Analyses on the Pricing Factors from a Case Study of Light Trucks

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Abstract

The purpose of this paper is to clarify analytically the relation between the characteristics and the pricing of the products of individual manufacturers, so we can offer beneficial information for designing and developing products. Light trucks of 1 ton to 4 ton have been taken up as examples. We carried out analyses based on the information on the evaluations of the functional characteristics by surveying the specifications obtained from light truck catalogues.

Key Words: sales price, pricing factors, evaluation, multivariate analysis

1. Introduction

There are products that are accepted by many customers and those which are accepted by only a few customers although the products achieve almost the same level of practical use functions and attractive functions. It is generally said that it is the multiple interactive effect of such items as the product power, sales power, and the recognition characteristics of products which sell well. The objects of this paper are products that are entering their maturity and these products have comparatively few differences in their characteristics of customer recognition or brand images, and it can be said that the weight of the use function is fairly high. The discussions here try to pursue the factors for the differences in the market share with such products as the objects.

Factors for the differences in the market share can be broadly divided into the product power factor and the sales power factor, but this study placed focus on the former for study. The purpose was to offer beneficial information for the concept making of new products that are liked by the customers. Also, information concerning light trucks (between

1t~ 4t) were collected by obtaining the cooperation of Company I in this study.

The purpose of this study has tried to analytically clarify the relation between the characteristics and the market shares of products, but such pioneering work is hardly found. There have existed heretofore studies regarding product concept making for the purpose of designing and developing products that sells and are liked according to the engineering approach and several methodologies have been published including QFD (quality function deployment) (1). However, these studies only show the methodology of product concept making while expressing logically that a product will not become a hit product unless the needs of the customers are not grasped.

They do not take up actual new products and analyze the relation between the product concept and market share. Therefore, they do not step into the intended domain of this study and so the subsequent development methodology can be said to be a study in a new domain.

This study was carried out in 3 steps. The 1st was the analysis of the decision factors of the standard sales price based on the product specifications that are shown in the product catalog of light trucks. The 2nd was to pursue the purchasing factors by measuring the degrees of expectation and satisfaction of the customers toward the functional characteristics of the light trucks by carrying out surveys on the actual conditions of the customers. Thirdly analyses were carried out on such major purchasing factors of the light trucks on the basis of these 2 analyses and analyzed their relation with the market share.

This paper is the first step of this study. That is the analyses of the factors that determine the standard sales price of a light truck. Here, the standard sales price is the general, standard price at the time the manufacturer sells to the final customers or to agents and the representative case is the price shown in catalogues or price lists, or the desired sales price of the manufacturers.

It is considered in this study that this standard sales price is decided by adding the strategic element of the enterprise to the overall evaluation value of such matters as the product specification of the product.

Standard sales price
  = overall evaluation value of such matters as the product specification + strategic elements

We considered that the strategic elements of the enterprise have not been considered in this study, and the overall evaluation value of the product specifications was the major

factor for deciding the standard sales price. It has been analyzed how the standard sales prices of the products (light trucks) of manufacturers with large (or small) market shares are mainly decided from what kind of product specifications, etc.

2. The Selections of the Product Specification and the Outline of Analysis

Here, product specifications were collected and analyzed from product catalogues of 1992,1995, and 1998 to search for factors considered to have strong relations in deciding the standard sales price. The manufacturers chosen as the objects were 4 companies with the top market shares for light trucks having carrying capacities of 1 ton and above and below 2 tons, and the top 3 companies for light trucks of 2 tons or larger and below 4 tons. Here, only the analysis based on the data of 1998 will be shown in table 1 (a total of 133 styles for 1~2 t and 374 styles for 2~4 t).

Table 1. The number of light truck styles (1998)

	1t ~ < 2t	2t ~ <4t
A company	42	54
B company	36	149
C company	22	171
D company	33	-

Table 2. The Finally Decided Sixteen Product Specifications

Specifications	Units	Specifications	Units
(1) Maximum loading capacity	t	(9) Hill climbing power	tan θ
(2) Engine output	ps	(10) Minimum radius of rotation	mm
(3) Overall length of body	mm	(11) Transmission (A/T or M/T)	1 or 0
(4) Overall width of body	mm	(12) Type of platform (steel or wood)	1 or 0
(5) Overall height of body	mm	(13) Rear wheel tires(double or single)	1 or 0
(6) Floor height from ground	mm	(14) 4 WD or 2 WD	1 or 0
(7) Area of platform	mm×mm	(15) Suspension (independent or leaf-rigid)	1 or 0
(8) Weight of truck	kg	(16)Grade (limited specifications)	1 or 0

Numerous product specifications of light trucks obtained from product catalogs were extracted. Next, the product specifications that were thought to have large influences on the decision of the standard sales price of light trucks were selected based on the opinions of specialists. Furthermore, extractions were made by correlation analysis from these primarily selected product specifications and the finally decided ones were the 16 specifications shown in Table 2.

Multivariate regression analyses and principal component analyses were carried out to clarify how the product specification values for individual annual periods affect the decisions of the standard sales prices. The specification values were normalized here. Here, Company A and B whose market shares were the highest and the lowest will be taken up to describe the decision factors for the standard sales prices. Now, the company having the top-ranking market share for 1~2t light trucks was Company A and that with the lowest share was Company B. And, the company having the top-ranking market share for 2~4t light trucks was Company B and that with the lowest share was Company A.

Table 3. The Result of Multivariate Regression Analyses by Loading Capacity and Manufacturer

Specifications	1 ~ <2 t capacity		2 ~ <4 t capacity	
	Co. A	Co. B	Co. A	Co. B
Maximum loading Capacity	0.254	0.344		0.097
Truck weight			0.201	0.258
Engine output power			0.349	0.239
Hill climbing power	0.260			0.054
Overall body length	0.136	0.061	0.365	
Overall body width				0.212
Overall body height				
Platform area				0.136
Height of platform from ground				
Minimum rotating radius				
4 WD	0.678	0.503	0.384	0.246
Transmission	0.511	0.383	0.430	0.186
Rear tires	0.152		0.101	0.034
Suspension		0.115		
Platform type		0.080	0.046	-0.116
Grade		-0.143		-0.252
Contribution ratio	0.936	0.994	0.977	0.971

3. Factors that decide the Standard Prices by Multivariate-Regression Analyses

The authors considered the decided product specification values as the explanatory variable, and the standard sales price as the dependent variable, and carried out multivariate regression analysis by step-wise regression for individual loading capacities and manufacturers. The explanatory variables and the standardized partial regression coefficients were as shown in Table 3.

In the case of 1~2t light trucks in Table 2, it can be said that their specifications such as 4WD, maximum carrying capacity, and transmission, exert large influences on the decision of the standard sales prices for the products of both Company A and B. Also, although the standardized partial regression coefficient values for the overall body length were small, they commonly have influence on the decision of the standard sales price for both companies.

The difference between Company A and Company B is that product specifications such as the hill climbing power and the rear wheel tires have been taken up in the product of Company A. Such product specifications can be said to be "ease of running", "ease of materials handling", and "ease of operation", when expressed in terms of major purchasing factors of the customers as shown in Table 3.On the other hand, in the case of products of Company B, such product specifications as suspension can be said to affect the decision of the standard sales prices. If we show these in similar terms, they can be said to be "comfortableness", "attractiveness", and "the ease of running".

In the case of 2~4t light trucks in Table 3, the product specifications that can be considered to have influence on the decision of the standard sales prices are, for both companies, engine output power, 4WD, transmission, and the weight of the truck. Other factors that have influence on the standard sales prices are rear tires and the type of platform.

The products specifications that differ between company A and B show that the overall length of the body and the transmission affect the decision of the standard sale price for the products of company A. That is, if we use the expression mentioned above, they can be said to be "ease of materials handling", "ease of running", and "ease of operation". On the other hand, for the case of products of Company B, the maximum loading capacity, hill climbing power, overall body width, overall body height, platform area, and grade affect the decision of the standard sales price. They can be said to be "the ease of running", "ease of materials handling", "comfortableness", "attractiveness", and "ease of running".

The products of Company B that high market shares have more product specifications that affect decision of the standard sales prices than the products of Company A and can be said to include the product specifications in a more comprehensive (overall) manner.

4. Factors that decide the Standard Sales Prices by Multivariate Regression Analyses

Principal component analyses were carried out for the 16 product specification values that were decided before and multivariate regression analyses were carried out under the condition of letting the principal component scores as the explanatory variables and the standard sales prices as the dependent variables. Furthermore, principal components were adopted this study until the cumulative contribution ratio of the principal components reached about 70% for Company A, (Though it is usually 80%, for Company A the meanings of principal components after 4th level are not clear, so we adopted up to the 4th level), and 90% for Company B (also the 4th level).

The standardized partial regression coefficients and the contribution ratios of their equations according to the individual carrying capacities and manufacturers are as shown in Table 4.

In the case of 1~2t capacity light trucks shown in Table 4, the principal component was the overall performance for both products of Company A and B. As for other cases, many individual principal components were in common, and no large differences appeared between the two. This cannot be helped due to the characteristics of the analytic technique.

These differences in the product characteristics may be connected to their market share difference.

However, if we positively search for any difference between the two, the following factors can be said to be so. "Ease of materials handling" seems to influence the decision of the standard sales prices for Company A, and "ease of running" for Company B.

Although these differences in the product characteristics can be considered to be related to the differences in market share, it is not possible to clarify the degrees of the relation by this analysis.

Similarly, for 2~<4t light trucks, the 1st principal component was the overall characteristic for both Company A and Company B and was similar to the case of 1~<2t light trucks. Many common items can be seen for the 2nd and lower principal components, but if we positively try to find any difference between the two, they are the following factors. For products of Company A, "ease of materials handling" and "ease of running" seem to have effects on the standard sales price, while in the case of products of Company B, "ease of running" seems to have influence.

Table 4. The Result of Multivariate-regression Analyses of the Principal Components

Loading Capacities	Principal Component	Product of Company A		Product of Company B	
		Meanings of Principal Components	Standardized Partial Regression Coefficients	Meanings of Principal Components	Standardized Partial Regression Coefficients
1~<2t	1st	OC	0.746	OC	0.858
	2nd	EOMH (1) EOR	-0.099	EOMH (1)	0.061
	3rd	EOMH (2) EOD	0.157	EOR (1) EOD	0.280
	4th	EOMH (3)	-0.216	EOR (2) EOMH (3)	0.284
	Contribution Ratios		0.637		0.900
2~<4t	1st	OC	0.814	OC	0.791
	2nd	EOR (1) EOMH (1)	-0.123	EOR (1)	0.059
	3rd	EOMH (2) EOD	0.054	EOMH EOR (2)	0.090
	4th	EOMH (3) EOR (2)	0.213	EOR (3) EOD	-0.108
	Contribution Ratios		0.727		0.905

OC: Overall Characteristic   EOMH: Ease of Materials Handling
EOR: Ease of Running   EOD: Ease of Driving

5. Conclusion

In this paper we analyzed the factors that determine the standard sales price of light truck. In the case of 1~2t capacity light trucks, "Ease of materials handling" seems to influence the decision of the standard sales prices for Company A, and "ease of running" for Company B. And for 2~<4t light trucks, "ease of materials handling" and "ease of running" seem to have effects on the standard sales price for products of Company A, while in the case of products of Company B, "ease of running" seems to have influence.

Next we'll analyze the purchasing factors by measuring the degrees of expectation and satisfaction of the customers toward the functional characteristics of the light trucks by

carrying out surveys on the actual conditions of the customers. So we can compare the basis of these 2 analyses and pursue their relation with the market share.

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