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## ORIGINS AND DEVELOPMENT OF THE PRODUCT LIFE CYCLE CONCEPT

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### ABSTRACT

Underpinnings and recognition of the product life cycle concept are found in the writings of sociologists, anthropologists, economists, and marketers of the last two centuries. The fashion cycle and advertising spiral are antecedents of the well-known graphic form of the PLC that has been discussed for the last forty years.

### INTRODUCTION

Marketing researchers frequently use the product life cycle concept (PLC) as an accepted element in theory building. For example, Tellis and Fornell (1988) assume the traditional shape of the PLC as they examine the relationship between advertising and product quality in the four stages of the PLC. Curry and Riesz (1988) also utilize the PLC concept in their longitudinal analysis of price and quality relationships. They find that the correspondence between price and product quality for brands within a product form increases over the duration of the PLC.

Despite the common use of the PLC by current researchers and practitioners, few are aware of the origins and early uses of the PLC. This manuscript identifies and analyzes changes in marketing thinking on the product life cycle concept (PLC) over time. Through a broad survey of several academic disciplines, probable origins and influences on the evolution of the concept are traced. From the marketing literature three related concepts that help describe the PLC are noted and discussed - the fashion cycle, diffusion theory, and the product life cycle. Finally, this manuscript analyzes the validity and usefulness of the PLC. Older works are emphasized to help fill a gap in previous marketing research on the product life cycle concept.

### UNDERPINNINGS OF THE PLC

In the attribution of "life" to a product, marketers explicitly draw on concepts from the biological sciences. Many marketing writers refer to the analogy of an individual's life to describe a product's life (Schultz and Rao 1986; Stanton 1964; Tellis and Crawford 1981). However, the geometric growth and decline of the traditional PLC bell-shaped curve has its biological origins in studies of populations of species. Pearl (1925) analyzed populations of yeast and fruit flies to experimentally demonstrate the existence of the familiar curve. The shape of the population curve is influenced by biological influences such as food supply, oxygen, and competitors. These factors constrain the size of populations.

Malthus (1798) applied principles of population biology to the human race, postulating that the increase in man's population is necessarily limited by the means of subsistence. Thus, he argues that man is biologically determined to experience a similar bell-shaped curve in his population. At the best the human population faces a "maturity" stage due to the limits of room and

nourishment. Darwin (1859) also noted that the geometrical tendency of a population to increase must be checked by destruction at some period. Later authors (Commoner 1971) disagree that biological determinism applies to the human population. The utilization of science and technology can overcome population constraints by expanding the sources of food, providing new living arrangements, and controlling the growth of population.

The deterministic ideas of Malthus and Darwin were extended by social scientists in the nineteenth century. LeBon (1898) stated that each element in a civilization experiences a four-stage process of propagation and decline. Aspects of culture such as ideas, arts, literatures, and religions are fated to such a process. The first stage is adoption by a small number of apostles who possess great prestige due to their intensity and authority. In the second stage the idea is rapidly accepted as it is imitated. Penetration occurs everywhere in the third stage, as it spreads to all classes. Then, lastly, the governing classes lose faith and the idea begins its decline.

Tarde (1903), a sociologist, applied the biological concepts espoused by Malthus and Darwin to culture, including products of industry in his analysis. He felt that innovations in industry propagate through spontaneous and deliberate imitation at a more or less rapid rate "like a family of termites."

Examples were seen in the consumption of coffee and tobacco, and in the construction of locomotives, which overtook stage coaches as a means of transportation in nineteenth-century Europe. Tarde called the decline of a good "disimitation." He said that it occurs when superior rivals arise. As further evidence for his proposition, Tarde quoted a story told by Tocqueville. A builder of trading vessels told the French visitor that due to frequent changes in naval fashions, it was in his best interest to construct vessels of little durability. "Thus, the fickleness of taste in fashion favors manufacturing which is essentially ephemeral" (Tarde 1903, p.335).

Tarde departed from LeBon when he stated that aspects of culture, including goods, "are not subject to inevitable and irreversible decline. The idea of repetition dominates the universe, but it does not constitute it" (Tarde 1903, p.383).

The main factor that drives the adoption of innovations, according to Tarde, is imitation of the superior by the inferior. Superiority varies with the times and the culture; therefore it includes physical strength, bravery, wealth, high political class, scientific genius, industrial ingenuity, and race. "Trickle-down" from the upper classes is the most common influence, yet he stated that imitation can go from the bottom to the top.

Writing at approximately the same time as Tarde, the institutional economist Veblen (1899) argued that the leisure class is the primary influencer on the types of goods consumed. Believing that emulation is the root motive of ownership, Veblen theorized that those in the lower classes seek to conform to what the leisure class consumes. "This conspicuous leisure and conspicuous waste are reputable because they are evidence of pecuniary strength" (Veblen 1899, p. 141). He claimed that this financial power reveals success and superior force that men of all classes wish to possess. When lower classes imitate the upper classes in a certain fashion, the style loses its appeal to the wealthy. Subsequently, the loss of status of the style makes it equally unattractive to the "inferior class."

Other economists used biological analogies to interpret the development of firms. Chapman and Ashton (1914) studied the sizes of businesses in the textile industries in parts of England from 1884 to 1911. They concluded (p.512):

Indeed the growth of a business and the volume and form which it ultimately assumes are apparently determined in somewhat the same fashion as the development of an organism in the animal or vegetable world. As there is a normal size and form for a man, so but less markedly, are there normal sizes and forms for businesses.

Marshall (1920) noted that a firm's vigor declines with age. In a discussion of business cycles, Clark (1934) noted that products have "growth curves." Automobiles are mentioned as a product form that requires several decades to reach maturity. Boulding (1950, p. 34) insisted that there is an "inexorable and irreversible movement towards the equilibrium of death. Individual, family, firm, nation, and civilization all follow the same grim law, and the history of any organism is strikingly reminiscent of the rise and fall of populations on the road to extinction."

In contrast to the prevailing view of economists, Penrose (1952) believed that drawing on biological concepts to explain social phenomena is ill-founded. Biological ideas applied to firms and goods suggest explanations that do not depend upon the conscious, willed decisions of human beings, obscuring the fact that "firms are institutions created by men to serve the purposes of men" (Penrose 1950, p. 809). She posited that the appeal of biological analogies to the social scientist springs from a yearning to discover laws that determine the outcome of human actions. The discovery of such laws would allow for more reliable power of prediction; yet, she was unconvinced that such laws have been uncovered.

Another discipline that contributed to underpinnings of the product life cycle concept was anthropology. In a seminal work the cultural anthropologist Kroeber (1919) postulated that social phenomena are expressible by nearly similar geometrical curves. He identified five stages that he acknowledged are analogous to biological phenomena: origin, growth, climax, decline, then death or petrification. These stages apply to aesthetics, politics, religion, and manufactured objects. Kroeber chose to quantitatively measure changes in articles of womens' formal dress over a 75-year period to support or reject his hypothesis. Richardson and Kroeber (1940) further studied stylistic changes in formal dress over a three-century period.

Both studies provide evidence that dimensions of dress, such as length and width of skirts, change "with a slow majesty" and regularity in periods averaging fifty years apart. Thus, the full-wave length of their periodicity is approximately one century (Richardson and Kroeber 1940). The primary inference drawn by Kroeber is that the regularity in change dwarfs the influence that any individual can possibly exert in altering fashion. Civilizational determinism is a far greater influence than any psychological explanation such as imitation or emulation (Kroeber 1919).

Writers of several generations ago observed and described cycles in nature and society that exhibit a normal distribution. They differed both between and within disciplines on the factors that

influence these cycles. Biologists, some economists, and a few anthropologists offered deterministic explanations, viewing the cycle as an independent variable. Some economists, and most psychologists and sociologists viewed the cycles as dependent on factors such as emulation and imitation.

#### PRODUCT LIFE CYCLE DESCRIPTIONS

Conscious of waxing and waning cycles, marketers in the last sixty years have become more specific in describing this phenomenon as it relates to fashion, innovation, and products. Three constructs - fashion cycles, diffusion of innovations, and product life cycles, all posit a normal distribution curve that helps describe the concept. These topics are discussed in order, as they pertain to the development of the product life cycle concept.

##### Fashion Cycles

Changes in consumer tastes for clothing can be identified throughout the last one thousand years (Robinson 1963). As has been discussed, Veblen (1899) and Kroeber (1919) were two of the first to propose theories on the phenomenon. One of the first sources in business books or journals that delineated and described a multi-staged cycle is The Harvard Business Review (1927). The unnamed author of the article discussed a "style cycle" for clothes that involves an appearance, increase, climax, waning, and disappearance, as the first style gives way to another style. Three stages are identified, based on the buyers' motives, and correlated with type of retail outlet:

The desire for <u>distinctiveness</u> :	Exclusive specialty shops.
<u>Emulation motive</u> :	Better department stores.
<u>Economical emulation</u> :	Bargain basements.

The author noted that this third stage leads to a rapid demise of the style.

One year later in his classic Economics of Fashion, the marketer Paul Nystrom (1928) synthesized contributions from several disciplines to explicitly identify and analyze the fashion cycle. First, he distinguished "fashion" as a prevailing "style" at any given time. This represents a clarification of previous confusion of the terms, as occurred in the Harvard Business Review article (1927). The fashion cycle describes "the rise, culmination, and decline of popular acceptance of a style" (Nystrom 1928, p. 18), represented by a normal distribution curve. Thus, Nystrom believed that the decline rate is the same as the acceptance rate. However, later researchers have shown that many styles go out of fashion more rapidly than they are accepted (Scherer 1941). In contrast to the anthropological views of secular trends spanning up to a century, Nystrom focused on the life of a single fashion. This short-run view has more application and interest for marketers.

Mentioned throughout his book are several dozen factors that influence a style's acceptance and decline. These untested opinions represent most of the factors mentioned by writers of the time. I have summarized and arranged these into socio-cultural, psychological, historical and technical/managerial factors.

## FIGURE 1

### Factors that Hasten Fashion Cycles (Found in Nystrom 1928)

- I. Sociocultural
  - \* Increased Wealth
  - \* Increased Leisure Time
  - \* Higher Education
  - \* Upper Classes' Examples (the wealthy and intelligent who possess much leisure-time)
  - \* Young Peoples' Examples
  - \* Societal Ideals of Youthfulness, Equality, Progress, and Change
  - \* Decline in Sumptuary Laws
  - \* Social Mores of Modesty and Hygiene
- II. Psychological
  - \* Curiosity
  - \* Sexual Motivations
    - \* Emulation
    - \* Fatigue and Boredom
    - \* Rebellion Against Convention
    - \* Self-assertion
    - \* Desire to Show Status
- III. Dominating Events (Historical)
  - \* Wars
  - \* Worlds' Fairs
- IV. Technical/Managerial
  - \* Improved Manufacturing Capabilities
  - \* Advances in Communication and Transportation
  - \* Advertising and Other Promotion

Nystrom promoted the "trickle-down theory," accepting Veblen's ideas that conspicuous consumption and conspicuous leisure are strong influencers on fashion changes. He believed that imitation of royalty and nobility is much less extensive than in the preceding centuries. A more dominating influence is wealthy, fashion-conscious social groups (1928). The influence of commercial promotion on fashion changes is limited, according to Nystrom.

Other writers have suggested many other factors that drive the fashion cycle and have often disagreed about which are most critical. The fact that few have empirically tested the factors has often reduced the discussions of fashion cycles to mere opinions and anecdotes. For example Flugel (1930) postulated that the essential influence on fashion is competition of a sexual kind. Others refined that idea to emphasize the driving factor of attracting desired attention through distinctiveness (Young 1937). Price (1913) credited the ethical atmosphere of the time as a primary factor in determining which styles become fashions. Bell (1976) expanded on this idea in discussing the roles of religion and nationalism in fashion.

Whereas disagreement about key factors exists, the validity of the concept of the fashion cycle has not been disputed. One of the few empirical tests of

short-run fashion cycles provides evidence that the cycle exists (Reed 1987).

Most of the literature focuses on the role of different leadership groups that consumers imitate (Sproles 1981). The oldest theory regarding the forms of leadership that determine new trends is upper class leadership theory, previously discussed as the "trickle-down" theory. A newer, more persuasive idea is the mass market theory of Katz and Lazarsfeld (1955). This theory suggests that fashion influence occurs informally within an individual's own social class and peer group. People often look to their friends and associates for cues on fashion. To many analysts this is the most pervasive fashion process (Sproles 1981). A third theory attributes some fashion trends to subcultures that possess a unique style that is noticed and admired by the larger population (Sproles 1981).

Some writers believe that designers exert a major influence on fashion changes (Klein 1939; Robinson 1961) and that marketers can take actions to keep clothes in fashion (Houghton 1926; Link 1932). Others scoff at these views (Bell 1976; Frey 1940; Sapir 1931; Stuart 1925), citing examples of fashions that designers and retailers were unable to sell. In a turnabout from his earlier writings, Robinson (1975) emphasizes the inexorability of fashions. These latter writers, either implicitly or explicitly, accept some of the deterministic explanations of earlier biologists and anthropologists as they argue that managers are powerless to influence fashion cycles. Although the effects of advertising may be limited, distribution affects the availability of styles of clothes that a consumer may purchase (McKendrick, Brewer, and Plumb 1982).

The fashion cycle is an antecedent for the product life cycle, describing the waxing and waning of consumer preferences for ego-intensive goods in a series of stages. These cycles can be repeated and are applied to both secular trends and short-run changes.

#### Diffusion Theory

Diffusion theory, as discussed by sociologists, attempts to explain the spread of an innovation over time from its originators to ultimate users or adoptors (Bowers 1937; Danhof 1949; Ogburn and Gilfillian 1933; Rogers 1962). Anthropologists (Graebner 1911; Heine-Geldern 1968; Wissler 1923) view diffusion as the spread of culture from one ethnic group or area to another. Marketers have primarily drawn on sociological analyses in applying diffusion theory to models of new product acceptance (Bass 1969; Mahajan and Muller 1979; Robertson 1967). Two aspects of this theory are particularly relevant to the PLC concept: the classification of new product buyers into adopter categories, and the development of the adoption process.

Bowers (1937), studying the adoption of amateur radio transmission sets, was one of the first to empirically identify that adopter distributions follow an S-shaped curve. He also discovered that interpersonal channels are more important than mass media channels for early adopters. Danhof (1949), in industrial diffusion research, identified four kinds of adopters: innovators - the first firms to adopt a new idea, initiators - the firms who adopted soon after the innovators, fabians - the firms who adopted only after the utility was widely acknowledged in the industry, and drones - the last firms to adopt new ideas. One of the most prominent researchers in diffusion theory is Rogers (1962), who cites Tarde (1903) as an important influence in his work.

Roger's empirical research over the last three decades confirms that innovations are diffused through society in a manner resembling the normal curve. The first 2.5% to adopt a product are defined by Rogers as innovators, the next 13.5% as early adopters, the next 34% are early majority, and next 34% as late majority, and finally, the last 16% are called laggards. Each of these groups moves through the adoption process of awareness, interest, evaluation, trial and adoption, although at different times and at different paces. Characteristics of people or firms in each category are also described. For example, Rogers inductively concludes that innovativeness is positively related to cosmopolitanism.

This theory of the diffusion and adoption of innovations provides theoretical support for the life cycle curve. However, Roger's model has two weaknesses for applications to marketing. First, the model assumes 100% adoption; however, for most marketing innovations, not everyone will adopt. Second, it only considers one-time purchases. In the marketplace most products involve repeat purchases, a factor that the product life cycle incorporates.

#### The Product Life Cycle in Business and Marketing Literature

The classic product life cycle differs from fashion cycles in that all products are proposed to go through a one-time, non-repeatable process of growth and decline. The focus is on sales of the product, rather than on the types and characteristics of adopters, as in diffusion theory. Trade literature antecedents will be considered, followed by an analysis of descriptions of the PLC concept in academic literature.

Throughout the last century trade literature authors have discussed the waxing and waning of products over time. Schaler (1888) considered changes in land carriages, as innovations and style changes lead to the end of certain carriages and the introduction of others. Hurd (1916) related that Western Union experienced stable sales and declining profits until they discovered and promoted new uses for telegraph service. After promoting the use of the telegraph to send holiday greeting and business advertisements rather than just "bad news and critical messages", Western Union's sales greatly increased in the 1910s.

Dickinson (1923) discussed the need for manufacturers to drop products that are overtaken by technical innovations and changed buying habits. Diversification strategies and promoting new uses for declining products are other responses to changing realities in the marketplace. In a striking understanding of the marketing concept, Dickinson (1923, p. 70) told readers to "keep your minds fixed on the final consumer and what he or she is thinking." McCullough (1929, p.96) agreed as he postulated that the determining factor in a product's decline is the "eye and mind of consumers."

Giles (1927) identified four managerial actions that may help keep products from declining: find new uses, advertise, sell abroad or to different segments in the U.S.A., and improve the product. Potter (1932) addressed the need to develop repeat sales of products to keep sales and profits from declining over time. These examples from the trade literature reveal that an informal concept of the product life cycle was a part of businesspeoples' thinking in the first third of this century. In contrast to the perspectives of many social scientists, they did not view cycles as inexorable.



Kleppner (1933) was one of the first marketing academics to discuss phases that products go through over time. In his "advertising spiral" concept, he identified three stages that are used as the basis for determining appropriate types of advertising: pioneering, competitive, and retentive. In the pioneering stage marketers introduce a product with advertising that reveals a need and shows how the product meets that need. At the competitive stage advertisers show the distinctive merits of their brand over the others. Products in the retentive stage are at the height of their success, with advertisers merely keeping the name of the brand before current buyers.

Kleppner advised managers with goods in the retentive stage to seek a new cycle for their products by appealing to groups of people who are unfamiliar with the good, or who have not purchased it previously. Repeated "widenings" of the market constitute Kleppner's spiral. The stages are not correlated with sales or profits. Instead, he stated that the stage of a product is in the mind of a group of people at one time. Thus, a product may be in several stages at the same time, since it is viewed differently by different groups of people.

The term "product life cycle" was mentioned first by Dean (1950), in an economics-oriented study of pricing policies for new products. Dean called his descriptive model "the cycle of competitive degeneration" (p.53), conceptually emphasizing the perishable distinctiveness of products as competition increases. Another early discussion of the concept comes from a publication of Alderson and Associates (1951), reprinted by Lazer and Kelley (1962). Alderson diagrammed three periods in the growth of a business over time: establishment, expansion, and stabilization. No period of decline is mentioned.

The first graphic description of the classic PLC concept was found in an article by Forrester (1959). The familiar S-curves of sales and profits are diagrammed as a function of time in four stages: introduction, growth, maturity, and decline. Sales peak at the saturation stage, whereas profits are at their highest at the end of the growth stage. Apparently building on Kleppner's work, distinctive goals and methods of advertising are proposed for each stage in the cycle.

One of the first formalized expositions of the PLC in a textbook was found in Stanton (1964). He cites a book-length discussion by Booz, Allen, and Hamilton published in 1960. They encourage managers to focus on the profit curve and to develop a continuing stream of innovations in order to survive as a company.

Levitt (1965) popularized the PLC concept in a managerially-oriented article, describing the appealing intuitive logic of the concept as a product interacts with its market. He also attracted marketers to the PLC by emphasizing its use as a forecasting tool that can provide managerial implications of sales and profit levels as a product moves through the PLC stages. However, Levitt (1965), Clifford (1965) and those marketers before them merely postulated the existence and usefulness of the PLC. Empirical evidence to confirm or falsify the concept had not been presented.

## VALIDITY OF THE PLC

From Levitt's work in 1965 to the present, marketers have debated the validity of the PLC. Several dozen writers using quantitative and qualitative arguments have addressed the controversy. Buzzell (1966) provides one of the first empirical tests of the PLC concept. He analyzed sales data for several food product forms over a sixteen-year period, uncovering evidence of product life cycles with different stages. Another contribution of his work is the identification of different types of PLC maturity stages. Some products do not reveal a stage of decline.

Brockhoff (1967) also provides empirical evidence of the PLC, using product form as the level of aggregation. In addition, his study discovers that sales of related products affect total sales. Thus, the PLC is not merely a function of time. Cox (1967) finds strong evidence of the PLC among brands in the ethical drug industry. However, his identification of several shapes of the PLC adds to understanding that the normal distribution is a conceptual ideal not apparent in every product.

One of the most ambitious studies in the PLC literature was undertaken by Polli and Cook (1969), as they evaluated the sales behavior of 140 categories of nondurable consumer goods at three levels of product aggregation. They attempted to quantify six stages of the PLC (with three for different types of maturity). Comparing actual sales histories with figures generated from a simulated sequence, they find evidence of the existence of the PLC. Product forms fit the PLC more appropriately than brands or classes - especially when in the same market segment within a general class of products. Ten years later Rink and Swan (1979) find twelve patterns in their review of 19 empirical studies of the PLC. These include the shapes of cycle/recycle, stable maturity, and growth-decline-plateau.

Some take this diversity of shapes as evidence that the PLC concept is not valid, as Dhalla and Yuspeh (1976) conclude from their review of PLC studies. They feel that brand managers, particularly, cannot use the PLC concept to predict future sales or to help in strategy formulation. Using anecdotal evidence, they conclude that the PLC concept has done more harm than good by persuading top executives to neglect existing brands and place undue emphasis on new products.

Field (1971) argues that the PLC is not a valid concept for use by marketers. He uses the fact of recurring cycles in fashion to infer that "the deceased are not entombed forever" and that products do not have inevitable deaths. However, the fashion cycle is not the same concept as the product life cycle. Enis, LaGarce, and Prell (1977) also react against the biological determinism implicit in the PLC. They posit that the PLC is a dependent variable, relying primarily upon the managerial strategy implemented for the product at a particular time. Consistent with their views, they redefine the PLC in managerial terms: development, entry, maintenance, proliferation, and exit/decline. Parsons' study (1975) lends some support to the view that sales levels are not a function of time alone, but are also affected by managerial actions. He shows that prices for brands are more elastic at early stages in the PLC. Ayres and Steger (1985) demonstrate that a firm's technology and manufacturing flexibility can be used to influence the shape and rate of change of a product's life cycle.

Two further developments of thinking on the PLC are notable. Wind and Claycamp (1976) identify the product's profitability and market share position as key variables, in addition to sales. They develop a product evaluation matrix using these variables that improves strategic understanding of a product relative to its competition. Midgeley (1981) addresses criticisms of the PLC that have focused on the bewildering diversity of PLC shapes. His study represents an advancement in marketing thought on the PLC as he examines underlying processes that influence the shape of the life cycle. He is one of the first to recognize that outcome sales related to the PLC should be decomposed into more fundamental measures of consumer response. Sales of any product class, form, or brand can be decomposed into first purchases and repeat purchases. These repeat purchases can be further decomposed into the number of people buying per time period, and the number of units bought on each purchase occasion. Midgeley's simulation model shows that by manipulating the ratio of mean adoption to mean interpurchase times and depth of repeat, the diversity of shapes of the PLC can be reproduced and explained.

In the early 1980s a consensus was emerging within the discipline that the product life cycle represents the summary of numerous interactive forces for change present in the relevant product-market (Day 1981). Factors that influence initial adoption include comparative advantage of the new product, perceived risk, information, and availability. Manufacturers can design their marketing programs to influence each of these four factors (Day 1981). Later stages are affected by factors such as changes in relationships with substitute products, buyer learning, and competitive turbulence.

More recent empirical studies continue to confirm the validity of the PLC (Mercer 1984; Schultz and Rao 1986; Thierart and Vivas 1984). State-of-the-art research demonstrates acceptance of the PLC concept in the marketing discipline. Tellis and Fornell (1988) assume the traditional shape of the PLC as they examine the relationship between advertising and product quality in the four stages of the PLC. Curry and Riesz (1988) also show that they accept the PLC concept in their longitudinal analysis of price and quality relationships. They find that the correspondence between price and product quality for brands within a product form increases over the duration of the PLC. Current marketing literature reveals wide acceptance of the validity of the PLC as a generalized pattern of market structure and performance over time. Most of the skepticism regards the usefulness of the PLC as a strategic tool.

#### USEFULNESS OF THE PLC

Throughout the century marketers have attempted to use the product life cycle concept as a managerial tool in developing marketing strategies. In addition variants of the PLC have been applied to retailing forms and firms (Davidson 1970; Davidson, Bates, and Bass 1976; Hollander 1960; McNair 1958), services in general (Potts 1988), and the exporting and importing of a good (Vernon 1966; Wells 1968).

However, there are difficulties in applying the traditional PLC concept operationally. Many writers on the PLC provide normative statements about appropriate managerial strategies and tactics for sales of brands in various stages of the PLC (Cox 1967; Dean 1950; Forrester 1959; Levitt 1965; Onkvisit and Shaw 1986; Parsons 1975). These have led to a conventional wisdom about

appropriate managerial actions at each stage in the cycle. For example, intensive advertising is considered to be crucial in the introductory stage to develop product awareness (Buzzell 1966) and price reductions are important in the maturity stage to encourage repeat buying so as to better compete with many companies marketing similar products (Levitt 1965).

In the last few years, several researchers have examined the length of PLCs and considered the managerial implications. Testing products in several industries, all have discovered that PLCs are shortening (Bertrand 1988; Combs 1987; Qualls, Olshavsky, and Michaels 1981; Rosenau 1988). This finding suggests the need to develop a continual stream of new products. These shortened PLCs may be a feature of a consumer society that incessantly demands new and different products.

Onkvisit and Shaw (1986) are two recent writers who agree with Levitt, and others previously mentioned, that the PLC is a valuable tool that suggests proper courses of action to lessen the impact of competitive changes. They present several general ideas on how to respond to potential or existing competitors at each stage in the PLC.

There are three problems with most prescriptive attempts to apply the PLC concept to practitioners' situations. First, most of the prescriptions (e.g. Levitt 1965) lack empirical support for their validity, and merely represent each author's opinion of how the PLC could be useful to businesspeople. Levitt's (1965) discussion demonstrates a second problem. He implies that the PLC applies to product class (nylon), and that various product forms (parachutes, hosiery, and tire cord) extend this original life cycle. Subsequent writers have applied the PLC concept to industries and three forms of product aggregation - class, form, and brand, without consistent agreement on the most appropriate unit of analysis (Hoverstad 1982). Product class seems to be the most appropriate unit of analysis, however (Day 1981). Third, writers have been unable to give managers guidance on how to determine the current stage in the PLC of their products. Nor have the means been found to predict when a product will move into the next stage. Difficulties in applying the PLC have led some (e.g. Thorelli and Burnett 1981) to conclude that the PLC has not demonstrated much value in strategic planning.

In the last two decades there has been extensive work to develop quantitative methods for PLC-related forecasting. Tools to forecast sales, market share, and profitability throughout the product life cycle have become increasingly sophisticated and complex. Stochastic models, causal models, time-series and projection techniques, and conjoint analysis are some of the computer-aided forecasting procedures being used (Mahoud, Rice, and Malhotra 1988). First-purchase diffusion models show a promising track record; however, quantitative models have not successfully forecast the maturity and decline stages (Day 1981). A forecasting approach which joins market segmentation techniques with the PLC holds some promise for forecasting demand over time in several service industries (Cohen 1988). Its accuracy has not been validated, yet.

## CONCLUSIONS

Marketing practitioners and academics have implicitly and explicitly discussed aspects of the PLC concept throughout the last century. Writers in several

academic disciplines have helped to provide a theoretical basis for the product life cycle concept. Their work also reveals that marketers are not the unique discoverers or owners of the PLC concept.

With formal descriptions and empirical tests by marketers, the PLC has gained wide acceptance in the discipline as a broad generalization that explains the phenomenon of sales behavior over time. Less agreement exists about the managerial usefulness of the PLC. Marketers have become more critical about applications of the concept in business situations. Much of this criticism is due to ambiguity in the concept. The conditions and identifications of the PLC stages are not clearly specified. Thus, determinations of when and where the PLC is applicable are uncertain. The PLC seems least able to predict behavior about a brand - the unit of analysis that is of the most concern to managers. However, the PLC provides some explanation of how and why sales of a product change over time. Marketers currently believe that the PLC can be used by managers in a limited way to help formulate general competitive strategies that change as a product moves through its life cycle.

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