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PRODUCT LIFE CYCLE MANAGEMENT

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CONTENTS

INTRODUCTION

All products and services have certain life cycles. The life cycle refers to the period from the product's first launch into the market until its final withdrawal and it is split up in phases. During this period significant changes are made in the way that the product is behaving into the market i.e. its reflection in respect of sales to the company that introduced it into the market. Since an increase in profits is the major goal of a company that introduces a product into a market, the product's life cycle management is very important. Some companies use strategic planning and others follow the basic rules of the different life cycle phase that are analyzed later.

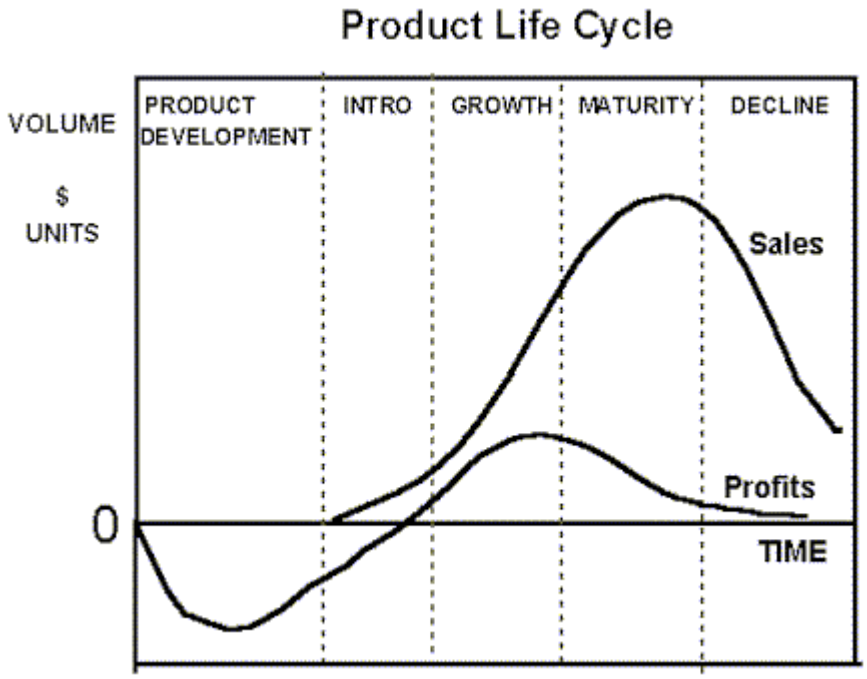
The understanding of a product's life cycle, can help a company to understand and realize when it is time to introduce and withdraw a product from a market, its position in the market compared to competitors, and the product's success or failure.

For a company to fully understand the above and successfully manage a product's life cycle, needs to develop strategies and methodologies, some of which are discussed later on.

PART 1: PRODUCT LIFE CYCLE MODEL DESCRIPTION

The product's life cycle - period usually consists of five major steps or phases: Product development, Product introduction, Product growth, Product maturity and finally Product decline. These phases exist and are applicable to all products or services from a certain make of automobile to a multimillion-dollar lithography tool to a one-cent capacitor. These phases can be split up into smaller ones depending on the product and must be considered when a new product is to be introduced into a market since they dictate the product's sales performance.

Fig. 1: Product Life Cycle Graph



Source: William D.

1. PRODUCT DEVELOPMENT PHASE

Product development phase begins when a company finds and develops a new product idea. This involves translating various pieces of information and incorporating them into a new product. A product is usually undergoing several changes involving a lot of money and time during development, before it is exposed to target customers via test markets. Those products that survive the test market are then introduced into a real marketplace and the introduction phase of the product begins. During the product

development phase, sales are zero and revenues are negative. It is the time of spending with absolute no return.

2. INTRODUCTION PHASE

The introduction phase of a product includes the product launch with its requirements to getting it launch in such a way so that it will have maximum impact at the moment of sale. A good example of such a launch is the launch of “Windows XP” by Microsoft Corporation.

This period can be described as a money sinkhole compared to the maturity phase of a product. Large expenditure on promotion and advertising is common, and quick but costly service requirements are introduced. A company must be prepared to spent a lot of money and get only a small proportion of that back. In this phase distribution arrangements are introduced. Having the product in every counter is very important and is regarded as an impossible challenge. Some companies avoid this stress by hiring external contractors or outsourcing the entire distribution arrangement. This has the benefit of testing an important marketing tool such as outsourcing.

Pricing is something else for a company to consider during this phase. Product pricing usually follows one or two well structured strategies. Early customers will pay a lot for something new and this will help a bit to minimize that sinkhole that was mentioned earlier. Later the pricing policy should be more aggressive so that the product can become competitive. Another strategy is that of a pre-set price believed to be the right one to maximize sales. This however demands a very good knowledge of the market and of what a customer is willing to pay for a newly introduced product.

A successful product introduction phase may also result from actions taken by the company prior to the introduction of the product to the market. These actions are included in the formulation of the marketing strategy. This is accomplished during product development by the use of market research. Customer requirements on design, pricing, servicing and packaging are invaluable to the formation of a product design. A customer can tell a company what features of the product are appealing and what are the characteristics that should not appear on the product. He will describe the

ways of how the product will become handy and useful. So in this way a company will know before its product is introduced to a market what to expect from the customers and competitors. A marketing mix may also help in terms of defining the targeted audience during promotion and advertising of the product in the introduction phase.

3. GROWTH PHASE

The growth phase offers the satisfaction of seeing the product take-off in the marketplace. This is the appropriate timing to focus on increasing the market share. If the product has been introduced first into the market, (introduction into a "virgin"[1] market or into an existing market) then it is in a position to gain market share relatively easily. A new growing market alerts the competition's attention.

The company must show all the products offerings and try to differentiate them from the competitors ones. A frequent modification process of the product is an effective policy to discourage competitors from gaining market share by copying or offering similar products. Other barriers are licenses and copyrights, product complexity and low availability of product components.

Promotion and advertising continues, but not in the extent that was in the introductory phase and it is oriented to the task of market leadership and not in raising product awareness. A good practice is the use of external promotional contractors.

This period is the time to develop efficiencies and improve product availability and service. Cost efficiency and time-to-market and pricing and discount policy are major factors in gaining customer confidence. Good coverage in all marketplaces is worthwhile goal throughout the growth phase.

Managing the growth stage is essential. Companies sometimes are consuming much more effort into the production process, overestimating their market position. Accurate estimations in forecasting customer needs will provide essential input into

[1] A good example of a "virgin" market can be considered the market of China. This market was closed to most western companies and their products and is slowly opening up to new products and services.

production planning process. It is pointless to increase customer expectations and product demand without having arranged for relative production capacity. A company must not make the mistake of over committing. This will result into losing customers not finding the product “on the self”.

4. MATURITY PHASE

When the market becomes saturated with variations of the basic product, and all competitors are represented in terms of an alternative product, the maturity phase arrives. In this phase market share growth is at the expense of someone else’s business, rather than the growth of the market itself. This period is the period of the highest returns from the product. A company that has achieved its market share goal enjoys the most profitable period, while a company that falls behind its market share goal, must reconsider its marketing positioning into the marketplace.

During this period new brands are introduced even when they compete with the company’s existing product and model changes are more frequent (product, brand, model). This is the time to extend the product’s life.

Pricing and discount policies are often changed in relation to the competition policies i.e. pricing moves up and down accordingly with the competitors one and sales and coupons are introduced in the case of consumer products. Promotion and advertising relocates from the scope of getting new customers, to the scope of product differentiation in terms of quality and reliability.

The battle of distribution continues using multi distribution channels[2]. A successful product maturity phase is extended beyond anyone’s timely expectations. A good example of this is “Tide” washing powder, which has grown old, and it is still growing.

5. DECLINE PHASE

[2] Multi distribution channel is one that offers back up distribution ways. A good example is the use of retail stores and the use of Internet. The former requires a completely different distribution channel than the latter and a product usually is distributed through the former first.

The decision for withdrawing a product seems to be a complex task and there a lot of issues to be resolved before with decide to move it out of the market. Dilemmas such as maintenance, spare part availability, service competitions reaction in filling the market gap are some issues that increase the complexity of the decision process to withdraw a product from the market. Often companies retain a high price policy for the declining products that increase the profit margin and gradually discourage the "few" loyal remaining customers from buying it. Such an example is telegraph submission over facsimile or email. Dr. M. Avlonitis from the Economic University of Athens has developed a methodology, rather complex one that takes under consideration all the attributes and the subsequences of product withdrawal process.

Sometimes it is difficult for a company to conceptualize the decline signals of a product. Usually a product decline is accompanied with a decline of market sales. Its recognition is sometimes hard to be realized, since marketing departments are usually too optimistic due to big product success coming from the maturity phase.

This is the time to start withdrawing variations of the product from the market that are weak in their market position. This must be done carefully since it is not often apparent which product variation brings in the revenues.

The prices must be kept competitive and promotion should be pulled back at a level that will make the product presence visible and at the same time retain the "loyal" customer. Distribution is narrowed. The basic channel is should be kept efficient but alternative channels should be abandoned. For an example, a 0800 telephone line with shipment by a reliable delivery company, paid by the customer is worth keeping.

PART 2: ANALYSIS OF PRODUCT LIFE CYCLE MODEL

There are some major product life cycle management techniques that can be used to optimize a product's revenues in respect to its position into a market and its life cycle. These techniques are mainly marketing or management strategies that are used by most companies worldwide and include the know-how of product upgrade, replacement and termination. To comprehend these strategies one must first make a theoretical analysis of the model of product life cycle.

In the mid 70's the model of product life cycle described in "Part 1", was under heavy criticism by numerous authors. The reasons behind this criticism are described bellow:

a. The shift changes in the demand of a product along a period of time makes the distinction of the product life cycle phase very difficult, the duration of those almost impossible to predict and the level of sales of the product somewhat in the realm of the imagination.

b. There are many products that do not follow the usual shape of the product life cycle graph as shown in fig. 1[3].

c. The product life cycle does not entirely depend on time as shown in fig. 1. It also depends on other parameters such as management policy, company strategic decisions and market trends. These parameters are difficult to be pinpointed and so are not included in the product life cycle as described in "Part 1".

The model of product life cycle also depends on the particular product. There would be different models and so different marketing approaches. There are basically three different types of products: a product class (such as a cars), a product form (such as a station wagon, coupe, family car etc of a particular industry) and a product brand of that particular industry (such as Ford Escort). The life cycle of the product class reflects changes in market trend and lasts longer than the life cycle of the product

[3] Professor Cox was able to identify six different shapes of the product life cycle graph in a research of a 256 pharmaceutical products.

form or brand. In the other hand the life cycle of a product form or brand reflects the competitiveness of a company (i.e. sales, profits) and therefore follows more closely the product life cycle model.

Nevertheless, a product manager must know how to recognize which phase of its life cycle is a product, regardless of the problems in the model discussed above. To do that a good method is the one, suggested by Donald Clifford in 1965, which follows.

- Collection of information about the product's behavior over at least a period of 3 – 5 years (information will include price, units sold, profit margins, return of investment – ROI, market share and value).
- Analysis of competitor short-term strategies (analysis of new products emerging into the market and competitor announced plans about production increase, plant upgrade and product promotion).
- Analysis of number of competitors in respect of market share.
- Collection of information of the life cycle of similar products that will help to estimate the life cycle of a new product.
- Estimation of sales volume for 3 – 5 years from product launch.
- Estimation of the total costs compared to the total sales for 3 – 5 years after product launch (development, production, promotion costs). The estimate should be in the range of 4:1 in the beginning to 7:1 at the stage where the product reaches maturity.

Strategies that must be applied as soon as the phase of product life cycle is recognized are given in the table bellow.

Table 1: Strategies of each product life cycle phase

	Development Phase	Introduction Phase	Growth Phase	Maturity Phase	Decline Phase
Strategic Goal	Make your product known and establish a test period	Acquire a strong market position	Maintain your market position and build on it	Defend market position from competitors and improve your product	"Milk" all remaining profits from product
Competition	Almost not there	Early entry of aggressive competitors into the	Price and distribution channel pressure	Establishment of competitive environment	Some competitors are already withdrawing

		market			from market
Product	Limited number of variations	Introduction of product variations and models	Improvement – upgrade of product	Price decrease	Variations and models that are not profitable are withdrawn
Price Goal	High sales to middle men	Aggressive price policy (decrease) for sales increase	Re-estimation of price policy	Defensive price policy	Maintain price level for small profit
Promotion Goal	Creation of public – market product awareness	Reinforcement of product awareness and preference	Reinforcement of middle men	Maintain loyal to middle men	Gradual decrease
Distribution Goal	Exclusive and selective distribution through certain distribution channels and creation of high profit margins for middle men	General and reinforced distribution through all distribution channels available	General and reinforced distribution with good supply to the middle men but with low margins of profit for them	General and reinforced distribution with good supply to the middle men but with low margins of profit for them	Withdrawal from most channels of distribution except those used in the development phase

Source: Avlonitis G.

PART 3: PRODUCT LIFE CYCLE TECHNIQUE EXAMPLE : PRODUCT CANNIBALISM

Product cannibalization occurs when a company decides to replace an existing product and introduce a new one in its place, regardless of its position in the market (i.e. the product's life cycle phase does not come into account). This is due to newly introduced technologies and it is most common in high tech companies. As all things in life there is negative and positive cannibalization.

In the normal case of cannibalization, an improved version of a product replaces an existing product as the existing product reaches its sales peak in the market. The new product is sold at a high price to sustain the sales, as the old product approaches the end of its life cycle. Nevertheless there are times that companies have introduced a new version of a product, when the existing product is only start to grow. In this way the company sustain peak sales all the time and does not wait for the existing product to enter its maturity phase. The trick in cannibalization is to know when and why to implement it, since bad, late or early cannibalization can lead to bad results for a company sales[4].

1. UNFAVORABLE CANNIBALIZATION

Cannibalization should be approached cautiously when there are hints that it may have an unfavorable economic effect to the company, such as lower sales and profits, higher technical skills and great retooling. The causes of such economic problems are given bellow.

- The new product contributes less to profit than the old one: When the new product is sold at a lower price, with a resulting lower profit than the old one, then it does not sufficiently increase the company's market share or market size.
- The economics of the new product might not be favorable: Technology changes can force a product to be cannibalized by a completely new one. But

[4] IBM made some severe mistakes in the past by avoiding cannibalizing because it was the market leader, letting competitors succeed.

in some cases the loss of profits due to the cannibalization is too great. For example a company that produced ready business forms in paper was forced to change into electronic forms for use in personal computers. Although the resulting software was a success and yield great profits, the sales of the paper forms declined so fast that the combined profit from both products, compared to the profits if the company did not cannibalize the original product showed a great loss in profits. (See table bellow)

Table 2: Comparison of revenues - profits

"Software" Revenue	"Software" Profit	Lost "Forms" Revenue	Lost "Forms" Profit	Change in Profit
$10	$5	$15	$10	-$5

Source: McGrath M.

- The new product requires significant retooling: When a new product requires a different manufacturing process, profit is lower due to the investment in that process and due to the write-offs linked to retooling the old manufacturing process.
- The new product has greater risks: The new product may be profitable but it may have greater risks than the old one. A company cannot cannibalize its market share using a failed or failing product. This can happen in high-tech companies that do not understand enough of a new technology so that to turn it into a successful and working product. As a result a unreliable product emerges and replaces a reliable one, that can increase service costs and as a result decrease expected profits.

2. OFFENSIVE CANNIBALIZATION STRATEGIES

Cannibalization favors the attacker and always hurts the market leader. For companies that are trying to gain market share or establish themselves into a market,

cannibalization is the way to do it[5]. Also cannibalization is a good way to defend market share or size. A usual practice is the market leader to wait and do not cannibalize a product unless it has to. It is thought that a company should acquire and develop a new technology that will produce a newer and better product than an existing one and then wait. Then as competitors surface and attack market share, cannibalization of a product is ripe. Then and only then quick introduction of a new product into the market will deter competition, increase profits and keep market share. But this strategy does not always work since delays will allow the competition to grab a substantial piece of the market before the market leader can react.

3. DEFENSIVE CANNIBALIZATION STRATEGIES

Controlled cannibalization can be a good way to repel attackers as deforesting can repel fire. A market leader has many defensive cannibalization strategies that are discussed bellow.

- Cannibalize before competitors do: Cannibalization of a company's product(s) before a competitor does, is a defensive strategy to keep the competitor of being successful. Timing is the key in this strategy. Do it too soon and profits will drop, do it to late and market share is gone.
- Introduction of cannibalization as a means of keeping technology edge over competition: A good strategy is for a company, that is the market leader, to cannibalize its products as competitors start to catch up in terms of technology advancements. (For example "Intel Corporation" cannibalized its 8088 processor in favor of the 80286 after 2 ½ years, the 80286 in favor of the 386 after 3 years, the 386 in favor of the 486 after 4 years, the 486 in favor with the Pentium after another 4 ½ and so on). So the market leader dictates the pace and length of a product's life cycle. (In the case on Intel the replacement of 486 to Pentium took so long because competitors had not been able to catch up).

[5] INTEL and AMD are companies that use cannibalization as an offensive strategy tool. Amd uses it to grab a bite of Intel's market share of CPUs and Intel uses it to defend its market share as market leader. Another example is the "war" waging between Sega and Nintendo as one company after the other cannibalize its products, introducing new ones, in an effort to keep and gain market share.

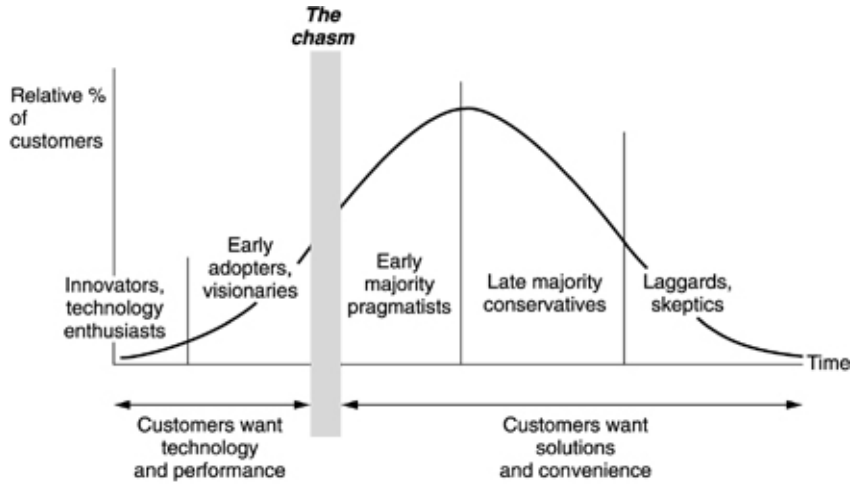
- Management of cannibalization rate through pricing: When cannibalization of a product is decided, the rate at which this will happen depends on pricing. The price of the new product should be at a level that encourages a particular mix of sales of the old and new product. If the price of the new product is lower than the price of the old then cannibalization rate slows down. If the opposite happens then the cannibalization rate is increased. Higher prices in new products can reflect their superiority over the old ones.
- Minimization of cannibalization by introducing of the new product to certain market segments: Some market segments are less vulnerable to cannibalization to others. This is because there is more or less to lose or gain for each of them. By choosing the right segment to perform the cannibalization of a product a company can gain benefits without loses and acquire experience on product behavior.

PART 4: PRODUCT LIFE CYCLE IN RESPECT TO THE TECHNOLOGY LIFE CYCLE

As a new technology matures so is the product or service that uses this technology. The change that occurs during a technology life cycle has a unique reflection on the customers and so on the product life cycle.

In the early days of a new technology, early adopters and technology enthusiasts drive a market since they demand just technology. This drive and demand is translated as the introduction phase of a new product by many companies. As technology grows old, customers become more conservative and demand quick solutions and convenience. In this case a product usually enters in the realm of its growth and as time passes its maturity.

Fig. 2: Change in customers as technology matures



Source: Norman D.

The “chasm” shown in the graph above depicts the difference between the early and late adopters. Each needs different marketing strategies and each is translated to a product’s different phase of its life cycle. One should note that the late adopters hold the greatest percentage of customers in a market. This is why most products begin their life cycle as technology driven and change into customer driven as time passes by. A good example of this is the computer market. In one hand customers ask for

ease of use, convenience, short documentation and good design. On the other hand customers rush out to purchase anything new regardless of its complexity. This is why companies[6] in the computer industry withdraw their products long before they reach their maturity phase. This is the moment that a product reaches its peak i.e. the time that both early and late adopters buy the product.

[6] Intel Corporation is one of the companies that usually withdraw products during their peak to replace them with other ones of better and newer technology.

PART 5: USE OF PRODUCT MANAGEMENT FOR SUCCESSFUL PRODUCT LIFE CYCLE

Product management is a middle level management function that can be used to manage a products life cycle and enables a company to take all the decisions needed during each phase of a product's life cycle. The moment of introduction and of withdrawal of a product is defined by the use of product management by a Product Manager.

A Product Manager exists for three basic reasons. For starters he manages the revenue, profits, forecasting, marketing and developing activities related to a product during its life cycle. Secondly, since to win a market requires deep understanding of the customer, he identifies unfulfilled customer needs and so he makes the decision for the development of certain products that match the customers and so the markets needs. Finally he provides directions to internal organization of the company since he can be the eyes and ears of the products path during its life cycle.

To improve a product success during each of its phase of its life cycle (development - introduction – growth – maturity – decline), a product manager must uphold the following three fundamentals.

- Understand how product management works: When responsible for a given new product, a product manager is required to know about the product, the market, the customers and the competitors, so that he van give directions that will lead to a successful product. He must be capable of managing the manufacturing line as well as the marketing of the product. When the product manager has no specific authority over those that are involved in a new product, he needs to gather the resources required for the organization to meet product goals. He needs to know where to look and how to get the necessary expertise for the success of the product.
- Maintain a product / market balance: The product manager as the person that will make a new product to work, needs to understand and have a strong grasp of the needs of the customer / market and therefore make the right decisions

on market introduction, product life cycle and product cannibalization. To achieve the above he must balance the needs of the customers with the company's capabilities. Also he needs to balance product goals with company objectives. The way a product's success is measured depends on where the product is in its life cycle. So the product manager must understand the strategic company direction and translate that into product strategy and product life cycle position.

- Consider product management as a discipline: Managing a product must not be taken as a part time job or function. It requires continuous monitoring and review. Having said that, it is not clear why many companies do not consider product management as a discipline. The answer lies in the fact that product management is not taught as engineering or accounting i.e. does not have formalized training.

ANNEX 1: PRODUCT LIFE CYCLE PHASES QUICK REFERENCE

INTRODUCTION PHASE	
PRICE	High, customers willing to pay premium for new product. Early adopters.
PROMOTION	Limited. Highly targeted promotional efforts aimed at specific customers
DISTRIBUTION	Direct (factory to customer) or limited distribution through specific strategic partners.
SALES	Small team of highly skilled salesmen with good knowledge of the market.
DEVELOPMENT	Focus on time to market and uniqueness.
MANUFACTURING	High expenditure for new production capacity.
SERVICE	High level of service for targeted customers.
SUPPORT	Direct factory support. Engineering involvement is required.
TRAINING	Focused on new product features, benefits, differentiation, pricing and functionality.
TECHNOLOGY	New and innovative.
COMPETITION	Limited. May be offering different solution for the same problem or application.
MARKET SHARE	Low overall.
GROWTH PHASE	
PRICE	10% of market level. – 10% if the brand name is weak and competition is severe, + 10% if sales are good and competition does not have similar product to offer.
PROMOTION	Heavy. Targeted promotions, trade shows, direct mail, sales seminars, articles and press releases.
DISTRIBUTION	Highly skilled. Focused channels with strong technical skills if needed, complementary products and services.
SALES	Everywhere possible. Retail shops, telephone, internet.
DEVELOPMENT	Complete development. Market penetration is sustained with variations and improvements of the product.
MANUFACTURING	Addition of capacity and automation.

SERVICE	Local and regional, fully staffed.
SUPPORT	Phone support.
TRAINING	Transition to newer version of product.
TECHNOLOGY	Newer and leading edge.
COMPETITION	New appearing worldwide.
MARKET SHARE	High growth. All out market warfare with competitors.
MATURITY PHASE	
PRICE	Stable.
PROMOTION	Focused on reliability, quality, predictability, new enhancements.
DISTRIBUTION	Many distributors, alternative channels, offshore sales.
SALES	Direct sales focused on hi-volume, high profit.
DEVELOPMENT	Focused on cost reductions.
MANUFACTURING	Focused on increasing yield and productivity.
SERVICE	Distributors take over the service efforts.
SUPPORT	Local channels lead support.
TRAINING	Competition differentiation.
TECHNOLOGY	Aging
COMPETITION	Well established.
MARKET SHARE	Predictable market share every year. Limited opportunities for quick gains.
DECLINE PHASE	
PRICE	High compared to the demand.
PROMOTION	Limited – no promotion or advertising efforts.
DISTRIBUTION	Use of existing channels.
SALES	Maintenance and repair orientated for high-tech products.
DEVELOPMENT	Focused on cost reduction.
MANUFACTURING	No capital expenditures, outsourcing.
SERVICE	High prices on spare parts.
SUPPORT	Phone support.
TRAINING	None
TECHNOLOGY	Old and outdated.

COMPETITION	Limited.
MARKET SHARE	Shrinking fast.

Source: Daft L.

ANNEX 2: FRAMEWORK EXAMPLE FOR CANNIBALIZATION

Many companies find it very difficult to estimate the impact of cannibalization of a new product. This is way companies frequently make the wrong decisions on when and what to cannibalize. As mentioned before, they introduce a product to early into a market or too late and subsequently they lose a great share of the market and the process of cannibalization backfires at them. The following table shows a theoretical analysis of a products revenues and the impact of cannibalization of it in favor of another product.

Course 1		**2000**	**2001**	**2002**	**2003**	**2004**
Investment		-10000	0	0	0	0
Units sold		50	400	1200	2000	2000
Selling price	($)	50	45	42	40	40
Revenue	($)	2500	18000	50400	80000	80000
Net income	(%)	15	15	15	15	15
Net income	($)	375	2700	7560	12000	12000
Net investment	($)	-9625	-6925	635	12635	24635
Course 2		**2000**	**2001**	**2002**	**2003**	**2004**
New product income	($)	375	2700	7560	12000	12000
Cannibalization						
Units sold		0	300	1000	1500	1500
Selling price	($)	40	40	40	40	40
Revenue cannibalized	($)	0	12000	40000	60000	60000
Net income	(%)	15	15	15	15	15
Income cannibalized	($)	0	1800	6000	9000	9000
Income net of cannibalization	($)	375	900	1560	3000	3000
Net investment	($)	-9625	-8725	-7165	-4165	-1165
Course 3		**2000**	**2001**	**2002**	**2003**	**2004**
Income net of cannibalization	($)	375	900	1560	3000	3000
Expected lost sales						
Units		0	0	500	1000	1000
Selling price	($)	40	40	40	40	40
Lost revenue expected	($)	0	0	20000	40000	40000
Net income	(%)	15	15	15	15	15
Lost income expected	($)	0	0	3000	6000	6000

Income net of cannibalization with adjustment for low sales	($)	375	900	4560	9000	9000
Net investment	($)	-9625	-8725	-4165	4835	13835

In the table above there are three courses to be taken. The first one is a financial analysis of a product. How units of the product are expected to be sold over the next 3 years, how many of them were sold over the period 2000 and 2001, their total revenue, their total income, and the profits compared to the initial investment.

Course 2 considers the impact of cannibalization over the same period of time. In 2001 300 of the total 400 units were sold of the original product and only 100 of the newly introduced product and so on. In the analysis net income from Course 1 is the starting point and adjustments due to cannibalization are made. The analysis shows that losses from cannibalization are never fully recovered and a loss of $1165 is left at the end of 2004.

Course 3 shows the situation if the company did nothing compared to cannibalization. Lost sales are due to competition that already has cannibalized its product and gains market share. A total of $15.000 could be lost be the end of 2004. Compared to the cannibalization alternative, there is a profit and an increase in total income which will cover the initial investment and which would expect to rise around $13.000 by the end of 2004.

So cannibalization seems a good idea but a better would be to delay it for 2 years (2000 and 2001) so as to optimize revenues and income from both existing product and new product.

Source: McGrath M.

REFERENCES

Aaker D. *Strategic Market Management*, Willey, 1995.

Avlonitis G. *Strategic Industrial Marketing*, Stanoulis, 2001.

Barringer P. H. "Why you need practical reliability details to define life cycle costs for your products and competitors products", Barringer & Associates, on-line <http://www.barringer1.com>

Business Studies "The product Life Cycle", on-line <http://www.learn.co.uk>

Clifford D. "Managing the Product Life Cycle", European Business Journal, July 1969.

Cox W. E. "Product Life Cycles as Marketing Models", The Journal of Business, p.p. 375-384, October 1967.

Daft L. *Organizational Theory And Design*, West Publishing, St Paul Minnesota, 1992.
Drummond G. Ensor J. *Strategic Marketing: Planning and Control*, Butterworth – Heinemann, 2001.

Genesis Strategies "Product Life Cycle Management", on-line <http://www.genesisstrategies.com>

Hata T. Sakamoto H. Kato S. Kimura F. Suzuki H. "Feasibility Study for Rapid Product Life Cycle", University of Tokyo, on-line <http://www.cim.pe.u-tokyo.ac.jp>

Jensch J. "Strategic Marketing and the Product Life Cycle", 1999, on-line <http://www.questteam.com>

Life Cycle Strategies Inc. "Three Fundamentals for Effective Product Management: A Practical Guide for Improving Product Success", 1999

Lightfoot W. "Product Life Cycle Stages", on-line <http://www.marketinginc.com>
McGrath M. *Product Strategy of High-Technology Companies*, McGraw-Hill, 2000.

McNamara C. "Basic Overview of Organizational Life Cycles", on-line <http://www.mapnp.org/library/org_thry/org_cycl.htm>

Norman D. "The life cycle of a technology: Why it is so difficult for large companies to innovate", 1998, on-line <http://www.jnd.org>

Resources "Locational Implications of the Product Cycle", on-line <http://www.faculty.washington.edu/krumme/systems/pcycle.html>

Smith J. C. "Product Life Cycle", on-line <http://www.accessnorthga.com>
Twiss B. C. "Forecasting Market Size and Market Growth Rates for New Products",

Journal of Product Innovation Management, p.p. 19-29, 1984, Elsevier Science.

William D. & McCarthy J. E. *Product Life Cycle: "Essentials of Marketing"*, Richard D Irwin Company, 1997.