Product Life Cycle

The product life cycle is one of the more pervasive concepts in marketing literature. In its fully articulated form this concept has practical relevance for the marketing manager in formulating product, pricing, distribution, and promotional strategies. The concept is also valuable for product portfolio analysis and setting strategic objectives.

The product life cycle is typically presented as a sales curve over time, from introduction to final withdrawal, divided into five stages (see *Figure A*). It is important because certain types of market behavior and patterns of marketing strategy are consistently found at similar life cycle stages—for instance, competitor entry and exit, evolution of product design, advertising-to-sales ratios, and advertising strategy.

"Product" in the Product Life Cycle

It is important to begin by defining "product," which has four quite distinct meanings, each differing in level of aggregation.

Levels of Aggregation

1. *Category*. At the highest level of aggregation, "product" refers to a *product category*: all products of all competing producers which, despite differences in appearance and performance, essentially serve a set of functional needs in a roughly similar manner. A set of basic customer needs is often met by a number of product categories. Typically different product categories offer quite distinct customer benefits in satisfying common needs. Thus, for instance, passenger automobiles, bicycles, airplanes, railroads, ships, and motorcycles all provide consumer transportation. Other examples of product categories are conveyor belts, computers, audiotapes, and cameras.

2. *Subcategory*. At a finer level of aggregation, "product" refers to a *product subcategory*: a homogeneous grouping of products from all competing producers that are more similar in how they are perceived and used by customers than items in a product category. For example, within the product category of automobiles are the subcategories of sports cars, luxury cars, compacts, and

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subcompacts; within the product category of computers are the subcategories of mainframe, mini-/micro-, and personal computers.

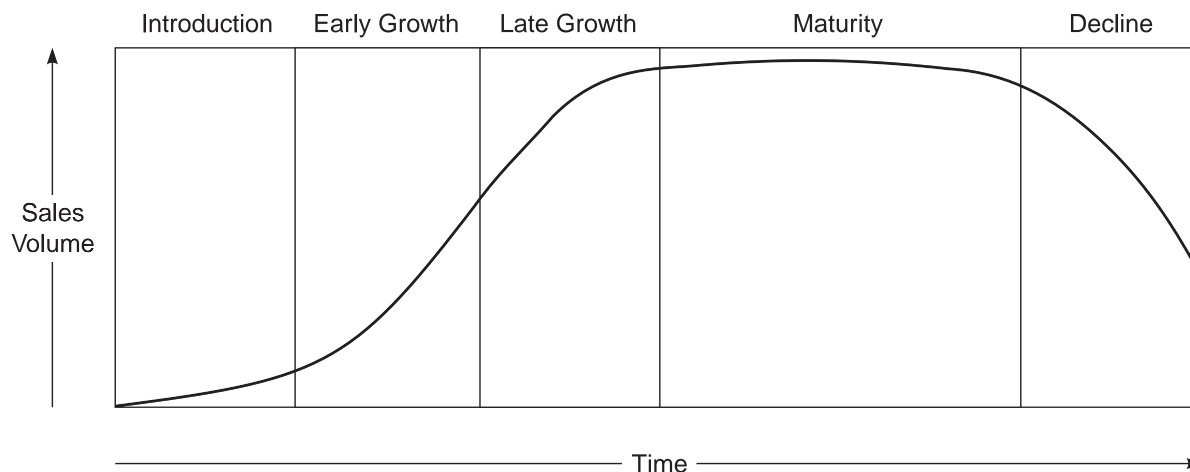
3. *Brand.* "Product" also refers to a *brand*: all items produced by one organization in a product subcategory. Thus, Jaguar, Cadillac, and Pinto would be brands.

4. *Model.* Finally, "product" refers to an *item* or *model* produced by one organization. Thus, a 4-door Pinto station wagon would be a "product" in the most specific sense.

Sales patterns for *models* or *brands* may follow a curve similar to that in *Figure A*. However, because an individual producer can manipulate at will the amount of resources committed to a model or brand and how they are committed, sales curves of many different shapes are found in practice. Consequently, a model with declining sales may have a new advertising campaign launched, and its decline may reverse. Further, analysis at the model or brand level gives little insight into such market behavior factors as competitor entry and exit. For these reasons it is not useful to think of the product life cycle as a model or brand phenomenon.[1]

For both product category and subcategory, however, consistent patterns resembling *Figure A* are typically found across a wide variety of products. Both product category and subcategory thus satisfy a major condition for use in the product life cycle. Often analysis at the category level will provide important insights. More likely, however, subcategory analysis will be most valuable, because marketing strategy is typically developed at that level. For a company wishing to enter the personal computer business, life cycle analysis of the computer product category is of little value, but analysis of the life cycle for personal computers would be more worthwhile.

Figure A The Product Life Cycle



The factors associated with a given level of sales demonstrate that sales pattern consistency is typically found at the product subcategory level. Sales patterns are a function of two separate but interacting sets of variables—market potential factors and marketing strategy efforts of competitors.

[1]Occasionally critiques of the rationale for product life cycle appear. They are typically based on the misconception that model or brand is the appropriate level of analysis. See Nariman K. Dhalla and Sonia Yuspeh, "Forget the Product Life Cycle Concept," *Harvard Business Review* 54 (January–February 1976): 102–112.

Market Potential and Marketing Strategy Variables

Market potential refers to the capacity of the population to absorb some number of units of the product per annum. This is a function of population, income levels, the underlying need for the product subcategory, the population's knowledge of its availability, desire to consume product items, and usage or replacement rates.

Furthermore, competitors commit varying levels and types of resources to market development and sustenance in the forms of product development and design, distribution effort, and also advertising, sales, and promotion expenditures. These increase the availability of the product, the population's knowledge of it, and demand for it. In addition, competitors can vary the prices for their products.

Current resource commitments, together with the prior resource commitments that have enhanced the population's knowledge of and desire to purchase items in the product subcategory, interact with the variables determining market potential to produce a given level of sales in any time period.[2]

Moreover, market potential and marketing strategy variables are each based on the independent actions of many actors. Individual customers, firms, or consumers pursuing purchasing goals underlie market potential; competitor companies pursuing short- or long-term profit objectives influence marketing strategy. The interaction of the behaviors of these two groups, each with its own set of objectives, results in the relatively consistent shapes of product life cycle curves for many different product subcategories.

Stages in the Product Life Cycle

The sales pattern of a product subcategory over time can be divided into five stages as shown in *Figure A*. After product *introduction*, sales typically build slowly until they begin to rise at an increasing rate—*early growth*. Sales continue to grow, but at a decreasing rate during *late growth*. Next comes a period in which sales are relatively constant—*maturity*; and finally a *decline* phase occurs, in which sales decrease until the product is finally withdrawn from the market.[3]

Introduction

The introductory phase of a product life cycle may follow many years of research and product development by one or more organizations. At introduction and sometimes throughout the phase, there is just one pioneer. However, other competitors may enter during introduction and jointly share the market development task. Whether a monopoly exists depends on how difficult the product and/or production process is to imitate and whether the product or process is patented. Competitors are likely to be attracted to the business to the extent that they perceive it to be highly profitable and to the extent that the new product threatens their existing businesses.

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[2]If within a product category two or more subcategories are in competition, the sales in one subcategory are affected by the market potential factors and resource commitments in the others (for example, sales of mechanical watches are affected by sales of electronic watches). Further, if a basic set of functional needs is served by more than one product category, sales in a given product category are affected by factors in the others (sales of airline tickets are affected by sales of long-distance bus and train tickets).

[3]To identify correctly the position of a product in the product life cycle, sales year by year may need to be adjusted for changes in population, levels of disposable income, and so on.

The introduction phase has many uncertainties; customers may be fearful that the new product will not perform adequately, and the producer(s) may be unsure of optimal marketing strategy. The resource requirements to develop the market and insure product survival into early growth can be extremely high; they may outstrip the previous commitments for research and product development. As an example, RCA reputedly spent $30 million on research and development for color TV; it spent over three times that much, or about $100 million, on market development.

During introduction, there are typically few designs of the product; one or more entrants struggle to build volume to a profitable level. Advertising is devised to educate customers about the product subcategory to stimulate primary demand, with somewhat less emphasis on differentiating individual brands. Personal selling effort is important to inform customers and distributors about the use and value of the product and reduce their risks. Price may not fully cover total production costs in anticipation that volume will build and all costs, both direct and indirect, will be covered later.

The length of the introduction phase depends on a number of factors and can range from a few months to many years. A major factor is the quantity and quality of the marketing effort expended by entrants in the new and developing market. The following variables are likely to make the introduction stage longer: the more radical the change in customers' habits required for adoption of the innovation; the greater the complexity of the product; the more difficult the demonstration of its benefits; and the greater the risk of using the new product. Also, despite substantial potential benefits of the product, if its price is high relative to those of alternatives, introduction may be long. To the extent that a decision to adopt involves a number of people rather than an individual, as for an industrial product, introduction is also likely to take longer. Other factors that can slow introduction are delays in obtaining adequate distribution and changes in the national economy that affect customer purchasing power. On the producing side, technical problems with the production process, early product failure, or inability to expand production capacity to meet growing demand can retard market development.

Early Growth

The early growth phase is characterized not only by increasing sales, but also by increasing *rate of growth* of sales. The increasing sales trend that marks the close of the introduction phase tends to attract competitors, who continue to enter during early growth and, by their marketing efforts, help increase sales growth. Frequently, the pioneer's inability to fully satisfy market demand eases market entry for a newcomer.

Typically in early growth, products introduced by new market entrants differ little from the original: competitive entries imitate rather than involve radical design changes. Often new distribution channels open as new competitors struggle for distribution, and promotional activity tends to remain high. However, promotional expenditure-to-sales ratios tend to drop through this phase as the denominator, sales, increases. The advertising emphasis shifts to brand differentiation and selective demand creation. Price tends to fall as economies of scale, associated with increasing sales, permit price to be used as a competitive weapon.

Overall, though, early growth is not a period of intense competition. Because sales grow quickly, many competitors can share sales growth. Sales do not have to come at the expense of other competitors; they can come from the growth in the market. The corollary is that a company's sales can be increasing while its market share is decreasing.

Late Growth

Sales continue to rise in the late growth phase, but the rate of growth decreases until it nears zero. A major change in market character in this period is typically fewer competitors. The growth

rates achieved in the early growth phase can no longer be maintained, and the stronger competitors initiate tough actions to retain their sales growth, forcing weaker entrants to withdraw.

In contrast to the imitative product strategy of early growth, extensive product modification occurs as competitors seek differential advantage through product design. Typically, product variations proliferate as competitors adapt their products to specific customer requirements. Distribution is very broad, but the slowdown in sales growth tends to make distribution outlets more selective about the brands and individual items they will carry. In contrast to the early growth phase, price becomes a major competitive weapon in late growth, and pressure is put on margins in the distribution channels. Purchase terms and the amount and length of credit available become more favorable to customers, and warranties and service policies become more advantageous. As the weaker competitors fade, price cutting and a broad array of promotional devices are used to stave off withdrawal from the business.

Maturity

The maturity phase commences with a termination of sales growth; sales remain relatively constant and are affected primarily by changes in basic macroeconomic factors. At this stage most sales are to repeat users, and if economic conditions are depressed new consumption may be relatively easy to postpone.

Pricing tends to be competitive, and attempts to segment the market rely more on packaging and promotional strategies than on basic product differentiation. Often industry structures formed in early growth become stabilized in this period, frequently as oligopolies, and the market positions achieved by early maturity can often survive for many years (for example, General Motors' domination of the U.S. auto industry since the late 1930s; General Electric's domination of the market for steam turbine generators since the turn of the century).

Distribution is critical in maturity. Because differential advantage in the product is often difficult to achieve, producers concentrate on holding on to distribution outlets. Companies with broad product lines sold through common outlets have a considerable advantage over more specialized producers. (For example, Procter & Gamble developed great distribution strength in supermarkets.)

The cost economies and market positions achieved by entrenched competitors make it difficult to enter a mature market. Competitors that do enter typically have significant resources and are able to mount major promotional efforts to gain sufficient market share for competitive cost positions. They may also have developed advanced production technology or targeted particular market segments.

Decline

The maturity phase of the product life cycle may last many years, but eventually sales begin to turn downward and the product enters its decline. This phase is marked by decreases in annual sales that may range from very gradual to steep. Sales decline is caused by either the growth of a new substitute product (color TV's replacement of black and white) or a change in customer needs that renders the product obsolete. Typically, decline is shorter when one product subcategory is replaced by another than when obsolescence of a product category is involved. As sales decline, industry overcapacity grows. Fierce price competition is used to fill capacity, although temporary respite may be gained by more stable firms as competitors drop out and increased volume becomes available for those remaining. However, price decreases may be difficult to make as excess capacity leads to increased costs, resulting in higher prices, which in turn result in greater excess capacity, forming a vicious cycle. In general, marketing expenditures drop in the decline phase as competitors reduce support. Advertising may move from mass media toward more specialized media to target more

directly remaining consumers and reduce advertising costs. Cost reductions are also sought by pruning product lines to achieve greater economies of scale in manufacture.

Late in decline there may be opportunities for profitable operation if a core of loyal, relatively price-insensitive buyers remains and only a few producers are left.

Trends in the Time to Maturity

The maturity phase of the product life cycle can last many years, and, further, market positions achieved by maturity are often sustained throughout that phase. Thus it is of crucial strategic importance to identify any long-run trends in the time it takes a product to reach maturity from introduction.

Recent studies seem to indicate that the time from introduction to the peak of the life cycle curve is decreasing. In one study 30 products in the home electric appliance industry were divided into three groups. Ten were selected whose commercial origins predated 1920; they included the electric range, refrigerator, vacuum cleaner, and washer and dryer. Ten had origins between 1920 and 1939 and included the radio, automatic toaster, electric hot water heater, automatic washer, and others; and 10 were developed between 1939 and 1959, including the frying pan, humidifier, TV, and washer-dryer combination. The products in the first group took an average of 34 years from introduction to the point of maximum sales, the second group averaged 22 years, and the third group averaged 8 years.

Whereas 30 years ago a company with a new product failure would have time to undertake more development effort and re-enter the market before the growth phases were over, the shortening of the product life cycle places a heavy premium on entering the market with the right strategy the first time. The trend toward shorter life cycles has resulted from improved technology, greater information dissemination, and greater consumer purchasing power.

Product Adoption during the Product Life Cycle

Consumer Classifications

A company attempting to determine strategy for a product needs to determine the types of consumers or firms likely to adopt it at different stages in its life cycle. Consumer research yields some general statements about these groups. Consumers may be classified as innovators (2% to 3% of the population), early adopters (13% to 14%), early majority buyers (34%), late majority buyers (34%), and laggards (16%).

1. *Innovators* are the first purchasers of a new product. They tend to be cosmopolitan, well traveled, socially mobile, and financially privileged. They read journals and magazines extensively, are more frequently exposed to communications concerning an innovation, and decide more easily than others to try something new. They purchase new products in the introduction stage of the product life cycle. They may influence others to the extent that they have contact with early adopters, but their purchases do not lead to widespread imitative behavior.

2. *Early adopters* are the true opinion leaders. In contrast to innovators, they are well entrenched in the social structures of their communities and are among its

leaders. They tend to be aware of new products through their contacts with local business people; other members of the social system ask them for advice. Their adoption decisions have a far-reaching impact as examples. Innovators are characterized as venturesome; in contrast, the most striking characteristic of early adopters is the respect they command.

3. Members of the *early majority* group are slower to try new products, entering the market only after their peers have adopted. Their first purchases tend to be in the later parts of the early growth and early parts of the late growth phases of the product life cycle. They are less privileged than early adopters, but their income and social position are still above average. They have a great deal of contact with early adopters, whose purchase behavior they monitor before entering the market themselves, but they are less socially mobile and tend to be older.

4. *Late majority* buyers make their first purchases in the late growth and maturity phases of the product life cycle; by this time the innovators and early adopters may have repurchased the product or moved on to new product subcategories. Late majority buyers are slow to adopt innovations, in part because their income is below average. They wait, therefore, until the price has fallen to a level they can afford. In contrast to the earlier described groups, these buyers tend to rely on mass media rather than interpersonal sources for their purchase information.

5. *Laggards* are excessively traditionalist. They tend to be isolated from the social processes in their communities, and their purchases are governed by long-established habits that are slow to change. They tend to have little social mobility, are older, and have fewer financial resources than the other adopter groups. Products are well into maturity before laggards make their first purchases. However, the tradition of this group accounts for the slow death of many products. While members of the other groups have moved on to new product subcategories, laggards are still purchasing an original product. Because their purchase behavior is habitual, they do not need advertising to persuade them to buy.

Industrial Consumers

Adoption of product innovations by industrial firms has been less studied, but some observations can be made. Often within an industry one or two firms may function as opinion leaders. They have greater resources for testing new products and efficient decision-making systems for adoption. Firms with more cumbersome decision-making systems are more likely to take longer to adopt, as are firms with few resources for testing, who may let their larger competitors test and adopt new products before they decide to purchase.

On the other hand, established companies in an industry may be more committed to existing products and processes by past investments than are newer, smaller firms. In such cases smaller firms may be quicker to adopt. Sometimes organizational culture militates against new product adoption. Management may feel secure with its present purchases and be unwilling to risk new products. Or a "not-invented-here [NIH]" syndrome may cause executives to look askance at innovations developed by other companies.

Characteristics of individual industrial buyers may also be important in the adoption decision. For instance, one study found that the more well-educated and experienced the buyer, as measured by the number of jobs he or she held, the earlier adoption took place.

Strategic Objectives in the Product Life Cycle

For management contemplating entry into a market early in the product life cycle, one critical issue is financial results. Profit performance typically varies through the life cycle, and it is impossible to make general statements about individual firm performance over time because it depends both on a firm's own strategic objectives and its resource commitments and on the strategic objectives and resource commitments of competitors. Some patterns do emerge, although for any given firm and product life cycle, they are impossible to predict.

One pattern often found commences with an innovator's launch of a product and willingness to accept losses early in the introduction phase. High costs surround start-up, and although low price sensitivity often permits high prices and high margins on direct cost, the margins frequently do not cover the full costs of production and marketing. Thus, profitability may be subordinated to market development as a strategic objective in this phase. As the market starts to take off, however, plant capacity fills and opportunities increase for near-term profit. The innovator seeks such short-term profit to compensate for the losses suffered during introduction and initial research and development. In the late growth phase, however, prices are cut in an attempt to maintain historic growth rates. Although price cuts are somewhat offset by cost efficiencies, profits may be reduced for all competitors.

By the start of the maturity phase the industry has stabilized, and profitability of competitors is typically related to their market shares. (The innovator may by this time have lost its dominant position.) A company entering maturity with a dominant market share can, if it makes appropriate resource commitments compared with those of its competitors, retain that position and its profitability throughout maturity. By contrast, a company that enters maturity with low market share will probably find it very difficult to achieve profitability. Desire to enter the maturity phase of the product life cycle with a dominant market share may cause early entrants in the market to forego high profits in the growth phases. Instead, market share is their key strategic objective and profitability is subordinated until maturity commences and a dominant market share has been obtained.

To finance research and development for a new product and losses in the introduction and growth phases, cash must come from other parts of the organization, often from products in the maturity phase that have dominant market share. This cash funds products in early life cycle stages, so that they in turn will become dominant in maturity and able to fund other new products.[4]

The ability of companies to forego profit early in the product life cycle is a function of their ability and determination to finance the drive for market share from more mature products. Small companies may find this impossible, and even large companies may balk at postponing profit until maturity, especially when profit in growth may be relatively more certain than that in maturity.

If at least one competitor aggressively seeks market share in the growth phases, the time from introduction to the start of maturity may be considerably shortened. Fewer companies will enter the business and they will leave it more quickly if the late growth phase of competitive turbulence is reached sooner. Further, if a company gains a reputation for aggressively pursuing market share in the growth phases, it may inhibit other companies from competing in new product markets it has entered or is believed about to enter.

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[4]See George S. Day, "Diagnosing the Product Portfolio," *Journal of Marketing* 41 (April 1977): 24-38, for an analysis of the product portfolio.

Entry Strategies in the Product Life Cycle

Management must decide at what stage in the product life cycle to enter the market. Broadly speaking, there are four possible entry periods: in the introduction stage as a *pioneer*, in early growth in a *follow-the-leader* mode, in late growth as a *segmenter*, and in maturity as a *me-too* entry. Any of these postures may lead to success, but each requires different capabilities.

Pioneers

A critical requisite of a *pioneer* company, one that will launch many new product categories and subcategories, is strong research and development. The organization must be willing to fund research to produce the new products, but it must also be prepared to accept inevitable research failures. Pioneers need to be able to afford large numbers of high-quality people and sufficient organizational slack to shift people when swift responses to competitive action are required. They need strong competitive intelligence to keep abreast of competitive research efforts and patent lawyers to provide them (if at all possible) with legal monopolies on their discoveries.

In a successful pioneering company, production, engineering, and marketing work closely together, and the organization is prepared to launch products that are not completely perfect to gain a jump on competition. However, it must also be prepared to fund the ongoing product development necessary to upgrade a product once it is on the market.

Follow-the-Leader Companies

In contrast to pioneers, *follow-the-leader* companies put their resources into development. They wait until a pioneer has launched a product and monitor its progress. If they believe it has the potential for success, they invest heavily in development. They can afford this expense because they are not funding extensive research. To monitor market activity they need strong market intelligence groups; they also have staffs of patent lawyers not only to write good patents, but to find ways around competitors' patents. Follow-the-leader companies also need extensive resources for market development. The pioneering company has a head start as the product moves from introduction to early growth. Therefore the follow-the-leader company must conceive and execute its development programs quickly.

Segmenters

Segmenters enter in the late growth phase of the product life cycle with a modified product designed to fit the specific needs of a particular market segment. Segmenter companies tend to exert little research and development effort, but they commit substantial resources to product design and engineering. They may have strong market research departments, often skilled in advanced quantitative technologies, to identify market segments that are incompletely served by current products. Because they are late entrants, segmenters must be extremely cost-conscious in deciding which applications to develop, and they need efficient manufacturing organizations. Successful segmenters have a flair for minimizing engineering and production costs by using the same parts in many different applications.

Me-Too Companies

Me-too companies enter the market in maturity, so they do not need research or development departments. Their product design is dominated by manufacturing cost considerations, and they tend to be slim organizations with minimum overhead. They tend, however, to be strong marketers, able to promote and price their products aggressively against entrenched competitors.

A company that spans the range of entry possibilities from pioneer to me-too may have severe problems of strategy implementation. Thus if a company is launching me-too products, which demand efficient manufacturing operations carrying little overhead, it is unlikely to be able simultaneously to support the research demanded of a pioneer.

Product Life Cycle Extension

For the individual firm competing for sales and market share in a product subcategory, there are basically two modes of behavior. The first is to attempt to win sales from competition by better product design, promotion, advertising, and distribution aimed at the current identified needs of customers. The second involves essentially an extension of the product life cycle. This extension can take place in a number of ways:

1. Increase use of the product among current users;

2. Obtain more varied use among current users;

3. Identify new users.

More frequent usage of the product can be obtained through promotional activities explaining the benefits of increased use. For instance, a campaign to encourage brushing one's teeth after every meal might increase toothpaste sales. Further, the planned obsolescence changes of the auto industry lead to more frequent automobile purchases.

More varied usage of the product can be achieved by identifying product applications not previously exploited. The Arm & Hammer Company expanded the uses for baking soda into controlling refrigerator and drain odors, thereby vastly increasing sales of a previously no-growth product.

New users of the product can be obtained by redefining the target market. Depending on current product distribution, sales might be expanded by targeting different geographic areas, types of environment (urban, suburban, rural), age groups, or income levels.

All these ways of extending the product life cycle can be enhanced by proliferation of product design, price reduction, and appropriate distribution and promotion decisions.

Conclusion

The product life cycle concept is a useful way to think about product and market development. Taking account of the product life cycle forces managers to think about the future. Foreseeing market factors likely to affect them enables managers to plan better their total resource allocations and the nature of those allocations. They can better anticipate when they will have to drop prices, introduce new product modifications, and reformulate promotional approaches.

Finally, and perhaps most important, the product life cycle framework encourages managers to develop a proactive rather than a reactive stance. They are less likely to be surprised by competitors and more likely to plan for several years and be prepared to introduce contingent strategies as necessary.

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