THE IMPORTANCE OF LONG TERM PRODUCT DEVELOPMENT IN THE HOUSEHOLD APPLIANCE INDUSTRY

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PREFACE

I welcome the opportunity for writing a thesis, because it is a useful way to put into practice the very reason that attracted me to get enrolled in the MBA program in the first place.

My previous education and training have been as a product designer, and what I wanted to achieve through this program, was to widen my horizons and perspectives on how design and management can be combined.

This thesis will analyze the importance that the development of new products must have as a long term goal in the plans of any company in the household appliance manufacturing industry. Starting with the detection of a need in the market, the creation of a product to solve it, and its successful launching.

To come up with new products must rank high in the company's priorities; they have been called the lifeblood of the industry, an indeed they are. A company needs new products, not only to increase market share but to survive as well.

The development of new products may be a long process --it may take several years--and expensive, but no company can afford not doing this. This situation conflicts with the emphasis that many American companies have in short term return on their investments, which takes them to use strategies that only offer short-term solutions, and eventually will damage the future of the company over the long run.

This thesis will be the capstone of my educational experience since I came to New York City, almost eight years ago. I started with the masters in Industrial Design at Pratt Institute in Brooklyn, New York; after graduation I worked as a designer in a Long Island Company, at the same time I went back to Graduate school; so this thesis will signify the completion of my second masters, this time in Business Administration at the New York Institute of Technology.

This thesis will close a chapter in my life, my stay in New York has been a very enriching period, and has given me culture, life experiences and awareness in the international fields of business, economics, and art and design as well.

I want to thank my family, for being very supportive and understanding all these years. I also want to dedicate this thesis to my friends, the old and the ones that I have made here.

It is my hope and intention that what I have learned and lived in the United States, can be shared and turned into a positive contribution for my country, Mexico.

I want to acknowledge professors Charles F. Fromme and Dr. Marvin Weiss for directing the research for the completion of this thesis.

Brooklyn, New York.
May 1990.

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Statement of the Problem

Introduction. When a company wants to come up with a new product, it is using long term product development. It starts by analyzing the market and the consumer, trying to detect a niche unfulfilled by current products, and from there it traces a strategy that will lead from the initial concept to the final product.

A company must plan for the future and should have long and short term goals. In the day to day operations, the company must have an efficient organization, raising the productivity levels and constantly finding new ways to manufacture products faster and with better quality. All the things mentioned above are necessary to keep consumers satisfied and try to make them repeat buyers.

The long term goals must include the expansion of facilities, the increase of market share, the improvement of actual products and the development of new products.

Hardly a day passes without reading how the Japanese and other foreign countries keep doing inroads in the American market, and how their products and quality are superior to the American counterparts. This is why people prefer to buy Japanese cars, stereos, VCRs, television sets, microchips, computers, and the list keeps growing, even though the consumer must pay a premium price to acquire them.

The United States is still ahead of Japan in basic research, but somehow the Japanese have learned to translate these discoveries into marketable products, faster and better

than the Americans.

If we ask, how this ever took place ?, we must face that this change did not happened overnight, it has been a gradual process. The nation that occupied the economic spotlight by itself--for more than three decades after World War II--grew fat and unresponsive to a changing world, and now is forced to share the stage with some other nations, like Japan and West Germany.

Looking back we can find some of the reasons for this: most companies put too much emphasis on short term return on investment, and the innovative drive of previous years waned down. New products did not appeared frequently and when they did, most of the times only had cosmetic changes and not skin-deep improvements, and quality was not a first priority as well.

This trend seems to continue, many companies keep closing plants and shifting their manufacturing facilities abroad, attracted by low wages and a quick return on their investment; this has been proved in several cases to be a short term solution. The company should find a way to face foreign competition using technology and raising its productivity levels.

It seems that the American economy wants to change from being an industrial to a service economy, but fueled mainly by a consumption-led growth, which during the last years has beenfunded with borrowed money, thus adding to the gigantic national debt. It will be definetely better and healthier for the economy to have a production-led growth as it was before.

As it was mentioned before, the importance of the manufacturing sector for the economy is obvious, and for those companies the development of new products must rank high among their priorities. The company must be marketing oriented, and listen and care for what the consumer wants and needs.

The market opportunities can sometimes arise unexpectedly, and for this reason the company must be flexible, adapt-

able and responsive to the change; is important as well, that the company may be able to deliver the product or service better than their competitors.

The Importance of Planning. A company must develop a blue print of their growth strategy that indicates the goal that they are trying to achieve, like market share or the number of new products per year.

This plan must indicate where the company wants to go and when it will get there, also offer directions and consider detours in case the main route is blocked by problems or changes in the environment.

When we drive we map out the best possible way to go from one place to other; a sport team develops a strategy on how to beat the rival team and they constantly have drills to perfect their moves. A company does the same, but in a larger and much complex scale; the manager must study the company internally and evaluate its human, financial and productive resources, and see how well they can develop new products or can update the actual ones.

The manager must look outside, beyond the company's limits, to find out who the competitors are, what is the market like, and keep up with any technological changes. The manager must be concerned about the environment, and be updated with any government regulations that may have an effect on the company, it is also important to follow very closely the consumer's responses.

The manager must study all the above factors and evaluate any changes and--if necessary--review the original plans accordingly.

The company's goals must be far-sighted and near-sighted as well, and try to achieve a balance in the perspectives of the big picture. American companies are renowned--in general--for being fond of short-term results and tend to sacrifice the rewards that come with long-term planning.

This short-term tendency explains in part, why so many companies have lost part of their market share--or even worst, some are out of business--to foreign competitors, who have been more patient in reaping the benefits of developing new technologies and products over the long term.

I consider important to include two definitions of what strategy is, the first one is by Alfred Chandler:

> Strategy is the determination of the basic long-term goals and objectives of an enterprise and the adoption of courses of action and the collection of resources necessary for carrying out these goals.[1]

The second definition of strategic planning is by Catherine Hayden, which also includes a table:

> Strategic planning is a discipline that a company undertakes with a greater or lesser degree of formality to determine explicitly what it should do in the future.
>
> The objective of strategic planning is to create real and increasing economic value for the company's shareholders, and to determine how best to use the company's resources within its competitive environment.
>
> It is helpful to look at it as a discipline comprised of three processes that take place at various levels of the company's hierarchy. The three processes are pulled together and integrated in the planning process and carried out in a sequence and timetable called a planning cycle.[2]

CORPORATE HIERARCHY	ANALYTICAL/ CREATIVE P.	ORGANIZATIONAL PROCESS	IMPLEMENTATION PROCESS
Corporate Group Division Business Function	.Analyzing capital markets, industries and competitors .Formulating a corporate strategy, strategic plans.	.Resource allocation. .Planning cycles .Report formats .Who reports to whom, and who is responsible for what when.	.Spending the resources to implement projects, programs and procedures to carry out the strategies. .Measurement systems and incentives.

Table 1. The Planning Cycle.
Source: Catherine Hayden, The Handbook of Strategic Expertise, (The Free Press, New York, 1986), p. 313.

The company who wants to plan for the future must be aware that if anything is bound to happen, is that the business world will keep being in constant turmoil, technology will change faster than ever ctreating instability. This situation will make many companies go out of business, while new ones will be created to take advantage of new opportunities in the market place. Another factor of utmost importance will be the new environmental laws, that will affect the way of doing business as we know it today.

Peter Lorange gives some suggetions on how to face the major issues:

> First- is the need to develop a strategic structure that lends itself to frequent redefinitions of the strategic business entities, yet allows for a workable linking with a more stable operational structure.
>
> Second- is the need to tailor not only the planning process to the emerging needs of the various businesses but also to tailor all the strategic subsystems to the same businesses. There should be consistency among the different systems to have an overall, integrated system.
>
> Third- is the need to monitor the environmental constraints, through sharpened strategic control.
>
> Fourth- is the need to develop a strategic style within the company that allows for dismantling such internal constraints as lack of flexibility and lack of competence building.[3]

The Importance of New Products.

Why New Products ? As I mentioned before, my background has been as a product designer, that is why I want to focus this thesis on the development of new products as part of a long-term planning strategy.

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[1] Catherine Hayden, The Handbook of Strategic Expertise, (The Free Press, New York, 1986), p. vi.

[2] Ibid., p. 313.

[3] Peter Lorange, Implementation of Strategic Planning, (Prentice-Hall Inc., Englewood Cliffs, N.J., 1988), p. 445.

My emphasis will be on consumer goods, more specifically household appliances, excluding industrial products like machinery and the automobile industry, although when convenient I will borrow examples of product development strategies from those fields as well.

I will start with two definitions of what a product is, the first comes from the marketer Philip 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.[4]

The second definition is from the point of view of the designer Henry Dreyfuss, who was one of the pioneers of this discipline in the United States.

> We bear in mind that the object being worked on, is going to be ridden in, sat upon, looked at, talked into, activated, operated, or in some other way used by people individually or en masse.[5]

Consumer goods directly satisfy human wants or desires, products such as electrical appliances, furniture, etc., are for personal or household use.

We are living in times of rapid changes and no company, either small or large can be sure of its future, inaction or keeping the same products without changes over the years can lead to losses in market shares, and eventually to the bankruptcy of the company.

Time does not stand still, there are constant technological innovations, low consumer loyalty, a shortening of the product life of most products; and to all this, we have to add the increasing access of foreign-made goods to the American market.

We may conclude that the very survival of any company, depends on its flexibility and ability for finding where the

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[4] Philip Kotler, Marketing Management, 6th ed., (Prentice-Hall Inc., Englewood Cliffs, N.J., 1988), p. 225.

[5] Henry Dreyfuss, Designing for People, (Grossman Publishers, New York, 1974), p. 23.

market goes and what the consumer really wants, and in being constantly updated.

Despite the changing situation of what Peter Drucker calls 'turbulent times', the financial rewards for a successful product are big, and this--no doubt--will keep luring companies to the market, hoping that they have in their hands or the drafting boards, the answer to what the market really wants.

But for each product that succeeded there were many others that failed:

> In 1985, an estimated 10,000 new products were introduced to the American market, after five years, some 8,000 of these products will have been discontinued and withdrawn after millions of dollars and thousands of hours were invested in their development and marketing.
>
> All businesses, institutions, countries and entire civilizations either grow through innovation and change or they die without them. They die because bureaucracy and inertia sets in. When institutions and countries lose their desire to change, they become unable to react and adapt to a changing world.[6]

But when can we say that we are dealing with a new product ?, the first thing is to distinguish a new product from an invention, which is more of a breakthrough.

An invention is when preexisting knowledge was combined in a new way to bring about something that did not existed before, like it was the case of television, the VCR video cassette recorder, etc.; most of the times a new product tends to be an adaptation for the market of an invention, they are innovations rather than pure inventions.

It seems that the U.S. companies forgot that innovation means small but steady improvements--not just breakthroughs--John P. McTague who is the research Vice-president at Ford Motor Co. says: "The cumulation of a large number of small

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[6] Edwin E. Bobrow and Dennis W. Shafer, Pioneering New Products (Dow Jones-Irwin, Homewood, Illinois, 1987), p. 11.

improvements is the surest path, in most industries, to increasing your competitive advantage". [7]

But coming up with a new product does not mean anything until we can overcome the resistance of consumers for trying something new.

It is necessary to find the purchase leaders, those who are more adventurous and more likely to break old habits and try new products, even if that means changing their behavior and learning new procedures. It is known that the purchase followers will start buying the product if the leaders report liking it.

Thomas Robertson divides the measure of newness of a new product in three categories:

> 1- Continuous Innovation. This is a low learning situation that requires the least amount of change in consumption patterns, like a new car model.
>
> 2- Dynamically Continuous Innovation. It requires a medium amount of learning and involves some disruption of the consumption pattern and level of learning. For example, the digital clock meant reading the time in a different way.
>
> 3- Discontinuous Innovation. It requires high learning as new consumption patterns are created for previously unknown products, this is the case of the VCRs when they first came into the market.
>
> Note- in marketing this stage is called EPS, extensive problem solving, and works better when it is complemented with store demonstrations. [8]

I am interested in finding a way for achieving a successful combination of design and management, and in being able to launch new products 'that will make it' in the market; as a matter of fact this is how I will like to focus my future working career.

This is what Mark Oakley says about the importance of design in his book "Managing Product Design":

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[8] Bobrow and Shafer, op. cit., p. 11.

> There are currently signs of an emerging awareness that industrial success is now very closely dependent upon design performance. In past decades, the key problem that had to be solved by the producers of goods were, successively, achieving quantity, then quality, then diversity.
>
> Today, the purchasers of most products are able to choose between many competing models, all offering similar quality and value for money. Increasingly, design is the factor which determines the final purchase decision. [9]

But lately, during the last few years there has been recognition and praise for the innovation drive and design of their products that some American companies are finally using to face the product invasion coming from Europe and Asia.

The topic of design--because of its importance for any goods-producer company--has been raised recently in different business magazines like Forbes and Fortune; Business Week even had as a recent cover story, an article on the importance of good design in the American manufactured products, this is what the article says:

> After relegating design to the backseat in the 1970s, U.S. manufacturers are once again discovering that is key to industrial competitiveness. Design, they are relearning, is more than skin-deep, it is at the very heart of the product.
>
> The difference is design, that elusive blend of form and function, quality and style, art and engineering. A good design appeals to the eye, but must also be reliable, easy and economical to operate and service. It should also be simple to manufacture.
>
> If any single trend stands out in American design today, it is simplicity, increasingly the message is that products should be easy to use, safe and comfortable. Their purpose should be self-evident from the moment you look or touch them, thanks to the electronics revolution, the inwards no longer dictates the outer form. [10]

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[9] Mark Oakley, Managing Product Design (Weidenfeld and Nicolson, London, 1984), p. 3.

[10] Bruce Nussbaum, "Smart Design," Business Week (April 11, 1988), No. 3046, pp. 102-108.

Historical Evolution in the Design of Products.

To better understand the design of new products, I consider important to have an overview of their historical evolution, because products reflect the advances in technology, and also by being articles of everyday life, they are symbols of the prevailing style and the ideology of an specific era.

Products reflect with their design, the cultural process that society has gone through the years. I will start the description of the product evolution with the years before the industrial revolution:

Before 1780- the method of production was by hand, slow and very limited. There was no labor division and the local craftsmen and artists were not specialized, because they created the ideas and the objects as well. Products served the needs of a privileged social minority, so the cultural spread of this objects was very limited.

After 1780- the industrial revolution started in England with the introduction of machinery for the textile industry, and then it spread out to some other industries like steel, etc.

The revolution at first was a slow moving process, and the most important concepts were: mass production, division of labor with a tendency to specialization--the worker repeating the same operation over and over, this brought a massive increase in productivity.

These changes also included a transformation of transportation, which accelerated in speed and volume with the introduction of the steam engine for the railroad and the increase of maritime trade going from one continent to the other.

1851- the Crystal Palace exhibition in London was the first international showcase for new products which encouraged and promoted better design standards for manufactured goods. In several countries--like the U.S.--the use of the railroad and telegraph for communication was generalized, which were important tools in the industrializa-

tion of the most advanced economies.

Businesses grew larger and more complex, and they started to need specialized managers to run them and capital markets to finance them.

1850-1900- the products made during these years were rough and had low quality, were mass produced and had applied ornamentation. Most products were in high demand, so demand outstripped the offer in most cases.

The emergence of the electrical appliance industry can be traced back to the 1880s, and it had its origin in the new electrical engineering industry. Adrian Forty said:

> There was a strategic alliance between the supply industries and the appliance industries. Electrical engineers found that to reduce the costs of production and therefore the price of electricity, it was essential to increase the ranges of uses to which electricity could be put and also to increase the number of consumers. [11]

As a result, the giant companies that dominated the electrical industry had a strong profile in the appliance field as well, some of those companies in the U.S. were General Electric and Westinghouse. The first appliance product to enter the American home was the electrical fan.

The concept of mass marketing did not existed as we know it today; there was barely any market research because the wants and needs of the consumer were not taken into account, he only was a buyer. The selling was focused in the needs of the seller and his need to convert his products into cash. [12]

1900- the three major industrial nations at the beginning of this century were: England, Germany and the United States. They all used the machine very extensively and tried to simplify products by eliminating unnecessary

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[11] Penny Sparke, Electrical Appliances (E.P. Dutton, New York, 1987), p. 25.

[12] Penny Sparke, Design Source Book (Chartwell Books, Secaucus, N.J., 1986), p. 20.

ornamentation and favored the use of modern technology and materials, what evoke was a simple and rational style.[13]

The use of electricity as the power source for appliances at home were more common, they were mostly used by homemakers because of the changing status and scarcity of domestic servants. The purpose of the small appliances was to make life easier, the first ones were toasters and irons, as well as small electric motors which could be connected to sewing or washing machines.[14]

1900-1920- there was a shift of economic power from Europe to the U.S., and the country emerged as the first economic power. Some of the major American contributions were:

- The invention and perfection of mail-order marketing services by Sears Roebuck, which increased their reach beyond cities to small towns; also the way of doing business at the retail stores was upgraded.
- The concept of the assembly line developed by Henry Ford, revolutionized the working process, and the way industrial and household products were conceived, designed and manufactured. He translated the methods and ideas of standardization into the manufacture of consumer goods.
- Management science was based in the examination of production processes, and was developed by work-study engineers. The most important was Frederick Taylor who wrote "The Principles of Scientific Management" in 1911, he also originated the time and motion studies.[15]

These two decades were a period of very high growth, production was standardized in order to meet the needs of a growing middle class that was a ready and willing market, that absorbed all the goods that America could produce.

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[13] Stephen Bayley, XXth Century, Style and Design (Van Nostrand, Reinhold Co., New York, 1986), p. 68.

[14] Penny Sparke, Electrical Appliances, pp. 26-27.

[15] Bayley, op. cit., pp. 76-77.

World War I, 1914-1918. there was an increase in the economic activity as war time demands stimulated opportunities to expand the company's operations more rapidly than they would during peace time.

The economic fluctuations associated with the war reinforced the preocupation with organizational structure, because more companies--especially the large ones--had a rigid centralized hierarchy that seemed not to be flexible or responsive enough.

After World War I, the electric refrigerator began to be manufactured for the domestic market, this was achieved partly by the efforts of the General Motors Co. When GM moved into the appliance area it created a special division called Frigidaire; they borrowed the steel technology and the assembly line production techniques from the automobile industry. Other companies that moved into mass-production were General Electric and Kelvinator. [16]

1920-1930- during this decade the volume of economic activity increased greatly, and this made possible for business enterprises to grow in size and number. The American appliance industry as we know it today was properly formed during this period, and between 1921 and 1929 the output of the industry tripled in value.

This brought as consequence the creation of companies that were larger and arranged in multiunit organizational structures. This was the case of General Motors that needed to match the flow of raw materials and finished products more closely to fluctuations in demand, thus forming multidivisional structures. [17]

This type of organizations could produce more sales, achieve lower costs, offer greater profits and be more responsive.

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[16] Penny Sparke, Electrical Appliances, pp. 28-29.

[17] Craig R. Hickman and Michael A. Silva, The Future 500 (New American Library, New York, 1987), p. 18.

Even before the recession of 1929, many companies started to recognize the need for effective planning over and above day-to-day operations management. Managers placed new emphasis on inventory control, forecasting demand, and they also began to sudy the business cycle.[18]

To finish my review of this decade, I will mention the two different approaches that the two major automobile manufacturers had about developing a new product, because this had a ripple effect in the consumer goods industry as well:
- Ford Motor Co. they kept producing cars at a very high pace and achieved economies of scale, this made possible to bring the cost of the car down, so even middle class people could afford them. Henry Ford had an obsession with technology, therefore his famous phrase 'Engineering first'; but he did not notice that the needs of the market were changing, nevertheless he kept on producing the same Ford model 'T', without any basic changes and in the same color. Ford is also remembered by other phrase: 'The customer can have any car he wants, as long as it is black.'
-General Motors Co. on the other hand, GM paid more attention to the changes in the consumer's preferences than Ford did. They came with a broader selection of models targeted to different types of consumers, so they initiated market segmentation which is a key concept in marketing.

GM's phrase was 'styling first', they said that styling could be used as a weapon that will add value--real or not--in the eyes of the consumer. In 1926, GM sold more cars than Ford did, and it has never lost that lead ever since then.[19]

1930-1940- the economic boom of the 1920s came to an end with the Wall Street crash of 1929, and The Great Depression lasted well into the 1930s.

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[18] Hayden, op. cit., p. xvi.

[19] Bayley, op. cit., pp. 128-129.

The Depressionleft many companies in an unknown situation and in a state of desperation. Commercial success and indeed survival is dependent on increasing consumption for the company to grow; but in this case there was no growth, so each manufacturer was forced to compete against each other to increase their market share, or at least not to lose any share.

To make matters worst, the National Recovery Act stabilized prices of consumer goods in 1932, but it was then that manufacturers discovered that they could increase sales by adding style to their products, so now goods were competing on appearance alone since prices were fixed.

In many cases design was not a quest for efficient function, it was merely the manipulation of an object's character and appearance in order to stimulate sales. This is the reason because design was named 'The silent Salesman'. [20]

The first generation of design professionals people like Raymond Loewy, Walter Dorwin Teague and Henry Dreyfuss --in a way--helped with their designs to pull the American economy out of the recession. They worked on just about everything from soft-drink bottles through office duplicators and locomotives among other products.

It was the designer Walter D. Teague that said:

> Modern design entered the American home not through the front door but by the way of the kitchen, bathroom and garage.

The 1930s had a very unique style called streamlining, in a way was the expression of the romance with the machine; in many cases it turned out to be an exaggerated aerodynamic styling that was applied everywhere, from consumer goods to office equipment.

During this decade many new electrical appliances were welcomed in the house, this was a major opportunity for the designer to come up with many new domestic gadgets. The kitchen

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[20] Id.

products followed the lead given by Detroit autostyling and new models appeared for the same reason--in order to make previous appliances seem obsolete, although in the case of the blender by rotating the position of the motor, and putting it in the base they originated a new product, the popular food processor. [21]

The 1930s closed with the New York World's Fair of 1939-40, which was conceived as an exposition of technological advances that would emphasize social and historical relevance as a 'fair of the future'. It was also said that 'It lays the pattern for a way of life which would have an enormous impact in the years to come.'.

In management there was an interest in diversification for risk reduction; mangement systems were enhanced to allow for quick measurement of and response to marketing changes, but also for a resource allocation process that balanced the short-term cost of investing versus potential long-term returns. [22]

1940-1950- this decade saw the most devastating war that mankind has ever known, in World War II the economic and human losses were astronomically high; but wars have positive sides as well, in this case the United States was established as the world's most important industrial and economic power, while its major competitors laid in ruins.

The war pushed manufacturing plants to the limit of their productive capacity, and proved to be an important catalyst for accelerated scientific and technological change. It stimulated new mass-production techniques in a number of key industries.

There was also a rapid development of man-made materials as substitutes for traditional ones, such as rubber and metals. Plastic technologies were significant in this aspect. [23]

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[21] Edward Lucie-Smith, A History of Industrial Design (Van Nostrand, New York, 1986), p. 176.

[22] Hayden, op. cit., p. xv.

[23] Bayley, op. cit., p. 204.

By 1940, before the U.S. entered the war, the memories of the depression were fading fast and a housing boom was underway, and this brought a commensurate increase in the manufacture of domestic furnishings, appliances and tableware. American producers were gearing up to produce an even greater volume of consumer products and automobiles, when the government began its defense program. [24]

The manufacturers with more vision, started to get ready even during the war time, to what will be a seller's market in every product area once that the war was over. The businessmen use the hunger for post-war products to attract attention to their wares, and they surveyed the response to new ideas as a guide for product planning and development. [25]

In the period immediately after the war, housing was the major problem facing the country. One plant after another closed down, and within a yearafter the end of the war, 12 million men were demobilized to return to private life, with promises that the Federal Housing Administration would help them buy houses. The answer came with the construction of middle-class suburbs, like in Levittown were identical houses were built on a kind of a moving production line. [26]

The demand for consumer goods soared with the construction fever, and every house wanted to have a television set, a car, a radio and a vacuum cleaner. Factories rushed into full production as soon as materials became available. Some of the appliance brands became households names after 1945, like it was the case of: General Electric, Westinghouse, Frigidaire, Sunbeam, Maytag, Hoover, Kelvinator and Bendix.

1950-1960- this was a period of great confidence and of economic expansion and steady demand for products and services, and most people believe that life will

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[24] Arthur J. Pulos, The American Design Adventure (The MIT Press, Cambridge, Mass., 1988), p. 11.

[25] Ibid., p. 50.

[26] Id.

only get better.

The American appliance industry had in this decade a period of expansion, the appliance consumption was a rapid expanding market and continual efforts were made by manufacturers to penetrate new markets by producing and increasing number of cheaper and cheaper products.

This growth policy brought with it, the need for aggressive marketing and the search for ways for making appliances more attractive. Technology development facilitated volume production and price reduction, also the need to make products desirable to new markets placed growing emphasis on design. [27]

Some of the man-made products discovered during the war, finded a commercial application. Lightweight nylons and plastics, including resins and acrylics, changed our experience of the relationship between the size and weight of objects. [28]

The transistor was discovered, and it turned out to be a device vastly superior to the vacuum tube in processing electric signals, and this produced a rapid miniaturization in radios and televisions.

Another factor was the flexibility possible in the molding of the new plastics and their wide range of bright colors, all this allowed new and unconventional colors and shapes in a broad variety of products. [29]

Market research studies were established as common practice by some companies to establish consumer preferences and their motivations.

Two major forces were apparent in the economy; one was the appearance of the conglomerate in the American business scene, were companies will expand acquiringand merging with

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[27] Sparke, Electrical Appliances, pp. 28-29.

[28] Kathryn B. Hiesinger, (Ed.), Design Since 1945 (Baldin, England, The Philadelphia Museum of Art, 1983), p. xi.

[29] Id.

businesses often unrelated to the original lines, this situation does not always works right because of the different corporate cultures.

The second force was an intensive drive for foreign markets, some observers called the period from 1955 to 1970 a 'golden economic era', where organizations faced few obstacles to prosperity and growth. [30]

1960s-1980s- the domestic and international environment became increasingly complex, the 1960s were a period of contrasts where unparalleled material prosperity was accompanied by unprecedent social unrest.

During the 1960s a flourishing consumer society was named 'the throaway society', in which obsolescence, styling, novelty and change were all characteristics of industrially produced goods, whether cars, refrigerators or food processors.

The decade of the 1970s had the oil embargo and the end of cheap gas, which brought new attitudes from energy users, and conservation became a buzzword. One of the consequences of this crisis was 'stagflation', a term coined to describe no growth in the economy combined with high inflation.

In the 70s management's main concern became protecting profits from raising costs and new competitors; inflation eroded margins and masked real growth but nevertheless it kept attracting new entries.

This period has had many technological changes, and new manufacturing processes increased automation, also the designer had at his disposal many new materials. The use of plastics became generalized, and is practically found everywhere in an endless number of products. In 1982, plastic production surpassed that of steel worldwide and we formally entered the plastic age.

The miniaturization in electronics allows designers a freedom to give shape to products with fewer restrictions than ever before.

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[30] Hickman and Silva, op. cit., p. 28.

During these years the presence in the American market of European and Oriental products is self-evident, as these countries had totally recovered from the war effects. They had an advantage over their American counterparts, because their industrial infrastructure was newer and more up-to-date; besides that, their manufacturing processes and management techniques had been more flexible and responsive to the actual needs, thus enhancing the productivity of the work force.

Many American companies were caught off guard and were slow to respond, maybe because they were used to dominate the world market at ease and without any major competitors. This lack of adaptability has put many companies out of business, or has forced them to move their production facilities abroad.

Several American industries that had their origin in the U.S., are now foreign-dominated, like is the case of the phonograph, color TV, tape recorder (audio and video), telephone and integrated circuits among others.

In the late 1980s, the American manufacturing sector seemed to be catching 'a second breath', where design and development of new products has started to rank high in the priorities of several companies that have been looking for excellence, by paying attention to the market, and they have been listening for the consumer's wants and needs and offering in return product quality.

> Technology will bring about huge structural changes in the organization of work, means of communication, services and patterns of travel. Up to the present, mass production has used specialized equipment to produce standardized goods, but in the future versatile robots will be capable of making infinite varieties of different products.
>
> Robots will challange the former assumptions that economical production depends on long lead times, high volumes, low unit costs and standardization. With the computer controlled 'flexible' manufacturing systems of modern factories, manufacture will be sophisticated, that a factory will not necessarily produce or assembly only one particular type of merchandise.[31]

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[31] Bayley, op. cit., p. 290.

In the 1980s management continues wrestling with finding the optimal combination of structure and strategy, measuring performance, allocating resources, analyzing buyers, protecting profits and especially finding new ways to compete.

Time horizons have shortened and competition has intensified, to the point where an opportunity not taken advantage of, quickly becomes a threatening imperative. The emphasis has shifted to using strategic management to build and sustain competitive advantages. [32]

The Role of Design in Other Industrial Economies.

Design in Germany.- as it was mentioned before, at the beginning of this century Germany along with the U.S. and Great Britain, was one of the leading industrial nations.

In Germany there were some giant companies like AEG and Siemens that dominated the electrical industry. They invested vast sums of money into the establishment of a mass-production system, it satisfied first the energy needs of factories, rail roads and public lighting; but after doing that, they looked for ways to enter the private home, because that could reduce the cost of production and the price of electricity, thus making it available to the average consumer. [33]

The electrical engineering industry turned from other products to concentrate on the manufacture of electrical appliances, in such a way that the U.S. and Germany led the way in the early decades of this century of appliance industrialization, while a number of other European countries followed their lead. German appliances were renowned--and still are--by their rational and simple style.

The period in between the two World Wars saw the rise of the Bauhaus school, which is still considered the most

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[32] Hayden, op. cit., p. xvii.

[33] Sparke, Electrical Appliances, p. 26.

influential school of design in this century. It was founded in the early 1920s and it has the reputation of having being the initiator of the modern design movement.

The design theory of the Bahaus was to stress aesthetic principles and encourage the use of machines; one of the most important achievements of the school was the development of tubular steel furniture for production in series. [34]

The Bahaus insisted that form should be seen as a substitute for ornamentation and standardized forms must be geared to mass-production technology, all this epitomized simplicity and rationality. The school was closed in 1933, and most of its leading figures emigrated to America, thus helping to spread the Bahaus philosophy. [35]

The rational tradition remained alive during Hitler's Third Reich; important advances were done in aircraft and missile design. The Volkswagen's Beetle was conceived as the people's car, and was to be a mass-produced vehicle; at the same time the country was linked with superhighways called autobahns intended for military and civilian use.

After World War II, Germany was partially destroyed with tremendous human and economic losses; with most of the productive capacity in ruins the future did not look good at all, but nevertheless the German recovery or 'miracle'--as it was called--was remarkably rapid. This was aided by two factors: the strong base of applied design and technological knowledge established before the war and the character of the German people.

During the 1940s and 1950s, the best exponent of German design was the company Braun, that produces household goods. The Braun products soon became internationally recognized as images of perfection in design, sophisticated but geometrically simple.

In the following decades, German products have establishhed themselves for their excellence in engineering, design and quality.

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[34] Bayley, op. cit., pp. 188-191.

[35] Id.

Design in Japan.- in the years after World War II, the Japanese government had as a prime objective --as it happened in Germany and Italy--the reconstruction of the national economy after their military defeat.

The many economic, social and political reforms that had been initiated in the late 1940s became the foundation of Japan's post-war recovery.

The existing power base that in the Japanese industry was associated with the war efforts, was redirected to the manufacture of consumer goods. During the first twenty years or so after the war, the main emphasis was not in designing products but in achieving high efficiency in the manufacturing processes; they developed the JIT or just-in-time system. [36]

The approach that the Japanese used in the manufacture of products was different than the one used by the Western companies; what they did, was to let the means of production influence the fruits of the industry. Their philosophy was to have the most efficient factories, and from there let quality and innovation arise from the factory floor. [37]

In the late 1950s and early 1960s, some presidents of the most important Japanese companies began to promote design as an element in the company development.

The first wave of Japanese exports to the West were rather humble, and consisted of copies or imitations of Western products already in the market, but at lower prices.

This initial strategy worked fine for them, because in the case of the automobile industry it opened the doors of the lower end of the market, and the same happened with the electronics and camera industries.

The Matsushita company that now embraces National, Technics, Panasonic, and Quasar, was the first group of Japanese companies that set up an industrial design department in the industry in 1951. Other companies followed this innovation,

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[36] Bayley, op. cit., pp. 192-194.

[37] Id.

Canon camera and Sharp corporation in 1953, and Sony company in 1961. [38]

Sony is one of today's most successful Japanese companies, and it owes the origin of its fortune to the early 1950s when it secured the rights to use the transistor--that was invented at AT & T's Bell Laboratories--with an irrisory sum of $25,000 dollars as down payment on royalties.[39]

The transistor ignited the consumer electronics revolution with the transistor radio; the first mass-produced radio came out in 1955, and in 1959 the first portable radio miniature came to the market.

Sony adopted a consistent design image until the 1960s with the creation of its design department, and design has been since then a complement of its technological innovation and imaginative marketing strategy. [40]

As I mentioned before, the Japanese entered the Westerns markets with a low-price strategy, but by offering good quality that was constantly improved, they moved up the economic ladder. Japanese products are now synonyms with the latest technology, and their ability to miniaturize and to apply their good design taste, have helped to bring radical changes in the design of consumer products.

The pace of innovation in the Japanese products has increased during the last years as a result of a very competitive market, with the Korean and Taiwanese products following at a close distance. It seems that when Japanese companies want to move ahead, they have decided to practice planned obsolescence, but this time instead of applying cosmetic changes to the products as it was in the past, now what they are using is--real or apparent--technology.

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38 Id.

39 Gene Bylinsky, "The New Look at America's Top Lab," Fortune, (February 1, 1988), Vol. 117, No. 1, p. 63.

40 Bayley, op. cit., pp. 192-194.

Development of New Products.

Evaluating the Need of New Products in the Company.

Before any design work can begin, it is necessary to decide what are the real needs of the company. To manage design effectively it is essential that new or improved products are allowed to appear only after careful planning has confirmed the need for them. This should start with an assesment of the company's skills and resources, and information of the markets as well, both as they are now and as they are expected to be in the future. [41]

All companies need to have a new product development strategy, even just to survive or for being leaders in their fields. This can turn out to be a very expensive--but necessary-- economic exercise, and the very future of the company can depend on how successful these decisions are taken.

> The potential rewards from developing successful new products are high but the risks are also high. The number of new products in the market seem to increase every year, so there are more products fighting for the same shelve space, and this is decreasing the average length in years of the product life, along with a decline in the brand loyalty by consumers and retailers.
>
> Booz-Allen & Hamilton, a large management consulting firm, reports that from a survey of leading companies throughout the world, that the number of new product introductions is expected to double over the next five years. The survey attributes this pace to several external environmental factors: technological advances was the major factor with 90%; changing consumer needs 72%; shortening product life 55%; increasing foreign market access 53%, and increasing labor cost 35%. [42]

The need for new products in the company must be evaluated from different perspectives, and must take into account the marketing, manufacturing and financial capabilities the

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41 Oakley, op. cit., p. 20.

42 Bobrow and Shafer, op. cit., p. 7.

43 Robert H. Hayes and Steven C. Wheelwright, "Link manufacturing Process and Product Life Cycles," Harvard Business Review, (January-February 1979), Vol. 57, No. 1, p. 40.

company has:

> Companies must make a series of interrelated marketing and manufacturing decisions. These choices must be continually reviewed and sometimes changed as the company's products and competitors evolve and mature. A company may choose a product or marketing strategy that gives it a broader or narrower product line than its principal competitors.
>
> Having made this decisions, the company has a further choice to make: should it produce this product line with a manufacturing system--a set of people, plants, equipment, technologies and control procedures--that will permit a relatively high degree of flexibility and a relatively low capital intensity ?, or should it prefer a system that will permit lower cost production with a loss of some flexibility to change (in products, production volumes and equipment), and usually a higher degree of capital intensity ?. [43]

The Product Life Cycle.- products as well as persons, have a life cycle with four well defined stages: birth, growth, maturity and decline, and I can include further death.

Products always have finite lives in terms of their value to the company as part of its operations. The concept of limited product life is well known to marketing specialists, the plotting of different life-cycle curves help to demonstrate several important points: [44]

- The life of a product is never infinite.
- There are different stages in the sales history of the product.
- Adequate indication is usually available that revised or that new designs are needed.
- Failure to develop and launch new products in time may result in a temporary decline in profitability or even the death of the enterprise.

The way of calculating the curve is by relating sales volume to time. The form of the life cycle curve will be dif-

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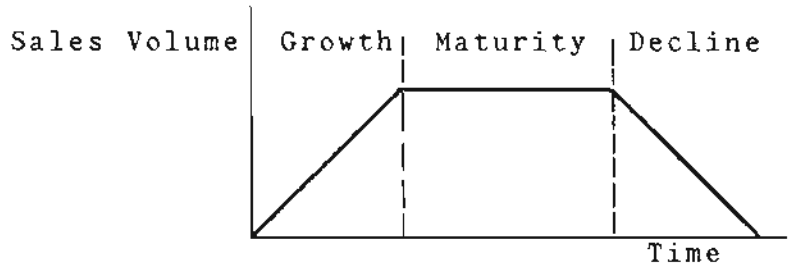
[44] Oakley, op. cit., pp. 22-25.

ferent for every product.

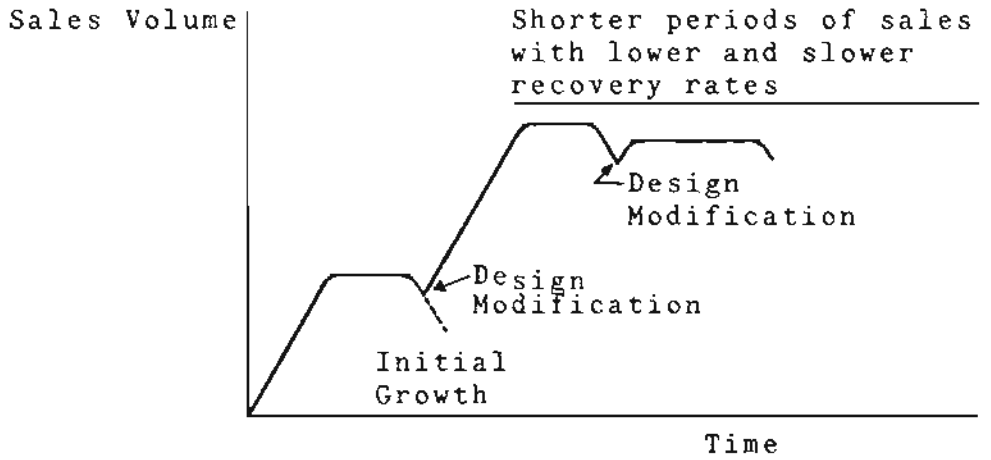
The most generalized product life-cycle is shown below:



Source: Mark Oakley, Managing Product Design, (Weidenfeld and Nicolson, London, U.K., 1984), p. 23.

Figure 1

Sometimes the decline in sales can be reversed by modifying the design of the product with a 'facelift', or a technological alteration to allow some new element of technology to be introduced; in this case the life-cycle curve will look like this:



Source: Mark Oakley, Managing Product Design, p. 24

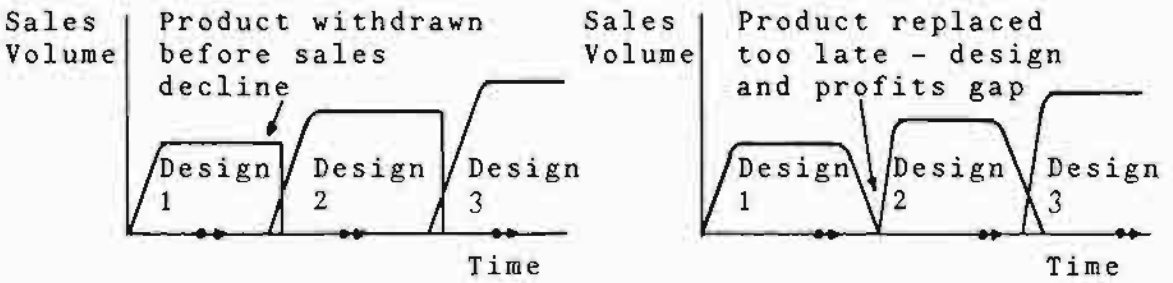
Figure 2

It may be possibly to greatly extend the life of a product by well-tuned design changes, although there is usually a a limit to the number of changes that can be made before a form of diminishing return is experienced.

A judgement must be made about the cost/benefit comparison between modifying an old product relatively cheaply or investing more heavily in a completely new product form.

When a compnies studies the life-cycles of their products one thing that they must try to avoid, are the gaps that occur when the decline in sales of the original product have advanced too far, this is particularly important to practice in the firms that are based on a small number of products.

These two figures illustrate two possible situations where there are design gaps:



Source: Mark Oakley, Managing Product Design, p. 25.

Figure 3

When we talk about product life-cycle, we must necessarily mention not only the product because this could be a generic term, but instead we must refer to the brand the company has and the benefits the consumer gets by using it.

The only way that a product and a brand could be called the same, is when a new product that has never been seen comes into the market, and then people associate the two of them together; this was the case of facial tissues and Kleenex, or photostatic copies and Xerox copies. But in most cases, competitors will emerge sooner or later, therefore the need of talking about brands.

Controversy arises because we often forget to specify in which stage of the product life-cycle our product is located, so first of all we must have a clear distinction between a product category, a product form and a brand:

- Product Category.- this is the grouping of products that

satisfy needs in the most general forms, like the need for transportation or the need for processing information with computers.

- Product Form.- this a further specification in the needs of the consumer, now we must know what he wants out of the product category. In the case of computers is necessary to know the capacity, what is going to be used for, how much a consumer can afford to pay and other requirements.

A product form and the product category can be in different stages, taking the computer example again, we can say that the market for main frame computers is in decline, the mid-frame is in the mature stage, and the personal computers are in the growth stage.

- Brands.- this is the fight for an specific market, say among the personal computers the ones that are also portable. The consumer may choose among the different brands and there is a high degree of substitutability.

This table is a summary of what has been said about category, form and brand:

Category	Forms	Brands
Needs	Wants	Preferences
- To process information Computers	- What form out of the product category -main frame -mid-frame -PCs -portable -stationary	- What brand out of the product form form -IBM -Apple -Zenith

Table 2, Category, form and brand.
Source: Dr. A. Poczter's Marketing Management class.

> Product life-cycle is an attempt to recognize distinct stages in the sales history of the product. Corresponding to these stages are distinct opportunities and problems with respect to marketing strategy and profit potential. [45]

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45 Kotler, op. cit., p. 349.

Introductory Stage.- this is when our product-brand breaks into the market and is first distributed and made available for purchase, sales growth is usually slow Profits are negative or low because of weak sales, heavy distribution and promotion expenses.

The marketing plan to be used depends in one of these three comprehensive behavior models, they are:

- EPS Extensive Problem Solving.
- LPS Limited Problem Solving.
- RRB Routinized Response Behavior.

These three models try to explain the consumer, because we do not act in a continuum, it basically depends on the specific situation.

This table describes how to use each one of the models:

	Concept of Product Class	Concept of Brand	Most Important Element	Process
EPS New Product Class	No	No	Promotion	People to develop Concept: 1- Assimilation 2- Descrimination
LPS Know Product/ New Brand	Yes	No	Advertising	1- Brand identification 2- Perceived Instrumentality 3- Unique selling proposition.
RRB Concept of Brands	Yes	Yes	Sales	Price Availability

Table 3, Consumer Behavior.
Source: Dr. A. Poczter's Marketing Management Class

If you have a product that is new to the market and that will establish a new category, then there will be no competitors, the potential ones will be at the side lines in an attitude of wait-and-see. When you have a product that is a pioneer, then you have the most difficult task because you must

educate the consumer, obviously this is the most expensive and riskier stage, but the rewards are also higher.

> According to studies, the firms that pioneer new markets typically develop sustainable competitive advantages. William Robinson and Claes Fornell studied a broad range of mature consumer and industrial goods businesses, and found that market pioneers generally enjoy a substantially higher market share than late entrants:

	Average Market Share	
	Consumer Goods	Industrial Goods
Pioneer-------	29%	29%
Early Follower-	17%	21%
Late Entrant---	13%	15%

46

A company, but especially the market pioneer, must carefully choose between a rapid-penetration or slow-penetration strategy. If the pioneer chooses the initial marketing strategy of rapid-penetration to make a 'killing', it may sacrifice long-run revenue for short-run gains.

As it was mentioned before, the market pioneers have the best chance of retaining market leadership if they plan their cards right.

Growth Stage.- there is a rapid climb in sales that brings positive cash flow. If the opinion leaders report liking the product then the followers will start buying the product-brand as well.

In this stage there are many opportunities, so this will attract many competitors because it seems there is enough room for everybody, although this may lead to overcapacity in the industry.

> The firm in the growth stage faces a trade-off between high market share and high current profit. By spending a lot of money on product improvement, promotion and distribution, it can

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46 Ibid., p. 357.

> capture a dominant position. It foregoes maximum current profitin the hope of making even greater profits in the next stage. [47]

There are several marketing strategies that a company may follow in this stage, one of them is to improve product quality and/or add special features. The company may try to enter new market segments or create new distribution channels.

The company must shift from the product awareness achieved during the introduction stage to a level of product conviction and purchase.

Maturity Stage.- during this stage the rate of sales go down, or at least they stay flat; this period usually lasts longer than any of the two previous stages and is the most challenging for the company if they want to keep the product in the market.

Most potential consumers have tried the product, so future sales depend on population growth or by replacement demand. There is overcapacity and this intensifies competition, so it is a good tactic to segment the market, along with trying the most efficient cost producer.

The production volume can be increased by upgrading the product or by getting brand users to step up their usage, another approach is if the consumer have more usage per occasion (maybe double), and finally try to discover new and varied uses. The classical example is Baking Soda, which originally came as a baking complement, and now it has some uses that the first creators never thought about, things like refrigerator odors, stomach antacid and even drain cleaner !!.

> Often the most reliable source of new revenue is a line extension. Johnson & Johnson has produced 17 versions of the Band-Aid since introducing the product in 1920.
>
> General Electric is especially aggressive in seeking new targets for its product arsenal. For Ultem, that heat-resistant plastic, the company has discovered close to 200 applications. [48]

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[47] Ibid., p. 359.

[48] Kenneth Labick, "The Innovators," Fortune (June 6, 1988), Vol. 117, No. 12, p. 64.

Decline Stage.- during this period there is definetely a decline in sales, this may be slow or rapid. The company must try to have an orderly withdrawal from the market.

The decline stage can be caused by a number of reasons: consumer shift in tastes, increased domestic and foreign competition, or simply technological advances that can make the product obsolete.

The company must plan in advance what to do with its declining products, especially if they only have a few. They could 'milk' the product and phase it out with the introduction of a new product to replace it, trying to avoid the appearance of design gaps (see figure 3).

For durable goods this stage is not for purchasing, but for replacement of spare parts.

> When a product is maturing in its life cycle, its service cycle is only beginning to generate steam. The service life cycle covers the installed base of products needing maintanence.
>
> The installed base consists of the difference between total shipments and 'total decay', that is the reduction in numbers still in use caused by the product wear and discard, the cusmer's upgrading or switching to a substitute, or cannibalization of the product by spare parts. [49]

The table below gives a clear idea of the different marketing strategies that we can use during the product's life-cycle:

	INTRODUCTION	GROWTH	MATURITY	DECLINE
MARKETING				
CUSTOMERS	Innovative/ High Income	High Income/ Mass Market	Mass Market	Laggards/ Special
CHANNELS	Few	Many	Many	Few
APPROACH	Product	Label	Label	Specialized
ADVERTISING	Awareness	Label Lead	Lowest Price	Psychographic
COMPETITORS	Few	Many	Many	Few

[49] George W. Potts, "Exploit Your Product's Service Life Cycle", Harvard Business Review, (Sept/Octob. 1988), Vol. 66, No. 5, p.32.

PRICING

PRICE	High	Lower	Lowest	Rising
GROSS MARGINS	High	Lower	Lowest	Low
COST REDUCTION	Few	Many	Slower	None
INCENTIVES	Channel	Channel/ Consumer	Consumer/ Channel	Channel

PRODUCT

CONFIGURATION	Basic	Second Generation	Segmented/ Sophisticated	Basic
QUALITY	Poor	Good	Superior	Spotty
CAPACITY	Over	Under	Optimum	Over

Table 4, Marketing Strategies.
Source: Dale L. Flesher, The New Product Decision, (National Association of Accountants, New York, 1984), p. 33.

Finding a Niche for the New Product.- one of the key elements in marketing is the concept of market segmentation, this is the recognition that not everyone of us has the same needs or wants; so the product must be tailor to suit the needs of a group of consumers with similar characteristics.

Through market research findings we can elaborate the consumer profile and get to know his/her age, sex, education, incime, geographical location, family size and family life cycle among other data.

Market segmentation will help to avoid the advertising 'spill', this can be done by choosing the most appropriate media to reach the consumer and the times and frequency as well.

> Today's abbreviated product life cycles and accelerated technology development lead some business marketers to hurry to introduce a new product, even if that means skipping some of the traditional up-front market research and assesment.
>
> Marketers who fail to conduct such time-consuming market research make a strategic mistake. Although making short cuts with market place homework may speed the new product to the market, it also boosts the chance that the product will fail when it is introduced. [50]

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50 Kate Bertrand, "New Product Success Starts With 'Homework' ", Business Marketing, (August 1988), p. 37.

These are some of the elements used for segmentation:

- Demographics.- this is the most common method for segmentation, it uses socio-economic variables, like a position of a family in their life cycle described by their age, marital status and the age of the family's members.

To identify opportunities, demographic data must be coupled with social trends, like the increase in the divorce rate or the increase of single parent households.

- Attitudes.- they can be used to differentiate market groups or personality traits among consumers. To this is necessary to add the use of life style segmentation, which can be defined by the person's activities, interests, opinions and values. This is appropriate for products that have a high psychological appeal. [51]

- Usage Rate.- it is based on differentiating heavy users of a product from light users, so products can be better targeted.

- Preference/Choice.- this is the most important criterion and is based directly on how consumers respond to the new product. Segments are identified based on the characteristics of the product that they will prefer and ultimately use; this can give us information in the elasticity to price, and the importance of some of the product attributes. [52]

People who try to forecast the future, predict that the market segmentation is going to be more accurate, and the products to be delivered will be more personal, or closer to what a specific consumer desires.

> If the 1980s has been the decade of segmentation, the 1990s will introduce the era of super-segmentation or micro-marketing. Faced with numerous and more aggressive transnational competitors in both domestic and international markets, managers will be forced to search for even narrowers market niches and tailor new products and services to them.

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[51] Glen L. Urban and John R. Hauser, Design and Marketing of New Products (Prentice-Hall Inc., Englewood Cliffs, N.J.), pp. 95-98.

[52] Id.

> Using advanced consumer research and information technology and taking advantage of the hundreds of new television channels and other advertising media, marketers will learn to target consumers with a precision that until recently was unconceivable.
>
> In the fight to grab market share quickly the ability to target and reach consumers so precisely can be an overpowering advantage against rivals that are still using mass-market techniques.
>
> Micromarketing is being speeded by a wealth of computerized information. Indeed, data from cash registers scanners in stores, fed instantly by phone line to corporate headquarters, can give managers precise information about the buying habits of consumers in a particular neighborhood in any town in the country. [53]

Determining a Strategy.- between the realization that new products are needed and the actual setting up of design projects come three important stages of analysis and decision:

1st Stage, Identifying Opportunities for New Products.- in order to decide which areas offer the best prospects for growth, a careful analysis must be made of the firm and its environment, and take into consideration things like:

- The firm's resources, limitations, objectives and plans.
- Factors outside the firm, as they exist at present, together with projections of future conditions.
- Get a true picture of the company's capabilities, highlighting the strengths and weaknesses which in turn will have an input in the choice of the product that better matches them.
- The productive plant must be studied, know where it lies the greater expertise and what are the aptitudes and flexibilities of the work force.
- Study the environment in which the company operates, try to identify competitive threats to existing products and try to

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[53] Aimee L. Stern, "In Search of Micro-Niches," Business Month (July 1989), pp. 60-62.

detect opportunities for new products.

- To get information, some of the sources that may be consulted are: sales force reports, department reports, government statistics, trade associations, annual reports, business magazines, newspapers and media in general.[54]

2nd. Stage, Determining a Strategy for New Products.- the objective of this phase is to put together those areas where the company is strong and those where there are apparent opportunities in the market.

If the company decides to go ahead and develop new products, the strategy to be developed must take into consideration the skills and resources the company has available.

It is helpful to try to forecast future trends, what the size of the market will be and what the position of the competitors will be.

The resources that the company needs are not only financial, but most important of all are the human resources that the company will need to achieve their goals; it needs cooperation from everybody, from the worker in the assembly line all the way to top management.

The company will have to have adequate machinery and test equipment, something that is also necessary is a special shop where to build models and prototypes.

3rd. Stage, Screening and Selection of Specific New Product Ideas. the main source for new product ideas should come from the Research and Development (R&D) department and/or design department; although innovation must be encouraged from the ranks of workers and employees as well.

Market research results can be used to identify the needs of consumers. Consumer's complaints must be taken into account, either to improve an actual product or to get ideas for new ones. It will be helpful if the company has a 1-800

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[54] Oakley, op. cit., pp. 28-41.

number where the customers can call toll-free, this together with an address where they can send their comments or sug-gstions.

An excellent source for new and fresh ideas is the sponsoring of design competitions. The company can profit or at least benefit if they contribute to research activities done in universities around the area where the company is located.

The screening and selection of new ideas must evaluate several aspects like: product characteristics, marketing, manufacturing, social, and legal and political matters as well. [55]

The following table represents in a graphic way the strategy that has been described above:

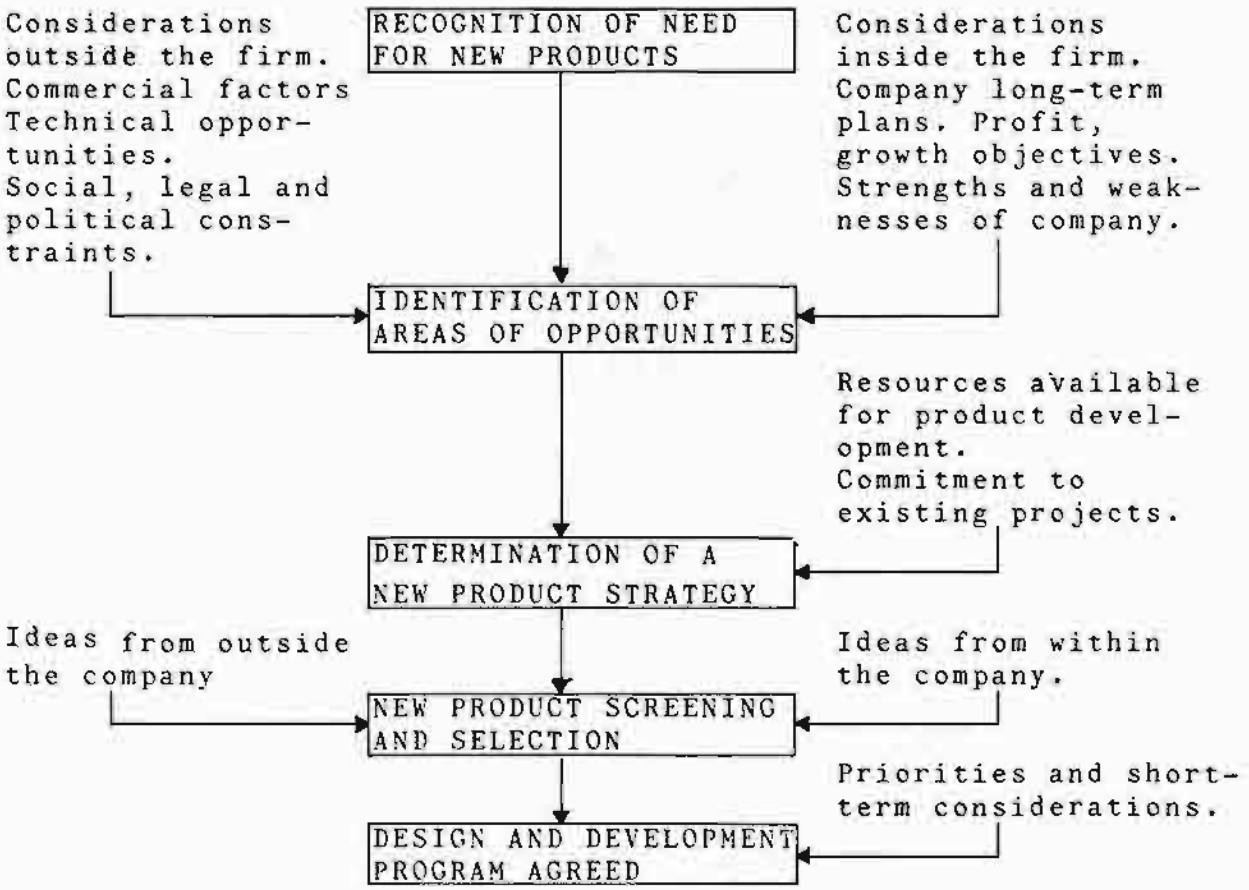

Table 5. Strategy For New Product Decision.
Source: Mark Oakley, Managing Product Design, p. 27.

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[55] Id.

Design Brief.- this is the tangible result of the planning activities which is a firm proposal for the design project.

The design brief shall serve as a guide on how to use the available resources for the design work and to confirm the specifications which the new product must satisfy.

The design brief must give in detail:

- Exact type of product to be designed.
- Major technical requirements, like the size of the controls and any other safety feature.
- Cost constraints, they must have a target selling price and consider manufacturing capabilities and production costs.
- It must comply with any other special requirements. [55]

2. Scope and Limit of this Study

The emphasis of this study is on manufacturing, mainly the American industry, although when convenient I will mention Japanese and European companies as well.

I am trying to limit this thesis to consumer goods to be used at home, like electrical appliances. I am excluding industrial products(i.e. machinery), and the automobile sector.

3. Definitions and Important Terms Used in this Study

CAD Computer-Aided-Design.- this is the use of computer systems to assist in the creation, modification, analysis or optimization of a design.

CAM Computer-Aided-Manufacturing.- it is the use of of computer systems to plan, manage and control the operations of a manufacturing plant through either direct or indirect computer interface with the plant's production resources.

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[55] Id.

Ergonomics.- applied science concerned with the characteristics of people that need to be considered in designing and arranging things that they use, in order that people and things will interact most effectively and safely. It is also called biotechnology or human engineering.

Industrial Design.- it is the discipline that originates and develops ideas to design the form of manufactured products. Industrial Design is concerned with the appearance of three-dimensional machine-made products.

Leveraged Buyout LBO.- this is the takeover of a company by other using borrowed funds. Most often the target company's assets serve as security for the loans taken out by the acquiring firm or investors, who repay the loans out of cash flow of the acquired company.

Research and Development R&D.- the scientific evolution and the marketing of a new product or service. Once such a product has been created in a laboratory or other research setting, marketing specialists attempt to define the market for the product.

Styling.- this is the alteration of the style of a product to increase the sales appeal or utility or just simply to improve appearance.

4. Methods of Research Used in Preparing this Study

My sources of information have been: books, business magazines, newspapers, class notes, and my personal experience as a designer and as an MBA student.

I have also used the information that was sent to me, with the TechSearch form that I filled out at the beginning of the semester, and that has given me brief descriptions of articles related to my study. I have also used the Info-Track computer system for periodical research.

I have used the collections of the following libraries: Brooklyn Business Public Library at Cadman Plaza; Brooklyn Central Public Library; Port Washington Public Library, Long Island; Pratt Institute Library, Brooklyn; Museum of Modern Art, New York City; New York Institute of Technology, Old Westbury campus and Metropolitan center.

5. The Organization of the Rest of this Thesis

Chapter II.- this is the "pro" chapter, I will highlight the advantages of long-term planning and describe how to plan and finance it, and the reasons because it pays off.

I will compare the advantages vs. the disadvantages of short-term planning with emphasis on quick return on investment, and how in the long run this may affect the possibilities of a company for getting ahead of its competitors.

I will analize who the excellent companies are, how they got there and what they do right. It is important to create the right corporate culture because it can help to spur the development of new products.

The product development process must be backed up by manufacturing, R&D and marketing; people from these departments and others must be made part of the design team when creating a new product.

The multi-department team has advantages, because every department will know what is expected from them, they will also feed back the process, so the final solutions will be realistic and as trouble-free as possible.

Chapter III.- this is the "con" chapter, the disadvantages of long-term planningis that the risk of the shareholders in most investments increases with time, especially in a company that is not making the right moves or that has a CEO that does not inspire confidence. This can also happen in an economy with high inflation and/or recession.

The risks of developing new products are high, that is why so many of them fail, therefore it is important to know the reasons and try to avoid them.

Products may not only fail in the market, they can represent a hazard or threat to the consumer, and the company may be liable for this or any other legal infractions. It is important to have throughly tested design before it hits the market.

The new product will form part of the material culture, and in this consumer society where we live nothing seems to be permanent; many products have a built-in planned obsolescence , it is internal when the product does not work beyond certain warranty period, it is external when the product does not appeal anymore because of changes in fashion, styles or trends.

Chapter IV.- the conclusion will be that is necessary for a company to have a long-term product development strategy to survive and move ahead. I will also attempt to summarize my findings.

CHAPTER II

THE ROLE OF LONG TERM DEVELOPMENT AS OPPOSED TO SHORT TERM PROFIT GOALS IN THE HOUSEHOLD APPLIANCE INDUSTRY

Advantages on Long-Term Product Development

Planning.- Long-term planning is the strategic planning that a company formulates as a 'blue print' and that goes beyond five years. It is the commitment of financial resources, capital expenditures, machinery and adequate installations that a company uses to meet specific goals over a period of time, like is the case of development of new products in the company.

Long-term planning must come as a logic consequence of the present, and the two of them must be linked and articulated by medium term goals as well.

Long-term development can be considered as an investment for a brighter future, is like to plant seeds that will not bear fruit until years later; so same as the farmer does, we must be patient and let the plant (project) grow, giving it the proper care, water, fertilizer, etc.

Planning for the future does not guarantee that a new product is going to be a success, but it helps in narrowing down the objectives and keeps the mind set in a definite goal to achieve.

> Achievement of long-range goals may require adherence to a specific strategy--such as market, product, or labor relation strategy--that in certain economically difficult years might cause higher than normal expenses. In the short-run, these expenses reduce profits; but, in the long-run they are 'investments' designed to pay off.[1]

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[1] Robert L. Banks and Steven C. Wheelwright, "Operations vs. Strategy: Trading Tomorrow for Today," Harvard Business Review, (may-June 1979), Vol. 57, No. 3, p. 113.

If a company really has a long-term product development philosophy, it should also use it to evaluate the manager's decisions; in other words, use the same yardstick to synchronize goals with actions.

> Another way of minimizing detrimental short/long-term trade-offs, is to increase the emphasis on long-term goals in measurements of managerial performance.
>
> To ensure performance on long-range objectives, management can conduct milestone reviews on a regular basis (e.g. quarterly) along with normal operating reviews. [2]

The company must try to make its goals the employee's goals as well, and make them aware of this. Communication lines must be open all the time not only at the higher levels, but all the way down the factory floor; otherwise the situation will be people pulling in different directions at the same time, and objectives will be harder to achieve.

> Besides measuring performance measures, an attempt should be made to make lower-level managers knowledgeable about long-term corporate goals and how operating managers contribute to the achievement of those goals.
>
> Good managers will more likely make appropriate trade-offs when they have a sound understanding of long-term plans. To improve communications some companies increase the number of meetings between top and lower level managers to discuss the corporate goals and how each person fits into the grand plan. [3]

New Product Development.- Manufacturing companies must have a well defined policy for the development and introduction of new products, and for the constant update and improvement of the products already in the market.

It is more recommendable for a company not to wait until it comes with a 'homerun' product, this is,a real breakthrough; even though this is highly desirable it is far more difficult,

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[2] Ibid., p. 117.

[3] Id.

it is better to do what the Japanese do, this it connect "hits", or as they put it: "make tiny improvements in a thousand places" in a constant basis.

New product development is a game of numbers, the more you try the better you are going to get at that, and the more likely that you will come up with excellent products.

The company must make this happening, by having a R&D and/or design department, and financing and sponsoring their activities while having a creative corporate culture.

A recent article in Business Week described how R&D spending pays off, they analyzed the statistical data from their R&D scoreboard, and demonstrated beyond any doubt that the companies with the strongest performance in their markets are also the ones that spend the most, pound per pound on R&D. They also raised the theory that in high-tech companies, it seems clear that R&D drives sales and profits and not the other way around. [4]

As I mentioned before, but I think is important to remark, there is no company that can afford not to invest in product development, especially in these days when brand loyalty is decreasing, product life is shortening and technology is changing faster than ever.

A situation that requires even more attention is when your product line belongs to a market that is in the growth stage, because this means that you are more vulnerable than what you think; all this means that the competence is going to be very intense, and there will be more newcomers attracted by the opportunities.

A company should not be caught off guard, and must have a R&D strategy for the development of new products and try to avoid market encroachments by larger companies.

Depending on the complexity of the product itself or

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[4] Anthony J. Parisi, "How R&D Spending Pays Off," Business Week, (Innovation Issue, June 1989), pp. 177-179.

the industry, the "gestation" or development period for a product may vary from several months to up to four or five years for automobiles. The process goes through different stages, starting with market research to find out if there is a need for the product that the company is planning to develop.

Once the need has been detected, the creative part begins with the design and/or R&D department getting involved, first through a brainstorming session, later with some of those ideas taking shape in form of rough sketches that will be refined and complemented with simple 3-D dimensional models called mock-ups; the material used for mock-ups can be paper, cardboard, plastic, wood, or any other material that can be easily transformed to suit the designer's purposes.

Mock-ups create a real physical feeling of what the product will be, and can be tested and presented to possible users to get feed back from them and after that back to the drafting board. The next step will be a final model and prototype that has all the improvements and corrections considered important along the design process, this model looks identical and uses the same materials that a mass-produced product will have. This final prototype is used for fine-tuning before starting production.

The use of CAD-CAM systems significantly reduce development time, this along the use of flexible machinery can put a company ahead ot its competitors and make it able to respond in a brief period of time to any changes in the market.

To participate in the development of a new product from scratch, is a very challenging and interesting experience that is filled with hurdles and frustrations, but at the same time brings fulfillment and satisfaction when the product is finally in the market.

The development process is by no means a predictable linear path, that is why the company's timeline when it comes to new products must be long. The company must be patient and

able to tolerate failure, and trying not to stop the creative team for being bold and experimenting new ways for designing a product, but at the same time make a point for not missing market opportunities.

> Jim Burke, Johnson & Johnson's CEO, tells his first stab at innovation when he started his career at J&J, his first project a children's chest rub, had failed dismally. He was summoned to the office of the chairman, General Robert W. Johnson.
>
> When Burke walked in, General Johnson asked, "Are you the one who just cost us all that money?", Burke nodded. The General said, "Well, I just want to congratulate you. If you are making mistakes, that means you are making decisions and taking risks, and we won't grow unless you take risks."
>
> To this day, Burke believes that innovation can be nurtured through creative conflict. "I have tried to encourage that sort of conflict without fear of retribution," he says "you end up with a lot more ideas." [5]

To get better results, many companies are using the multi-disciplinary approach where people from different departments participate in the development process since the very beginning, and not only at the end as it used to be.

This approach brings input to the project, multiple ways of solving problems and different concerns that are addressed as the project moves along, such as manufacturing, sales, marketing, design, etc.

The development of a new product should not be a sole event in the company, several projects must be carried with some overlapping; for no reason the company should rely on only one project, because so many things can go wrong or be delayed and then the company can get in troubles.

> The new product development strategy that Dow Chemical uses, is to invest heavily "to feed the pipeline" with new products; they are prepared

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[5] Kenneth Labick, "The Innovators," Fortune, (June 6, 1988), Vol. 117, No. 12, p. 60.

> to absorb losses for five years or longer at the expense of short term gains until the profits start pouring in.
>
> The idea is that the reservoir that they fill today will supply them with earnings in case of a downturn of the economy. [6]

Financial Aspects. The financial side in the introduction of new products has to be analyzed even before the project starts because the company will have to foot the bill for as long as the project lasts and even beyond that, because after the product finally hits the market it will take some time before any profit can be made.

The project has to be considered from different perspectives and not only by the numbers, there are many variables like the market situation, strategy of competitors, development of new technologies, etc; all this need to be taken into account to avoid failure in the market place.

> To figure out which project make economic sense is theoretically simple, a manager maps out the expected costs and revenues over the years and then using a percentage figure as the cost of money over time, calculates the project's present value. If it is positive the project is a go.
>
> In practice, of course, the exercise is not so simple, since no one can be sure what the expenditures or revenues or cost of money will be. [7]

The financial policy that many American corporations follow is to put more emphasis on quick return on investments, this draws criticism because for that reason, they tend to avoid long term projects; but in the end what is more likely to happen for those companies, is that they are trading tomorrow for today.

Things may be changing, because there is an emerging awareness that if the company wants to survive in the long run,

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[6] Louis S. Richman, "How Capital Costs Cripple America," Fortune, (Aug. 14, 1989), Vol. 120, No. 4, p. 52.

[7] John J. Curran, "Companies that Rob the Future," Fortune, (July 4, 1988), Vol. 118, No. 1, p. 84.

then it must develop new attitudes and must be willing to get adapted to a different environment and ways of doing business.

> The short-term versus long-term conflicts are now more obvious than they used to be. Through the expansion and development of formal strategic planning processes during the last decade, top managers have become more aware of where the corporation should be going, and deviations from the prescribed courses are more noticeable.
>
> The effects of unrelated short and long-term tradeoffs appear to have relatively mild consequences, but taken together may adversely affect a corporate strategy.
>
> [8]

In doing the research for this section, I came across with the article "Managing Our Way to Economic Decline", it was written more than ten years ago by Hayes and Abernathy, but their description of some of the failures by modern American managers still keep being actual, and it is widely used by different authors.

> Long-term solutions to America's problems may not be correctable simply by changing our government's tax laws, monetary policies and regulatory practices. It will also require some fundamental changes in management attitudes and practices.
>
> Such determination, such as striving to excel, requires leaders--not just controllers, market analysts and portfolio managers.
>
> The key to long-term success--even survival, it is what it has always been: to invest, to innovate, to lead; to create value where none existed before. [9]

One of the better known and oldest ways a company has for raising capital which will allow them to start new adventures, like development of new products, plant expansion, etc., is the issuing of stocks.

Stocks are defined as the ownership of a corporation

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[8] Banks and Wheelwright, op. cit., p. 113.

[9] Robert H. Hayes and William Abernathy, "Managing Our Way to Economic Decline," Harvard Business Review, (July-August 1979), Vol. 58, No. 4, pp. 66-77.

represented by shares that are a claim on the corporation's earnings and assets.

Although many investors are still very wary about putting their money back in the Stock Exchange Market, especially about "Black Monday" in 1987, stocks still represent another example of thinking long-term; historically they have outperformed bonds or money funds, not to say savings accounts.

> On October 19, 1987, the Stock Market crashed, with the Dow Jones Industrial average plunging an unprecedented 508 points. Many individuals are so devastated that they have sworn off stocks entirely.
>
> The crash has taught a painful lesson: stocks can rise and fall rapidly, and thus they are risky for some people. For the fact is that stocks have chalked up a good record, over the 62 years for which records are available, they have far outperformed bonds and short-term money funds.
>
> In the 1926-87 period, stocks delivered an average annual return, including dividends of 9.9%, far outpacing the 4.9% for bonds and the 3.5% for money funds. After subtracting 3% average inflation, stock's real return of 6.9% dwarfs the 1.9% for bonds and 0.5% for money funds. Such comparisons, of course, ignore the consequences if an investor has an unfortunate knack for picking losing stocks. [10]

To estimate long-term decisions regarding stock prices, analysts use what they call "key value drivers", like expected sales growth, operating profit margins, investments needed to sustain growth, taxes and cost of capital.

John J. Curran writes in an article, that the stock market is not always adverse to long-term new product development projects, and the stock value reflects this when the announcements are made.

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[10] Randall Smith, "Why Buy," Wall Street Journal, October 19, 1988 , p. A1.

> Sometimes long-term decisions are welcomed in the Stock Market, according to the studies of Randall Woolridge of Penn University he has found that: the market carefully evaluates investment decisions and what is the market's response, to corporate announcements of such risky investments as joint adventures, entering a new business and research programs.
>
> But the investors instead of getting worried with these chancy long-term decisions, they welcomed them with cheers.
>
> On average, stocks quickly outperformed the market by more than a percentage point on announcements of strategic investments. [11]

If a company happen to have bad quarterly results, it does not mean that investors should immediately shun the company, but if this keeps happening, then it will show cracks in the company structure and probably fundamental long-term weaknesses.

The Stock Market most of the times gets the real value right, and can see through the accountants "gimmicks" when they try to cover the wrongdoings of the company.

The 1980's could be called the decade of the takeovers, where many companies changed owners, and the market looked ripe for speculators trying to make a fast buck. This situation may be different in the 1990's.

> By allowing Time Inc., to buy Warner and repel Paramount's hostile bid, a Delaware court backed directors over stockholders in picking the path to corporate value. In fact, directors, not shareholders are charged with the duty to manage the firm.
>
> Other effects of this decision are:
> -If a company is not sold, directors are not always obliged to maximize the immediate value of the stock.
> -Pursuit of an established long-range plan may be a valid reason for rejecting a takeover bid.
> -Protecting a corporate culture might be a valid reason for resisting a takeover. [12]

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[11] John J. Curran, "Companies that Rob the Future," Fortune, (July 4, 1988), Vol. 118, No. 1, pp. 84-89.

[12] Bill Saporito, "A Legal Victory for the Long-Term Managers," Fortune, (Aug. 14, 1989), Vol. 120, No. 4, pp. 56-59.

Customers and Service. More than 25 years ago, Theodore Levitt wrote the article "Marketing Myopia" which has since then become a landmark in marketing. The article changed the way a company perceives itself.

Levitt mentioned some of the dangers facing a company that has the wrong orientation. This could be when the company think it is indispensable; or when it is product oriented and think that technological superiority alone will make it better; there are even those companies with a production oriented mentality, which produce all what they can.

Any of these orientations steer the company away from what it should be the center of its strategy; a company must be customer-oriented, the customer is the reason of existance (raison d'être) for any company.

> Service, quality and reliability are strategies aimed at loyalty and long-term revenue stream growth.
>
> Executives from the excellent companies believe they must maintain a long-term view of service as a revenue builder.
>
> This point is all too often misused in big American companies, profit objectives, while very necessary, are internally focused and certainly do not inspire people by the thousands way down the line. Service objectives, on the other hand, are almost without fail meaningful to down-the-line employees. [13]

The Human Element. The human element is the most important asset that a company may have and as such it must treat it, providing the most adequate conditions so it may bloom.

Working in a stable environment helps the employee to perform better, and if this coul--ideally--be combined with profit sharing and stock ownership, all this will help to enhance the holistic concerns of the company.

When relatively job security is established along with

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[13] Thomas J. Peters and Robert H. Waterman, In Search of Excellence, (Warner Books, New York, 1982), pp. 116-117.

slower evaluation and promotion, then the short-term measures by the one CEOs and employees alike are evaluated, will lose its importance.

> Akio Morita, the chairman of the Japanese Sony Corporation said this about American job security: "American management treats workers as just a tool to make money. You know, when the economy is booming, they hire more workers, and (when) the recession comes, they lay off the workers. But you know, recession is not caused by the workers.
>
> Layoffs are most visible in the auto industry. But job security is a critical issue through the economy, for white-collar employees in financial services as well as blue-collar workers on the factory floor.
>
> Only a relative handful of companies with more than 1,000 employees maintain a no-layoff practice, and their numbers are diminishing under competitive pressures.[14]

The sense of belonging to the organization coupled with improved evaluation and promotion processes will contribute to the evolution of relatively long-planning. The employee in such an organizational environment could become a source of innovation.

In a constantly changing world, a company and its people must keep abreast of technological changes and innovations. Employees must be willing to change careers, learn new techniques and acquire new skills; and try to cooperate with management in their effort to improve processes.

A company that wants to establish itself at home and abroad, must realize that now more than ever we live in an interdependent world, "The Global Village"; thus the need for having a better understanding of foreign languages and cultures.

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[14] John Hoerr, "A Japanese Import That's not Selling," Business Week, (Feb. 26, 1990), No. 3147, p. 86.

Disadvantages on Short-Term Strategy

Planning. Short-term planning deals with investment projects with a maturity of one year or less.

The emphasis that American managers put on short-term return on investment is well known, as opposed to the patience that the Japanese companies use to nurture the development of new products before they can make any profit.

The development of new products is a lengthy process that can take anywhere from less than a year to two or three in some instances. Development time sounds like quite a long time for some investors, which instead prefer to tie their money into more profitable "paper games" adventures.

After the Tax Reform of 1986, the American financial capital has become much more speculative, and many investors have taken advantage of loopholes in the new laws.

A classical example of speculation are the leveraged buyouts or LBOs that are debt financed; this is when a company buys another company and then resell it in parts, because they say that "the sum of the parts is more than the whole".

The LBOs are totally improductive transactions--but highly profitable for some--and I call them that way, because when they occur, not a single extra unit will be produced, so it seems that the only winners are the speculators.

Takeovers bring quick restructure and cost-cutting, because there is a need of urgency to pay back the borrowed money as soon as possible. This has meant--in many cases--massive layoffs of employees and workers alike, and the decrease in the amount of money spend in R&D projects or any other activity that does not produce an immediate result.

> When executive suites are dominated by people with financial and legal skills, it is not surprising that top management should increasingly allocate time and energy to such concerns as cash management, and the whole process of corporate acquisitions and mergers. [15]

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[15] Hayes and Abernathy, op. cit., p. 68.

Changes in the external environment are occurring at a more rapid pace than in the past, and this has increased the pressure for short-term performance and making accurate forecasting more difficult.

This changing situation forces managers to make trade-offs between short and long-term decisions. The authors Banks and Wheelwright say that managers are moved to act by two basic considerations:

> The two considerations are:
> 1- The manner in which the manager performance is measured by the corporation. They are motivated to take actions that will reflect favorably on them personally, either immediately or in the future.
> They are very aware of how success is measured in their organizations in terms of both status and compensation. Trade-offs appear to be made not so much with remuneration in mind, as with a careful eye on how the decision will be viewed by peers and superiors.
> 2- Between the short and long-term decisions, there appears to be a natural tendency for operating managers to lean toward achieving short-term goals, which are visible and easily comprehended. [16]

One way for reducing the number of times a manager faces a crossroad where he/she has to make a trade-off between short and long-term decisions is by having realistic goals.

> The most frequent situations in which detrimental of short/long-term decisions occur is when a manager fails to meet the budget goals agreed on for his/her division or cost center.
> Establishing realistic goals is the step that appears more applicable to companies in any stage of development of their planning processes. Increased accuracy in the budget numbers themselves can be achieved by incorporating economic-cycle predictions and historical-trend analysis in setting budgets.
> Flexibility should be given for unforeseen problems, thus easing short-term pressures on managers. [17]

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[16] Banks and Wheelwright, op. cit., pp. 116-117.

[17] Id.

Manufacturing Strategy. The American economy has changed its economic base along the years, from being agricultural to that of an industrial society, and now is moving into a post-industrial phase; the new foundations are based in the information and service sectors.

What this new shift in the economy seems to have left behind are empty buildings that used to be factories, rusted steel mills, and abandoned shipyards.

There is a de-industrialization of the American landscape, while on the other hand more and more of the manufactured products consumed in the country are supplied by competitors or by the new-industrialized-countries (NICs).

I think that the encouragement of this trend is creating fundamental weaknesses in the economy, but many American companies keep relocating their manufacturing facilities off-shore because labor is cheaper.

On the long run this situation will create a dependency on other countries to supply the products that the U.S. used to be able to produce and even export to other countries. Some of the consequences are beginning to be obvious, in the recent years the U.S. passed from being the largest creditor to the largest debtor nation.

Richard K. Hay and Toby Kashefi propose a synthetic model where they analyze the implications for American management, the emphasis of short-run over long-run contributions both in terms of motivations and decisions related to the temporal substitutes of capital.

> This is how the managerial emphasis on the short-run has affected business behavior.
> 1- Businesses have diverted funds from production requiring innovation and creativity toward production which uses existing production processes.
> 2- Businesses have diverted funds from R&D while pursuing mergers and acquisitions.
> 3- Businesses have developed have developed highly sophisticated structured decision systems for controlling operations but continue to ignore the development of effective decision support systems, which are prerequisites to effective long-run planning.

4- Businesses have created uncertainty and unrest with workers because of employment insecurity.
5- Businesses have emphasized optimizing financial returns on portfolios rather than in maximizing long-run returns on invested capital. [18]

Financial Aspects of the Short-Term Strategy. The reason why most American managers love to take short-term decisions may have an explanation in the cost of money.

> Expensive money forces U.S. managers to maximize investment returns on a project-by-project basis. But investing strictly by the numbers leads to perverse effects that stiffle many worthwile long-term investments with high capital costs setting a high discount rate; safe long-term projects that offer lower returns are often spurned. Riskier projects make the cut because they promise bigger paybacks. Obviously projects with quick payoffs sail through.
>
> American companies pay creditors more interest than its major global rivals do, and have to assure shareholders higher returns. These costs explain the oft-noted propensity of U.S. corporations to focus on the short-run. The cost of capital determines the discount rate companies use to compute the present value of future earnings.
>
> The higher the returns investors expect, the higher the discount rate, and the sooner a project has to begin paying off.
>
> The U.S. has borne the highest cost of capital of the leading industrialized economies. Simply put, with an after-tax cost of nearly twice as high as Japan's, American companies can afford to wait just half as long as their Japanese competitors for capital investments to reach an acceptable level of profitability. [19]

This figure compares the cost of capital in Japan vs. what it costs to repay the same capital in the U.S.

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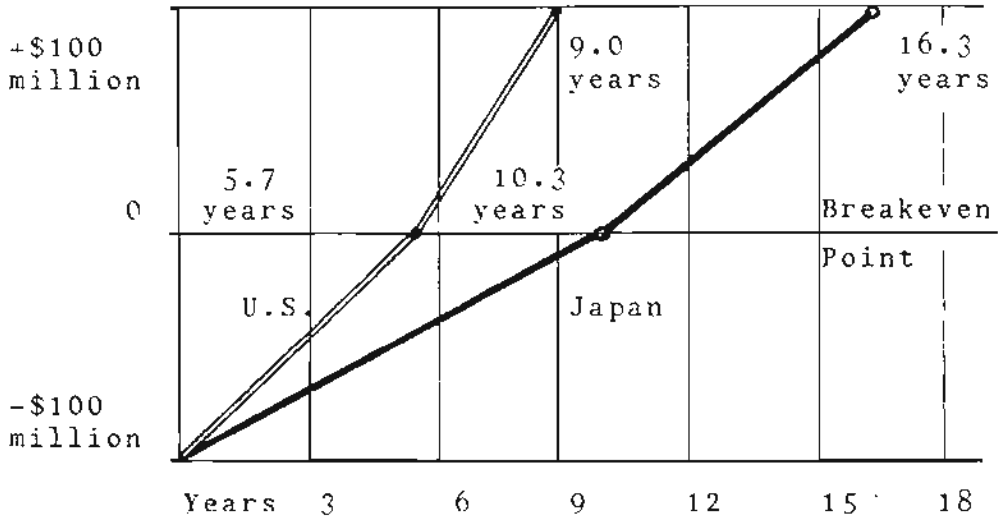
18 Richard K. Hay amd M. Toby Kashefi, "A Holistic Management Model for Facing the New Competitive World," Advanced Management Journal, (Winter 1985), Vol. 50, No. 1, p. 7.

19 L. Richman, op. cit., p. 50.



Source: Louis S. Richman, "How Capital Costs Cripple America," Fortune, (Aug. 14, 1989), Vol. 120, No. 14, p. 54.

Figure 4

The 1980's was the decade of the mega-deals with frequent mergers and acquisitions. The LBOs changed the way of doing businesses in America, this situation forced many managers to take short-sighted financial decisions.

In the article "Companies that Rob the Future", John J. Curran describes the results of short-sighted decisions to improve short-term results; this is done to face adversity or to save profits in one of the year's quarter profit goals, but it may have bad consequences later on.

> When a company shows an increase in profits of 40% per quarter, these are more likely no great news, because in most cases they surely mask bad news. Many chief executives are jacking up profits by pouring money into quick pay-off projects and do this by starving investments that would yield income years from now.
>
> They are doing this for a number of reasons, most commonly a desperate wish to raise the company's stock price, to fend off prospective acquirers. Ironically, that strategy is often backfiring, because investors see the prodigal policies for what they are and sell their stock.
>
> When a company steals building blocks from the future to make itself look better today, investors frequently see right through the illusion. [20]

[20] Curran, op. cit., pp. 84-89.

In these days when we frequently read news of how the U.S. is losing its technological edge in some industries to Japan, we also find on the other hand that the reaction of many American companies have been to trim their R&D budget, so in some ways they are contributing to the decline in productivity when it should be just the opposite.

Managers should allocate more capital resources among technological alternatives as basic research, but even more important than that is that the company should emphasize the commercial application of the laboratories findings, and make improvements as well of those products that the company already has in the market.

Part of the problem are the investors, they are enamored of reaping short-term profits from debt-financed takeovers, LBOs and other levering schemes.

George N. Hatsopoulos a leading analyst of the cost of capital says that "high-leverage discourages long-term investment, because leveraged companies siphon off cash to pay off debts and stick with technologies that promise a quick return".

The Excellent Companies

In 1982 with the business book "In Search of Excellence", which was a best-seller, the authors Peters and Waterman touched a very sensitive point of corporate America; they sang a different song from those pesimistics that say that the U.S. supremacy is fading fast, and that the new sun of the world's economy is raising over the Pacific basin with the Japanese.

The authors studied the best managed American companies and found why they are better than the rest, they called them excellent and described how they achieved that distinction.

The Webster's dictionary describes the word excel as being greater than the others; excellence is the fact or state of excelling, or a superiority. The synonyms of the word excel are: exceed, surpass, outdo, beat, overdo.

The book states that there is nothing new under the sun, these companies were above all brilliant on the basics; what they give are examples and suggestions but not recipes that can convert a mediocre company in a good one.

I think that is important to mention what they describe as attributes, just keeping in mind that each company has its own corporate culture, and that the teams they can put together are formed by people with different backgrounds.

> 1- A Bias for Action. Even though these companies may be analytical on their approach to decision-making, they are not paralyzed by the fact. In many of these companies the standard operating procedure is: "do it, fix it, try it", moreover the companies are experimenters supreme. They are lean and avoid the bureaucratization that almost inevitably comes with size.
>
> 2- Close to the Customer. These companies learn from the people they serve; they provide unparalleled quality, service and reliability; they make things that work and last. Many of the innovative companies got their best ideas from customers, and this comes from listening, intensely and regularly.
>
> 3- Autonomy and Entrepreneurship. The innovative companies foster many leaders and innovators throughout the organization, they are called champions. They try not to restrict people so they can be creative, and encourage practical risk-taking, and support good tries.
>
> 4- Productivity Through People. The excellent companies treat the rank and file as the root source source of quality and productivity gain. They avoid the we/they attitudes or regard capital investment as the fundamental source of efficiency improvement.
>
> 5- Hands-on, Value Driven. IBM's chairman Thomas J. Watson said that "the basic philosophy of an organization has far more to do with its achievements than do technological or economic resources, innovation and timing.
>
> [21]

These attributes can help to form a corporate culture that encourages innovation, that inspire people to take paths

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[21] Peters and Waterman, op. cit., pp. 13-15.

never travelled before, or to put it simple just daring being different. To have this kind of attitude is vital for the team working in the development of new products, or in the improvement of those already in the market.

Innovation in the Company. The dictionary describes the word innovation as a new method or device, or the process of making changes; the syninyms are: alteration, newness, variation or departure.

In this era we live in, technological changes seem to speed up faster every time, reducing the productlife of any product in the market. If there is a permanent truth is that nothing remains the same.

No company must be sure of the supremacy of its product or market share, because competitors are working hard to come up with new ways to upgrade, variate or depart from the products already in the market.

Our attention span is very short, and our brand loyalty not too strong; we are always attent to listen to the chant of the mermaids, and we wil go with whoever offers novelty.

> One way or another, thousands of product lines in every type of industry are being transformed. Innovating--creating new products, new services, new ways of turning out goods more cheaply--has become the most urgent concern of corporations everywhere.
>
> Innovation is their best bet for revving things up, in addition technology has forced the pace of change and sharply cut the effective lifetimes of all kinds of products.
>
> Consumers respond more quickly than ever to the latest rage. Little wonder that innovation is this year's hot word among management consultants and the subject of several new management advice books.[22]

There are some American companies that are the darlings of the business magazines when it comes to innovation, and the fast rate of new product development that they keep. One

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[22] Kenneth Labick, "The Innovators," Fortune, (July 6, 1988), Vol. 117, No. 12, pp. 51-52.

of them is 3M who is constantly used as a role model.

> Through the decades 3M has managed to keep its creative spirit alive. The result is a company that spins out new products faster and better than just about anyone. It boasts an impressive catalog of more than 60,000 products. What's more, 32% of of 3M's $10.6 billion in 1988 sales came from products introduced within the past five years.
>
> At a time when many big U.S. corporations are trying to untangle themselves from bureaucracy, 3M stands apart as a smooth-running innovation machine, and is celebrated year after year in the rankings of most-respected companies.
>
> 3M's corporate guidelines are:
> - The 25% rule, which requires that a quarter of a division's sales come from products introduced within the past five years. Meeting the 25% test is a crucial yardstick at bonus time.
> - The 15% rule, it allows virtually anyone at the company to spend up to 15% of the workweek on anything he/she wants to, as long as it is product related.
> - Motivate the champions, when a 3Mer comes up with a product idea, he/she recruits an action team to develop it. Salaries and promotions are tied to the product's progress. The champion has a chance to someday run his/her own product group.
> - In-house grants, guaranteed free time doesn't secure that there will be money to build a prototype. So the company created Genesis grants, which give researchers up to $50,000 to carry their projects past the idea stage. A panel of experts and scientists awards as many as 90 grants each year. [23]

Design in the Company

What is Design ?. During the last few years the word design has become a catchword, and now is common to see it or hear it through advertisements promoting the virtues of X or Y product. Design is used to distinguish our brand from look-alike products in the market.

It seems that through the excessive use of the word it is beginning to lose its virtues, but the side effect is that

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[23] Russell Mitchell,"Masters of Innovation," Business Week, (April 10, 1989), No. 3099.

the general consumer has raised his/her awareness and expectatives of what good design is, now he/she expects than when buying a product he will receive not only receive good service and quality, but also something pleasing to the eye.

To demonstrate the ubiquitous presence of design in the American culture, I can mention that a few weekends ago, I went to Manhattan and during the lapse of a few hours, and within less than a half-a-mile from each other, I visited three design exhibits.

First I went to the Citicorp building, where Home Design Magazine had an exhibit in the atrium of the building of what they considered the best 100 objects or products designed for the home, things like chairs, stoves, lamps, etc, were on display.

My second stop was at the IBM gallery, where they had the exhibit titled "Graphic Design in America", they presented the evolution of the graphic language in this century, they logos, magazine covers, posters, annual reports, packages, etc.

And finally I went to the Museum of Modern Art, the so called "cathedral of good design", where they have the contemporary design clasics, some of them have become cultural icons. The museum has an assortment of products, from Olivetti typewriters to Tiffany lamps, and furniture designed by Charles Eames or LeCorbusier.

Design deals with the part of the product that interacts directly with the consumer, like the physical appearance, the controls, the shape. One of the main purposes of design is to smooth the operation for the user and try to eliminate any area of conflict.

The Power of Design. Design is no longer a luxury but a necessity. Philip Kotler says that "design is one of the few hopes a company has to stand out from the crowd, by producing superiorly designed products".

Kotler also argues that: "in order to succeed, a company must seek to creatively blend the major elements of the design

mix, namely performance, quality, durability, appearance and cost".

> Only in the early 1980's did things really started to change. From Tokyo to Turin, Milan to Munich, London to Los Angeles, companies large and small belatedly began to embrace "the new era of marketing", in which product design is used as a key competitive weapon.
>
> For those involved in competition on a global scale--a rapidly increasing proportion of companies--the design dimension is becoming a particular important factor.
>
> Design is being exploited more and more to create competitive distinctiveness for products of all kinds, whether they be Olympus cameras or Sony Hi-Fis from Japan, Philips compact discs from Holland; Wilkinson razors from Britain; Audi automobiles from Germany; or the "Swatch" watch from Switzerland. [24]

This past March I attended a conference at the University of the Arts in Philadelphi, Pa., it was part of the Seminar lectures on Design Management that they have organized. The purpose of the lectures was to bridge the gap between design and business management; I was particularly interested because my thesis deals with the same topic.

The lecture was given by Peter Lawrence who is the chairman and founder of the Corporate Design Foundation based in Boston; they organize lectures on design management in different cities across the U.S..

Lawrence says that "not enough attention is given to design in the U.S., and this has to do, that design is not part of management literature or education, and Business schools do not include an introduction to design in their curriculums". I can also add to that, that manufacturing courses are also necessary to be added to the curriculum.

I must mention that the same happens the other way around, this it that design schools do not have business courses ; the consequence is insufficient communication between the creative and the business side of the corporation.

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[24] Christopher Lorenz, The Design Dimension, (Basil Blackwell, Oxford, England, 1986), p. 98.

> Design is a corporate asset, and it must be reviewed and managed more closely. Not only can it control a company's identity, but also can have a major impact on how a company serves its customers.
>
> In the U.S. the industrial design is too often brought in at the end of the development cycle. Considering that the designer's training and concern is with ease of use and service to the customer, as well as appearance, his absence is particularly unfortunate. This absence is in large part the difference between U.S. and foreign products. [25]

Product Success Through Design. The new definition of design is that is user-driven and strategic. The designer rather than applying cosmetics is responding to the needs of the customer and user with new product ideas, projecting a new future for the company by representing it in 3 dimensions.

There are many companies that have incorporated design as a central element to the company's purpose, some large companies like Olivetti, Philips, IBM, Ford, and others, are example of that.

Some examples of what successful application of design can represent for a company are the followings:

> At Sony for example, it is often the industrial designer who originates the product concept. The concepts for both the Walkman and the Watchman began with industrial designers in the Sony Design Center. Recently, the development of the products known as "My First Sony" were originated and developed by one of Sony's in-house design groups; what they designed were not toys, but "electronic products for children", the colors and the construction were appropriated for them; had bigger handles, easier to use buttons, and windows to see the inside of the machine.
>
> Zelco Industries brought us the well packaged and designed Itty Bitty Book Light and a wide range of other products. In the words of its founder and president, Noel Zeller, Zelco is successful because

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[25] Peter Lawrence, "The Economic Necessity of Design," Seminar Papers on Design Management, (University of the Arts, Philadelphia, Pa., March 1990).

"We came to the conclusion that design really sells". The company which was founded in 1976, grew at an annual rate of 15% from 1985 through 1987.

Xerox Corporation also had a design-led strategy; from 1976 to 1982, Xerox's share of the copier market in the U.S. dropped from 82% in 1976 to 41% in 1982 due primarily to Japanese competition; the company instituted major changes from 1980 to 1986.

An important component of this restructuring was the complete revision of their approach to the design of products. In 1982, Xerox created a strategic business office. Industrial design became part of this office, there was a new way of thinking, "there had to be a shift in the way Xerox designed its machines, from thinking about the machine as the center of the design to thinking about the user as the center of the design".

The 1075 copier was the first machine to embody the elements of this new design strategy. Introduced at the end of 1983, it became the second most successful copier ever made since its first 914 plain paper copier in 1959. The 1075 was the first generation of user-oriented machines that enabled Xerox to recapture market share moving from 41% to 52% of the market. [26]

Design Management. Design is an activity completely different to what usually takes place inside the walls of a manufacturing company or a regular office; design is not a linear process, so the way to manage design must be different accordingly.

In today's fast-paced, fiercely competitive world of commercial new product development, speed and flexibility are essential. This new emphasis may conflict with the traditional sequential approach to product development, instead a holistic or "rugby" approach--where the team tries to go the distance as a unit, passing the ball back and forth--may better serve today's competitive requirements.

The main characteristics of this new product development process are:

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[26] Lawrence, op. cit.

1- Built-in Instability, top management kicks off the development process by signaling a broad goal or general strategic direction, but offering the project team a wide measure of freedom.
2- Self-Organizing Teams, a group can be self-organized when these conditions are present:
a) Autonomy- headquarters is limited to providing guidance, money and moral support.
b) Self-trascendence- the team starts with the goals set by top management, until they begin establishing their own goals.
c) Cross-fertilization- a project team consists of members with different backgrounds, when they interact is that cross-fertilization takes place.
3- Overlapping Development Phases, under the holistic approach, the phases overlap considerably, which enables thr group to absorb the vibration or "noise" generated throughout the development process.
4- Multilearning- because members of the project stay in close touch with outside sources of information, they can respond quickly to changing market conditions. Team members engage in a continual process of trial and error to narrow down the number of alternatives.

Learning at the corporate level is best achieved by establishing a company-wide movement or program, like Fuyi's total quality control movement as basis for changing the corporate mentality. [27]

Ultimate Design Standards. The ultimate ideal of a well designed product is not only to be accepted by the consumer and have commercial success, but if on top of that, the product is so innovative that it deserves a design award, it will be so much the better.

A design recognition boost the ego and the image of the designer and the company that manufactures the product. The two recognitions that everybody seeks are: an award from the Industrial Designers Society, and a place in the Museum of Modern Art in New York city.

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[27] Hirotaka Takeuchi and Ikujiro Nonaka, "The New Product Development Game," Harvard Business Review,(Jan-Feb. 1986), Vol. 164, No. 1, pp. 137-146.

> The Industrial Design Excellence Awards program offered by the Industrial Designers Society of America (IDSA), rewards the most creative of its members every year. Juries composed of designers choose ID magazine's Annual Design Review winners in such categories as: consumer products, equipment and graphics.
>
> Design's most elite and difficult win is a spot in the permanent collection of the MoMA. [28]

Manufacturing

Introduction. Manufacturing is the activity of making identical goods on a large scale and with the use of machinery. The process of manufacturing the parts and the subsequent process of assembling the parts to make the final product, takes place at the factory.

I have always been fascinated to observe how a product is made, it is like magic to see how raw material is refined and shaped through different manufacturing processes, and then how parts are put together as they move down the assembly line. But there is not such magic, behind the seemingly effortless process there is the work and talent of many people. A product is nothing else but the result of team effort.

Henry Ford transformed the concept of what a factory was, after he introduced the concept of the assembly line, the world was never the same. It is thanks to automation and the high output of factories that we can consume inexpensive goods, that can be easily replaced, thus helping to define our life style where nothing is permanent, the so called "thro-away society".

The U.S. is still the industrial leader of the world, but it does not enjoy the absolute and undisputed first place that occupied during the first three decades after World War II.

The country seems to be losing its leadership, and there

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[28] Bruce Nussbaum, "Designed in America," Business Week, Innovation Issue, (June 1989), p. 138.

are people already blowing the whistle in alarm, in what they foresee as a declining trend of a country slipping from the spotlight to a--perhaps--secondary position in the world economy during this last decade of the century.

> "The technological colonization of the U.S. is already under way, says the president of a major California company. More and more, he says, U.S. companies are being reduced to providing services--marketing, distribution, and field support--to foreign manufacturers that rake off the bulk of the profits. Japanese holdings in the U.S. are growing four times as fast as the U.S. economy, and Japan's rate of direct investment is accelerating.
>
> Changes are needed, and it is becoming clear to more and more industry leaders and government officials that a coordinated effort to salvage U.S. industry is essential, call it industry policy if you must. [29]

The actual tendency of many American companies is not to study and find ways on how to manufacture products in better ways; instead what is happening is that many companies are opting for the apparently less expensive alternative of moving production facilities abroad.

It is important to know about the hidden costs when deciding about moving facilities:

> A survey by the National Tooling and Machine Association about U.S. costs finded that:
> -Shipping can add from 5% to 15%.
> -Paperwork and communications can add 3%.
> -Extra inventory in the supply line can add from 5% to 10%, and as much as 35% for design revisions. [30]

If the manufacturing facilities are alienated from the engineering and design offices, an important source of feedback for the constant improvement of the product is cut off.

When the production takes place away from the design

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[29] Otis Port, "Agenda for Change," Business Week, Innovation Issue, (June 1989), p. 146.

[30] Otis Port, "A New Vision for the Factory," Business Week, Innovation Issue, (June 1989), pp. 170-173.

board, there is less interaction and the possibilities for the designer and/or engineer to wonder around in the assembly and talk to the workers are greatly reduced, thus diminishing the exposure and contact with the "real thing" and the possibility for coming up with new ideas.

The problems facing the American manufacturing sector are varied, Otis Port gives a list of the shortcomings, those areas where is necessary to work the hardest if any improvement is to be expected in the near future. Some of them have already been mentioned:

- outmoded and inflexible factories.
- inefficient organizations.
- mass-production mind set.
- low-skilled workers.
- technologically illiterate management.
- very near-term financial horizons.
- high capital costs. [31]

Moving from the general to the specific, or from macro to micro-economy, a company must plan very carefully what will be the strategy that they will follow for survival and growth; study the strengths and internal weaknesses and plan accordingly.

A starting point couldbe to analyze the layout and production line the company has, and determine if it is necessary to update it, incorporating flexibility and speed. For example instead of using a linear process, the assembly line could be arranged in a "U" shape, around logical work cells.

Costs can be trimmed by organizing the work according to the necessary operations, reducing the distance between workers, machines and materials, and organize sequentially. The use of ergonomic studies can facilitate the physical job for the worker and reduce the possibilities of injuries.

The Swedish automobile manufacturer, Volvo, has successfully organized the work force of one of its plants in Sweeden, the have work teams of 10-12 workers that are able to put

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[31] Otis Port, id.

together the whole car. The Volvo's approach is a novel one --although slow during the implementation phase--they have semi-autonomous teams, and members rotate positions among themselves therefore getting a holistic perspective of the final product; as opposed to most assembly operations which are repeated over and over, thus creating boredom and reducing self-esteem.

A company should not try to cover the whole spectrum of any specific market, instead it must look for a niche in that market and/or work with custom-made products that have a higher profit margin. An ally in the company's strategy is the supplier.

The supplier is a very important element of the product chain-link, even though most of its job takes place outside the assembly plant. The supplier must be part of the development network for new products.

It is essential to think long-term when dealing with suppliers, have long-term contracts and relationships; this includes sharing the risk in the capital outlay for specialized and/or flexible machinery.

A company who work with its suppliers must aim for vertical integration to get state-of-the-art parts and components, and try to get the most out of the experience and skills that they can bring to a project. That is why, the sooner they join the development team, the better.

Quality. The Webster's dictionary defines quality control as the aggregate of functions designe to ensure adequate quality in manufactured goods, by initial critical study of engineering, design, materials, processes, equipment and workmanship.

All of the above elements will be reflected in the benefitial attributes of a product as they really are or as they are perceived by the product's potential buyer.

> American industry now understands that the quality war is won or lost at the very start of the design process. Poor design as the Japanese learned

> some years back, contributes up to 40% of all quality problems.
>
> Another good reason to focus on design: between 60% and 80% of all costs are fixed at the design stage. Clearly there is a stiff economic penalty for not getting the things right the first time.
>
> Studies show that assembly usually accounts for two-thirds of the product's total manufacturing costs, thus if you simplify assembly, then you will be on the road to improve manufacturing competitiveness. [32]

There are two main approaches in the quality movement, the first one is called SPC, or Statistical Process Control.

> SPC has become the holy grail of the quality school. One has to go back to the earliest stages of the design process to have a significant impact on product quality.
>
> This approach to quality thus not only impact the customer as a hidden cost, but exposes the manufacturer to the ultimate danger that is customer disatisfaction. [33]

The second major exponent is the Japanese Genichi Taguchi, who was the first to tie the idea of "economic loss" to quality.

> According to him, any deviation from the ideal or target value represents an economic loss to quality because:
> 1- Customers get progressively disatisfied as the product approaches the marginal limits of acceptance, and they perceive lack of uniformity from unit to unit.
> 2- Internal manufacturing costs increase as the factory strains to bring units into specifications. [34]

Taguchi recommends that the answer to some quality problems is not to spend more money to tighten the specs, but rather design products that are insensitives to the vagaries of the manufacturing processes.

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[32] Ernest Raia, "Quality in Design," Purchasing, (April 6, 1989), Vol. 106, No. 6, pp. 58-69.

[33] Id.

[34] Id.

Productivity. Rising productivity is the lever of economic development and growth; it provide what economists call "costless growth". When labor and capital, the key factors of production are most productive, the economy is getting the biggest return for its investment; the most output for a given level of input.

> A broad definition of productivity measures the relationship between the quantity of goods and services produced during a period of time; and the input of labor, capital, and natural resources used in the production processes.
>
> The relationship between input and output is highly dynamic. Since output is by definition equal to input, measured productivity--the ratio between the two--must remain constant. [35]

Quality, productivity and design are not three separate areas, but they must be considered in many aspects like one, because they are closely related. The approach to design and its assembly must come as a consequence of team effort.

Design for assembly is having an important impact in the factory floor, these are some of their guidelines:

> 1- Minimize the number of parts, combine or eliminate.
> 2- Minimize assembly surfaces, simplify the design so that fewer surfaces need processing.
> 3- Design for top-down assembly, take advantage of gravity to assist in assembly.
> 4- Improve assembly access, design for easy access, unobstructed vision.
> 5- Maximize part compliance, design with adequate grooves, guide surfaces, and specifications for mating surfaces.
> 6- Maximize part symmetry, symmetrical parts are easier to orient and handle.
> 7- Avoid separate fasteners, incorporate fastening into components, such as snap-fits. [36]

When the design of a product is done having the final assembly in mind, the workers have less problems putting it

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[35] Sar A. Levitan, Productivity: Problems, Prospects and Policies , (The John Hopkins University, Baltimore, 1984), p. 5.

[36] Therese R. Welter, "Designing for Manufacture and Assembly," Industry Week, (Sept. 4, 1989), Vol. 238, No. 17, p. 82.

together, there are less quality problems and the productivity increases.

Software Programs. With the advent and use of the ubiquitous computer in the office and plant floor, has come as well, a proliferation of software programs to run those computers.

I will name the most popular programs and a brief description of each. We must bear in mind that technology and computers alone will not make better products, this must be combined with an early involvement of engineers, designers, and others, working in the design and manufacturing process.

Software programs are not recipes to come up with new products, rather are to be used as tools or checklists aids, and they can not be a substitute for professional experience and/or the specific needs for each project.

1- New Products, The name is "The New Products Diagnostic Audit", by Kuczmarski & Associates. Examines the firm's historical new product performance, strengths and weaknesses vs. competitors, new product management practices and factors needed for success. [35]

2- Finite-element Analysis, this is a computer-aided engineering (CAE) tool.
It gives product designers a convenient mechanism for assesing functional performance of a part or product before testing prototypes. Designs can be represented through wireframe or solid modeling. [36]

3- Concurrent Engineering, this is a computer-aided engineering tool (CAE).
It is the simultaneous development of both the product and the process to make it. This computer-integrated program brings together different departments. [37]

4- Producibility Engineering, this is a computer-aided engineering tool (CAE).

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[35] Bertrand, op. cit., p. 38

[36] Therese R. Welter, "Designing for Manufacture and Assembly," Industry Week, (Sept. 4, 1989), Vol. 238, No. 17, p. 80.

[37] Otis Port, "A New Vision for the Factory," p. 146.

Tend to think of the producibility of individual parts rather than of the total product structure. It is used to control costs before large investments are made.
A setback for this procedure is that we can end up with simpler parts easier to manufacture; but there might be more of them in the final product, creating a complicated product.[38]

5- DFA Design for Assembly, by Boothroy and Dewhurst of the University of Rhode Island.
This software approach seeks to simplify component handling and assembly.
Design drives product cost, fewer parts means fewer parts to make (or buy), fewer parts to store in inventory, fewer things that can go wrong.
This program evaluates design efficiency and assess the product's producibility.[39]

6- DFMA, Design for Manufacture and Assembly, by Boothroy and Dewhurst of the University of Rhode I.
This is an upgraded version of DFA. These programs are backed by years of research data on assembly times, material properties, manufacturing processes.The software make the process faster and easier.
DFMA approach is called holistic because its integration of parts results in lower total associated costs. The program brings design and manufacture together, thus encouraging team work.
DFMA analyze a product's total structure, and how everything function and fits together; because most of the problems occur not with the components themselves, but with the interfaces between components.[40]

7- Customized Package , this is the most expensive software type, and has to be written by a programmer. It can be very useful, because it is based in the technical possibilities installed in-house, or that of the company's suppliers.
There are two types:
A) Paper Type, the company comes through its different departments with a listing of preferred components, standard production routings, etc.
B) Self-checking Software Modules, this is a helpful tool for the designer, it checks moldability of plastics, formability for metal drawing, etc.[41]

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[38] Welter, op. cit., p. 80

[39] Raia, op. cit., p. 59.

[40] Welter, op. cit., p. 59

[41] James Dean, "Organizing for Manufacturable Design," Harvard Business Review, (January/February 1989) Vol. 67, No. 1,p. 28.

CHAPTER III

FACTORS LIMITING LONG TERM PRODUCT DEVELOPMENT IN THE HOUSEHOLD APPLIANCE INDUSTRY

Advantages of Short Term Planning.

Planning. A company must have the capability and necessary flexibility for giving short-term answers to changes in the market, or to any shift in the consumer response to their products. A company must be ready to upgrade its technology and match any improvement that the competitors are offering.

In the book "In Search of Excellence" it is mentioned that one of the most important qualities a company may have it is when is driven by a bias for action. The excellent companies do not take too long to make decisions, and in a world of constant changes, this is the only way a company may be ready and not miss any market opportunity for slow response.

The short-term response companies install a sense of responsability in each one of their people, so they can take decisions; their philosophy is: "do it, fix it, try it." To keep a company lean is necessary to reduce the number of layers to a minimum.

When a company like 3M see that any of its divisions grows over 300 people, they prefer to split the personnel and create another subdivision.

Top management must teach medium and lower-level managers how to manage for the short term, but without losing sight of the company's long-term goals, that is where the company wants to be one or five years from now; every little decision or move that is taken must bring the company closer to its objectives.

> American managers should reject the barrage of criticism they receive for focusing so much on short-term results. Instead they should concentrate on doing a much better job on those short-term results. Why fight that reality when we can take advantage of it ?, concentration on short-term goals need not to be at the expense of long-term perspectives.[1]

John F. Welch, chairman of the General Electric Corp., give example of the importance that short-term planning has for his company and the program to increase competitiveness in the 1990's: "The indispensable additional ingredient will be speed; getting there faster, getting there first."

> There is no way that business managers can or should ignore short-term performance requirements; they are too compelling, they are too important, and they are too critical to developing world-class performance capability.
>
> There is evidence that basic performance capability is a much greater factor in the success or failure of companies than is formal strategic planning. Poor products, and not a lack of planning is what hurts the company's competitiveness.[2]

Financial. The operating budget is the manager's road for a small part of the long-range plan. It is also an instrument to assist in the accomplishment of the long-term financial performance levels.

> The operating budget should be correspondent with the long-range plan and they should have the same goals, by relating each other performances so they can act as complement.
>
> Companies should not be transfixed with organization charts or job descriptions, or that authority matches responsability. The company should put more emphasis in short-term earnings but without creating an imbalance of short and long-term goals.
>
> To avoid this of happening a company should foresee and consider the extent, type and basic

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[1] Robert Schaffer, "Don't Waste Time Planning," New York Times, October 29, 1989 , No. 48038, p. F2.

[2] Id.

causes of trade-offs likely to occur and then had tailored their selection of variable controls to the needs of the situation. [3]

In this era of mergers, where companies buy other companies and they get results faster; it may make economic sense to buy rather than build new plants or modernize existing ones.

> Mergers are obviously an exciting game; they tend to produce fairly quickly and decisive results, although they are not always positive; There are some risks involved:
> First, is the financial one, because the buying company has to come up with the total sum as fast as possible.
> Second, is the blend of two different corporate cultures, something that is difficult to accomplish in a smooth way, but if this is achieved it can generate synergy. [4]

The U.S. has the highest cost of capital of the industrialized countries; American companies pay creditors more interest and have to assure their shareholders higher returns. This explains in part the propensity that American managers have for focusing on the short-term.

This situation has a positive side effect, because if a company has pressure to come up with results in a given time, this forces them to sharpen their senses; and carefully focus the energy and scarce capital the company has, avoiding waste, trimming cost where possible and most of the time spurring creativity.

The time factor puts pressure on the company at all levels, so the growth objectives must be achieved promptly, and no time can be wasted in endless meetings and theoretical discussions about the possibilities of new products or other sort of decisions.

The best approach for a company is to try to come up

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[3] Banks and Wheelwright, op. cit., pp. 116-117.

[4] Hayes, op. cit., pp. 67-77.

with fresh alternatives to existing problems, and the answers --most likely--will be down-to earth practical solutions, "the beef without the fat".

Disadvantages on Long-Term Strategy

Planning. High stakes exists in the planning and development of new products, besides the initial capital outlays--that can amount to millions--a company must be willing and also be prepared to wait several years before it can recover the money originally invested.

There are other possible problems, namely if there is a technological breakthrough in the industry given by one of the competitors, can bring the ruin to all the long-term plans the company might have had. A downturn in the economy may be equally devastating.

> Capital expenditures programs such as: new plant construction, new equipment, cost reduction investments and long-term product development are among the most vulnerable areas for short and long-term trade-offs.
>
> The cost associated with implementing the programs can easily reduce near-term profits, so many times they are postponed or cutoff. [5]

New Product Failure. The successful introduction of a new product, always a high-risk operation, has grown more difficult in recent years. In the first chapter it was mentioned that in 1985, an estimated 10,000 new products were introduced to the American market, and how after five years, some 8,000 of these products will be discontinued.

The value of each square foot of shelves and counter space in supermarkets and other stores, is so high, that the new product needs a fast start, otherwise other competitor's products that sell better will take advantage and will lead sales. What it is even worst, if the store owner sees that the merchandise does not move, he may think of dropping our

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[5] Banks and Wheelwright, op. cit., pp. 116-117.

whole line for complete.

Michael Paschkes says that corporate scrutiny should be given to each product before it is launched, because the cost of failure in this area is extremely high, both in monetary and prestige terms. It is hard for a company to withdraw its product from the market because of dismal sales, after enormous investments in research and development and time, personnel and equipment.

> Paschkes gives several suggestions to guarantee the failure of a new product:
> 1- In Research Take Consumers at their Word- it is easy for a consumer to say yes, especially when it does not cost you anything.
> 2- Trust the Test Market- Try to read between the lines, always keep in mind that test markets are subject to upside and downside distortions as well; better is to monitor the market with utmost care.
> 3- A New Product is Always Welcome- there had been many failures of excellent products that had bad timing, the market was not ready yet.
> 4- Count on the Package and Product that Sells Itself. The package of the new product must say "buy me", but the real "sell" of the product must be its appearance, performance, quality, etc.
> 5- Consider Only the Top People- The new product to succeed, must forge a chain that starts with the approval of the consumer, and continues through shipping docks, all the way to the consumer's house. [6]

The Legal Aspect of Products

The Designer Responsability. The designer with his/her work will have a bigger impact that we may actually think; the designed product will be made--most likely--thousands of times, so this is going to alter the environment. The product will also have interactions with the activities and lives of many consumers while the product is been used.

The responsability for the designer is to foresee all the possible uses that a particular product may have, and

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[6] Michael Paschkes, "How to Guarantee New Product Failure," Harvard Business Review, (July 12, 1976), Vol. 54, No. 4, p. 40.

try to make its handling and operating as safe and trouble-free as possible.

> Man alters environment in preferred ways beyond that of any other creatures. The bird designs a nest and the nest is exactly the same time after time. There is no modification in design except by man, and he rapidly changes his type of nest, not just as to material but in total strategy.
>
> I see responsible design as anticipating what other men will do. The rsponsability of the designer is to try to find ways for man in which to make it possible to carry on and not pollute; and this can be done by design. [7]

The Company's Responsability. A company must be responsible with the products that delivers to the market. The company has en ethical and legal obligation to stay behind the products that design and manufactures, although this is not always the case; I will describe a problem that two companies had with their consumers and the different approach that they followed, one responsible and the other was just the opposite:

> A classic example of a corporation putting its interests before those of the customers is the case of Ford's Pinto. The company knew that after people had accidents with the car, that the product was not safe enough, but nevertheless they went ahead and kept distributing it, even after the magazine Mother Jones refer to them as "two million fire-traps on wheels".
>
> Ford justified its action with a debased form of utilitarian reasoning, they measured the cost of correcting the gas tanks defects against the benefits of people not-burned-to-death. This profit-line decision-making aside from its ethical limitations, often backfires.
>
> Although negligence was never proved, Ford paid its toll with press reaction and people shunning their products for many years.
>
> The other side of the coin was the Tylenol crisis, in this case the corporation put its customer safety before the bottom line, and this

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[7] R. Buckminster Fuller, "The Designer," Seminar session on design responsability,(American Iron Institute, New York, March 1969).

> is why Johnson & Johnson's recall of its products had a cost of almost $100 million. They pulled Tylenol off the market after 7 people died from ingesting cyanide-laced Tylenol capsules.
>
> In the months after the tragedy, the company mounted a massive media campaign to alleviate consumer fears. They put a consumer hot line toll-free number, they also reimbursed people for their returned Tylenol products, and to eliminate problems in the future, they put a triple sealed packaging that became standard for some of their other products as well. [8]

Patents. When a designer or company have designed a product they consider have some unique features, is when they apply for a patent that gives him/her/them, the legal rights as the only owner.

The dictionary of Business Terms defines patent as the grant of right to exclude others from the making or selling of an invention during a specified time. It gives to its owners a legitimate monopoly.

Industrial Spying and Clones. If a patent protects a company from competitors who want to make the same or a very similar product, the making of unauthorized "clones", or spying and stealing information, it can give a competitor most of the information they need to manufacture the product. The companies who follow these practices, do not have great investments in R&D, and very little overhead; or to reverse the old saying is " the gain without the pain".

The "clone" is an identical copy of a successful product already in the market; "clones" are mainly manufactured in the emerging economies of the NICs. A clone is difficult to track, most of the times they do not display a brand, or offer any warranty, but what it makes them attractive is the price, that can be half as much than the original product.

A classical example are the IBM computer clones.

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[8] Ted Tuleja, Beyond the Bottom Line, (Facts on Five Publications, New York, 1985), pp. 75-77.

The second case, industrial spying, is when a company wants to know more about a competitor and do that through illegal means.

> Most industrial organizations have information their rivals do not and it gives them a competitive edge. Such secrets are often thought of as technological in nature: blueprints, secret formulas, breakthrough processes and the like.
>
> The Restatement of the Law of Torts, the authority in the trade secret field, defines a trade secret as "... any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to gain an advantage over competitors who do not know or use it." This definition form the basis of the Uniform Trade Secrets Act.
>
> In general, the owner of a trade secret invests money and effort in creating it. He also protects the secret by keeping it secure, and by requiring employees not to divulge it. It is that obligation of secrecy the courts enforce when an employee, for whatever reason, reveals a trade secret to an unauthorized person.
>
> A properly protected trade secret usually cannot be obtained by legitimate intelligence gathering. The most common way a company's trade secrets are lost is through departing employees. When an employee leaves a company, trade secrets often leave with him, either in his head or in his briefcase.
>
> [9]

But there are also legal ways to get information about the competitor moves; data can be collected from trade journals, business newspapers and magazines, publications like the Thomas Register or Standard & Poor's directory, conferences, trade fairs, informal conversation, etc. If all or part of the information gathered through the sources just mentioned, are to be of any use in decision-making, they have to be kept in order, selected, interpreted and presented so it can be of any use.

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[9] Rene Zentner, "When Competition Crosses Legal Limits," Machine Design, (October 12, 1989), Vol. 61, No. 20, pp. 93-96.

Product Safety. That the product they manufacture is safe is one of the major concerns for any company, not only for ethical reasons, but economic as well.

The manufacturer is concerned that anyone of the consumers of its products may present a legal demand when the product they market is not safe enough.

The manufactured product does not finish with the physical object, the spectrum is very broad, and it includes some of the following items: spare parts, service and/or warranty, catalogue data, instructions for use, shipping package, labels and warnings.

Statistics reflect the growing awareness for safety:

> Never have Americans been more concerned about product safety. Recent surveys on consumerism reveal a greater increase in concern about "dangerous products" than about any of the other eight major consumer problems listed.
>
> In part, this heightened public aprehension reflects a growing awareness of the enormous (and escalating) costs of unsafe products: last year, more than 70,000 Americans died of product-related accidents, while thousands more suffered disabling injuries.
>
> The economic costs of these accidents were also staggering--over $100 billion in property damage, lost wages, insurance, litigation, and medical expenses. [10]

The Consumer Product Safety Commission has a guideline of those instances when your product may be liable:

> -Your product is defective in its design (not suitable for intended use).
> -Your product is defective in its manufacture (inadequate testing and inspection)
> -Your product is inadequately labeled as to proper use and possible warnings.
> -Your product is packaged in such a way that parts can be sold separately, or instructions can become detached before sale, allowing sale in an incomplete and dangerous form. [11]

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[10] Stephen Brobeck and Anne C. Avery, The Product Safety Book, (The Consumer Federation of America, E.P. Dutton, New York 1983), p. 212.

[11] John Kolb and Steven Ross, Product Safety and Liability, (Mc-Graw-Hill Book Co., New York, 1980), p. 12.

Warning Labels. Most products have warning labels preventing the consumer of any improper use of it. The author Donald Norman sustains that any product that is properly designed, easy to understand and operate, does not need labels:

> There is a lack of concern and knowledge about how design affects the users of products. Moreover, in this day of increased legal liability for the way products are used, it is in everyone's best interest to make designs simple to use, simple to understand, yet still powerful enough to do the job.
>
> Bad design cannot be patched up with labels, instruction manuals, or training courses.
>
> Human error is the leading cause of industrial accidents and a major cost factor in the office. Humans do make mistakes, but with proper design, the incidence of error and its effects can be minimized.
>
> Warning labels and large instruction manuals are signs of failure, attempts to patch up problems that should have been avoided by proper design in the first place. [12]

But there are many companies that are besieged with lawsuits and that do not agree with Norman; they think that one way to head off liability problems is by improving safety labels:

> In a survey of 500 chief executives, 47% of the 264 respondents said their firms have made warning labels and instructions more explicit. Patrick McGuire of the Conference Board said that the labels are trying "to idiot-proof the products". A few years ago, insurance companies never wanted you to indicate someone could be injured using your product, but now they are saying "be specific". [13]

The machine maker J. Deere & Co. hired Henry Dreyfuss Associates to design safety decals, they vividly warn what will happen if you are not careful.

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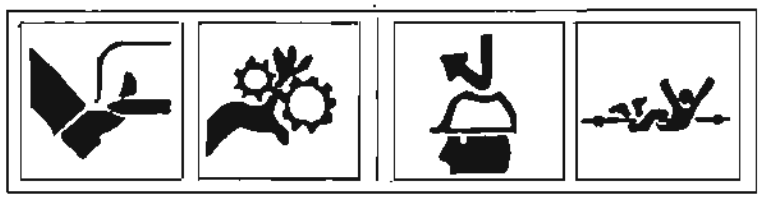
[12] Donald Norman, The Design of Everyday Things, (DoubleDay, New York, 1988), p. viii.

[13] John Pierson, "Ounce of Prevention," Wall Street Journal, August 23, 1989 , Vol. CCXIV, No. 37, p. B1.



Source: John Pierson, "Ounce of Prevention," Wall Street Journal, (Aug. 23, 1989), p. B1.

Figure 5

Manufacturers are coordinating their warning labels and other communication efforts by using color.

> Ingersoll-Rand says sales of a line of industrial grinders are up 165% since it redesigned the tools to incorporate, among other things, color-coded labels to discourage the use of the wrong rotating attachments.
>
> Use of color to convey information is "on the upswing," says Merritt Seymour, director of Industrial Design at USG Interiors. Color is a quick way of communicating in a world of specialized products and where "more and more (workers) don't speak English."
>
> With help from Four Design, Ingersoll-Rand chose eight colors to match grinders with accessories. [14]

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[14] John Pierson, "Color Comes Into Vogue For Industrial Messages," Wall Street Journal, February 13, 1990 , Vol. CCXV, No. 31, p. B1.

CHAPTER IV

SUMMARY, FINDINGS AND CONCLUSIONS

Summary

Introduction. Before I started writing this thesis, I remember that I constantly read or heard about the short-term planning horizons that American managers are renowned for.

Being a product designer myself, I was interested in finding out how this short-term mentality affects development of new products; many managers do not want to take a long-term view to product development, so they divert funds and personnel to other projects. The consequences of this kind of attitude is that the creative process is slowed down, and sacrifices many good ideas that "don't make the fast buck", because they take a long time to develop.

In Chapter I, I described how the 1960s and 1970s represented the decline of the superiority of the American manufactured products; new products did not appear frequently and when they did, only had cosmetic changes and not skin-deep improvements, they also had poor quality.

This situation took place, because American companies were confident that consumers will buy their products, regardless of shabby quality and poor design; after all they got used to that after twenty to thirty years after World War II, the international competition was minimal, and the domestic competition was not very intense either, and had for themselves the huge American market.

The increasement of global competition during the last two decades, has made many companies review their grownt policies and growth strategies; those who were imprepared or

to slow to adapt to the new situation, are now out of business.

Long-Term product development is instrumental to any plan the company has for the future, if they want to keep and/or increase market share. We are living in times of rapid changes, where inaction is equal to a premature death in the market place. The survival of a company depends on knowing where the market goes, and catering the consumer's needs.

Success depends on how well the product performs, how well it is built and designed, and if it satisfies the consumer's needs and fulfills his/her expectations.

I gave a brief description of the evolution in the design of products, starting before the Industrial Revolution all the way to the 1980s. Products are a reflection of our material culture and of the society where they were conceived, manufactured and used.

In the development of new products is always important to know where are we coming from, to learn from the past and avoid repeating the same mistakes, in other words, draw from our own experience.

Products can be a very important factor in the economy of a country, and they were a vital element in the reconstruction of the economies of Germany, Italy and Japan, that were distroyed during World War II.

A company must evaluate the need for developing new products and must take into consideration its strengths and weknesses; and manufacturing, marketing and financial capabilities as well.

To deliver a product to the market is a very expensive and--sometimes--lengthy process, in which the company commits many of its financial, human and technological resources. The company has weigh very carefully all the different aspects related to the new product, reducing the possibilities that the product will be a failure in the market.

A company must follow the product life cycle of its

products to avoid the design and profit gaps that happen when the sales of a product are declining, and the product that is going to replace it, is introduced too late. A company should not try to rely on only one product, is better to diversify and have development of new products going at different stages, so that there is a continuous flow.

A company should try not to spill its resources trying to cover a mass market, especially in the case of the American economy that is composed of people with different backgrounds, cultures, languages, and interests. It is wiser for a company to find a niche in the market and cultivate it.

In Chapter II, I mentioned the role of long-term development of new products as opposed to short-term profit goals. Long-term development is an investment for the future which requires adherence to a specific strategy course in things like market, product and labor relations.

The company needs to make its people aware of its goals, keep the communication channels open, and create the right culture where creativity and innovation can flourish.

The best approach to product development is a multi-functional team, people coming from different departments, and therefore different ways of looking at things.

> Design decisions should be integrated, informed and balanced, and is very important to involve manufacturing engineers, repair engineers, purchasing agents, designers and other knowledgeable people early in the process.
>
> The product designer asks: "what good if it does not work."
>
> The finance person asks: "what good if it is not profitable."
>
> The manufacturing engineer asks: "what good if I can't make it."
>
> The team success is measured by how well all these questions are answered. [1]

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[1] Daniel E. Whitney, "Manufacturing By Design," Harvard Business Review, (July-August 1988), Vol. 66, No. 4, pp. 84-85.

The human element is the most important factor in the company's strategy, and as such must be treated, making it grow and bloom. A stable environment helps people to work better, job security gives a sense of belonging, and slow evaluation and promotion will avoid a high turnover of personnel from CEOs to workers.

A company must establish realistic growth goals, and should be flexible for unforeseen problems. Short-term along with a long-term strategy will help a company keep focus of where it is going, avoiding waste; being lean and responsive will permit a company shift and change directions, if there is any major change in the market place.

I reviewed some of the characteristics that makes a company excellent, they have virtues that use over and over; they are good in the basics: they stay close to the customer, are moved by a bias for action, and try to experiment things; in other words, they are not afraid of trying new ways for doing things.

A company that can be used as role model is 3M, they are innovation-driven and enforce that at least a quarter of a division's sales must come from products introduced within the past five years. They motivate people who are hot with new product ideas to step forward, these are the people who become product champios and who are responsible to put together a team that will make the idea possible.

I mentioned the importance of having a good designed product, design has been called "the silent salesman" and in a world where there are more and more look-alike products, design becomes like the personal signature of the company, a way to make its products different from its competitors and superior at the same time. There are many companies that have successfully used design as a sales tool.

The de-industrialization of the American economy must stopped, that is if the country does not want to become dependent on the outside to have their product needs satisfied.

The manufacturing facilities should be updated, making them flexible, as to be able to manufacture for small batches to medium runs; this can be done along with a program to re-train operators and managers alike; so they can improve their skills and become technologically literate.

The company must consider quality, productivity and design, not like three separate areas, but like one; because any decision affects the other two. If a team comes up with a product that is designed with assembly in mind, this will help to increase productivity and at the same time the quality problems will decrease, and the product will be easier to service and operate.

In Chapter III, I listed the different factors that limit the development of new products, one of them are the high stakes and cost involved with starting a new company, or developing a new project. The U.S. has the highest cost of capital of the industrialized countries, so this means the companies have to repay faster.

Expensive money is a disadvantage that can be turned into an advantage; the pressure keep managers on their toes, always attentive and responsive, so they deliver quick answers to what's happening, instead of sitting on the problem for a long time. Short-term goals need not to be at the expense of long-term perspectives.

It is very important to consider the legal aspects of any of the company's products. The company and the designer are responsible to the consumer and the environment as well. The best of their knowledge and experience should be used when designing a product; the product must be safe to withstand and even extreme usage.

The products developed by the company are not isolated in the market place, they are interrelated with other product systems, and more important of all, will be operated by the consumers, people like us, curious creatures, restless beings. When designing is better to keep the big picture of where the product is going to be inserted, and do not think on the product itself alone.

The American way of life is that of an affluent society with a tremendous appetite for new products, that make life easier and fulfill certain needs. The life of a product in the market place is becoming shorter and shorter, either because it was planned that way (planned obsolescence) or because it is not longer fashionable to wear it or to use it, so it is necessary to discard it and get a new one.

To make sure we are aware of new consumer products or services, we are bombarded with advertising, Joseph Rosenbloom says that "instead of being the masters, we become the slaves of the things we buy and consume."

The 1960s and 1970s, saw the rise of the consumer movement, it was formed by regular people who were fed up with being constantly disapointed with the performance and quality of household products they bought, so people got organized and complain to stop what they saw like abuses from the manufacturers.

The most visible organizer has been Ralph Nader, a lawyer who articulated the frustration and disatisfactions among American consumers. Nader now has a center for the study of responsive law in Washington D.C.; he first grabbed the public's attention when he wrote "Unsafe at any Speed", a critical look at automobiles.

> The New consumerism argues that the profit motive alone, without the bettering influence of broad social concern, has a capacity to wreak irreversible damage to the environment as well as to human life.
>
> All what the new consumerism is saying is that a sense of social responsability must be interwoven with the drive for profit. The two need not be incompatible. They argue that, if the business community wiill not assume its proper share of social responsability, then government must intervene in the public interest.[2]

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[2] Joseph Rosenbloom, Consumer Complaint Guide, 8th ed., (MacMillan Publishers Co., New York, 1981), p. 2.

Statement of Findings

When I started the research for this thesis, was surprised of the wealth of information on some of the topics covered by this thesis, like: innovation, creativity, R&D, competitiveness. All these terms have become hot words, and lately have received a lot of attention, in part as a result of the concern that the U.S. is slipping from the economic spotlight that it occupied for many decades, as the sole premier nation in fields like manufacturing, technology, etc.

A concern among the government policy-makers and the CEOs of many companies is that is necessary to improve the rate of translation of basic research findings into commercial products and applications.

This is a field in which the Japanese have excelled in the past, because lacking a technology of their own, they followed a copy-cat policy, but most of the times they improved it. First they concentrated on making products cheaper than anybody else, this latter changed, and the policy was a concern on quality and in making the best-built products.

There is an awareness on the importance that innovative and well-designed products have for a company, either just to survive or for the increasement of market share. I found several articles on the topics described above, especially in business magazines; newspapers like The Wall Street Journal are also giving attention to design, and have a weekly column called Form + Function; The New York Times also carry frequent articles on the subject. Even main stream magazines like Newsweek and Time, have a section on design.

It was mentioned before, that one of the reasons that companies spend so much time speculating about takeovers and buyouts LBO, is because most of their CEOs have legal and financial backgrounds, and who understand little about how a product is developed or the technical aspects of its manufacture.

That is why Design managers should try to achieve a balance, so managers will be better trained not only for taking

financial decisions, but also will be knowledgeable of other technical fields like engineering, design, etc. In chapter II I mentioned a conference that I attended on the topic of design management, a few weeks later I found this article in The Wall Street Journal:

> The Corporate Design Foundation in Boston announced a $1 million program to integrate design into the curriculum of 21 leading business schools. Initial funding is from IBM, and grants are being sought elsewhere. The moneu will be used for research fellowships, teaching and library materials, workshops and the like.
>
> "We have ignored design as a topic in education for our future managers," says Peter Lawrence, chairman of the foundation."Our Asian and European counterparts have demonstrated clearly that quality in the design of products is critical to success. [3]

I also came accross with an article on Lewis Cullman who wants to bring managers out of the corporate office and down to the factory floor, but realizes that most of them are ill-prepared to take this step. He wants to start the first graduate degree in manufacturing management.

> He sees factories, not high finance. In his view, the business messiahs of the 1990s will be manufacturers rather than money grubbers. And equipping tomorrow's leaders with the skills to maneuver in such world has become his passion. The business school that he is endowing is that of Purdue University.
>
> His endowment is coming at a time when academicians are starting to consider the merits of such an interdisciplinary approach to teaching business, and also as a way to reverse the decline of America's manufacturing base.
>
> The people I see now running businesses are all steeped in finance, and no one seems to have any manufacturing qualifications to understand what goes on out on the floor of the plant.
>
> Indeed, many of the major Fortune 500 companies today are run by lawyers, accountants or some other finance types. Education statistics

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[3] John Pierson, "Pushing the Idea of Design into the MBA Arena," Form + Function Column, Wall Stree Journal, March 14, 1990 , Vol. CCXV, No.51, p. B1.

> say it all. According to Meyer Feldber, dean of the Columbia U. Business School, fewer than 4 per cent of all college students in the United States will graduate this year with degrees in engineering, while about 25 percent will earn business degrees, [4]

Limitations of this Study

I based this study to information available in business magazines, newspapers, books, and in my personal experience as a designer and as a MBA student.

I consider that having had the time, resources and connections, it would have being better to complement my research with visits to some of the large companies, and interview managers about their policies when it comes to development of new products. Combining these two approaches I could have drawn my own conclusions from first-hand experiences and not only based on somebody's else research.

Suggestions

Company Level- The company must have an innovative corporate culture that permeates through all different levels and departments. Encourage the organization of work teams for product development, and look for product champions who can be passionate and lead the team, steering them from the idea conception level to the final product.

The company must make clear its long-term goals in product development, strategic growth, and in general the goals that the company wants to achieve. The company must let everybody know his/her place in the "big picture", and how they will play for the whole orchestra.

If managers and workers alike understand the meaning of when and how to take long vs. short-term decisions, it will be easier to make decisions once that the situation arises.

Short-term considerations should not be the only--or the

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[4] Deirdre Fanning, "Bringing Up Managers for the Factory Floor," New York Times, (March 4, 1990), No. 48,164, p. F37.

most important--element to take into consideration when the performance of an employee is evaluated, and this holds true for anybody, from top to bottom.

The human element is key to any strategy the company wants to pursue, the company must build up on their people, and encourage creativity and cooperation among the members of multi-functional teams, all this will help to the cross-fertilization of ideas, knowledge and experience.

Government Level- The government can do its share to improve the long-term situation and the chances to survive and succeed for the American manufacturing sector. Some people suggest that the government should have an industry-led policy, like the MITI (Ministry of International Trade and Industry) does in Japan.

First, it will be good to revise the tax laws and fix the loopholes that have stirred (among other factors) the wave of takeovers and LBO that occurred in the decade of the 1980s, these speculative actions do not bring too much good to the economy, except for the participants in them. One of the results is that companies trim their budgets for development of new products, and freeze many capital outlays; in other instances, people get laid-off and complete factories are shut to get cash to pay for debts.

The liability system must be changed, a limit must be put to the activities of people like lawyers, business men and other speculators; who like in the case of takeovers, it is only a few people who are the winners, and the losers are the rest of us consumers, who end up paying more for a product. A side effect is that companies passes litigation fees into the product's price, this inflate prices, thus many American products are not competitive in international markets, because of high prices.

I do agree that manufacturers must be held responsible for the products they design and sell, and be punished for criminal negligence if that is the case; but judges must

restrain themselves from awarding millionaire compensations for minor faults; what this situation is creating is more of the same, because this encourages people to do the same. It seems that suing product companies has become a national sport, to see who gets the most money.

I believe a ceiling should be put for compensation in case of product liability; and try to discourage the horde of hustlers who go out of their ways to use products in ways for the ones they were not designed, hoping to get hurt and be able to have a case in court.

I took the following paragraphs from a newspaper display that an insurance company placed, and where they call for a reform of the American Liability system.

> The American system of liability has become the source of a "hidden" tax on our economy--a tax that can account for as much as 50% of the price paid for a product.
>
> What's worse, it has been estimated that this hidden tax amounts to $80 billion a year. Our economic competitor's legal systems do not encourage litigation to the extent we do. Consider for example, there are 30 times more lawyers per capita in the U.S. than in Japan.
>
> The impredictability of our liability system is also enormously costly to American competitiveness. For example, in a recent survey of CEO's, the Conference Board found that worry about potential lawsuits caused 47% of firms surveyed to discontinue one or more product lines. In addition, 25% stopped certain product research and development, and 39% decided against introducing a new product.
>
> The current system often encourages the frivlous suing of those with the ability to pay--in other words, those with "deep pockets", like is the case of most companies. [5]

The MBA Career Track- The 1990's will bring new competition from different continents, in 1992 Europe will become a commercial block that encompasses 12 countries; the reunited

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[5] "Why Reforming our Liability System is Essential if America is to Succeed in Overseas Markets," AIG Insurance Company (advertisement), New York Times, February 20, 1990, p. D3.

Germany and Japan loom over the horizon like even more powerful competitors to what they have been in the past. Even in this the NorthAmerican continent there is proposal for the formation of an economic trade zone thae will include Canada, the United States and Mexico.

The Pacific Rim countries (The "Little Tigers" or NICs) and other newly industrialized countries are moving up the scale from being pools of cheap assembly labor to more sophisticated levels, where original ideas are coming out in form of new products, technologies, etc.

The economy of most countries--either by choice or because they are forced by the circumstances--is going global, and all this means new markets, new competitors, and the companies to take advantage of the situation are those which are flexible, have new thinking and the right attitude to face up the challanges.

For all the reasons mentioned above, is important that the future managers be aware of other countrie's cultures, of the way they conduct businesses. To overcome the communication barrier is fundamental that managers be proficient in at least another language other than their own.

Some of the nation's premier business schools are realizing of the changes the economy is undergoing, so they are looking ahead and are changing their curriculums accordingly, to be attune with the times.

> Partly in response to shifting student attitudes, business educators have begun to rethink their schools' curriculums, now heavily weighted toward financial skills. Many are looking for ways to introduce more material on international business, on manufacturing, operations management and ethics. Says John Rosenblum, dean of the Darden school: "This is the perfect time to change. We have the opportunity afforded by shifting student interests and the strength afforded by the popularity of MBA programs, which went up to 67,000 degrees awarded in 1988, compared to 21,000 in 1970.[6]

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[6] Peter Nulty, "Where the 1988 MBAs are Going," Fortune, (August 29, 1988), Vol. 118, No. 5, p. 49.

Conclusions

Development of new products like a long-term goal, requires a new way of thinking, demands to be open minded, active, constant, but patient at the same time.

A company must set innovation as part of that long-term goal, and make it part of a corporate culture that promotes risk-taking; keep the company small, lean, avoid the bureaucratization that comes with size. A company must be ready to changes in technology and/or consumer preferences.

Try to manufacture in small batches, look for a niche in the market.

Most of this recommendations are easier to say than to put into practice, but things have not changed that much, even more than 500 years ago the Italian Machiavelli recognized that men are more likely to follow than to lead, to copy than to invent:

> Men walk almost always in the paths trodden by others, proceeding in their actions by imitation. ...It must be considered that there is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. [7]

A company must have three main concerns:

1- Consumer, which is the reason of its existance and should be at the center of its policy. The company must be consumer-oriented.

2- Environment, the social, political and physical environment, which the ones the company interacts.

3- Profit, for itself and for the shareholders. The most successful companies are the ones that reinvest part of the profits to pay for future growth, to expand and update the productive capacity, and for research and development of new products.

The best companies are the ones that not only react to

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[7] Niccolo Machiavelli, The Prince (New American Library, New York, 1952), pp. 48-49.

the circumstances , but also act, they try to make things happen.

The research that I have done to write this thesis has opened my eyes to the need that exists in new product development to bridge the gap between design and management. Many companies have been using cross-functional teams with good results, the harmony between the work-team creates synergism that will be reflected in a better designed product when it gets to the market.

In my future career path I want to bring design and management into one area, and either work as a consultant or as a product manager. As a manager I would like to do design and at the same time manage a product line from its conception stage to the moment it gets to the market place and beyond.

END

BIBLIOGRAPHY

Periodicals

Alster, Norm, "What Flexible Workers Can Do," Fortune, February 13, 1989, Vol. 119, No. 4.

"Are You Ready for the Big Jump," Engineering, (U.K.), April 1990, Vol. 230, No. 4.

Bartlett, Sarah, "Cracks in House that Debt Built," New York Times, August 17, 1989, No. 47965.

Bartlett, Sarah, "Power Investors," Business Week, June 20, 1988, No. 3057.

Banks, Robert and Wheelwright, Steven C., "Operations vs. Strategy: Trading Tomorrow for Today," Harvard Business Review, May/June 1979, Vol. 57, No. 3.

Berg, Eric, "A Slimmer Navistar Puts Stress on speed," New York Times, July 6, 1989, No. 47,923.

Berg, Eric, "Thinking Long Term is Costly to Caterpillar," New York Times, November 24, 1989, No. 48,055.

Berger, Suzanne and Dertouzos, Michael L., "Toward a New Industrial America," Scientific American, June 1989, Vol. 260, No. 6.

Bertrand, Kate, "New Product Success Starts with Homework," Business Marketing, August 1988.

Bylinsky, Gene, "The New Look at America's Top Lab," Fortune, February 1, 1988, Vol. 117, No. 1.

Carrol, Paul B., "Speeding the Execution of Designer's Plans," Wall Street Journal, March 30, 1989, Vol. CCXIV, No. 61.

Curran, John, "Companies that Rob the Future," Fortune, July 4, 1989, Vol. 118, No. 1.

Dean, James W., "Organizing for Manufacturable Design," Harvard Business Review, January/February 1989, Vol. 67, No. 1.

Dewar, Robert, and Don E. Schultz, "An Idea Whose Time Has Come," Marketing Communications, May 1989, Vol. 114, No. 5.

Drucker, Peter F., "The 10 Rules of Effective Research," Wall Street Journal, May 30, 1989, Vol. CCXIV, No. 100.

Dumaine, Brian, "How Managers Can Succeed Through Speed," Fortune , February 13, 1989, Vol. 119, No. 4.

Dumaine, Brian, "The New Marketing Rules," Fortune, November 6, 1989, Vol. 120, No. 11.

Gannes, Stuart, "The Good News About U.S. R&D," Fortune, February 1, 1988, Vol. 117, No. 1.

Gauthier, Michael R., "Executives Go High-Tech," Business Month, July 1989.

Gleckman, Howard, "The Quiet Crusader," Business Week, September 8, 1989, No. 3124.

Gomory, Ralph, "Innovation vs. Invention," U.S. News, December 14, 1987, Vol. 103, No. 24.

Greenwald, John, "Coca-Cola's Big Fizzle," Time, July 22, 1985, Vol. 126, No. 3.

Hay, Richard K., "A Holistic Management Model for Facing the New Competitive World," SAM Advanced Management Journal, Vol. 150, No. 1, Winter 1985.

Hayes, Robert, "Link Manufacturing Processes and Product Life Cycles," Harvard Business Review, January/February 1979, Vol. 57, No. 1.

Hector, Gary, "Yes, You Can Manage Long Term," Fortune, November 21, 1988, Vol. 118, No. 12.

Henkoff, Ronald, "Cost Cutting: How to Do It Right," Fortune, April 9, 1990, Vol. 121, No. 8.

Hicks, Jonathan, "Light and Tough, New Materials Head for the Mass Market Stage," New York Times, March 25, 1990, No. 48,185.

Hoerr, John, "A Japanese Import that's Not Selling," Business Week, February 26, 1990, No. 3147.

Kleinfield, N. R., "How 'Strykeforce' Beat the Clock," New York Times, March 25, 1990, No. 48,185.

Klimstra, Paul D., "Managing R&D Projects," Research.Technology Management, May/June 1988, Vol. 131, No. 3.

Knowlton, Christopher, "What America Makes Best," Fortune, March 28, 1988, Vol. 117, No. 7.

Krubasik, Edward G. "Customize Your Product Development," Harvard Business Review, November/December 1988, Vol. 66, No. 6.

Kumpe, Ted, "Manufacturing: The New Case for Vertical Integration," Harvard Business Review, March/April 1988, Vol. 66, No. 2.

Labick, Kenneth, "The Innovators," Fortune, June 6, 1988, Vol. 117, No. 12.

Landau, Ralph, "U.S. Economic Growth," Scientific American, June 1988, Vol. 258, No. 6.

Lawrence, Peter, "From Rowing Machines to Tiny Lights," New York Times, February 12, 1989, No. 47,777.

Lawrence, Peter, "The Economic Necessity of Design," Seminar and Lecture, Published by the University of the Arts, Philadelphia, Pa., March 1990.

Levi Wallach, Susan, "Melding Design and Manufacturing," Electronics Magazine, March 1990, Vol. 63, No. 3.

Levitt, Theodore, "Marketing Myopia," Harvard Business Review, July/August 1960, Vol. 38, No. 4.

Markoff, John, "A Corporate Lag in Research Funds is Causing Worry," New York Times, January 23, 1990, No. 48,124.

Mitchell, Graham and William Hamilton, "Managing R&D as a Strategic Option," Research. Technology Management, May/June 1988, Vol. 31, No. 3.

Mitchell, Rusell, "Masters of Innovation," Business Week, April 10, 1989, No. 3099.

Moore, Lisa J., "Judging the Perennial Favorites," U.S. News, April 25, 1988, Vol. 103, No. 41.

Morita, Akio, "Something Basic is Wrong in America," New York Times, October 1, 1989, No. 48,008.

Murray, Thomas J., "Rethinking the Factory," Business Month, July 1989.

Neff, Robert, "Rethinking Japan," Business Week, August 7, 1989, No. 3118.

Nulty, Peter, "Where the 1988 MBAs are Going," Fortune, August 29, 1988, Vol. 118, No. 5.

Nussbaum, Bruce, "Smart Design," Business Week, April 11, 1988, No. 3046.

Oneal, Michael, "The Best and Worst Deals of the 80's," Business Week, January 15, 1990, No. 3141.

O'Connor, John, "Elegant Design for Everiday Life," Harvard Business Review, January/February 1990, Vol. 68, No. 1.

Paschkes, Michael, "How to Guarantee New Product Failure," Harvard Business Review, July 12, 1976, Vol. 54, No. 4.

Pennar, Karen, "The Productivity Paradox," Business Week, June 6, 1988, No. 3055.

Pepper, Curtis Bill, "Fast Forward," Business Month, February 1989.

Perrino, Albert C. and James Tipping, "Global Management of Technology," Research. Technology Management, May/June 1989, Vol. 32, No. 3.

Peters, Tom and Nancy Austin, "A Passion for Excellence," Fortune, May 13, 1985, Vol. 111, No. 10.

Peter, Tom, "New Products, New Markets, New Competition, New Thinking," The Economist, (U.K.), March 4, 1989, Vol. 110, No. 7592.

Pierson, John, "Color Comes Into Vogue for Industrial Messages," Form+Function Column, Wall Street Journal, May 13, 1989, Vol. CCXV, No. 31.

Pierson, John, "Pushing Idea of Design Into the MBA Arena," Form+Function Column, Wall Street Journal, March 14, 1990, Vol. CCXV, No. 11.

Phillips, Stephen, "King Customer," Business Week, March 12, 1990, No., 3149.

Port, Otis, "Back to Basics, " Business Week, June 1989, Innovation Issue.

Port, Otis, "How the New Math of Productivity Adds Up," Business Week, June 6, 1988, No. 3055.

Potts, George, W., "Exploit Your Product's Service Life Cycle," Harvard Business Review, September/October 1988, Vol. 66, No. 5.

Quickel, Stephen W., "The New Improved CFO," Business Month, July, 1989.

Raia, Ernest, "Quality in Design," Purchasing, April 6, 1989, Vol. 106, No. 6.

Ramirez, Anthony, "High Stakes for Product Managers," New York Times, December 4, 1989, No. 48,074.

Reich, Robert B., "The Next American Frontier," Atlantic Monthly, March 1983, Vol. 251, No. 3.

Reiner, Gary, "It Takes Planning to Put Plans Into Action," New York Times, March 12, 1989, No. 47,805.

Reynolds, J. I., "American Education for International Business," Management International Review, 1988/3, Vol. 28.

Richman, Louis S., "How Capital Costs Cripple America," Fortune, August 14, 1989, Vol. 120, No. 4.

Saporito, Bill, "A Legal Victory for the Long Term," Fortune, August 14, 1989, Vol. 120, No. 4.

Schaffer, Robert H., "Don't Waste Time Planning--Act," New York Times, October 29, 1989, No. 48,038.

Schiller, Zachary, "Stalking the New Consumer," Business Week, August 28, 1989, No. 3121.

Schlefer, Jonathan, "Making Sense of the Productivity Debate: A Reflection on the M.I.T. Report," Technology Review, August/September 1989, Vol. 92, No. 6.

Sellers, Patricia, "Getting Customers to Love You," Fortune, March 13, 1989, Vol. 119, No. 6.

Silk, Leonard, "Four Pathways Japan Might Take," New York Times, February 2, 1990, No. 48,134.

Sims, Calvin, "Baby Bells Moving Into the Lab," New York Times, April 20, 1988, No. 47,481.

Spragins, Ellyne, "When Power Investors Call the Shots," Business Week, June 20, 1988, No. 3057.

Stern, Aimee.L., "In Search of Microniches," Business Month, July, 1989.

Sterngold, James, "Japan Leading U.S. in Raising Capital for Corporations," New York Times, October 27, 1989, No. 48,036.

Szakony, Robert, "Critical Issues on Long-Range Planning," Research. Technology Management, May/June 1989, Vol. 132, No. 3.

Takeuchi, Hirotaka and Ikujiro Nonaka, "The New Product Development Game," Harvard Business Review, February 1986, Vol. 64, No. 1.

Taylor, Gary, "The Joys of Joint Ventures," Business Month, July, 1989.

Taylor, Robert, "Why Volvo is Planning to Go Back to the Future," Financial Times, (U.K.), June 9, 1989.

Teresko, John, "Manufacturing in Japan," Industry Week, September 4, 1989, Vol. 238, No. 17.

Trachtenberg, Jeffrey A., "The Not-so Ugly Americans," Forbes, December 1, 1986, Vol. 138, No. 12.

Weinberger, Caspar W., "Commentary," Forbes, October 2, 1989, Vol. 144, No. 7.

Weiss, Gary, "As the Crowd Goes One Way, the Market Goes Another," Business Week, January 15, 1990, No. 3141.

Williams, Lena, "Free Choice: When Too Much is too Much," New York Times, February 14, 1990, No. 48,146.

Other Sources

AIG Insurance Company (advertisement), "Why Reforming Our Liability System is Essential if America is to Succeed in Overseas Markets," New York Times, February 20, 1990, No. 48,152.

Fuller, Buckmister, "The Designer," Seminar Session on Design Responsability, American Iron Institute, New York, March 1969.