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## The Product Life Cycle—A Critical Look at the Literature

*David M. Gardner*



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College of Commerce and Business Administration

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The Product Life Cycle  
a Critical Look at the Literature

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This critical examination of the Product Life Cycle focuses on the literature since 1975. The conclusion is drawn that the Product Life Cycle is not a theory even though it is one of the seemingly most important concepts in marketing thought and practice. Rather than dismiss this concept, it is suggested that two complementary approaches be taken: a contingency theory approach and a meta-theoretical approach. Both approaches may result in a major reconceptualization of the life cycle phenomena.



It is difficult to find an introductory marketing text that does not devote considerable attention to a concept identified as the product life cycle. And in recent years there have been several literature reviews and a special edition of the Journal of Marketing devoted to this concept. Also the concept has received prominence as a central component in several strategic planning paradigms. If volume of journal and business articles is a guide, many feel it is an important concept. However, it now seems appropriate to take a critical look at this concept to see what we do indeed know, to see if we like what we know, and to think about where we go from here if, indeed, the product life cycle is to be a central concept in marketing thought and practice in the future.

This review is offered with great humility. The product life cycle is almost certainly one of the most well known if not most important concepts in marketing. Everyone reading this review will be familiar to some extent with the concept. For some, unique insights may come as they see something in a new light. For others, it may stimulate thought. Yet others, who are very familiar with the concept may find certain parts "old hat" but benefit from the bibliography. Nonetheless, the reader should realize that the purpose of this review is not to offer an exhaustive review of the literature nor an annotated bibliography. Rather, the purpose is to organize the literature and, secondly, offer suggestions for enhancing this concept. It will become clearly evident that, with minor exceptions, the literature reviewed has been published since 1975. The reader is directed to Rink and Swan (1979) for an early review of the literature. While suggestions will be put forth,

we will have to wait for another forum for every aspect of this concept to be explored in depth. It is an almost inexhaustible concept because it touches on almost every aspect of marketing and drives many aspects of corporate strategy, finance and production. We will be forced to limit our discussion primarily to those aspects directly related to marketing, and then only to those aspects explored in the current literature.

### Introduction

That the product life cycle holds the potential of being a central concept in marketing thought and practice is addressed by Hofer (1975) in his belief that:

the most fundamental variable in determining an appropriate business strategy is the stage of the product life cycle (Hofer 1975, p. 798).

Similarly, Biggadike (1981) lists the product life cycle as one of the five major contributions that marketing has made to strategic management. However, in his comments on the product life cycle, Day (1981) expresses the uneasy feeling of many.

There is a tremendous ambivalence toward the product life cycle concept within marketing. On one hand, the concept has an enduring appeal because of the intuitive logic of the product birth > growth > maturity > decline sequence based on a biological analogy. As such, it has considerable descriptive value when used as a systematic framework for explaining market dynamics. However, the simplicity of the product life cycle concept makes it vulnerable to criticism, especially when it is used as a predictive model for anticipating when changes will occur and one stage will succeed another, or as a normative model which attempts to prescribe what alternative strategies should be considered at each stage (Day 1981, p.60).

Is the product life cycle merely a description of some phenomena that seemingly exists? Or is there "truth" that has yet to be fully discovered and developed? Fortunately, or unfortunately, since 1975, approximately 300 articles have been published dealing with various aspects of the product life cycle. This compares with considerably less than 100 articles published prior to 1975. Many of these more recent articles offer insight into these very legitimate questions about this concept.

Questions surrounding the product life cycle concept are not merely academic trivia. Rather they seem to be addressing the validity of the "assumed" basic building blocks of marketing thought and practice. If marketing is to move toward a constituency-based theory of the firm as advocated by Anderson (1982) it is imperative that these basic building blocks of marketing theory be not only descriptive, but prescriptive. Only then, will marketing be able to achieve it's legitimate role in guiding the strategy of organizations.

If, in fact, these questions can be adequately addressed, then it is safe to assume that the product life cycle has the potential to serve as a major conceptual building block for the integration of the consumer orientation inherent in the managerial approach to marketing with the competitive strategy approach of strategic planning.

At this point, it would normally be appropriate to offer a definition of the product life cycle. As will become readily evident, that is a difficult task. For while it is a concept that most marketing academics and practitioners have familiarity, there are many questions and concerns, not the least of which is the question of whether there is a cycle or



cycles and many other associated issues. In fact, some would argue that the product life cycle concept either does not exist or exists for only some products.

The most widely held understanding of this concept is that it is an S shaped curve representing the sales history of a product. For the purpose of this review, a slightly modified understanding is offered. The working definition of the product life cycle used in this review is: the curve(s) that represent the sales history of a product class, product or brand over the life span of a given product class, product or brand.

To what does the product life cycle apply? In other words, what is a product? Interestingly, most authors assume that a definition of product is implicit. It does not seem to be a topic of concern. However, after reviewing several hundred references, it appears that almost all authors would find that this concept applies to products as defined by Kotler:

A product is anything that can be offered to a market for attention, acquisition, use, or consumption that might satisfy a want or need. It includes physical objects, services, places, organizations and ideas (Kotler 1985, 463).

Wasson in discussing products suggests that:

A product, then, is simply a perceived cue to some set of buyers that they will be able to complete a learned use-system which is perceived, in return, as yielding satisfaction of a set of active desires (Wasson 1974, p. 12).

Consequently, in the context of the product life cycle, product is generally broadly construed. With few exceptions, it is not limited to a physical product. Therefore, we should expect the product life cycle



to have relevance for services, organizations and ideas in addition to physical objects.

All products have a "birth." They come into being to satisfy a set of active desires in a unique way. The study of new products is closely linked to the product life cycle concept. It is not the goal of this review to incorporate the new product literature. The reader is referred to Wind (1982) and Pessemier (1982) for comprehensive discussion and reference to the new product literature. Unfortunately, it is all too common to treat new products as a distinct entity. Consequently, the majority of the new product literature is not linked to the product life cycle nor to the later stages of the cycle.

#### In The Beginning

The origins of the concept are not exactly clear. Gardner (1986, p. 5) speculates that the concept reflects what many have observed to be reality. This perception of reality eventually entered the literature as the product life cycle. Buzzell (1966) reports that one of the earliest references to an S-shaped curve similar to the product life cycle was that of Prescott. Prescott (1922) refers to the "Curve of Progress" or "Law of Growth." He proposed an equation which fit the growth of the automotive industry from 1900-1920 very well. Muhs (1985) in his attempt to trace the history of the product life cycle reports that Otto Kleppner (1931) conceptualized an antecedent of the product life cycle in his classic text, Advertising Procedure. He posited that most products passed through the stages of "pioneering", "competitive", and "retentitive" (Kleppner 1931, p. 5). Howard (1981,

p. 237) reports that the well known Austrian economist, Joseph Schumpeter (1939), seemed to clearly recognize a phenomena similar to the product life cycle in his theory of economic development. But for most of the 1930's, 40's and 50's, marketing thought was directed toward understanding the commodity, institutional and functional approaches to marketing. In the late 50's and early 60's, as the managerial approach came into prominence, the product life cycle seemed to be an early component. Joel Dean (1950, 1951) often is credited with being an early pioneer of this concept, even though he did not explicitly label this concept.

Muhs (1985) found that the first reference that actually labeled the concept as the "product life cycle" appeared in 1957. After reviewing data from over 300 clients of Booz, Allen and Hamilton, an extensive review of the literature and new product data on more than 400 manufacturers, Jones, then, Manager of New Product Planning at Booz, Allen, and Hamilton, made the following observation:

There are compelling forces behind this drive for new products. There is a life cycle that is characteristic of many--if not most--products. Since all products are "new" at their outset, we can call it the basic life cycle for new products (Jones 1957, pp. 41-42).

Yet, the list of definitions published by the American Marketing Association (Alexander 1960) did not include the product life cycle. By 1974, the product life cycle was embedded in our literature. In that year, Chester Wasson published a major monograph, Dynamic Competitive Strategy and Product Life Cycles (1974). He strongly believed that:

Successful management of every aspect of marketing strategy involves the appropriate match of marketing plans to the current stage of the market life cycle (Wasson 1974, p. 2).

#### As A Descriptive Variable: There Is Much Agreement

There is a surprising amount of agreement on the nature of relationships to be found in the product life cycle. For instance, Day (1986) lists the most commonly agreed upon features of the product life cycle as:

1. Products have a limited life.
2. Their sales history follows an S curve until annual sales flatten, when penetration of the potential market is achieved, and eventually decline.
3. The inflection points in the sales history identify the stages known as introduction, growth, maturity, and decline. Some life cycles add more stages, including a period of shakeout or competitive turbulence once growth begins to slow.
4. The life of the product may be extended by finding new uses or new users, or getting present users to increase their consumption.
5. The average profitability per unit rises and then falls as products move sequentially and inevitably through the stages (this follows directly from the presumed correspondence of the life cycle with the experience curve for average industry prices). (Day 1986, p. 59).

But, while there are major areas of agreement, a number of the assumptions that underlie the agreement on the basic relationships of the cycle have been questioned along with some methodological issues associated with empirical investigations of the product life cycle.

#### Is the Concept A Theory?

The role of theory is to "increase scientific understanding through a systematized structure capable of both explaining and predicting

phenomena (Hunt 1983, p. 4)." A legitimate question, then, is to seek to determine if the product life cycle is a theory with explanatory and predictive power.

Taking this position that the product life cycle concept is an attempt to classify and organize a given set of phenomena, then it is appropriate to examine this concept to determine the degree to which it achieves its organizational and classificational objectives.

According to Hunt (1983, p. 349) "organizing phenomena often represents the first step in theory development." Hunt suggests five criteria for evaluating classificational schemata.

1. Does the schema adequately specify the phenomenon to be classified?
2. Does the schema adequately specify the properties or characteristics that will be doing the classifying?
3. Does the schema have categories that are mutually exclusive?
4. Does the schema have categories that are collectively exhaustive?
5. Is the schema useful? (Hunt 1983, p. 355)

Unfortunately, the classification schemata does not hold up well given these criteria. It clearly is weak in meeting the first four criteria and Leavitt's (1986, p. 186) findings suggest that the fifth criterion is also weak.

#### Criticisms and Limitations

Arriving at the conclusion reached above is not difficult given the following criticisms and limitations. The reader should also note that these criticisms and limitations are really measurement issues. Difficulties in measuring the product life cycle(s) is directly related to difficulties in specification. Consequently, reliability and validity problems abound.



In their review of the product life cycle literature, Rink and Swan (1979) addressed many of these issues. These issues have also been addressed by Meenaghan and Turnbull (1981) and by Tellis and Crawford (1981). And many studies have spoken to several of these limitations. The issues that seem to be of concern fall into the following categories. Admittedly, there is overlap between these issues. Furthermore, no attempt is made to evaluate these issues nor rank their importance.

Criticisms and limitations are organized using Hunts criteria for evaluating classificational schemata (Hunt 1983, p. 349).

1. Does the schema adequately specify the phenomenon to be classified?

Unfortunately, the answer is a clear NO! It is not even clear that we are observing the correct phenomenon. In fact, Crawford argues:

We took the wrong concept from biology. The fixed sequence life cycle concept is used only for individual specimens in nature, something for which there is no analog in business. Instead, our problem is the management of a product type or brand (Crawford 1984, p. 11).

In addition, there is no agreement on the shape of the sales history curve. Is there a generic S shaped curve or widely different curves? If there are many curves, then we must question whether they are all best described by the product life cycle concept.

Wasson (1974, p. 11) postulated that there were at least nine variations of the classical S shaped product life cycle. The research of Rink and Swan (1980, 1982) indicates that there may be as many as eleven different product life cycles. Similar analysis led Meenaghan and Turnbull (1981) to charge:

The methods of stage identification are unlikely to provide management with a solid base upon which to plan future strategy (Meenaghan and Turnbull 1981, p. 9).

This is very similar to the earlier arguments of Wind and Claycamp (1976).

A closely related issue is that of the level of aggregation. In their classic study of cigarette sales data, Polli and Cook (1969) identified separate life cycles for product class, product form and brand. Tellis and Crawford (1981) after reviewing the literature suggest that:

Authors generally feel that product forms bear the closest approximation to the PLC, individual brands are difficult to model, and patterns at the level of product class are less apparent because of the longer sales trends involved (Tellis and Crawford 1981, p. 126).

With regard to his interest in price elasticity, Simon (1979) argues that:

The distinction between brand and product life cycle is crucial in this context because the price elasticity of a product reflects mainly the elasticity of primary demand, whereas the price elasticity of a brand reflects a compound of the primary demand and the cross-price elasticity (Simon 1979, p. 439).

But confusion abounds! In their stinging attack on the product life cycle, Dhalla and Yuspeh (1976) base their analysis primarily at the brand level. Yet, there is no agreement as to what level or levels are appropriate in marketing text books or elsewhere.

2. Does the schema adequately specify the properties or characteristics that will be doing the classifying?

Not really!



For Hunt, the typical explanation of the product life cycle is "vacuous."

If the level of sales determines the stage of the life cycle, then the stage in the life cycle can not be used to explain the level of sales.

Unless and until the product life cycle can be refined to the point where the stages can be identified independent of the sales variable, the life cycle concept will remain impotent and void of explanatory power (Hunt 1983, p. 131).

A naive tendency to equate the inflection points in the life cycle curve with time has seemingly mislead some scholars and practitioners.

However, Parsons (1975) clearly states that the:

Sales curve is not a function of time alone. External environmental factors and controllable marketing instruments determine the stage of the sales response curve (Parsons 1975, p. xx).

In a similar vein, Wind and Claycamp (1976) suggest that:

Traditional product life cycle analysis ... ignores the competitive setting of the product, the relevant profit consideration, and the fact that product sales are a function of the marketing effort of the firm and other environmental forces (Wind and Claycamp 1976, p. 8).

Likewise, Meenaghan and Turnbull (1981) argue that:

The shape of the life cycle curve will ultimately be determined by a host of industry, market and environmental factors (Meenaghan and Turnbull 1981, p. 9).

This is consistent with the argument of Wiersema (1982, p. 19) when he states that the three interrelated tendencies of demand maturation, technical maturation and competitive maturation occur along approximately parallel time paths. Consequently, it is difficult to disentangle the relevant effects.

In addition to problems with using sales and time variables to classify stages in the product life cycle, several authors have pointed out that the decline stage may often be a self-fulfilling prophecy.

If you say that all products, sooner or later, stop growing, enter maturity and then inevitably decline, then, it is reasonable to believe that changing sales figures indicate passage through stages of the life cycle. For Dhalla and Yuspeh (1976), the belief that brands will decline often leads to premature cutbacks in marketing and advertising support. They argue that in many cases appropriate use of advertising and other marketing tools can prevent the decline stage. Likewise, Tellis and Crawford (1981) feel that:

The death stage of the PLC need never be accepted as certain except when all other innovative modifications fail to provide a profitable alternative, as in the special case of fad and fashion products (Tellis and Crawford 1981, p. 131).

In his review of the underlying causes of product growth and decline, Wiersema (1982) postulates that there are three curves or maturation tendencies: demand, technical and competitive. Consequently, he argues that:

The simple assumption that sales growth will decline over time and will affect a variety of strategic and performance variables in a predetermined way is deceptive in that it overlooks the arbitrary nature of unit of analysis selection, the effect of unsystematic changes, and the fact that marketplace dynamics may be driven by at least three regular maturation tendencies that do not necessarily move in tandem (Wiersema 1982, p. 21).

For Cannon (1978, p. 238), prematurely "talking" products into decline "is far more a critique of naive' management than the model per se".

After reviewing the literature, it is also clear that the question of decline has not been separated from the necessary distinctions between product class, product form and brand.

3. Does the schema have categories that are mutually exclusive and collectively exhaustive?

Any concept that is based on a continuum will have difficulty meeting these criteria. The best that can be hoped for are clear distinctions with each category separated by some type of transition category or zone. The current relatively small number of categories is most likely too few. This results in an oversimplification of the product growth process.

If these two criteria were met, we would then be better able to determine if the concept applies to all product categories. For instance,

There seems to be an implicit, but universal assumption that all products must go through the life cycle. While this criticism is closely related to several others, Cannon (1978) suggests that:

The history of products ranging as widely as steel, aluminum, glass, shoes, bread and others bears little resemblance to the product life cycle. The overwhelming bulk of evidence suggests that demand for these key products is more a function of economic circumstances than life cycle (Cannon 1978, pp. 237-238).

Is this conclusion reached on the basis of a misunderstanding of the life cycle curve, or is it really a recognition of what Swan and Rink (1982, p. 73) label "stable maturity?" Or is due to the fact that most studies (Rink and Swan 1979, pp. 223-224) of the product life cycle have had consumer nondurable goods as their focus?

4. Is the schema useful?

This criterion may be addressed from two perspectives. The first is validity.

Given all the attention that the product life cycle has received, there is very little empirical evidence to support its validity. Dhalla and Yuspeh (1976, p. 110) strongly assert that "the PLC concept has little validity." Tellis and Crawford (1981) found little conclusive evidence to support empirically the product life cycle. Yet, Barksdale and Harris (1982) state:

While the evidence is not conclusive, the research that has been reported generally supports the life cycle concept and suggests that a bell shaped curve is a reasonable model of the sales record for many types of products (Barksdale and Harris 1982, p. 75).

The second perspective is that of usefulness to marketing practitioners. A particularly troublesome remark by Levitt (1986) may be more true than many would like to admit.

Yet a recent survey I took of (senior marketing) executives found none who used the concept in any strategic way. It has remained--as have so many fascinating theories in economics, physics, and sex--a remarkably durable but almost totally unemployed and seemingly unemployable piece of professional baggage whose presence in the rhetoric of professional discussion adds a much coveted but apparently unattainable legitimacy to the idea that marketing management is somehow a profession (Levitt 1986, p. 173).

Another Limitation

Even if these criticisms and limitations were only minor, a major limitation in developing the product life cycle as a theory is the failure to relate the concept to the diffusion of innovation literature.



The diffusion of innovation literature has a similar S shaped curve to that of the product life cycle. Both have stages of introduction, growth, maturity and decline. But in addition, the diffusion of innovation literature incorporates categories of adopters with a strong emphasis on social system interaction with new products. Wasson (1974, Chapter 5) clearly recognized the relationship between the product life cycle and the diffusion of innovation cycle. Unfortunately, there have been virtually no attempts to link the two concepts, even though Meenaghan and Turnbull (1981) point out that often:

The factors determining market adoption ultimately determine the life cycle shape and duration (Meenaghan and Turnbull 1981, p. 9).

Even a cursory review of such works as Roberston (1971) Innovative Behavior and Communication makes it clear that there seems to be much in common between the S shaped diffusion curve and the bell shaped life cycle curve. Engel, Blackwell and Kollat (1978, p. 301) briefly indicate how diffusion research is related to the product life cycle. Otherwise, the literature is almost completely silent on this potential or actual relationship.

#### Woe Is Me!

Faced with the serious nature of these criticisms and limitations, we are essentially faced with two choices. We can "throw-in-the-towel" and decide to respect the product life cycle as a "nice" descriptive concept that has general, but not specific applicability. Or, we can be appropriately cautious with respect to our present knowledge of the concept and be open to exploring this seemingly

important concept. Cannon (1978) views the majority of existing product life cycle research as decidedly unscientific. He states that research in this area demands:

1. Internal consistency in the proposed system,
2. A logical base upon which it has been evolved,
3. It is part of a more general system of knowledge,
4. The facility exists for identifying empirically testable hypotheses.

Almost all the investigation of the Product Life Cycle has been directed at this last point. Whether one adopts the traditional inductivist approach of the natural sciences or Popper's deductivism the empirical evidence against this concept meeting the more extreme claims of its proponents is formidable (Cannon 1978, p. 237).

Ignoring Cannon's call for research that goes beyond much of the present descriptive understanding of the product life cycle will inevitably force us to agree with Arora (1979) when he states:

Thus the concept of the product life cycle has limited usefulness in terms of either a planning tool or a predictive or forecasting tool because the theory at present cannot predict the performance of the brand over its life cycle as a function of marketing mix and relevant environmental factors (Arora 1979, p. 5).

Fortunately, empirical research is beginning to emerge that gives hope that the product life cycle will not need to remain as a concept with "limited usefulness." But Gardner has clearly stated that:

A simple call for more studies, no matter how loudly or eloquently stated, will unfortunately not adequately address the criticisms and limitations so widely shared. What seems to be needed is progress on two fronts. The first is an attempt to understand the phenomena that has made the product life cycle explanation so intuitively appealing. And then proceed to an exploration of whether or not the product life cycle, is indeed, the best model of that phenomena. This may lead to a major reconceptualization of the concept.



The second front seems to be research that focuses on the product life cycle as a dependent variable. Using historical data, it is important to start linking the product life cycle to marketing variables. But it is also important, to link the cycle to competitive as well as environmental variables (Gardner 1986, pp. 19-20).

### The Research Literature

Prior to 1975, virtually no empirical research was available in support of the product life cycle. In fact Wasson's (1974) major monograph dealing with the product life cycle contains only 42 references. The limited number of references is not Wasson's fault. References simply didn't exist, especially empirical references. However, since 1975, we have witnessed an increasingly accelerated number of empirical studies dealing with the product life cycle. Three reasons probably account for the great majority of these studies. The first is the existence of the PIMS data base. While it is awkward to use the PIMS data base to study this concept, nonetheless, some evidence is there for creative scholars. The second is the implicit or explicit use of the concept in competitive analysis paradigms like that of the Boston Consulting Group and the resulting frustration with some of the over simplified prescriptions. And third, there seems to be a growing realization that we simply do not know very much in a prescriptive sense about this concept.

It is the objective of this review to first review some of this more recent empirical literature, to briefly evaluate the phenomena, and to offer a few suggestions to guide future empirical research. There is no best way to organize this literature. This review is seen

as a complement to that of Rink and Swan (1979). There is very little overlap in the reporting of empirical evidence. However, the empirical evidence in this review is organized around specific marketing variables and decision categories. Furthermore, some evidence that may, at first blush, seem only tangential to marketing is reported. There is no claim that this review is complete or exhaustive. But hopefully, it is representative of current directions in research on this concept.

### Advertising

Mickwitz (1959) suggested that the demand elasticities of the marketing decision variables will differ between different stages of the product life cycle. For instance, advertising was identified as having the highest elasticity in the growth and decline stages, second to price in the maturity stage and second to packaging in saturation. Parsons (1975) empirically tested these assumptions by estimating a sales response function using non-linear least squares. His findings:

Supports the theory that demand elasticities change over the product life cycle. Time-varying elasticities generally mean that marketing effort in the early years of the product life cycle should be greater than would be suggested by constant elasticities. This shift in expenditures also serves to raise the barrier to entry of imitative new products (Parsons 1975, p. 480).

Using historical Sapolio cake cleanser data, Parsons found that the optimal advertising expenditures for both the time-varying and constant elasticity models recommended spending more money in earlier years than was actually spent. The recommended levels of advertising expenditure were two and five times, respectively, compared with

actual expenditures (Parsons 1975, p. 480). Arora (1981), also using the Sapolio cake cleanser data, found that advertising elasticity declines as the product advances through the product life cycle.

Earlier, Arora (1979) had addressed the question of advertising elasticities. Using ethical drug products, he attempted to estimate the elasticities of journal advertising, direct mail and detailing. Similar to Parsons, a time varying model was found to predict higher profits than a constant elasticity model. For instance:

Elasticity of journal advertising is maximum when the product is introduced: it approaches zero after 22 months since introduction. Elasticity of journal advertising equals that of detailing and direct mail at, respectively, about 8 and 15 months since the introduction of the product (Arora 1979, p. 60).

Using the same data base, Arora proposes an exponential model to determine the optimal allocation of the promotional budget over the product life cycle and the associated sales and profits.

Using Israeli mass produced brands of a non-durable consumer product, Liebermann and Ayal (1985) attempted to test Steiner's (1978) advertising life-cycle theory. Steiner's theory ties price and advertising to the degree of difficulty in obtaining initial distribution in the channel and subsequent changes as the brand gains familiarity and market acceptance. When the brand penetration is low, it is hypothesized that advertising levels will be low. As penetration increases, larger amounts will be spent on advertising. Regression analysis documents these assumptions in the direction hypothesized by Steiner.

Renforth and Raveed (1983) addressed the question of the quantity of information contained in advertisements at different stages of the

life cycle. By comparing the information content of advertisements in Ecuador, Australia and the United States, they found more information in Ecuador advertisements than the other two countries. For them, the explanation of this finding rests on the fact that a larger number of products in the earlier stages of the product life cycle are to found in Ecuador versus the U.S. and Australia with a consequent higher information content for the products in the earlier stages of the cycle.

Farris and Reibstein (1979) in an analysis of consumer good manufacturers, found differences between relative advertising and relative prices at various stages of the product life cycle.

#### Price

Joel Dean, in his classic article, "Pricing Policies For New Products" (1950), clearly recognized that products move through a life cycle. In his discussion of changes in price throughout the cycle, he focused primarily on "pioneer pricing." For Dean, pioneer pricing dealt with that situation where:

A company finds a product that is a radical departure from existing ways of performing a service and that is temporarily protected from competition by patents, secrets of production, control at the point of a scarce resource, or by other barriers. The seller here has a wide range of pricing discretion resulting from extreme product differentiation (Dean 1950, p. 30).

His well known policies of skimming and penetration pricing are two approaches for dealing with this type of new product. Unfortunately, we seem to have almost forgotten that this classic article also addressed pricing in maturity as well.



Since 1950, very few empirical studies have attempted to speak to Dean's prescriptions. However, Doland and Jeuland (1981) have specifically addressed skimming and penetration pricing. Using a methodology for determining optimal pricing strategy over the product life cycle, their analysis for the period in which the innovating firm has a monopoly shows:

That a skim policy of high initial prices followed by lower prices is optimal if the demand curve is stable over time and production costs decrease with accumulated volume. The second policy mentioned by Dean, penetration pricing, entails using low initial prices.....We show this policy is optimal if there is relatively high repeat purchase rate for nondurables or if a durable's demand is characterized by a diffusion process (Doland and Jeuland 1981, p. 61).

Unfortunately, there are very few additional studies relating pricing strategy to the stages of the product life cycle. For instance, in their review of price as it relates to the product life cycle, Schafer and Roper (1985) found little empirical literature, but were able to reach the following conclusions based on the existing descriptive and empirical literature.

1. On introducing a new product, the price should be set as high as possible and there should be intensive advertising activity.
2. During the transition from maturity to saturation, downward movements in price occur according to the various elasticities of the situation. In fact competition price differences become important to buyers, and a seller's discount and service policies become important marketing strategies. Cutting back upon these policies without regard to the life cycle of the product could be detrimental to the seller.
3. At the saturation level, a market price has emerged for the standard product which must be accepted by the producer if production is not to cease (Schafer & Roper 1985, p. 14).

These conclusions, are unfortunately, no different than those advanced by Wasson twenty years ago (1965).

Several studies are worth noting. Using the PIMS data base, Farris and Reibstein (1979) analyzed price and advertising data for consumer goods manufacturers. They were particularly interested in the relationship between premium price and high advertising expenditures. In general they found a strong association between price and advertising. With regard to the product life cycle, they report:

A stronger relationship between relative advertising and relative price levels when products are in the late stage of the life cycle than when they are new to the market. In new product categories, a considerable amount of confusion with respect to price is likely to exist in the market. Also, prices are probably changing fairly frequently.

Thus, the earlier the stage in the life cycle, the more confused the relationship between relative advertising and relative pricing (Farris and Reibstein 1979, p. 178).

In a particularly interesting study, Simon (1979) developed a brand life cycle model using 35 brands in seven German markets. His findings are consistent with the earlier hypotheses of Mickwitz (1959). Simon reports that the magnitude of price elasticity decreases in the introductory and growth stage, reaches its minimum at the maturity stage, and increases during the decline stage. Dino (1985), by examining sales data for radios, television sets and VCR's in the United States identified three stages for these electronic products. Price declines as products move from introduction to take-off and growth to the maturity stages of the product life cycle. Using a mathematical representation of the BCG hypothesis, Wernerfelt



(1985) reached similar conclusions: prices will decline early in the product life cycle and may increase later in the cycle.

Using a Bayesian approach, Tsurumi and Tsurumi (1980) focused on changes in demand characteristics as products age. They report:

The application of our Bayesian estimation of gradual parameter shifts in a simultaneous equation to U.S. demand for color-TV sets reveals that price elasticities increased gradually starting sometime in 1975, and the transition from the standardized stage to the saturation stage of the PLC took about a year. We may conclude from the empirical results that color-TV sets have now arrived at the stage of saturation in which the majority of consumers seek functional service values and thus consumers have become more price conscious (Tsurumi and Tsurumi 1980, p. 592).

### New Products

While a number of studies touch on some element of new products within the context of the product life cycle, this area has received relatively little attention. The most directly relevant is the study of Tigert and Farivar (1981) who assessed the Bass New Product Growth Model in forecasting sales of optical scanning equipment for super-markets. Of some interest are studies by Jones (1985) who discusses the effect of technology on life cycles and Wernerfelt (1984) who attempts to demonstrate that firms invest heavily at early stages of the product life cycle. Unfortunately, the later study is flawed by the limiting nature of the assumptions made by the author.

### Strategy

It is in the area of strategy where the product life cycle would seemingly have great relevance. In fact, we do see the product life

cycle as central to most "portfolio" concepts such as that of the Boston Consulting Group and it is also central to competitive strategy concepts such as Michael Porter's (1980). But, the direct analytical evidence is not as available as one might imagine.

In his argument for a contingency approach to planning, Michael (1979) states that "business objectives for a product will vary in different periods of the product life cycle (Michael 1979, p. 63)." From this widely accepted premise he applies the contingency approach to the various stages of the product life cycle to show how the steps in the planning process can be varied as the environmental elements change.

Hayes and Wheelwright (1979a, 1979b) argue that:

Separating the product life cycle concept from a related but distinct phenomenon that we will call the "process life cycle" facilitates the understanding of the strategic options available to a company, particularly with regard to its manufacturing function (Hayes and Wheelwright 1979a, pp. 133-34).

They believe that a strategic framework that incorporates both the product life cycle and the process life cycle is more appropriate for exploration of strategic options than either singly. Curley and Pyburn (1982) have explored the life cycle of intellectual technologies. In order to do this, they have added a third dimension to the product/process life cycle model. This third dimension encompasses the "experience and maturity of users (Curley and Pyburn 1982, p. 162)." Consequently, they advocate taking into account user sophistication in prescribing a life cycle for intellectual technologies such as word processors, CAD/CAM and robotics.

Using a game-theoretic model of marketing competition in an oligopoly, Karnani (1984) explored the value of market share at various stages of the product life cycle. His findings led him to conclude:

Regardless of whether the value of market share first increases and then decreases or decreases monotonically over the life cycle, it decreases very rapidly during the growth stage of the life cycle and less rapidly during the later stages. This supports the conventional wisdom that a firm should try to build market share during the growth stage. In fact (this) can be interpreted to mean that it is important to build share as early as possible in the growth stage, since the value of market share decreases most rapidly during that period (Karnani 1984, p. 708).

#### Diffusion of Innovation

As noted below, there is a critical gap between the seeming overlap between the diffusion of innovation literature and the product life cycle literature. While no easy explanation of the almost totally non-existent literature relating these two concepts can be found, Olshavsky (1980) has taken a tentative step in the right direction. Using data on 25 home appliance categories, he devised a parameter estimation procedure to test the hypothesis that the rate of adoption is not increasing over time. His findings strongly support an earlier contention of a rapidly shortening product life cycle.

#### Industrial

While the majority of published articles focus on consumer goods, several articles explore product life cycle issues within the context of industrial products. For instance, de Kluyver (1977) presents a

method for quantifying the product life cycle. The application of this method produced three types (shapes) of product life cycles for industrial components. He identifies these as innovative maturity (temporary delay in the growth pattern), growth maturity (more traditional bell shaped curve) and decline maturity (reaches peak sales quickly" whereas the decay rate levels off to the point where sales remain constant for some time, before final decay sets in.") (de Kluyver 1977, p. 26) He then proceeds to demonstrate, using discriminant analysis that "there is a correlation between the shape of the product life cycle and the degree of innovation the product represents (de Kluyver 1977, p. 30)."

Using the PIMS data base, Thorelli and Burnett (1981) examined the existence and nature of product life cycles for industrial goods businesses. This rather detailed and comprehensive study indicates that, indeed, for industrial products, relatively traditional product life cycle behavior was in clear evidence. But it also indicates, that the length of time from rapid growth to maturity is some 40+ years. Consequently, they explore the question of whether product age might be a better explanation than the product life cycle. They conclude:

Can, therefore, the (product life cycle concept) be practically ignored for industrial businesses? The answer from the PIMS data base is a qualified no. PLC forces are at work, but they do not appear to be the ultimate independent variable for strategic decision making in such businesses. However, at least at the impressionistic level we may say that certain characteristic patterns of association between a number of market structure and strategy variables are related to the rapid growth and maturity stage (Thorelli and Burnett 1981, p. 106).



Wasson (1976) has applied his early description of the product life cycle to this area. He argues that strategy must change with changes in the product life cycle.

Focusing only on the maturity stage, Hambrick (1983) identifies eight industrial-product environments. For Hambrick, having identified these environments, "the ultimate goal is to develop a contingency approach to business-level strategy (Hambrick 1983, p. 213)." In a somewhat curious argument Campbell and Cunningham (1983) suggest that it is necessary to tailor strategy to existing customers depending on what stage of the product life cycle the customer relationship is in.

An empirical study by Rink (1976) tests the assumption of Berenson (1967) that industrial purchasing executives use different purchasing strategies at different stages of the product life cycle. Using a balanced incomplete block design, Rink found that purchasing strategies do differ depending on stage of the life cycle. He also found that:

Within each PLC phase (1) there was a preferred order of purchasing strategies among executives for formulating purchasing strategy, and (2) that the rankings of strategies by purchasing executives were consistent. These results indicate that purchasing executives were utilizing the same criterion in evaluating purchasing strategies across the PLC stages (Rink 19xx, p. 240).

Later, Fox and Rink (1984) tested empirically the PLC-Procurement Strategy model. They report that purchasing executives are applying over sixty percent of the tactics specified by the Fox and Rink (1977) model.



In discussing the use of industry product life trends, Swan and Rink (1980) strongly suggest that:

Within an industry, therefore, it is reasonable to expect that the PLC pattern for a new product will exhibit a PLC trend similar to that of the old products (Swan and Rink 1980, p. 200).

However, to assure that the data from past trends is comparable, Rink and Swan recommend three steps:

1. Sales data should be adjusted for changes in the level of population, prices, personal consumption, expenditures, and supply shortfalls.
2. A consistent level of aggregation should be used in assembling PLC curves for the industry.
3. Select a uniform definition of "new" product (Rink and Swan 1980, p. 200).

In a similar vein, Kaminski and Rink (1984) suggest that the product life cycle is an appropriate guideline for the formulation and implementation of physical distribution policies.

#### International Product Life Cycle

While the product life cycle has been applied in several areas, one in which its application is seemingly very useful is that of explaining certain behaviors in international trade. In particular, the product life cycle has been used to explain how exporting, importing and manufacturing location change over the life cycle of the product (Wells 1968, de la Torre 1975). As Giddy (1978, pp. 91-92) suggests:

The model asserts that as a product moves through the stages of its life cycle (from new product to mature product to standardized product) it is associated with an international trade and investment cycle. The innovation of new products and processes tends to occur near the market of strong demand, and production of those innovations typically occurs in

the country of whose market they are designed, irrespective of cost. Thus, production of high-income consumer goods and labor-saving producer goods has often occurred first in the United States. Producers initially face a demand that is insensitive to price.

Later, the market matures, competition increases and product standardization begins to replace product differentiation. A modest export business usually blossoms, often initiated by unsolicited orders from abroad. Eventually, demand in foreign markets increases and in some (more advanced) countries reaches a size sufficient to support local production facilities. At this point, there is a strong incentive for the market leaders to invest abroad in response to possible threats to their established export markets, either by local imitators or rival multinational firms or by an anticipated increase in tariff levels. Still later, as potential or actual competition in the product increases globally, prices and profit margins are forced down and low production costs become increasingly important. Multinational firms tend to shift their location of production to low-cost countries, for export back to the richer markets, or to allow local firms to take over production (Giddy 1978, pp. 91-92).

The literature in this area of application is somewhat sparse, but as Ayal points out: "apart from its explanatory value, the theory has appealing prescriptive properties" (Ayal 1981, p. 92). Of particular interest are several analytical studies. For instance, Ayal examines the theory using international trade statistics for Israel, the United States, the European Economic Community and other regions of the world for 65 industries of manufactured goods (Ayal 1981). With specific reference to Israel:

The theory of the international product life cycle implies that a country like Israel can achieve export success only after the U.S. initial relative advantage has eroded. The data presented here show that in reality successful Israeli export performance frequently coincides with successful U.S. export. Furthermore, the data show that narrow range specialization is an important determinant of such success (Ayal 1981, p. 95).

In a study of 82 Canadian industrial goods firms, McGuinness and Little (1981) used foreign performance of new products as their dependent variable. They identified five product characteristics and two firm characteristics as having significant influence on foreign performance. They suggest that this indicates that something more than just "relative advantage" is operating to explain export performance.

In a more descriptive study, Thomas (1981) explores the international automobile industry in relation to the international product life cycle.

As Onkvisit and Shaw (1983) suggest, the International Product Life Cycle is more appropriate in some situations than others:

The application of the IPLC is not suitable for all types of products. A product should satisfy basic consumption needs which are essentially homogeneous in other parts of the world.

The IPLC is perhaps most applicable in situations where products are related through some common technology, and these are likely to be products possessing functional utility rather than aesthetic value. If a particular product can render itself to standardization, the trade cycle should be expected to apply. In contrast, a product may be partially or temporarily immune to foreign competition if it is a differentiated product with a unique image (Onkvisit and Shaw 1983, p. 75).

Using three empirical tests, Mullor-Sebastian (1983) found strong support for the hypothesis that industrial product groups behave in the manner predicted by the international product life cycle. However, she found less support for individual products.

Several authors suggest that the International Product Life Cycle model needs to be modified, or at least expanded to incorporate

certain contingencies. For instance, Harrigan (1984) feels that changing patterns of factor scarcity and income may alter the geographical pattern of product innovation and diffusion. The industrial policy of governments also needs to be incorporated or otherwise taken into consideration. For Harrigan, the shortening of the time frame in which products pass through the product life cycle must also be a consideration as well as the changing corporate strategy and structure involved with the trend toward global business.

In a different vein, Camillus (1984) argues that the life cycles driven by technological innovation are vastly different than those driven by social change. Consequently, for Camillus, multinational organizations and their strategy must be vastly different, given the nature of the phenomena driving the life cycle.

In an interesting argument, O'Shaughnessy (1985) asserts that most models for strategic analysis are based on a set of assumptions held by United States managers. Furthermore, he feels that there is an implicit belief "that these assumptions apply with equal rigour to other countries (O'Shaughnessy 1985, p. 23)." In his examination of the BCG matrix, the General Electric "business screen," Michael Porter's structural approach and evolutionary stages, he finds that one of the notions that influences each of them is that there is a non-protracted product life cycle.

For instance, he makes the following observations:

In more traditional societies than the US we tend to see extended life cycles for many products, since attitudes emanating from a more rule-bound culture are less receptive to innovation.



The decline phase of the life of a product is often protracted in traditional societies with "ways of life" becoming tied to the product. Also, of course, in less developed countries the diffusion and adoption process might be slower because communication is more primitive.

The growth stage may be more protracted as attitudes are slowly changed. Barriers to be overcome may not only be cultural. There may be ignorance and a necessary learning process.

The life cycle may also be lengthened because the latest technology is too expensive for the nation or individuals concerned. Technological progress may also be deemed socially negative because of unemployment consequences, with pressure for a labour-intensive manufacturing process.

In the US by contrast there exists a strong orientation in favor of change: assumptions of flux and fluidity are sealed into the culture (O'Shaughnessy 1985, p. 24).

### Experience Curves

In an intriguing study, Yelle (1983) examined sales, cost and profit data from the early years of the Ford Motor Company. He concludes:

An analysis of the Ford Motor Company's experience with the Model-T using only the learning curve is inadequate. The inadequacy stems from the fact that the learning curve does not yield clues as to what the sales pattern is like. As a result, one tends to focus primarily on whether or not costs are continuing to drop.

The major conclusion which should be drawn from this paper is that the product life cycle provides the all important sales picture to firms using the learning curve idea for long-range planning. The PLC provides clues which can strongly suggest changing consumer preferences. Hence, unless cost is the only factor of interest to consumers, the learning curve does not provide a sufficiently broad picture for long-range planning (Yelle 1983, p. 86).



## Applications

While this review has attempted to focus primarily on empirical studies, it is important to note that a number of authors in recent years have been attempting to apply the product life cycle to decision making. The thing that sets these works apart from many previous "descriptive" works is their emphasis on combining the product life cycle with other concepts.

For instance, Croon (1979) looks at the product life cycle as just one of several key aids in determining strategy. He argues that the product life cycle is an important aid in both determining and closing strategic gaps. From a "return on capital" perspective, he argues that a portfolio of products can be balanced by the appropriate "mix of life cycle" planning.

Barksdale and Harris (1982) explain that combining the product life cycle with the Boston Consulting Group's portfolio matrix offers a more comprehensive framework for strategic analysis and planning. They suggest:

The product portfolio matrix is connected in a fundamental way to the product life cycle. Specifically, stages of the product life cycle are defined by the growth rates of sales and, similarly, the market growth variable on the vertical axis of the portfolio matrix is determined by the rate of sales. This basic correspondence between the two concepts is recognized, but not emphasized, in the literature (Barksdale and Harris 1982, p. 78).

Their expanded 2 x 4 matrix:

Is based on the proposition that both the pioneering and decline stages of the life cycle are important and recognizes that product innovations as well as products with negative growth rates are significant and should not be ignored in strategic analysis (Barksdale and Harris 1982, p. 79).

They then proceed to look at the implications for each cell in this expanded matrix.

In a different approach, Weber (1979) talks about the usefulness of "inverted" product life cycles. He posits a gap between an individual firm sales at any given point on the product life cycle. This gap exists between the "industry market potential" and firm sales. In an argument that seems difficult to follow, he feels that the gap should be closed by first focusing on the product, then distribution and then usage and competition.

#### Organizational Design

Of direct relevance is the question of organizational design in relation to stages of the product life cycle. Utterback and Abernathy (1975) suggested that each stage of the product life cycle influences the management process in ways that leads to the adoption of different structural forms, at differing points in the cycle. Donaldson (1985) proposed a model based on this suggestion. His two dimensions are phases of the product life cycle (early and mature) and four classes of product diversity (All Early, Mostly Early, Mostly Mature and All Mature). He then proposes organizational forms for one product organizations, and organizations with related and unrelated products (Donaldson 1985, p. 31).

Kerr (1982) explores the idea of assigning corporate managers on the basis of the product life cycle. After examining what he considers to be questionable assumptions upon which this idea is premised, he suggests a strategy based on assumption that managers are

capable of a number of managerial styles and behaviors. Rather than changing managers as a product moves through stages of the product life cycle, Kerr suggests:

That by manipulation of the various dimensions of the incentive compensation system operating on a division manager, it is possible to focus that manager's efforts on critical strategic problems and to guide behaviors which contribute to strategic objectives (Kerr 1982, p. 63).

In an interesting application of the product life cycle, Krell (1981) explores the life cycle of the field of Organization Development (OD). He documents its evolution through introduction and growth. Using the product life cycle, a forecast of the separate development of Mainline OD and Traditional OD is offered. He suggests that the overall OD industry is moving from maturity to saturation with the following implications:

If OD follows the Product Life Cycle stages of other industries--and indications are that it will--we can expect that the friendly co-existence of practitioners in the 1970's will give way to secrecy about technology and the identity of clients. Competition will continue to increase as the number of practitioners increases faster than the number of potential clients and as external consultants adopt a heavy sales orientation to offset the proliferation of internal consultants.

Since the overall OD industry is moving from the Maturity to the Saturation Stage, we can expect that the packaging efforts of external consultants will continue to emphasize technology over the individual, just as in manufactured products. As the individual becomes less important and technology becomes more highly developed, the technology will become more easily and quickly adopted and copied. In very short order the companies will be unable to distinguish among the products offered and will accept less individual competence to get technological competence as a good price (Krell 1981, pp. 321-22).

### Other Applications

Applications of the product life cycle concept seem endless. A few of the applications have been the adoption of new word processing technologies (Pyburn and Curley 1984), the determination of the future location of high technology plants (Bee 1985), a close mathematical fit to the parabolic shape of the later growth, maturity and decline stages of the product life cycle for horse racing attendance and pari-mutual betting (Johnson and Armstrong 1981), the use of Gompertz and logistic curves to model the product life cycle (Rashidi, Gentry and Thornton (1981), the use of trajectory theory to monitor the product life cycle (1975), fashion life cycles (Sproles 1981), the existence of significant differences in the perceived importance of various advantages of franchising at each stage in the life cycle of a fast food franchise (Lillis, Narayana and Gilman 1978), and the similarity of the retail life cycle to the product life cycle (Davidson, Bates and Bass 1976).

### Where Does This Leave Us?

After getting over the initial feeling of frustration of such an abundance of literature that unfortunately, leaves more questions unanswered than answered, one can proceed in at least three directions. One can consign the product life cycle to a "nice" descriptive role and dismiss any serious future input into marketing theory and practice. Or, a call for more research can be issued. However, the first two directions seem inappropriate. They seem inappropriate for two reasons. First, recent empirical research is yielding valuable



insights. And second, we probably have been looking for rather simplistic and uni-dimensional answers, when in fact the marketing phenomena and decisions of which we are dealing are complex, multi-dimensional and non-deterministic.

The advocated direction is to proceed concurrently on two fronts. These two approaches are seen as highly complementary. The first is a contingency theory approach, the second is a meta-theoretical approach that may even include the reconceptualization of the phenomena that the product life cycle attempts to represent.

#### Contingency Theory

Organizational theorists have increasingly sought an approach that lies midway between the belief that there are universal principles and the belief that each organization is unique. Steiner (1979) has identified the contingency approach as that which:

Seeks to determine a relationship in which observable behavioral response in and to organizations is dependent upon specified environmental conditions (Steiner 1979, p. 405).

This dependent or contingency approach is both familiar and foreign. It is particularly foreign if we believe in a single, universal S shaped product life cycle curve. Two authors have applied the contingency approach to the product life cycle from a conceptual perspective. Hofer (1975) feels that different strategies are appropriate for different stages of the life cycle based on: markets and consumers, industry structure, competitors, suppliers, broader environmental variables and organizational characteristics and resources. Michael (1979) believes that the product life cycle "is ideal for showing the



practical application of the contingency approach to planning (Michael 1979, pp. 62-3)." His basic argument is that objectives will vary in each stage of the product life cycle, in particular the objectives of profit, market share, financial and physical resources.

The contingency approach seems to offer a way out of the box we may have created for ourselves by our seeming insistence on some form of a generic product life cycle. The literature reviewed in this paper clearly points away from such a generic life cycle and towards "life cycles." The application of this approach seems well underway if the research reported in this review of the literature is any indication of what is happening. However, it should be clear, that it is now appropriate to start thinking and planning future investigations with specific regard to the contingency approach. For instance, it would be useful to know, for a given set of industries, what the response elasticities are for a given set of variables between the growth and maturity stages of the product life cycle. Other variables of interest may be technology, type of industry, i.e. fragmented versus those with dominate and powerful leaders and challengers, industry age, dollar value of product and the extent of global competition.

#### Meta-Theory Approach

Much of the writing and research reviewed in this paper refers to the product life cycle concept. While the exact intent of each author is not known, it is curious that it is not referred to as a theory. It may be, that labeling the product life cycle as a concept reflects uncertainty as to whether it is a theory or at least has lawlike

generalizations that are a necessary requirement for theories according to Hunt (1983, p. 156). But whether or not most authors label the product life cycle as a theory, it seems appropriate to determine if the product life cycle at least meets the minimum requirements to be labeled as a theory.

We have already seen that the product life cycle concept as presently specified (Day 1986) does not meet even the minimum criteria for evaluating classification schemata. Consequently, there is little hope that the product life cycle (at least in its present form) can meet the requirements of theory, i.e., have empirical content, possess nomic necessity and be systematically integrated into a body of scientific knowledge. Unfortunately, we must conclude that the product life cycle is not a theory because a "theory must contain a systematically related set of statements, including some lawlike generalizations, that is empirically testable (Hunt 1983, p. 372)."

The main conclusion drawn from this is that there is a high probability that the product life cycle in its present configuration is probably not the most appropriate classification of the phenomena under observation. One can only speculate why the present configuration of the product life cycle as presently conceived is lacking in both explanatory and predictive validity.

But of more importance, is the need to reexamine this phenomena. It seems logical to start by examining our present understanding for lawlike generalizations and then proceed to develop empirical procedures that will allow us to empirically test these generalizations.

At the same time, we must also strive to avoid accidental generalizations, but with a strong emphasis on systematically integrating this phenomena into the larger body of marketing theory.

An extremely useful step in the right direction has been taken by Tellis and Crawford (1981). They make a strong case that the product life cycle concepts needs to be reconceptualized. Their proposal is to base the reconceptualization on an evolutionary approach from biology. They correctly point out:

That product growth is partly the result of the strategy adopted and not the reverse. A key implication of this premise is that a brand is not predestined to mature and die but can be kept profitable by proper adaptation to the evolving market environment (Tellis & Crawford 1981, p. 131).

They propose an alternative concept: the product evolutionary cycle. Their concept is based on the evolutionary cycle of biology that is used to explain growth and proliferation of species, groups of biological specimens that can breed within but not outside each group. This concept is attractive to them because it is dynamic and open-ended. The biggest difference is that, in contrast to the product life cycle concept, the product evolutionary cycle:

Is a dynamic, basically open-ended phenomenon in which the patterns do not follow any fixed sequence, except for the first and the last ones. It is thus indeterminate in shape but well-defined in terms of the three motivating forces (generative, selective and mediative) (Tellis & Crawford 1981, p. 129).

For Tellis and Crawford, the product evolutionary cycle:

Assumes that products are in a state of constant evolution motivated by market dynamics, managerial creativity, and government intervention, and that

the evolution proceeds in a direction of greater efficiency, greater complexity, and greater diversity. The evolutionary process consists of five well-defined patterns: product divergence, development, standardization, differentiation, and demise (Tellis & Crawford 1981, p. 131).

It is obvious that future work should be tied, in a logical empiricist sense, to developing a theory that can not only increase our understanding of the phenomena, but also increase our predictive ability. Much work needs to be done. However, future researchers should be encouraged to not just go on "shopping expeditions" in large data bases, but to devise testable hypotheses that will allow us to come closer and closer to that glimmering promise of the product life cycle as central to marketing thought and practice.



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