

Application of Fuzzy Theory and Analytic Hierarchy Process to Evaluate Marketing Strategies

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Abstract

Conventional marketing research generally focuses on a single layer's benefit. A notable example is the consumer layer providing managers with partial market information to evaluate relevant strategies. As generally known, marketing management encounters complex supply and demand behaviors, thereby necessitating that a successful marketing strategy adopt multi-layer' considerations, such as the consumer layer', channel-retailer layer', and marketing planner layer'. In light of above situation, this study applies fuzzy theory and the analytic hierarchy process (AHP) technique to analyze the performances of marketing strategies under multi-layer' benefits. In addition, conventional marketing research has difficulty in efficiently allocating the limited budget so that each desired criterion can be significantly enhanced by a group of events. Therefore, a weighting structure among the goal, layers, criteria, and strategies (i.e. a group of events) is also developed herein to trace the influential process and assist marketing managers in efficiently allocating resources (i.e. budget).

Keywords: Fuzzy theory, analytic hierarchy process, marketing strategy, milk market

1. Introduction

Marketing management stresses not only how to allocate limited resources in various marketing strategies (i.e. a series of events) and how to assess the performance from each strategy in terms of the larger or ultimate marketing goal. Therefore, this study evaluate potential marketing strategies from the perspective of multi-layer' points and construct a weighting structure capable of accurately reflecting the influential process among different layers, criteria, and marketing strategies. Based on the

weighting structure proposed herein, marketing managers can adequately allocate resources to selected marketing strategies which consist of various promotion events.

Annual revenues of fresh milk sales in Taiwan having exceeded 3.3 billions US dollars since 1997 reflect the general public concern over the value of a nutritious diet [1]. The leading fresh milk suppliers (i.e. Brand K, W, P, and F occupy 35%, 33.7%, 20%, and 8% market share, respectively.) are also major competitors in milk powder market [2]. Major fresh milk suppliers' sales strategies and, to a lesser extent, the milk powder market's fluctuations primarily influence the fresh milk market. According to a survey of the Taiwan's milk market [2], the

annual growth rate of fresh milk market has averaged around 17% in the decade. In contrast, the milk powder market has averaged an annual decreasing rate of 3%. Recent GATT negotiation revealed that the tariff of imported fresh milk will reduce from current level of 35% ~ 40% to 20% or less. This estimate implies that some foreign fresh milk suppliers, particularly those countries which produce milk at comparatively low price, e.g. Australia and New Zealand, will pose a significant threat to domestic suppliers after Taiwan joins the GATT.

As generally known, different customer clusters, geographical areas, packages and sizes, channels, and product mixes yield different consumer responses. In lieu of complex and uncertain market information, a better marketing strategy can not only consider a single layer's benefit, e.g. the consumer layer', thereby providing managers with only partial market information. Thus, a successful marketing strategy is subject to multi-layer' benefits, such as the consumer layer', retailer layer', and competitor layer'.

This study close examines Brand W Company, which holds the second position in Taiwan's milk market, as an example. The evaluated layers, criteria, and strategies are selected from elaborate (i.e. brainstorming) discussion by senior marketing planners of Company W. This paper is organized as follows. Section 1 presents the motivations and purposes as well as an overview of Taiwan's fresh milk market. Section 2 describes Company W's current competitive status, the desired ultimate marketing goal and five marketing strategies. Section 3 evaluates the

performance of five marketing strategies and analyzes the results from each layer's benefit and the all layers' benefits. Concluding remarks are finally made in Section 4.

2. Establishing weighting structure

2.1 Milk market status for Company W

According to a market survey by Company W and research by Taiwan's Food Research and Development Institute (TFRDI) [3], 71.3% of Taiwan's population drink fresh milk and 40.1% of them are frequent drinkers. The major products in fresh milk market are generally divided into fat fresh Milk, calcium fresh milk, low fat milk, and vitamin fresh Milk. Fat fresh milk, calcium fresh milk, low fat milk, and vitamin fresh milk hold 60%, 10%, 23% and 7%, respectively, of the market share. From the perspective of packaging and size, plastic big size (over 946cc), paper big size (over 946cc), paper middle size (437~500cc), paper small size (200~236cc), plastic small size (250cc 以下), alumni small package, glass small package, and other small packages have 59.64%, 4.49%, 4.49%, 0.85%, 14.36%, 4.28%, 6.74%, 3.32%, and 6.3%, respectively, of the market share. From the perspective of channels, store departments and supermarkets, chain convenience stores, distribution center stores, breakfast stores, and traditional grocers have 26.32%, 26.32%, 21.06%, 15.78% and 10.52%, respectively, of the market share. From a geographical perspective, 37.5%, 43.3%, 43.2%, and 32.3% of the population in northern part, middle part, southern part and eastern part of Taiwan are frequent drinkers, respectively. From the perspective of age, 35%, 35%, 43.5%, 50%, 44.1%, 35%, 35%, 35% and 25% of the population in the age below 20, 20~25, 25~29, 30~35, 35~39, 40~45, 45~49, 50~55 and over 55, respectively, are frequent drinkers. Interestingly, 43.4% of the female population are frequent drinkers as compared to only 36.9% of the male population. A positive trend arises between the rate of frequent drinkers and education.

Primary obstacles for the marketing planners of Company W are summarized as follows:

- (1) Although the market share of Brand W is extremely close to the leading Brand K and leads the third position Brand P by 10% of the market share, the brand image of Brand W is still markedly lower than Brand K and nearly same as Brand P in the consumers' mind;
- (2) Brand W takes the lead in terms of in the channel of store departments and supermarkets; however, Brand P owns over 1800 chain convenience stores. This finding reveals that although Brand W holds a larger market share than Brand P, Brand P poses a large threat to Brand W in channel control particularly when 26.32% of fresh milk is sold through the channel of chain convenience stores [3];
- (3) Owing to the rapid diversification of societal structure (i.e. preferences) in recent years, the image of Brand W is rapidly aging particularly since Brand B is a long established brand. Meanwhile, the Brand K and F have waged extremely successful advertising campaigns, resulting in a situation in average age of customers for company W is higher than company K and F; and
- (4) Although Brand F only occupies 8% of the market share, half of Brand F's sales are going through the channel of distribution center stores. Since Brand F has successfully exploited that channel, Brand W in that channel has been frequently challenged from Brand F.

2.2 Five marketing strategies

Based on above market situations, Company W's

ultimate marketing goal is not only to sustain sales profits but also to become the leading Brand in the market share (i.e., exceed market share of Brand K). Following elaborate discussion among senior marketing managers, five marketing strategies are induced and described below:

Strategy A: Rejuvenating the brand image

Strategy A attempts to redesign product packaging, reform corporate image, and blend in with young people's fashion through mass media. This can hopefully be achieved by instigating innovative changes to create new consuming motives and to attract a new generation's attention. However, potential side effects of Strategy A could be a loss of some traditional customers. Moreover, packaging and image renew do not necessarily ensure an expanding market share. In particular, Company W is well established and the previous Brand image which has been instilled in the consumer's minds for quite a long time is difficult to transform and rejuvenate in a short period. Building a new brand image and ensuring its continuous effect takes a considerable amount of time and resources. Marketing planners also recognize that Brand W is a large family involvement in many products aimed at satisfying different levels of needs. Thus, effectively integrating the entire product line and nurturing a new and continuous brand image are challenging tasks.

Strategy B: Launching a new product mix

Strategy B aims to launch a series of all new products and promote diverse products according to different needs, packages and sizes, consumers' clusters, channels, areas. Strategy B also attempts to identify and create new markets for all products in the Brand W family. After launching new product mix, Company W not only can attract new customers but also can develop new and positive image for the original customers. Also, some side-effects occur while executing strategy B. First of all, developing and launching a new product mix is quite expensive. In addition, the timing control is relatively difficult, particularly in terms of coordinating research, production, distribution, and

marketing departments. Moreover, a new product mix not only invades other Brands' markets, also hurts original Brand W's market. Comparing Strategy B with other strategies reveals that the profit rate is the highest and the possible failure cost is also the highest among five strategies.

Strategy C: Analyzing the latest consuming trends by continuous market survey

Strategy C strives to capture the latest consuming attitudes. Promotion events, sales activities, channel policies, product pricing and discount, and other responses for consumers' changeable styles can be adjusted over time subject to continuous market surveys. Strategy C is highly attractive in terms of relative easy in identifying the drawbacks of competitors, compensation of weaknesses in current sales policy, rapid response to consumers' tastes, and enhancement of many promotion events. Nevertheless, Strategy C has several limitations, including the following: (1) A large market staff is required to execute continuous market survey. (2) Although the short-term sales may increase rapidly, such as effect may hinder long-term sales. (3) Too many adjustments in promotion events, sales activities, channel policies, and responses to customers over time may incur a negative image and damage the original stable and consistent features of Brand B.

Strategy D: Developing healthy milk products

Strategy D launches a series of healthy products to lure customers who favor healthy products. Strategy D also heavily emphasizes nurturing a positive healthy image for Brand W and offering diverse healthy milk products to customers. However, most people already

consider fresh milk a healthy product. Moreover, the healthy image for top four brands in the Taiwan milk market is Brand K > F > W = P. Therefore, promoting a series of healthy fresh milk products may elevate Brand K's sales instead of inhibit them. Comparing Strategy D with other strategies reveals that the possible failure risk is the highest among five strategies.

Strategy E: Expanding sales networks

Allowing consumers flexible access fresh milk products of Brand W is the crux of Strategy E. Obviously, buying milk is completely different from buying a car. Consumers are generally reluctant to shop at several stores before deciding which brand's milk to buy. Consequently, the easier the access which customers have to a brand's milk implies higher milk sales for that particular brand's products. Consider Brand P. Although healthy image and product diversity of Brand P are the worst among the four brands, its market share still remains in third position and has rapidly grown over the past five years. This success is attributed primarily to that (a) Brand P owns over 1800 chain convenience stores and (b) only Brand P's and K's fresh milk products are allowed to be sold in these convenience stores. Thus, if Brand W could more heavily influence the channels (i.e. chain convenience stores and distribution center stores), the sales of Brand W could dramatically increase. However, the annual sales of the entire milk market have the upper bound, implying that doubling the sales networks would not reflect doubling in sales of fresh milk. In addition, as evidenced from that the problem of image aging (the major concern from marketing planners of Company W) can not be solved entirely (i.e. simply) by Strategy E.

2.3 Constructing evaluating structure

Having thoroughly reviewed five strategies and through expert interview survey, ten evaluation criteria are summarized for analyzing five marketing strategies under three layers' benefits. The marketing management of Company W employs three criteria to access the consumers layer's benefit, four criteria to

evaluate marketing planners layer's benefit, and three criteria to evaluate channel-retailers' benefit. The influential structure among the ultimate marketing goal, layers, criteria, and strategies are constructed below:

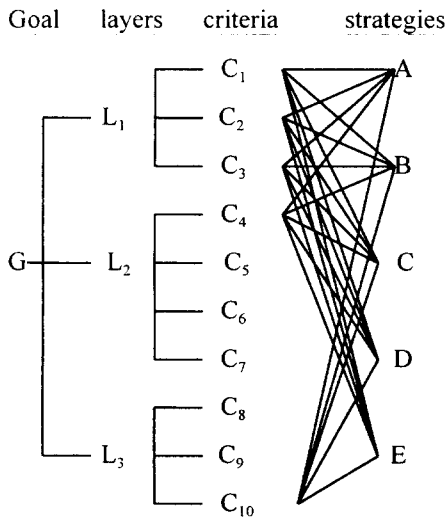


Fig. 1 Performance evaluating structure

G: sustaining sales profits and becoming leading brand in the market share

L₁: consumers' layer; L₂: marketing planners' layer; L₃: channel-retailers' layer

C₁: image of the product quality; C₂: convenience and availability of buying; C₃: attractiveness of promotion; C₄: better understanding of consumers' and sale-channels' change; C₅: better understanding of competitive strength of opposite products; C₆: maximizing the market share of products; C₇: promoting the image of products; C₈: preference of major customers; C₉: profit rate of the product; C₁₀: circulate rate of the product.

3. Weight evaluating and analysis results

Questionnaires are designed by the AHP technique and fuzzy theory. This study utilizes Quota Sampling method to take sixty samples in the consumer layer, thirty samples in the channel-retailer layer, and six samples in the

marketing planner layer. Calculation of eigenvalues, consistent indexes, fuzzy membership functions, and de-fuzzifying by gravity method is executed by a computer system coded by Visual Dbase 5.5. Under 0.05 α -level, some hypotheses are also adopted herein. Those results are summarized below:

Table 1 Performance evaluation of strategies by different layer's benefits

Layers strategies	L ₁	L ₂	L ₃	average
A	0.1620 (5)	0.1639 (5)	0.2262 (1)	0.1840
B	0.1715 (4)	0.1991 (4)	0.1866 (4)	0.1857
C	0.2075 (3)	0.2356 (1)	0.2097 (2)	0.2176
D	0.2402 (1)	0.1964 (3)	0.1707 (5)	0.2024
E	0.2193 (2)	0.2050 (2)	0.2068 (3)	0.2070

*The number in parenthesis denotes the ranking under each layer's benefit.

Table 2 An opinion hypothesis (0.05 α -level) among L₁, L₂, and L₃.

	L ₁ vs. L ₂	L ₁ vs. L ₃	L ₂ vs. L ₃
A	Accepted	Accepted	Rejected
B	Accepted	Accepted	Accepted
C	Accepted	Accepted	Accepted
D	Rejected	Rejected	Accepted
E	Accepted	Accepted	Accepted

Table 2 reveals that significant conflicting opinions for the performance of Strategy D exist between consumers and marketing planners and between consumers and channel-retailers. Also, significant varying opinions exist between marketing planners and channel-retailers for the performance of Strategy A. The following tables reveal the weight evaluation and opinion hypotheses for 60, 6, and 30 samples under the consumer layer, marketing planners layer, and channel-retailer layer, respectively.

Table 3 Consistent hypothesis (0.05 α -level) for consumers' samples

	L ₁	# of samples	Consistent hypothesis
C ₁	0.3850	60	Accepted
C ₂	0.3417	60	Accepted
C ₃	0.2733	60	Rejected

Table 4 Consistent hypothesis (0.05 α -level) for marketing planners' samples

	L_2	# of samples	Consistent hypothesis
C_4	0.2670	6	Accepted
C_5	0.2601	6	Accepted
C_6	0.2437	6	Accepted
C_7	0.2292	6	Accepted

Table 5 Consistent hypothesis (0.05 α -level) for channel-retailers' samples

	L_3	# of samples	Consistent hypothesis
C_8	0.3559	30	Accepted
C_9	0.3124	30	Accepted
C_{10}	0.3317	30	Accepted

Column 2 in above three tables expresses the evaluating weight for each criterion under each layer's benefit. Column 4 in Table 3, 4, and 5 indicate hypothetical results (using 0.05 α -level) as to whether inside consumers', marketing planners', and channel-retailers' opinions are consistent for weighting criterion themselves, respectively. Obviously, significant varying opinions among consumers for weighting criterion 3.

4. Concluding remarks

After the marketing planners of Company W reviewed the above results, this study applies linguistic words (see Table 6) to let marketing planners of Company W under the perspective of the entire ten criteria evaluate the performance of five strategies again. Table 7 summarizes the re-evaluated effecting weights from five strategies to the ultimate marketing goal.

Table 7 displays the different results with Table 1, indicating marketing planners perceive

different marketing strategies performance from the perspective of multi-layers' benefits. The weighting structure developed in this study can be feasibly employed to assist marketing management in efficiently allocating necessary budget (i.e. resources) to enhance each desired criterion, to trace the influential process, and to adjust strategies which are naturally comprised by many promotion events.

Table 6 Fuzzy values for linguistic words

Linguistic words	Fuzzy values
Very important	(0.7, 0.85, 1.0)
Important	(0.6, 0.7, 0.8)
Little important	(0.5, 0.6, 0.7)
Fair	(0.4, 0.5, 0.6)
Little unimportant	(0.3, 0.4, 0.5)
Unimportant	(0.2, 0.3, 0.4)
Very unimportant	(0, 0.15, 0.3)

Table 7 Re-evaluation of performance for five strategies

Planners	1	2	3	4	5	6	Normalized Average
Strategies							
A	0.45	0.54	0.65	0.53	0.57	0.64	0.1918
B	0.53	0.47	0.33	0.25	0.37	0.48	0.1404
C	0.71	0.51	0.66	0.72	0.65	0.56	0.2192
D	0.49	0.94	0.83	0.89	0.84	0.49	0.2568
E	0.39	0.46	0.66	0.68	0.43	0.73	0.1918

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