A C T A U N I V E R S I T A T I S L O D Z I E N S I S
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PRICING AND PRODUCT DEVELOPMENT STRATEGY. SOME REMARKS ON CONTEMPORARY MARKETING-MIX CONCEPTS

1. ROLE AND SIGNIFICANCE OF PRICING AND PRODUCT DEVELOPMENT STRATEGIES IN CONTEMPORARY MARKETING

In the contemporary marketing practice, product research and development and strategies in the field of product and pricing belong to the most significant elements of the marketing mix. In as much as in the sixties this fact was not so obvious, in the seventies and even more strongly in the eighties its obviousness became unquestioned. We can refer here to certain findings of the researchers. Thus, in as much as J. G. Udell (1968) determined on the basis of commonly known studies conducted in 200 US corporations a little earlier that in their opinion product research and development held its supreme first position on the list of rank order of importance and pricing policy sixth among 12 distinguished types of marketing activities a similar ranking announced later on by R. A. Robicheaux (1975) revealed major shifts on exactly the same list of rank order of importance - pricing ranked first, product research and development fourth, and customer services (very complementary element in relation to product development) - second. H. Simon (1982) proved that this interrelationship in significance between pricing and product development in the general context of marketing-mix strategies applied by enterprises had become even stronger: pricing continued to play its leading role but product development strategy fol-

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lowed it closely. Anyway, this tendency was already noticed earlier. Thus, for example, F. Livesey (1975) stressed explicitly that it was increasingly more necessary for enterprises to employ in their marketing-mix strategy its two leading elements, i.e. pricing and product development along with its differentiation.

We do not intend to discuss in greater detail in this paper external causes and factors which account for such and no other form of the analyzed phenomenon. As regards prices, the consolidation of the constant priority of pricing in an enterprise's marketing activity and its marketing-mix strategy must have resulted from inflationary trends in economies of many countries and from general economic instability (Ph. Kotler, 1980). As for product development, the enhanced interest of enterprises in this area of marketing strategy was connected, first of all, with technical and technological development and progress in manufacturing new or qualitatively improved products, and more generally with development of completely new and hitherto unknown products and their varieties, and with appearance of new markets for these products. On the other hand was resulted from constantly growing competition on markets especially for non-durable goods, as well. Competition through product development began to encompass more and more not only new products but recently increasingly more often and perhaps even primarily their brands. This issue will be discussed in bigger detail below. At this point, we would only like to state ending this part of our remarks that it is quite evident today that in the composition of marketing-mix both pricing and product research and development display a far-reaching interdependence in necessary and applied activities in enterprises. That is the first reason why it becomes necessary to search for some indispensable research bridge respecting the observed close interrelationship. The other reason ensues from the character of these elements being so close to each other by their marketing nature, which possess *per se* many characteristics being objectively mutually complementary and mutually accompanying one another in practice regardless of this or another form and intensity in their simultaneous, periodically, application.

In the further part of this paper we shall make an attempt to analyze one of such possible, in our opinion, solutions.

2. MARKETING STRATEGIES IN PRICE-PRODUCT RELATION TAKING INTO ACCOUNT PRODUCT AND BRAND LIFE CYCLES

Before proceeding to the core of the problem let us look first at a certain more loosely (and also less precisely) formulated problem of interrelationships between development of a product characterized by its quality[1] and its price. Such relationship can be described relatively clearly basing on the form of the price-product relation according to employed strategies connected with introduction and position of a new product on the market. This was done in an interesting way by Ph. Kotler (1980).

T a b l e 1

Marketing-mix strategies on product quality and price

Product quality	Price		
	high	medium	low
high	premium strategy	penetration strategy	superbargain strategy
medium	overpricing strategy	average-quality strategy	bargain strategy
low	hit-and-run strategy	shoddy-goods strategy	cheap-goods strategy

S o u r c e: Ph. Kotler: Principles of Marketing, New Jersey 1980, p. 402.

We do not intend to comment on findings presented in Table 1. We should note, however, that the product quality-price relation expresses not only relationships between these elements (there may be more such relationships in practice than it was shown by Ph. Kotler) but it also provides some important guideline for undertaking various marketing strategies by enterprises according to degree of product development (determined in this case by its quality) and a price fixed for it (with its quite wide range here). Let us move on now in these deliberations - not very precise as yet from the viewpoint of the analyzed relationships. We shall look more closely now at the already mentioned interrela-

[1] We are fully aware here that even the most generally understood quality of a product testifies only partly about its general utility for consumer, while changes in quality themselves also only partly reflect changes in product development.

tionships between sales, price and product however this time already in relation to the commonly known product life cycle (PLC) including four stages. These interrelationships could be compiled in the following short table.

Table 2

Observed interrelationships between sales, price and product in particular stages of product life cycle

Characteristics \ Stage	Introduction	Growth	Maturity	Decline
Sales	Low	Fast growth	Slow growth	Decline
Responses				
Price	High	Lower	Lowest	Rising
Product	Basic	Improved	Differentiated	Rationalized

Source: P. Doyle: The Realities of the Product Life Cycle, "Quarterly Review of Marketing" 1976, vol. 3, p. 5.

Also in this case we do not intend to comment in detail on the content and internal structure of Table 2. It should be noted, however, that interrelationships shown in the table will depend on the type and character of a product, and that they may assume a somewhat different form for different products. Thus, these are some average relationships and they may look different not only according to the type and character of a product but also according to the market situation and the market environment factors.

Let us now ask a question whether interrelationships presented especially in Table 2 can be practically utilized in attempts to shape a desirable curve of sales in particular stages of life cycle of a definite product through appropriate activities in the field of product strategy and pricing strategy also in particular stages of PLC. That does not seem to be fully possible, because the interrelationships presented above may constitute only some general guideline for undertaking such activities. Anyway, it was noticed already a relatively long time ago proposing that these general and not quite precise, and adjectivally formulated guidelines should be made more concrete expressing them in numerical values. The search for some sensible measure allowing to evaluate sensitivity of a product's sales to various elements of marketing strategy such as product development, price

or advertising was focussed on studies on elasticity coefficients. R. Dorfman and P. O. Steiner (1954) proposed already earlier that coefficients of demand elasticity in relation to quality of a product and in relation to its price should be used when analyzing the level of sales in the context of marketing-mix strategy. In the sphere of pricing, these studies were developing more rapidly and comprehensively. For instance, G. Mickwitz (1959) found out that price elasticity had been increasing during the first three stages of PLC and decreasing in the last stage. These findings were generally confirmed by later studies (J. Lambin 1970, Ph. Kotler 1971), although still later studies (e.g. L. J. Parsons 1975) differed from earlier ones, and in many cases even quite considerably. At this point, however, we would like to interrupt deliberately further analysis of development of the studies conducted solely in this field. This is prompted by the fact that estimation of any coefficients of elasticity for particular stages of PLC, despite its initially quite big methodological attractiveness, proved to be relatively little useful for the practice of marketing activities. We shall try to show it below. Thus:

1. On contemporary markets, really new products (in literal sense of this term) appear already extremely seldom. There predominate vastly on the market these products which were introduced already earlier (as new), while their present "novelty" results from their modifications, which anyway are often so far-reaching that they may even assume apparent characteristics of novelties. This process and this phenomenon are well illustrated by such diverse products as e.g. TV set, detergent, electronic pocket calculator, ball-pen, etc.

2. Competition on most markets concerns, to an increasingly smaller degree, new products but for its most part their brands. Development of products results in an increasing number and diversity of their brands, and it is primarily among these brands that competition takes place on different markets and on different segments.

3. The policy of achieving appropriate profits by enterprises is connected today with selling many successively offered brands of a product by all competing enterprises and not so much the same brands. In other words, it involves in fact the same products. The life cycle of products understood in this way, let us call them "basic products" displays - with the exception of some

groups of traditional products (e.g. some homogenous food products) - a tendency to its significant shortening in time. F. Livesey (1976) says, for example, that the life cycle of a certain the same class of pocket calculators on the British market lasted practically only three years, and their average price dropped by a high 80% over that time. It is underlined today that the process of shortening life cycles of products has intensified still further increasing their rate of "mortality". The above arguments indicate that there are more necessary and sensible today not studies on life cycle of products but rather on life cycle of their brands (BLC). Let us accept here, moreover, the following way of reasoning. After all, whether sales of a given item undergo bigger or smaller fluctuations over time and whether it survives at all on the market depend on its certain characteristics and properties whose expression is not the product itself but precisely its b r a n d. For instance, if sales decline over time, this means primarily that somebody else on the market offers new, more attractive and more desirable characteristics of this item, that is - offers a new type of brand and not a new product. That is firstly. Secondly, if sales of "our" brand decline over time then we try to respond to it and, for example (anyway quite often), we reduce a price of our brand. We do not know, however: (a) when to do it, and (b) to what degree reduce the price so that its reduction might be effective (i.e. maintain sales of our brand at the given stage of BLC postulated by us), on the one hand, and, on the other hand, take into account the fact that we are ourselves at the stage of e.g. preparing another, our own brand being "competitive" in relation to the one sold by us on the market at the present time. In order to increase the degree of precision and effectiveness of our possible activities connected with it we can no longer rely only on our intuition and possessed experience. We shall try to seek some other measure - as pointed out when analyzing PLC - which will be an objectivized and a concrete numerical measure. Such measure (as also indicated earlier) can be empirically estimated coefficients of price elasticity for particular stages of BLC.

Such postulated measure has yet another extremely important property in our opinion as different from those for PLC. While expressing in itself a concretely determined sensitivity of sales of a brand to a possible change in its price, it includes s i m u l t a n e o u s l y and expresses a degree of product

development, because a degree of product development, as it was mentioned earlier, is already immanently connected now with its development through brands. Thus, if we estimate price elasticities for particular brands separately then comparing them next we may obtain an answer indirectly, which of these brands are better and more competitive and to which of them the market is more sensitive than to others within the same product. We consider this finding to be important from the viewpoint of both theoretical and practical expressing of the relationship between pricing and product development strategies. We have not come across any attempt at just such determination of this relationship in the marketing literature so far.

The statement formulated above, similarly to applicability itself of estimated coefficients of price elasticity for elaborating practical marketing-mix strategies can neither be equally important nor equally significant for goods of different kinds. There are reasons to think that this postulate may be referring primarily to non-durable goods.

From among the known, anyway quite few empirical studies on relationships between dynamics of price elasticities and brand life cycles it is worth mentioning, first of all, the studies carried out by H. Simon (1979). There are also known his further theoretical-model works in this area.

In the next part of our paper, we are going to present primarily the theoretical-model aspect of these problems. Hence, we shall be making reference in some fragments of this study to concepts and solutions suggested by him.

3. MAIN PRINCIPLES OF AN APPLIED STRATEGIC PRICING MODEL FOR NON-DURABLES

3.1. THE BRAND LIFE CYCLE RESPONSE FUNCTION

Before proceeding to a detailed analysis of implications for price strategies connected with definite brands, let us look first at the construction of price dynamics response function and assumptions accepted in it.

The dependent variable defining a sales or market share of brand i, at time $t(q_{it})$ is explained by non-price factors and price factors. Non-price factors include mainly:

1) initial demand potential, which may be constant and equal to value (a) or time-decreasing $|a(1-r)^{t-t_i}|$, and

2) the carryover-effect which is assumed to be subject to an "obsolescence" $[\lambda(1-r)^{t-t_i} q_{it-1}]$,

where: t_i - the introduction period of the introduction of brand i; it is usually accepted that $t_i = 0$,

λ - the parameter expressing a decline in purchases of brand i over time connected with introduction of competitive brands to the market.

Among price factors we may include:

3) the direct impact of the price of brand i in question on sales at time t (bp_{it}), where b is a parametre,

4) the effect of impact exerted by prices of competitive brands (Δp_{it}) determined as:

$$\Delta p_{it} = \frac{\bar{p}_{it} - p_{it}}{\bar{p}_{it}},$$

where: $\bar{p}_{it}$ is an average price of competitive brands.

Thus, the pricing independent variable Δp_{it} may be interpreted as a share on the market of the price of brand i in question in relation to all competing brands.

It may be accepted that the variable (Δp_{it}) affects the volume of sales (q_{it}) in a dual way, and namely:

- in a linear way, i.e. then $f(\Delta p_{it}) = c \cdot \Delta p_{it}$, or
- in a non-linear way.

The problem of applying here an appropriate form of analytical function remains open and it seems to depend upon the character and kind of a given brand.

Summing up the above assumptions and findings, the model discussed here may be written in the following form:

$$q_{it} = \{\begin{matrix} a \\ a(1-r)^{t-t_i} \end{matrix}\} + \lambda(1-r)^{t-t_i} q_{it-1} + bp_{it} + \\ + \{\begin{matrix} c_1 f(\Delta p_{it}) \\ c \Delta p_{it} \end{matrix}\} + \varepsilon_t \qquad (1)$$

where: ε_t - random variable.

Model (1) contains, in principle, 4 alternative non-linear price dynamic response functions of brands. It is only on the basis of data and statistical tests that it can be decided which of these functions describes the examined relation relatively best. That, however, is already rather a task belonging to problems of econometric-statistical estimation procedures.

3.2. IMPLICATIONS FOR PRICE STRATEGY FOR BRANDS

In our opinion, a crucial problem here is to determine factors exerting their influence on price and the way of fixing the price which will be maximizing the magnitude:

$$\pi_t = \sum_{\tau=0}^{T} [p_{t+\tau} q_{t+\tau} - C_{t+\tau}(q_{t+\tau})] (1 + S)^{-\tau} \qquad (2)$$

where: T - time horizon, C - cost function, and S - discount rate.

Magnitude π_t may be interpreted as an amount of discounted profit in the analyzed time horizon T.

It is believed that the optimal strategy price depends on three factors:

- the short-run price elasticity (e_t),
- the marginal cost (C'_t),
- the marketing multiplier (m_t),

and it is described by the formula:

$$p_t^* = \frac{e_t}{1+e_t} (C'_t - m_t). \qquad (3)$$

In the formula (3), the coefficient of elasticity (e_t) is described by a well-known formula:

$$e_t = \frac{\partial q_t}{\partial p_t} \cdot \frac{p_t}{q_t}, \qquad (4)$$

while the marketing multiplier (m_t) is described by the formula:

$$m_t = \sum_{\tau=1}^{T} (p_{t+\tau} - C'_{t+\tau}) \lambda^{\tau} (1-r)^{\tau t + \tau(\tau-1)/2} (1+S)^{-\tau} \qquad (5)$$

Definition of the magnitude (m_t) results from the condition that $\frac{\partial \pi}{\partial p_t} = 0$ and from transformations of the formula (1). As a result

of these transformations, we obtain the relation[2]:

$$(p_t - C_t') \frac{q_t}{p_t} = -m_t \frac{\partial q_t}{\partial p_t} - q_t \qquad (6)$$

from which there can be estimated immediately (p_t^*) defined by the formula (3).

This so-called marketing multiplier measures the cumulative future effects (expressed in present value terms) of the current price as a multiple of the short-run prices-response ($\partial q_t / \partial p_t$). We can, thus, note that (m_t) is a function of future prices which are to be determined.

The short-run price elasticity (e_t) determines the optimal mark-up on marginal cost, be it myopic cost (C_t') or "strategic" marginal cost ($C_t' - m_t$). In this way, the marketing multiplier determines the difference between myopic and strategic price.
The formulas (3) and (5) show, moreover, that the difference between strategic price and myopic price is the bigger

- the greater the carryover-coefficient (λ) is,
- the smaller the rate of "obsolescence" (r) is,
- the smaller the discount rate (S) is,
- the more extended the horizon (T) is.

The values of the magnitudes listed above are estimated in different ways. Thus, the carryover-coefficient (λ) is obtained as a result of estimations of the function (1); on the other hand, the magnitudes r and s are treated as instrumental variables and they assume values resulting from market determinants and other external circumstances. This obviously calls for empirical studies, the magnificent example of which is the already mentioned pioneer study carried out by H. Simon (1979).

3.3. SOME GENERAL PRACTICAL RECOMMENDATIONS ENSUING FROM THE PERFORMED THEORETICAL-MODEL ANALYSIS

Limited size of the paper does not allow to present some more detailed findings resulting anyway from an equally concisely performed theoretical-model analysis of the problem. Hence, we shall

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[2] Due to lack of space, we are making here a major simplification of the numerical side of the problem.

present here only some general findings resulting from this analysis. They can be briefly compiled as follows:

Stage of Brand Life Cycle	Introduction	Growth	Maturity	Decline
price elasticity	high	medium	low	medium
quality elasticity (hypothetical)	high	medium	low	lower/lowest
optimal strategic price p_t^x in relation to optimal myopic price p_t^m	low	increasing	high	very high
optimal strategic price p_t^x in relation to marginal cost	low	increasing	high	decreasing

In order to submit the above compilation to a more concrete analysis it would be necessary to perform it on a more concrete example and on more concrete numerical data provided by estimations made. We can hardly do that in the present paper although we possess appropriate data, because such an analysis, by its very nature, is very lengthy. Hence, we shall restrict our attention here to three important, in our opinion, remarks by way of a commentary. Thus:

1. The process of shaping price elasticities in time is for particular stages of BLC distinctly different from this process for PLC. It could be mentioned here once again that some researchers (Mickwitz, Kotler, Lambin) stated that price elasticities for PLC are growing over the first three stages - our compilation for BLC shows quite a reverse situation.

2. The compilation shows an almost strict correlation between price elasticities and quality elasticities for BLC over time. That strengthens our conviction about existence of a far-reaching correlation between product development and price strategies for brands, which was strongly stressed above.

3. The implications ensuing from the shaping of an optimal strategic price in relation to an optimal myopic price are important here, because they involve, in fact, the necessity of making allowances for an enterprise's profits for longer periods through achieving them in shorter periods by means of such a basic "profit-creating" instrument as prices and price strategies applied within an appropriate time.

Finally, there arises a question whether the above mentioned problems connected with implementation of the strategies in the

field of product development and prices formulated in such way can be adopted in centrally planned economies and especially in these types of centrally planned economies which are market-oriented. Generally, such a possibility seems to exist although it is dependent on the degree of market-orientation. However, even in the case of a relatively big degree of their market-orientation there may appear here certain barriers, which result from systemic determinants and differences distinguishing centrally planned economies from market economies. In some countries, such attempts and studies may and should already be made, e.g. in Hungary. On the other hand, in Poland, in its present economic and especially deep market disequilibrium they cannot most certainly be recommended for the time being. Any attempts in this field cannot be made until the necessary conditions and circumstances allowing for and justifying their performance appear.

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POLITYKA CENOWA A STRATEGIA ROZWOJU PRODUKTU. KILKA UWAG DOTYCZĄCYCH WSPÓŁCZESNYCH KONCEPCJI MIX-MARKETINGOWYCH

W strategii mix-marketingowej, stosowanej współcześnie w praktyce działalności przedsiębiorstw, wzrosło szczególnie znaczenie dwóch jej elementów, a mianowicie polityki cenowej oraz strategii w zakresie rozwoju produktu. Wykazano to w początkowej części artykułu.

W związku z takim stanem rzeczy pojawia się konieczność bardziej uważnego i dokładniejszego prześledzenia zarówno pewnych na tym polu zmian, jak i zaproponowania określonych, nowych podejść badawczych, które uwzględniałyby również zacieśnianie się związku między strategiami w zakresie polityk cenowych oraz w zakresie rozwoju produktu. Problem ten przeanalizowano bardziej szczegółowo w dalszej części artykułu koncentrując się zwłaszcza na problemie cyklu życia m a r e k (odmian) produktu z pominięciem celowym analizy tradycyjnej, cyklu życia samego produktu. To podejście wydaje się być merytorycznie bardziej dla analizowanego problemu atrakcyjne, ponieważ rozwój produktu realizowany jest najczęściej obecnie przez powstawanie nowych jego marek (odmian). Analizę cyklu życia marek produktu można połączyć z obserwacją i oszacowaniem dynamiki elastyczności cenowych określonych marek produktów w poszczególnych fazach cyklu oraz prześledzeniem pewnych zależności występujących między ceną a różnymi markami produktu.

W artykule, w dalszej jego części, poddano głównie analizie pewne teoretyczno-modelowe aspekty tej problematyki eksponowane wcześniej zwłaszcza przez H. Simona. Wskazano również na pewne praktyczne implikacje wynikające z przeprowadzonej analizy.

W zakończeniu zwrócono uwagę na możliwość zastosowania rozważanych podejść dla praktyki przedsiębiorstw działających w zorientowanych rynkowo gospodarkach planowanych centralnie.