

Cannibalization and Product Life Cycle Management

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Abstract: The paper identify the optimal time (s) in product life cycle stages for introducing new product in the market and shutting down the production of existing product. Contingency approach has been used to evaluate outcomes of different possible marketing decisions that a firm can opt. Optimal combination of marketing decisions is one that maximizes the overall profit for all the subsequent periods till the remaining life of existing product. Moreover five contingency factors of marketing decisions are found. The paper is limited to a situation where only one new product is assumed to have influence on one and only one existing product. The paper includes implications for maximizing the profit by proposing a methodology that identify the best timing for introduction of new product and discontinuation of existing product.

Key words: Cannibalization • Payoff Matrix • Product Life Cycle

INTRODUCTION

Firms introduces new products because of technological development and changes in consumer needs over the period of time. Firms need to spend in research and development in order to introduce innovative products in the market to gain attraction and competitive advantages. But introduction of these new products not only influence the market of competitors' products but also sometimes its own products. The competition arises between products under same brand in the market. This internal competition between products of same firm is destructive sometimes rather than constructive because the share of existing product declines as a result of launching a new product. Not only the share of existing product declines but also the life of existing product is shortened as a result of internal competition between products. Even a successful innovation results in lower performance because of internal competition between products. Successful innovation provides a competitive advantage to a firm at one end but also a disadvantage of internal competition among products of same firms. Market timing of new product is important in this regard and firms must market innovative product at a time when it has a minimal impact on the sale of its equivalent existing products.

The purpose of this study is to construct a methodology that will help in minimizing the impact of cannibalization on a firm's profitability by taking an optimal market timing decisions about the exit of existing product and launch of new product. This study answers the research question that how to make a balance between choice of competitive advantage by introducing innovative products earlier than competitors and late enough to avoid the disadvantages caused by internal competition of products of same firm.

Cannibalization: Oxford dictionary defines cannibal as "A person who eat human flesh". In general terms it is defined as "An animal that eats animals of his own kind". In the field of marketing this term has been used first time by Heskett [1]. Product portfolio cannibalization (PPC) is the process of reduction in profit of an existing product due to introduction of a new product in market under the same brand and in the same product line [1]. Meredith and Maki (2001) [2] define two types of products portfolio cannibalization, upward and downward. In upward products portfolio cannibalization the price of new product is high as compared to existing product and people switch to the new product because of high quality. Downward product portfolio cannibalization occurs when the price of new

product is low as compared to existing product and people switch over to the new product because of low price.

Cannibalization may be unfavorable and may be favorable for the company. It will be unfavorable in the four cases. First it may be possible that new product is offered at lower price or fewer units are demanded by the market as compared to existing product which results in less profit. Second due to dramatic change in technology it might be possible that new product will completely cannibalize the existing product. Thirdly companies have to spend a lot of investment in product development phase before launching that product in to market and then recover the initial investment cost by generating revenue and it will take some time to recover the initial investment. Lastly new product also carries more risk and it might fail in the market and mostly high tech products carry more risk [3].

Product Life Cycle Stages: Vernon (1966) [4] introduced four stage model of product life cycle. First stage is the introduction stage, when sale is low because people are reluctant about new product workings and functions. Mostly products fail in this stage and in later stages probability of failure declines. In the second stage, sale grows rapidly and advertising expenses are made in that stage mostly. Then after growth, maturity stage starts when sale of the product reach to its climax. Finally decline stage starts when market is fully saturated or some competitors have launched new product.

Product Mix Vs Brand Mix: In the following, product mix and brand mix concepts are discussed as these are related concepts for understanding the Cannibalization phenomenon. Product is any offer by a company to gain attention from the market. Product line consists of the products having similar function. Number of products in a specific product line is called product line length. Product mix is set of all product lines. Each product line refers to the product group. Number of product lines is called width of the product mix. Companies can increase the length of its product lines either by stretching the product line or by filling the product lines. Stretching of lines can take place in three ways. First upward line stretching occurs when a product with higher price as compared to price of existing products is introduced in the market. Second downward line stretching occurs when a product with lower price as compared to price of existing

products is introduced in the market. Lastly product lines can be stretched in both directions. Filling of product line take place when the price of new products falls between the prices of existing products [5].

A similar concept to product mix is brand mix which consists of the brand lines. When a company introduces a new product in the already existing product category under the established brand, it is called line extension. When a company uses an established brand to introduce a new product, it is called brand extension. If new brand is combined with the existing brand for new product then such brand extension will be called sub-brand. In such case the existing brand which gives birth to sub brand is called parent brand. If parent brand is associated with multiple products through brand extension then it will also be called family brand.

Brand line refers to the set of products under a particular family and set of brand lines is called brand mix. There are following similarities between products mix and brand mix:

- Length of product mix and length of brand mix is always equal.
- Depth of product mix and depth of brand mix is also always equal
- If a company adopts new brand strategy then the both product width and brand width will be widened.
- If a company adopts line extension strategy then both product line length and brand line length will be increased.

So far as contrast between the two concepts is concerned, it is explained in Table 1 below.

Customers vary in responding to the marketing decisions of firms. Highly loyal customers are unlikely to switch to other brands even if the production of existing product is stopped and alternative new product has higher price. On the other end, less loyal customers are likely to switch over to other brands when existing is discontinued in market even if the alternative new product has lower price. Firms must take into account the proportion of its customer that can be switched over to other brands as a result of marketing decisions. Customers also have the choice to switch over to new product of same brand when existing product is also available in market. But this will depend on price and quality of existing and new products and customers assigns different weights to price and quality.

Table 1: Contrast between Product mix and Brand Mix

	PRODUCT MIX	BRAND MIX
1	Set of all product lines.	Set of all brand line.
2	Product line consists of the products having same function. For example P&G has the following product lines:Tooth paste, detergents, soaps etc.	Brand line consists of the products under a particular family brand and these products might have different function. For example P&G has the following brand lines:Madicam, Sony, Dove, Nokia etc.
3	In a particular product line, some products might have a different brand name.	In a particular brand line, all the products must have same brand name.
4	If a company adopts brand extension strategy then width of the product mix will be widened.	If a company adopts brand extension strategy then there will be no effect on the width of the brand mix.
5	If a company adopts brand extension strategy then there will be no effect on the product line length.	If a company adopts brand extension strategy then there brand line length will be increased.
6	If a company adopts multi brand strategy then there will be no effect on the width of the product mix.	If a company adopts multi brand strategy then the width of the brand mix will be widened.
7	If a company adopts multi brand strategy then product line length will be increased.	If a company adopts multi brand strategy then there will be no effect on the brand line length.
8	Product mix is measured along following four dimensions: Length of the product mix, width of the product mix, depth of the product mix and consistency of the product lines.	Brand mix is measured along following three dimensions:Length of the brand mix, width of the brand mix, depth of the brand mix but there is no concept of consistency of the brand lines.

Table 2: Payoff of Existing Product

		Existing Product	
		Continue	Stop
New Product	Launch	$\sum_{t=1}^r (r-s) [Ee, t(1-\delta) * Pe] / (1+i)^t$	0
	Don't Launch	$\sum_{t=1}^r [Ee, t(1-\delta) * Pe] / (1+i)^t$	0

Table 3: Payoff of New Product

		Existing Product	
		Continue	Stop
New Product	Launch	$\sum_{t=1}^r [(En,t + dEe,t) * Pn] / (1+i)^t$	$\sum_{t=1}^r [(En,t + (d+?)Ee,t) * Pn] / (1+i)^t$
	Don't Launch	0	0

Payoff Matrix: There are four contingencies for the product marketing decisions and a payoff matrix can be used to represent the payoff under each contingency. For optimal market timing decisions, firms should not be short term oriented or in other words, firms should not focus only on the payoff of current period only but also on the payoff of subsequent time periods. Following assumptions are used in the proposed model for optimal market timing decisions.

- There is one existing and one new product under the same brand name.
- To start production minimal demand for any product, should be $(1+\epsilon)$ times of breakeven demand where ϵ is greater than 0.

- Price and variable cost of product remains stable.
- Other firms can't introduce new products first or life of new product does not change with market timing decision of new product.

Firms receive payoff in each period for both existing and new products. Let suppose an existing product of a company has r years remaining life and company has successfully developed a new product after incurring research and development cost. Launching this new product may have impact on the sales of existing product if both products belong to same product family and remaining life of existing product may be shortened if sales decline below minimal demand level $(1+\epsilon)$ times of break even demand).

If $E_{e,t}$ is the demand of existing product in excess of breakeven in time period t then payoff for existing product is $E_{e,t}$ times the difference between price and variable cost (P_e). Demand in excess of breakeven $E_{e,t}$ declines if new product is launched and new product will capture δ share from market of existing product subject to the condition that production of existing product continue. However if company shut down production of existing product, then new product will definitely capture more share equal to $\delta + \rho$, where ρ is premium share of shutting down the production of existing product. Remaining share of the market $(1 - \delta - \rho)$ consist of buyers who will switch over to other brands. Table 2 and Table 3 shows the payoff of existing and new products respectively using present value approach with discount rate (i), which is assumed to be stable over a relatively shorter period of time till life of existing product. Life of existing product declines from r to $(r-s)$ years as a result of introducing new product in the market.

P_n and E_n are the Price and demand in excess of breakeven of the new product respectively. New product may be more profitable in specific period but this is although necessary but not sufficient condition for new product to be launched because in subsequent periods, sales of existing products declines and other companies may capture the share. Decisions regarding existing and new products are dependent upon five factors discussed in the following.

Cannibalization Rate: Keeping other factor constant, for low cannibalization rate (δ), new product should be launched in the market provided that new product payoff per unit after recovering fix cost is higher than that of existing product and forecasted demand is greater than desired threshold existing level. On the other end production of existing product should be carried on because it will not decrease profit and life of existing product much. However for high cannibalization rate (δ), production of existing product should be shut down because new product is capturing high share of existing product market. In between high and low cannibalization rate, there exist a range where optimal decision is to continue production of existing product and not to launch new product in market; although payoff per unit after recovering fix cost is higher for the new product as compared to existing product. This is because of the fact if firm stop production of existing product, significant number of customers will switch over to other brands and

new product do not capture adequate share of existing product market and hence loose customers. On the other end if manager decides to carry on production with introducing new product simultaneously then new product will capture enough share of the existing market to decrease its remaining life and hence decrease its profitability.

Premium Share of Shutting down the Production of Existing Product (ρ): Premium share of shutting down the production of existing product (ρ) does not directly influence decision regarding new product however determines decision regarding existing product. For low levels of ρ , production of existing product should be continued but as ρ increases gradually, there comes a point, when it is optimal to replace the existing product with new one.

Difference in Per Unit Payoff ($P_n - P_e$): Third factor is difference in profitability of existing and new products ($P_n - P_e$). Higher the per unit payoff after recovering the fix cost for new product relative to existing product, more likely it will be launch new product and shut down the production of existing product.

Remaining Life of Existing Product (r): Remaining life of existing product (r) is also influences the decision making regarding production of existing and new product. As r decreases, probability to replace existing product with the new one increases provided that new product is more profitable after recovering fix cost.

Excess Demand of New Product in New Market (E_n): Finally excess demand of new product in new market (E_n) relative to existing product is another factor. This is how much demand new product is generating out of new market. Greater this demand, greater will be the probability to replace existing product with the new one provided that new product is more profitable after recovering fix cost.

CONCLUSION

It is not always better to release innovation immediately after its complete development and testing because it may lead to inferior results because of decline in sales and remaining life of existing product. Company may need to delay before introducing new product in market and hence suffer from opportunity loss. This is

because company need to maximize the total profit of existing and new product for all periods until the life of existing product. If focus is just on the profit for current year, this will lead to inefficient results in relatively longer terms. Hence managers should take into account the probable impact of cannibalization before taking decision about launching new products.

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