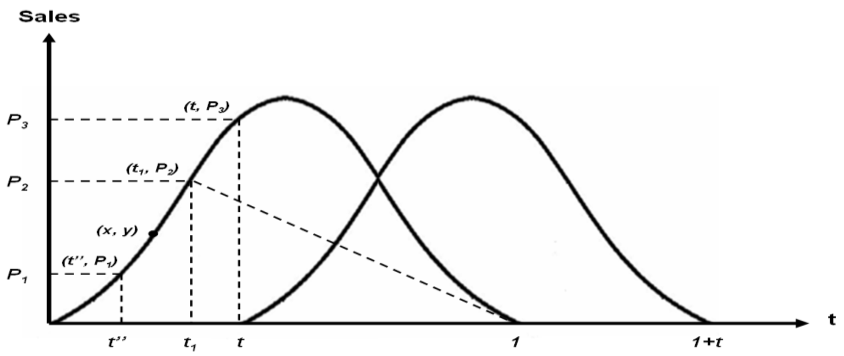

Figure 2：PLC combinations of product portfolio

Before constructing this model, the following terminology is used:

p_1, initial price

p_2, price while competitor appearing

p_3, price while launching a new product

t'', time of overcoming chasm point

t_1, time while competitor appearing

t, time while launching a new product

2.1 Revenue between time zone [0 , t'']

During this time interval, the revenue is obtained by the multiplication of both quantity of good sold and price; p_1

The equation can be expressed as (1)

$$G_1 = p_1 \int_0^{t''} f(t)dt \qquad (1)$$

Where G_1 is the revenue during this time interval. In practice, t'' is the point to cross the chasm so G_1 equal to the cost of overcoming the cost of chasm.

2.2 Revenue between time zone [t'' , t_1]

The revenue of this period can be derived by the expression (2) as

$$G_2 = p_1 \int_{t''}^{t_1} f(t)dt \qquad (2)$$

G_2 is the function of p_1, t'' and t_1.The magnitude of p_1 and the time span of both t'' and t_1 are in proportion to G_2. The more is the greater.

2.3 Revenue between time zone [t_1, 1]

This time zone is the end of the on-going product which is almost going through its PLC. The revenue expressed as follow:

$$G_3 = p_2 \int_{t_t}^{1} f(t)dt \times c_1 \qquad (3)$$

Where p_2 is decreasing while the competitors are breaking into the market. The t_1 also determine the magnitude of G_3 drastically. And c_1 is an adjustment constant to smooth the calculations.

2.4 **Revenue between time zone** [t_1, 1]

This time zone is sensitive to price setting

Because of the new product released to the market and these actions will cause the great changes of both p_2 and p_3.While p_2 is decreasing due to the keen competitions and p_3 is much higher than p_2 by the advantages of new product. The revenue of this part can be the expression (4):

$$G_4 = p_2 \int_{t_1}^{1} f(t)dt \times c_2 \qquad (4)$$

term p_2 affects the G_4 by means of the market rule.

2.5 **Revenue between time zone** [t , t+1]

During this time zone, the new product is launching the market and the price p_3 is in the high level.

The revenue as expression (5)

$$G_5 = p_3 \int_{t}^{t+1} f(t)dt \qquad (5)$$

2.6 Model settings

While identifying and calculating all the components of this model then the final working model can be formed as follow:

$$Y(t) = G_1 + G_2 + G_3 + G_4 + G_5 \qquad (6)$$

Where the constraints as

$$0 < p_3 \leq 1.8 \qquad (7)$$

For the purposes, to form the best timing strategies, let's find p_2 from the equation.

Furthering the equation (6), let's rewrite it:

$$Y(t) = p_1\int_0^{t''} f(t)dt + p_1\int_{t''}^{t_1} f(t)dt + p_2\int_{t_t}^{1} f(t)dt \times c_1 + p_2\int_{t_1}^{1} f(t)dt \times c_2 + p_3\int_{t}^{t+1} f(t)dt \times c_2 \qquad (8)$$

When the equation (6) is ready, find the maximum value of p_2, by means of (9).

$$Max\ Y(t) = G_1 + G_2 + G_3 + G_4 + G_5 \qquad (9)$$

$$0 < p_3 \leq 1.8 \qquad (10)$$

While putting the parameters into the equation (8), besides, p_2 the other parameters are known. The final result will be the optimal value of p_2 which is the pricing to consider some strategies.

2.7 Applications

In accordance with the assumptions of this model, it does fully comply with the typical normal distribution hence the expression (11) is the workable function to apply.

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{\frac{-1}{2}\frac{(x-\mu)^2}{\sigma^2}} \quad , -\infty < x < \infty \qquad (11)$$

Where both the $\mu = 0, \sigma = 1$ so this workable function can be simplified as

$$F(x) = \frac{1}{\sqrt{2\pi}} e^{\frac{-x^2}{2}} \quad -\infty < x < \infty \qquad (12)$$

Equation (12) is the real working function throughout this paper.

III. VERIFICATION

3.1 Case 1

Northrop Technology Corp. is planning to introduce a next-generation GPS System to replace the previous model the necessary market information as seen in Table1, in order to maximize the overall profit, Northrop should find the optimal timing to launch the new model.

Table 1：Market Information of Case 1

Market datum	$t''=0.2$, $t_1=0.28$, $p_1=1$, $p_2=0.75$, $p_3=1.65$
Old model	N-6
New model	N-8

Table 2：Results of Case 1

Parameters	$t''=0.2$, $t_1=0.28$, $p_1=1$, $p_2=0.75$, $p_3=1.65$
G_1	0.07847
G_2	0.01879
G_3	-0.1694 + 0.7175 * Erf (0+x/1.41421)
G_4	0.1678 – 0.2779 * Erf (0.707x)
G_5	-0.8020 * Erf (0.707x) + 0.8020 * Erf (1+x/1.41421)
Y(t)	0.678
t	0.366

The results of Table 2 are subject to parameters from Table 3, using Equation (12) to calculate all the related figures shown in Table 2. Obviously, Figure 4 depicts the optimal timing against the maximum revenue of the case.

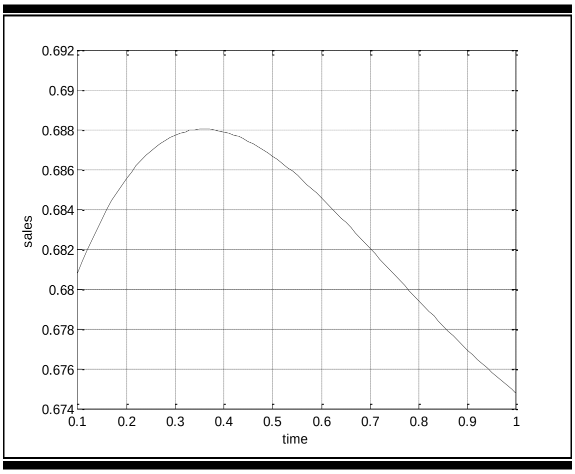

Figure 3 Optimal Launching Time of Case 1

Obviously, Figure 4 shows that when t = 0.366, the new model, N-8 should replace the old model N-6, to maximize the profit.

IV. CONCLUSION

As to this research, the algorithms is rigid, the steps and processes are well-defined to the development of this analytical model. As to the topic shows that this attempts is a challenging task.

An illustrative example assumed a practical case to reflect the real things to test this model whether it works or not. Can it be feasible to go for real applications ? And the answer seems to be obvious.

Some clarifications can be made:

1. The timing strategy is a proactive process for company to control and coordinate their operations in advantageous manners.

2. The optimal timing against stages transition is accessible.

3. The timing strategy is an alternative of product launching strategy.

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