

# Patterns Of Pleasure: The Design And Development Of Customer Satisfaction

By  
Douglas W. Lamm

Submitted to the Sloan School Of Management in Partial Fulfillment of the Requirements  
for the Degree of  
Masters of Science in Management  
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## **Abstract**

An outline for a new type of product development and planning methodology is introduced. Existing methodologies are focused on satisfying customer needs. This methodology is focused on creating feelings of satisfaction within customers.

The methodology addresses the following shortcomings of existing methods of product development:

- Subjective assessments of customer needs and product attributes can be unreliable
- Many products, such as services and "image" products, can not be specified as distinct bundles of attributes
- Revolutionary products that satisfy latent needs can not be reasonably assessed
- The measurement of customer needs is often distorted by biases
- "Problem needs" are easy to articulate whereas "excitement needs" are not

The methodology is derived from theories of human satisfaction (otherwise known as "happiness" or "quality of life"), psychobiology, aesthetics and the work of Dr. Tibor Scitovsky. The major difference with existing methodologies is that customer satisfaction is found to be maximized not by satisfying needs but by creating "patterns of pleasure" that include both need satisfaction and "need induction". A framework for analyzing patterns of pleasure, based on modifications of the theory of optimal arousal, is presented. The framework provides for direct physiological measures of customer responses to products. The relationship of the framework to patterns of "theme and variation" found in music and other arts and to existing economic analyses is also explored.

Thesis Supervisor: Dr. Drazen Prelec  
Title: Professor of Management

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### INTRODUCTION

#### How Satisfying Is Lemonade?

How satisfying is a glass of lemonade? What is it worth? Is there any relationship between value and satisfaction? Answers to simple questions like these form the basis for much of corporate strategy and most of new business/product development. Yet, though the questions are simple, the answers are not. For instance, lemonade bought from children at a neighborhood lemonade stand is typically valued at about \$0.75 per glass. The same glass of lemonade bought at the Windows on the World restaurant in New York costs \$6. If 4 glasses of lemonade had been consumed in the previous 4 minutes, the 5th glass might have negative value. Restricting lemonade consumption to the rate of one per 10 years, would create higher value per glass. If, through a previous message, we knew that by buying this glass of lemonade, we could save 100 square miles of rainforest, we might be willing to pay \$20. If we knew that by drinking the glass of lemonade, we could save our own life, we might be willing to forgo almost all of our future income.

As illustrated by the previous example, the value of a product often has little to do with its underlying costs. Economists would explain this fluctuation in value as being caused by fluctuations in supply and demand conditions and product elasticity's -- when we see high prices, we are witnessing a "dip" into consumer surplus or a change in demand conditions. The closer we approach a perfectly competitive market, the more prices reflect the costs of underlying attributes. Marketers would address the problem by clustering market segments according to common types and degrees of need.

Yet, neither economists nor marketers typically pay much attention to how products and their attributes are transformed into valuations and whether this valuation has anything to do with the satisfaction received by the customer. Marketers typically rely on revealed preferences (i.e. consumer buying behavior) to determine what needs are important. The

assumption is then made that by satisfying these needs, we can satisfy customers. But this approach is very similar to looking at the bottom line of an income statement in order to determine corporate strategy. Just as an effective business strategy can not be created without an understanding of the underlying dynamics of the business, so too do we forego the ability to create new product development strategies that will maximize satisfaction without a full understanding of how satisfaction is created. "Correlational thinking" with regard to the influence of environment, previous knowledge, satiation, rate of consumption and many other variables is common. "Causal thinking" is not.

How then, should we design and market products to maximize satisfaction? Typically, we attempt to satisfy customer needs. The hypothesis presented in this paper suggests, however, that the value of a product can be both understood and maximized not by understanding how products satisfy needs but rather by understanding how products create feelings of satisfaction.

### **The Overall Objective Of This Paper Is To Introduce An Improved Framework For Creating Satisfying Products**

This paper will introduce and develop a new framework for understanding and analyzing satisfaction based on a number of interesting findings of research in psychobiology. Because the research has been developed over the past 25 years, it is still in its adolescence -- particularly when compared with the more mature 200 year old tradition of economic analyses. As with any adolescent, the field is both prone to embarrassing mistakes and full of exciting potential. Thus, the concepts I have derived from the research have been labeled with my own interpretation of their probable validity. Concepts with a high probability of validity are presented as statements. Concepts with less probability are qualified with "may", "probably" etc. In order to illustrate the full potential of the research, I feel that it is as important to postulate potential applications as to present more well worn data.

In gaining a better understanding of satisfaction, it is hoped that many of the "challenges" of existing methods of new product development will be addressed. The

following is a representative list of some of the challenges:

- Subjective assessments of customer needs and product attributes can be unreliable
- Many products, such as services and "image" products, can not be specified as distinct bundles of attributes
- Revolutionary products that satisfy latent needs can not be reasonably assessed
- The measurement of customer needs is often distorted by biases
- "Problem needs" are easy to articulate whereas "excitement needs" are not

As a result of these and other problems, companies waste enormous amounts of money on their new product development efforts. Despite increasingly sophisticated analytical tools, new product failure rates remain very high. One study found that the failure rate was 4% for consumer products, 20% for industrial product and 18% for services. [12]. Booz Allen and Hamilton found the failure rate of products introduced in the market was in the 33-35% range between 1963 and 1981. They also found that only about one in seven new products actually reach the market. [13]. The Association of National Advertisers found that 27% of product line extensions failed, 31% of new products introduced in lines where the company already had a product failed and 46% of new products that were introduced in new categories failed [14]. Another study reports that 46% of the resources spent on new products are allocated to product that fail in the market or earlier process [13]

The costs of new product development are as enormous as the risks. The average cost of introducing a new pharmaceutical product is \$100-150 million. Texas Instruments lost \$660 million on the personal computer business [12]. RJR Nabisco lost \$20 million on "premier" smokeless cigarettes. Federal Express spent, and lost, \$190 million on Zap Mail. [11] The average cost of a new branded consumer product was between \$50 and \$100 million in 1985 -- with a 70% failure rate. The author of a competitive strategy states; "It is hard to justify such major expenditures for new product development on the grounds of entry deterrence alone, although the prospect of discouraging entry may certainly play a role." [63]

The overall objective of the paper is to develop a model of customer satisfaction and to apply that model to the new product development process so that companies can create more satisfying products. As I will show in a later chapter, by creating more satisfying

products, companies can expect to achieve greater sales and improved profits. It is also believed that by modifying existing methods of product development, many of the problems outlined above could be addressed.

In the next chapter, evidence will be presented to suggest that companies can maximize product value by gaining a better understanding of satisfaction. In particular, it will be shown that in order to generate feelings of satisfaction an understanding of "need induction" is as important as an understanding of need satisfaction -- but that need induction is typically left out of the new product development process. Chapter 3 will present some interesting cases that demonstrate how need induction has been used, sometimes inadvertently, in the new product development process to generate substantial profits. A model of human satisfaction, based on the latest findings in biology, psychology and sociology, will be presented in Chapter 4. Chapter 5 will relate that model to products in general while chapter 6 will relate the model to the new product development process in particular. Finally, the last two chapters will briefly discuss the ethics and future implications of an enhanced understanding of human satisfaction -- particularly, the relationship of satisfaction to new manufacturing and information technologies.

### **Existing Terms Are Defined With Precise Meanings**

In order to avoid a proliferation of new buzzwords, I have attempted to use existing terms wherever possible. However, because I have attached very precise and somewhat new meanings to some of those terms, it is important to define as clearly as possible the terms that will be used.

**Need.** Any gap between a desired and actual state in a system -- whether a customer, producer, product etc. Among "animate" systems, it encompasses both conscious and unconscious gaps. It applies equally to gaps arising out of boredom and gaps arising out of anxiety or pain.

**Satisfaction.** Any conscious positive emotional state. In psychology and consumer behavior, satisfaction is sometimes referred to as "positive affect" and is characterized by "reward" related behavior. However, the definition used here includes emotional states that apply to organizations as well as individuals. *And, most importantly, the*

*positive emotional state does not necessarily result in any observable behavior.*

Synonymous with "happiness". Includes "pleasure", "joy", "comfort", "ecstasy", etc.

**Need Satisfaction.** Any closing of a gap between a desired and actual state. *Need satisfaction is not the same as satisfaction. Need satisfaction refers to a time dependent process of closing a gap. Satisfaction refers to a time independent positive emotional state or feeling.*

**Need Induction.** Any opening of a gap between a desired and actual state. "Active" need induction refers to the searching out of a gap. "Passive" need induction refers to gaps that emerge solely through the passage of time.

**Comfort.** A positive emotional state that is characterized by a lack of any felt needs. Discomfort is a negative emotional state characterized by the presence of felt needs. Synonyms include "Relaxed" and "Calm"

**Pleasure.** A positive emotional state that arises out of a process of becoming comfortable. Synonyms include "delighted", "joyful", "gratified". Displeasure is a negative emotional state that arises out of a process of becoming uncomfortable. Synonyms include "distressed" and "upset".

**Stimulus.** The cause of any physiological response of an organism or the organism's organs or bodily systems. Three types of stimuli will be distinguished -- environmental (affecting one of the 5 senses), bodily (originating in the muscles or organs) and mental (originating in the brain).

**Habituation/Adaptation.** A process, mediated by mechanisms in sensory nerve receptors and the brain, that decreases levels of arousal or sensation.

**Arousal.** A measurable physiological response or activity level of an entire organism to a stimulus. Will be used most commonly to describe responses of various parts of the brain. Does not necessarily result in behavior or "externally" observable activities. Nor does it correspond to a conscious feeling.

**Sensation.** A measurable physiological response or activity level of one of an organisms senses, organs or muscles to a stimulus. Leads to arousal.

**Behavior.** Measurable activity of an entire organism.

**Restlessness.** A negative emotional state that is characterized by high arousal and low stimulation. An extreme form of "boredom".

**Anxiety.** A negative emotional state that is characterized by high arousal and high stimulation. An extreme form of "tension". Synonyms include "pain", "anger", "worry", "fear"

**Product.** Refers to both a tangible product and/or service unless otherwise noted.

## **Methodology And Acknowledgments**

The problems and issues addressed in this paper were initially identified through the observations, and occasional frustrations, that have accumulated over my 8 years of consulting in new product development. The "solutions" and ideas presented in this paper were developed through readings in economics, marketing, new product development, psychology, biology and aesthetics and through numerous conversations with my friends and colleagues at Innotech, the Sloan School of Management and with my Thesis Adviser Drazen Prelec.

The Joyless Economy: The Psychology Of Human Satisfaction, a book written by Stanford economics Professor Tibor Scitovsky has had a profound influence on this paper -- particularly regarding the theory of optimal arousal presented in chapter 2. The book was originally issued in 1976 and revised and re-issued in 1992. I find many of the conclusions about the effects of economics on the quality of life to be somewhat overstated (the "Joyless" part of the title). Nevertheless, the first half of the book presents a highly stimulating synthesis of a number of avenues of research in human satisfaction. Though I have attempted to distinguish Scitovsky's ideas from those of others through the use of references, the ideas are so intertwined in some sections of chapters 2 and 4 that a complete separation would be impossible. The following are the areas in which I perceive Scitovsky's influence to be greatest:

- Summary of the theory of optimal arousal as developed by psychobiologists Berlyne, Hebb, Malmo, Mclelland and others
- Development of the concept of a comfort/pleasure tradeoff
- Integration of the optimal arousal theory with the classification of products into "creative" and "defensive" categories
- Framework for understanding the contribution of products to overall satisfaction

I am greatly indebted to Professor Scitovsky. Without his analysis, this paper would probably have been an overextended meditation on the role of need induction in product development. With the stimulation and direction provided by his book, the paper has become a more integrated (perhaps overextended) meditation on the implications of psychobiology for the creation of more satisfying products.

## Chapter Two

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### WHY "FEELINGS OF SATISFACTION" SHOULD REPLACE "NEED SATISFACTION" AS THE GOAL OF PRODUCT DEVELOPMENT EFFORTS

In this chapter, I will present evidence and arguments for the reorientation of the goals of the product development process away from the satisfaction of needs and towards the generation of feelings of satisfaction. The argument is in four parts and is outlined as follows:

Feelings Of Satisfaction Are The Most Powerful Of The Motivating Forces

*Feelings of satisfaction are one of many motivating forces*

*Feelings of satisfaction are the most powerful of the motivating forces*

Feelings Of Satisfaction Are Created Through A Process Of Need Induction And Need Satisfaction

*Philosophical theories of satisfaction*

*Economic theories of satisfaction*

*Psychological/sociological theories of satisfaction*

*Biological theories of satisfaction*

*Though Theories Of Satisfaction Differ Widely, All Include Need Induction*

Existing Methods Of Product Development Ignore Need Induction

*The "marketing approach" stresses need satisfaction*

*Market research tends to assume needs are fixed rather than dynamic*

*The goal of concept generation and selection is to maximize need satisfaction*

*We do not create optimally satisfying products because we tend not to fully understand need dynamics*

Therefore, It May Be Possible To Change The New Product Development Process Such That It Results In More Satisfying Products

Some parts of this chapter, particularly the review of theories of satisfaction in sections 1 and 2, may seem to the reader to be a bit more detailed than necessary. However, the information in these sections will not only be used in this chapter but will also serve as a backdrop for the model of optimal satisfaction developed in chapter 4.

**Feelings Of Satisfaction Are The Most Powerful Of The Motivating Forces**

*Feelings of satisfaction are one of many motivating forces*

Texts on human motivation and customer behavior typically view our behavior as the result of many forces. Some of the forces, with examples of the disciplines that typically study the force, are listed in the following table.

<b>Motivating Forces</b>	<b>Examples</b>	<b>Discipline</b>
Instinct	Imprinting, conflict behavior	Ethology
Regulatory processes	Hunger, limbic system, homeostasis	Neurobiology
Learning processes	Drives, incentives, modeling, conditioning	Clinical/Behavioral psychology
Social processes	Conformity, attribution	Social psychology
Sensory stimulation and arousal	Pleasure, pain, stress, sleep	Psychophysiology
Cognitive processes	Expectations, consistency, dissonance, self actualization	Cognitive psychology

[43], [44]

As can be seen by the above table, the understanding of a single behavior would require the understanding of an enormous number of underlying forces. As a further complication, research indicates that the forces that are most active at any one time will vary greatly between individuals. [43] . Due to this complication, much of behavior, particularly customer behavior, is understood in terms of "rules of thumb" that apply

within a restricted set of conditions (e.g. a particular type of customer within a particular type of market).

*Feelings of satisfaction are the most powerful of the motivating forces*

Despite the fact that there are many processes that regulate our behavior, feelings of satisfaction have the potential to override all others. This concept is not new. Aristotle first hinted at it by declaring that all human motivation could be understood in terms of a search for happiness. Similarly, Thomas Jefferson added "the pursuit of happiness" to "life" and "liberty" as one of the inalienable rights of our Declaration Of Independence.

More recent scientific evidence to support this conclusion comes from neurophysiological investigations of behavior. The first of these studies occurred in 1954, when psychologist James Olds used electrodes implanted in the limbic center of the rat brain to stimulate what later became known as the "pleasure centers". When rats were allowed to self stimulate their pleasure centers by pressing a lever, they were found to press the lever up to 5000 times/hour. Further experiments have shown that rats will continue this behavior until they fall to the floor, sleep, awaken and press the lever again until near death. Food, sex and all other "rewards" are passed up in favor of the lever.

[45]

Since these first intracranial experiments were conducted, much additional research into the biology of pleasure has been conducted. For instance, pleasurable sensory stimuli in the external environment, such as music, are found to have similar effects to the implanted electrodes in many ways. The two most important differences are:

**"Extinction" takes longer.** Animals will persist in activities aimed at gaining rewards after those rewards are no longer being supplied. This is thought to be due to cognitive processes that create expectations of reward

**Satiation occurs.** Animals will show progressively less interest in any one stimulus over time

The fact that pleasure centers are dispersed throughout the brain whereas other behaviors are more localized suggests that pleasure serves as a mediator of other behaviors. And, in fact, this is found to be true. Turn off pleasure and animals will be

motivated by other forces. Turn on pleasure and other parts of the brain are inhibited.  
[45]

Were a product to create as much pleasure as an electrode attached to a pleasure center, and were the lever to represent payment for the product, it is not too difficult to imagine that a "pleasure lever" could become the ultimate product. Humans subject to the same experiments as rats have shown very similar results (as have many other species including fish, hamsters, rabbits, cats, dogs, dolphins, and monkeys). The main difference between humans and other species is that different parts of the brain are found to produce different types of pleasurable feelings (e.g. sexuality, inebriation etc). But human subjects have shown the same willingness to forego food and other essentials in order to have another chance to press the pleasure lever. The self destructive behavior of drug addicts is further evidence of the extraordinary power of satisfaction. [45] It would seem that in humans, as in rats, a successful "pursuit of happiness" can come at the cost of both "life" and "liberty".

Though it is a purpose of this paper to suggest ways in which an understanding of satisfaction could be used to imbue products with greater value, it is also a purpose to understand the responsible use of this knowledge. The last two chapters are devoted to an understanding of the ethical implications of the "sale of satisfaction" and to the suggestion of ways in which this understanding could be used to the ultimate benefit, rather than detriment, of the individual and society.

### **Feelings Of Satisfaction Are Created Through A Process Of Need Induction And Need Satisfaction**

From ancient times to the present, man has attempted to unravel the causes of satisfaction. Typically, the theories that have been developed are characterized by the most prevalent analytic frameworks of the times at which they were developed. Philosophical approaches to understanding satisfaction were most prevalent in ancient Greece. Economic theories of satisfaction were developed during the industrial revolution. Psychological approaches were largely developed during the first half of this century. And biological approaches have been developed in the latter half of the century.

Despite these radically different approaches, the following review will illustrate that all theories of satisfaction suggest that satisfaction is obtained through a process that involves both the development of needs (need induction) and the development of ways to satisfy those needs (need satisfaction). Further, that satisfaction comes not from passive need induction, in which needs emerge of their own accord, but rather requires active need induction, in which needs are sought out. Though chapter 4 will develop a more thorough and illuminating model of satisfaction, the simple demonstration that need induction is an essential element of a satisfaction producing process and that current methods of product development ignore need induction will go a long way towards explaining many of the weaknesses of current product development practices.

The following review of the theories of satisfaction is divided into four sections - philosophical, economic, psychological/sociological and biological. The sections are arranged chronologically so that the reader can obtain a better sense of the evolutionary trends that have shaped our current thinking -- and that will shape our future thinking.

### *Philosophical theories of satisfaction*

The classical Greek and Roman philosophers believed that happiness arises from a life of intelligent reflection. Aristotle is generally viewed as having pioneered the study of happiness in his Nichomean Ethics. In this and other works he argued that happiness is the supreme good and that all human activities are aimed at its attainment. Among his most well known phrases related to happiness are "...the good of man is an activity of the soul [the unique capabilities of the mind and body] in conformity with virtue [usefulness of the activity to someone other than the person performing the activity]" and "...each man derives pleasure from what he is said to love". To Aristotle, the complete devotion of one's energy to the activities, objects and/or people that one loves will lead to a life of happiness. [2]

Other classical Greek philosophers developed ideas similar to ancient Asian philosophical traditions. Epicures felt that happiness derives from tranquil peace of mind. This peace of mind arises through the development of the ability to regard the past with gratitude, the present with delight and the future without fear. The Stoics also believed that happiness derives from contemplation. However, they emphasized the development of "wisdom" -- the wisdom to know what is good and bad and how to control one's

passions. Similarly, the Roman statesman Cicero stated that "There is no fool who is happy and no wise man who is not". [1]

Modern western philosophy (17th to 20th century) has differed from the Greek model primarily through arguments that activities that lead to happiness are not necessarily related to intellectual pursuits. The moderns have tended to argue that happiness is subjective and derives from different sources for different people e.g. that physical pleasures may create as much happiness as intellectual for some people. While not entirely rejecting the idea that activities can be ranked according to their ability to create pleasure, they did tend to include a wider range of activities than the Ancients.

John Locke was the first to break from the Greek tradition by arguing that happiness is a "sensible pleasure". Locke argued that happiness is entirely subjective and that no activities can be ranked. The Scottish moral philosophers, David Hume, Francis Hutcheson and Adam Smith argued that "benevolent" activities (e.g. altruistic activities) will lead to the greatest pleasure. Similarly, Thomas Jefferson "made happiness the end of life, virtue [i.e. altruism] the basis of happiness, and utility the criterion of virtue". [2]

### *Economic theories of satisfaction*

Economic theories of satisfaction are rooted in the philosophical traditions of utilitarianism. Like Locke, the utilitarians saw happiness as entirely subjective. Jeremy Bentham and John Stuart Mill argued that happiness was a favorable balance of pleasure over pain "Nature has placed mankind under the governance of two sovereign masters, pleasure and pain". [1]

In order to apply these concepts to problems of social welfare, Bentham created the concept of "utility". Bentham's definition stated that utility was a "property in any object... to produce pleasure, good or happiness or to prevent...pain, evil or unhappiness". Bentham used the concept of utility to propose methods for designing social legislation that promoted "the greatest good for the greatest number". William Stanley Jevons extended Bentham's ideas to explain customer behavior as a "calculus of pleasure and pain". In general, the early utilitarian economists attempted to define utility as a psychologically measurable quantity -- something in the mind. Not necessarily something evidenced by the behavior of the body.

Modern economic treatments of satisfaction are aimed at translating these broad utilitarian philosophical directives into usable analytical tools. In contrast to the early utilitarians, modern economists tend to reject attempts at translating an understanding of feelings of customer satisfaction into marketplace behavior. Most of the tools used to determine utility, such as conjoint analysis, focus instead on "revealed preferences". It should be noted however, that modern economic texts still include pleasure or satisfaction as key components of their definition of utility. For instance, Samuelson defines utility as "the subjective pleasure or usefulness that a person derives from consuming a good or service." [5]. Pindyck states that "utility is the level of satisfaction that a person gets from consuming a good or undertaking an activity" [4]. Since, modern economic theory is based on the assumption that customers will behave in a way that maximizes their utility and since utility is defined as being largely composed of satisfaction, it can be said that a goal of modern economic theory is to understand customer satisfaction. Modern economic practice, in focusing instead on how customers make choices, falls somewhat short of this goal.

Several important principles have emerged from economic treatments of satisfaction. Central to economist's ideas of satisfaction is the "law of diminishing marginal utility". This law states that as the amount of a good consumed increases, the marginal utility of that good diminishes. Though marginal utility decreases with increased consumption, total utility always increases with increased consumption. It is the law of diminishing marginal utility that accounts for the downward slope of the demand curve -- as quantity of a good increases, value (or price) decreases. Given a set amount of money to spend on a wide array of products (a budget), customers will maximize their satisfaction when the marginal utility of each dollar spent is equal. Consequently, scarcity, or lack of quantity of a good, is the most important determinant of the satisfaction that one derives from a product or service. [5]

### *Psychological/sociological theories of satisfaction*

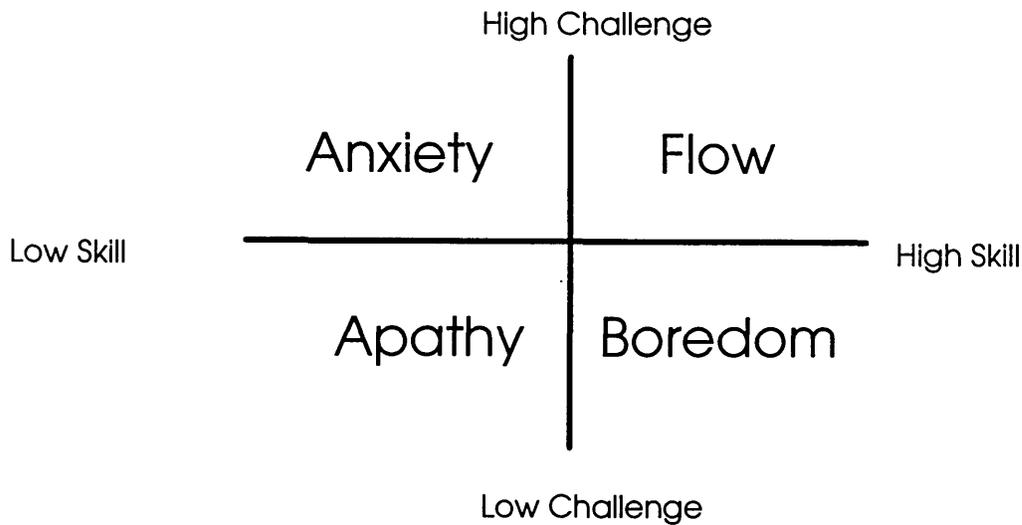
Psychological and sociological theories of happiness differ from classical economic or philosophical treatments primarily by discarding the notion that happiness derives from rational behavior. William James' The Principles Of Psychology construed rationality as a small portion of consciousness. Freud's theories subsumed conscious rationality

altogether by framing behavior as primarily influenced by the subconscious. Similarly, Jung explained behavior as being influenced by subconscious sociological forces. More recently, Herbert Simon's work shows that rational behavior is constrained by the information processing capabilities of the human mind.

Psychologists and sociologists have been increasingly migrating from their traditional study of dysfunctional behavior towards a study of normal behavior and emotion (e.g. satisfaction). As such, there has been such an eruption of theories of satisfaction within the past half century that to include even a representative sample would consume the rest of this paper. Thus, I have included in the following description only those theories that seem to have had the most influence on the business world.

Maslow's famous theory is based on evidence that positive mental health comes from the achievement of a state of homeostasis that is realized through the progressive satisfaction of a "hierarchy of needs". Needs are attended to roughly in the following order: physiological needs, safety needs, belongingness and love needs, self esteem needs and self actualization needs. The degree to which all these needs can be satisfied is related to the degree to which an individual has feelings of satisfaction "It would seem that degree of basic need gratification is positively correlated with degree of psychological health". [6].

Mihaly Csizsentmihalyi, a psychologist at the University of Chicago, has spent over 25 years studying states of "optimal experience". He has theorized that states of optimal experience are achieved when we are "unselfconsciously absorbed in an activity". He refers to this state as "flow". As shown in the following model, flow is achieved when we are pursuing activities in which our skills are matched to challenges. [7]



Most research conducted by sociologists, gerontologists and others on happiness within groups has made use of the concept of "subjective well being". Like the economists, these researchers assume that happiness is not an objective quantity that is externally measurable. Rather happiness can best be understood by obtaining people's own internal subjective views of their happiness.

Research from these "quality of life" surveys have correlated subjective rankings of happiness with other variables. Among the most important results to emerge from these studies is that one's subjective satisfaction with any given aspect of life reflects the gap between one's aspiration level and one's perceived situation -- but one's aspiration level gradually adapts to one's circumstances. Many different types of gaps have been identified (e.g. "goal vs. achievement", "ideal vs. real", "expectation vs. reality", "previous best vs. current best", "what I have vs. what they have" ).

Another important finding of these studies is that attitudinal variables are strongly related to happiness. Among those attitudes that are positively correlated are high self esteem, sense of personal control, optimism, and extroversion [2]. Finally, these studies have found that standard demographic or social classification variables (e.g. better health, more money, etch) are not found to be strongly correlated to happiness levels. [8]

### *Biological theories of satisfaction*

Biological approaches to understanding satisfaction tend to be related more to short term satisfaction (e.g. the generation of gustatory or sexual pleasure) than long term satisfaction (e.g. the generation of a high level of job satisfaction). Researchers have focused on the role of several variables including genetic constitution, neurochemicals, brain structure and brain activity. Since the model of satisfaction presented in chapter 4 will be based on biological theories of satisfaction, the following will serve only as an introduction and overview.

The role of genetic constitution in creating satisfaction has received relatively little attention. The most important finding is that after initial development in the teens, personality type and its resulting set of attitudes tends to be extremely resilient in the face of changing circumstances and age. Thus, those who are genetically predisposed to extroversion and optimism will tend to be happier throughout their lives than those who are not. [2] Similarly, genetic constitution is found to be related to the way in which we seek satisfaction. An extensive body of work has shown definite neurochemical differences in sensation seekers (e.g. mountain climbers) versus normals. [47]

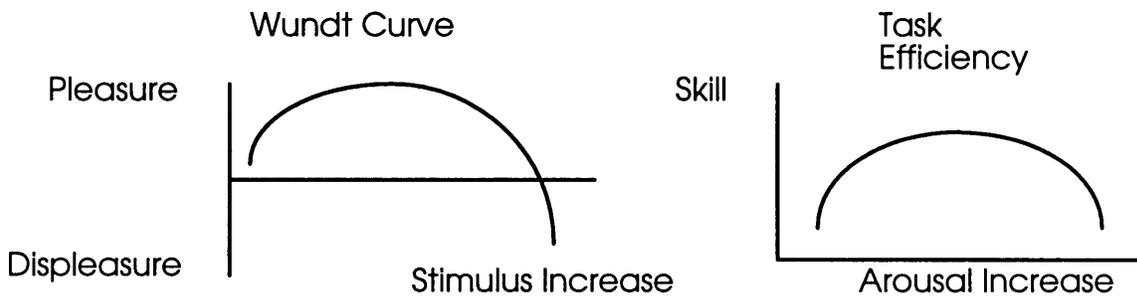
Neurochemicals are chemicals that directly or indirectly regulate the transmission of electrical signals across the ends of nerve fibers. Direct regulation is accomplished via neurotransmitters. Indirect regulation is accomplished via enzymes that act on the neurotransmitters. The neurochemicals that are most directly related to satisfaction are those that operate on various parts of the limbic system.

The limbic system, the most primitive part of the brain, is located on top of the spine and is thought to be related to emotion. Three parts of the limbic system have been identified as "pleasure" or "reward" centers. Nerves from these reward systems are connected to each other, to pain centers and to many other areas of the brain. In humans, stimulation of these pleasure centers creates various types of feelings depending in large part on the intensity of the stimulus.

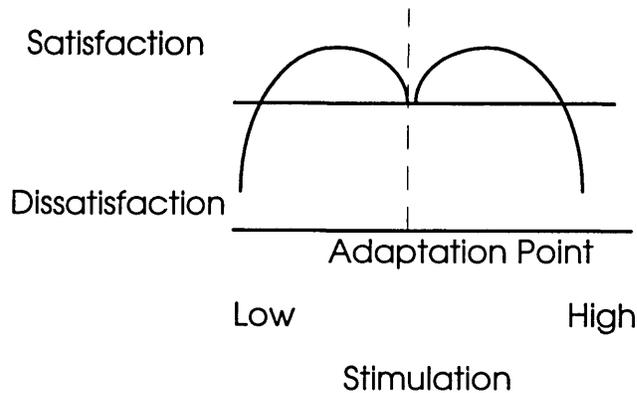
The study of brain activity has shed a great deal of new light on the generation of satisfaction. The theories of the philosophers, economists and early psychologists were all based on the assumption that the body seeks a state of homeostasis or rest. This "drive theory" of behavior implies that an organism is inert unless some disturbance

generates a need and an activity to eliminate that need. However brain wave research shows that neither the brain nor the body is ever inert. Even without any external stimuli, the brain is constantly aroused by the muscles and organs and by mental processing itself. [3]

According to the theory of "optimal arousal", first hinted at by Wundt in 1892 and developed most fully over the past 25 years, satisfaction is created by two, occasionally conflicting, positive emotional states known as comfort and pleasure. Experiments have demonstrated that it is intermediate levels of stimulation that cause the greatest level of comfort. At extremely low levels of stimulation, the dominant feeling is one of boredom and restlessness. At extremely high levels of stimulation, the dominant feeling is one of anxiety. Psychobiologists have found that somewhere in the middle lies an "optimal" level of stimulation. Since both restlessness, due to lack of stimulation, and anxiety, due to too much stimulation, cause increased arousal, it is also postulated that there is an optimal level of arousal. A great deal of evidence shows that, both the stimulus curve and the arousal curve (when plotted against efficiency at completing a task) have an inverted U shape. [3] These two findings are illustrated below:



Similarly, in studies of aesthetics, psychologist McLelland and coworkers have found that the greatest satisfaction is found from stimuli that are moderately different from an "adaptation point". Larger changes were found to cause dissatisfaction while smaller changes were found to be less satisfying. These findings are summarized in their well known "butterfly" diagram. [43]



Unlike comfort, pleasure is thought to be derived from changes in the level of arousal towards the optimum. Satisfaction or reward related behavior is seen as motivated by an attempt to maximize the positive feelings arising from comfort and pleasure. Too much comfort would lead to insufficient pleasure. Too much pleasure requires periods of discomfort. According to this view, satisfaction is the achievement of an optimal mix of comfort and pleasure. [3]

*Though Theories Of Satisfaction Differ Widely, All Include Need Induction*

Despite sometimes great differences in historical context, approach, and overall conclusions, the previous theories all support the idea that happiness comes from a process that requires not only the satisfaction of needs but also the active and usually conscious induction of needs. The intelligent reflection of the ancient philosophers is a method of creating pleasure through the searching out and solving of an infinite set of intellectually stimulating problems. The sensible pleasure of more modern philosophers includes the searching out of bodily challenges (e.g. exercise) as a source of pleasure. The early utilitarians focused on the balance of pleasure over pain. They did not, as is often mistakenly assumed, believe that the elimination of all pain (i.e. comfort) will necessarily lead to a feeling of satisfaction. The elimination of pain must be accompanied by activities that increase pleasure. The law of diminishing marginal utility and resulting theory of utility maximization of modern economists is based on the notion that there is an opportunity cost to the oversatisfaction of an old need. A new need must be sought whose satisfaction will yield greater utility than the old need.

Maslow's hierarchy of needs perhaps comes closest to suggesting that happiness derives solely from the satisfaction of a finite set of needs that emerge of their own accord. However, even Maslow appears somewhat uncomfortable with this idea:

"It is also probably true that higher needs may occasionally merge, not after gratification, but rather after forced or voluntary deprivation, renunciation or suppression of lower basic needs and gratifications (asceticism, sublimation, strengthening effects of rejection, discipline, persecution, isolation etc). We know very little either the frequency or the nature of these events although they are reported to be common in Eastern cultures... [or] what are the relative frequencies of gratification health and frustration health" [6]

Csiszentmihalyi's ideas about flow incorporate need induction through the seeking out of challenges that are well matched with skills. The findings of the subjective well being researchers that socio-demographic variables correlate only weakly with happiness and that aspiration levels adapt to current circumstances suggest that needs are neither absolute nor constant -- that new needs either emerge or are sought as old needs are satisfied.

Finally, as we will see in much more detail, the findings of biological studies of satisfaction are perhaps the most supportive of the role of need induction. As previously mentioned, these findings suggest that too much comfort precludes pleasure. Or, put differently, that "discomfort must precede pleasure" (known as the Law of Hedonic Contrast by psychiatrists). [3]

Thus, as shown in the summary table below, no matter how satisfaction has been studied over the past 2500 years, all theories support the notion that it does not come from the active satisfaction of a group of finite "passive" needs that emerge of their own accord. Rather, satisfaction comes from the active induction and satisfaction of needs. Given this very simple and seemingly obvious fact, one would expect that our new product development process would give some consideration to how needs might be induced -- without creating displeasure or discomfort as a byproduct. And yet, as shown in the next section, that is not the way the process works.

<b>Theory/Approach</b>	<b>Nature of Need Induction</b>
Ancient philosophy	Mentally stimulating problems
Modern philosophy	Search for bodily as well as mental stimulation
Economics	Search for more pleasurable activities at the margin
Hierarchy of needs	Possible role for induced "frustration"
Flow	Challenges to match skills
Subjective well being	Non-absolute quantity of needs
Psychobiology	Law of hedonic contrast

### **Existing Methods Of Product Development Ignore Need Induction**

*The "marketing approach" stresses need satisfaction*

As will be seen in the following review, the overall product development process and the techniques used within that process, generally focus on need satisfaction rather than need induction. As stated by Kotler, "Marketing is a social and managerial process by which individuals and groups obtain what they need and want through creating, offering and exchanging products of value with others...value is the customer's estimate of the product's overall capacity to satisfy his or her needs....the marketing concept holds that customers' needs and wants are the logical place to start in the search for new [product] ideas" [9]

For purposes of the following review, two observations can be made about the marketing approach to new product development. First, customer needs are assumed to be identifiable and created via forces outside the companies' control. Therefore, the role of a company should be to design products that satisfy needs -- the role of the company is not to design products that create, or help customers create, needs. Second, a company will be successful if it produces products that satisfy customer needs. The satisfaction of customer needs is not the same as the creation of feelings of satisfaction within customers (though it is often assumed that the two are synonymous).

The logic of the marketing approach is backed up by extensive research that indicates that products that originate via "market pull" have a relatively high rate of success. Cooper, in particular, has found that product concepts that originate with market needs

have a higher rate of success than product concepts that originate in R&D laboratories or are otherwise characterized by "technology push". [10]

This is not to say that companies avoid influencing the type and strength of customer needs. The goal of most promotional activities is to either increase the perceived ability of a product to satisfy a particular set of needs or to increase the strength or weighting of a particular set of needs. However, these activities are typically left to advertising agencies and the sales force and are typically undertaken only after product development has designed and released the product. More importantly, these are activities by which the company attempts to control the induction of needs. These are not activities in which the company provides customers with the opportunity to control their own induction of needs.

*Market research tends to assume needs are fixed rather than dynamic*

The goal of most methods of market research currently in use for new product development is the identification and weighting of customer needs relative to a certain product class. Needs types can be explicitly identified through one-on-one interviews, focus groups or observations of the product in use. Or needs can be implicitly identified through factor analysis or secondary market research. Segments of customers with similar needs can be identified through cluster analysis. Similarly, the weighting of various customer needs can be achieved explicitly through direct questioning or implicitly through regressions related to preferences or conjoint analyses.

An assumption underlying all these methods is that the types and levels of customer needs are fixed and measurable during some relevant time period. In new product development, that time period is the time between the research date and the use of the data for concept generation and evaluation. A customer who identifies needs X, Y and Z as relevant and who ranks the relative importance of needs as X, Y and Z respectively, will not change his or her mind (in any significant way) over the relevant time period.

It is well known, however, that research and survey results are highly sensitive to the way in which a survey question is asked and to the context of a survey. The use of aided versus unaided questions represents a good example of how easy it is to introduce bias.

For instance, one might expect different needs to emerge from the same person at the same point in time to the following two questions:

- Do you need to clean your teeth very well?
- Do you need to clean your teeth very well so that you will never need to visit a dentist again?

It is far more likely that a need will emerge in the second case than the first case. [15]

The sensitivity of market research results to question bias suggests that the existence and importance of customer needs is fluid, and not fixed, at any given point in time. As in Heisenberg's Uncertainty Principle, we can never have certainty regarding the existence of level of a need because the instrument we use to measure that need will always introduce error into our results. To this basic uncertainty is added variability caused by the influence of external events (e.g. hot weather will cause people to have a greater need for ice), syntactical misunderstanding, effects of prior experience etc.

Market researchers using the methods mentioned above generally work hard to eliminate bias and generate representations of "true" needs and need importances. But, as we saw in the example above, by simply changing the wording of a question, we can induce a need in the mind of the respondent. Just as there is no such thing as a perfect product, there is no such thing as a true need. Rather, as we will see later, needs are induced by "cues" (such as products, social settings etc). Traditional market research takes mental snapshots of customers in order to identify the need itself -- rather than understanding the ways in which cues generate needs and change those needs over time.

*The goal of concept generation and selection is to maximize need satisfaction*

Once needs are identified, concepts are generated to satisfy those needs. The "seeds" of concept generation sessions are typically either identified customer needs or attributes of competitive/related products. Customer needs are translated into engineering attributes/product specifications using techniques such as quality function deployment. Concepts are generated to fulfill those specifications using a variety of individual and group creativity techniques. In directly translating needs into specifications and specifications into concepts, the goal of the concept generation process is to satisfy

needs as completely as possible given certain design constraints. The only needs left unsatisfied are those that were dropped due to resource constraints or lack of ability to resolve design conflicts. Unsatisfied needs form the basis for future design changes.

Concept selection techniques are most commonly based on a selection matrix that measures concepts against various criteria. The criteria are usually a mix of "success factors" and internal company needs. Success factors can come from customer needs identified through market research (e.g. "will fit in the back seat of a car") or through strategic reasoning (e.g. "has the potential to gain protection through patenting"). Internal company needs are typically financial hurdle rates.

As can be seen by the quick review presented above, the optimal satisfaction of needs is the goal of both the concept generation and evaluation processes. In neither process is consideration given to the ways in which the customer can induce needs through the purchase or use of the product. For instance, in a review of over 30 sets of criteria generated by a new product development consulting firm, no criteria were found that related to the ability of a product to induce needs. [16]

*We do not create optimally satisfying products because we tend not to fully understand need dynamics*

We have seen that the marketing approach to new product development is aimed almost exclusively at the satisfaction of customer needs. Needs are assumed to be passive, fixed and under the control of the buyer not the supplier.

Due to this lack of understanding of active need induction, many have expressed frustration with "the confounding effects of marketing mix [e.g. promotion and distribution] variables" on the results of market research and product development efforts. [31] Just as one would not want to fly in a plane that was designed by someone who did not understand "the confounding effects" of weather patterns, neither will market research, or the resulting product development efforts, be optimally useful if they are not based on a full understanding of the dynamics of need induction and their relation to satisfaction.

## **Therefore, It May Be Possible To Change The New Product Development Process Such That It Results In More Satisfying Products**

In the previous three sections we have seen that:

1. Feelings of satisfaction have the potential to override all other forces that motivate customers to buy and use products
2. The active induction of needs is a necessary precondition of satisfaction
3. Current methods of product development ignore active need induction

Therefore, by integrating need induction into the new product development process, one would expect to be able to create greater feelings of satisfaction within customers. If those feelings of satisfaction are strong enough, we could expect customers to become highly motivated to use and purchase our products -- thereby realizing higher prices, greater sales and ultimately higher levels of profitability. Evidence from the business world to support a direct linkage between need induction and enhanced profitability will be presented in the next chapter.

## Chapter Three

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### REAL WORLD NEED INDUCTION

Its interesting to note that many of the cases in which need induction was found to lead to profitable business opportunities involved what were considered marketing or business mistakes. In fact, the mechanism operating in all cases is that a firm, either through active or passive means, did not fully satisfy their customers. Yet, customers responded to this dissatisfaction by rewarding the company with enhanced profits.

The cases presented below are all related to new product development. As will be discussed in greater detail in chapter 6, it is in new product development that opportunities for the "ethical" use of need induction are most prevalent. Because the discussion will not include the many pricing, promotional and distribution techniques that are used to induce needs, it is worth mentioning a few of these techniques below:

**Premium pricing** . It is well known that many luxury items have "reverse" price elasticities. The higher the price, the more is sold. Examples include cars and jewelry. Premium pricing can also be used when it is difficult to establish the value of a product. In this case, price becomes an indicator of quality [4].

**Advertising**. To review all the examples of need induction used in advertising would require an entire paper. Most important with regard to new product development are those techniques of persuasion that are used to reweight the value of product attributes or the overall value of the product. For instance, by using the bandwagon effect, advertisers can attempt to convince customers that a product that was not originally highly valued by an individual is, in fact, highly valued by others. Michael Jordan's endorsement of Nike sneakers is a well known example ("I want to be like Mike").

**Product education**. Just as education in classical music can help a consumer of the music appreciate, and need, its "finer points", so too can education about any complex or highly refined product increase value. The many classes in wine tasting offered by vineyards are a good example.

Many of the applications of need induction in product development make use of need inducing tactics somewhat similar to pricing, promotional or distribution tactics. This section is intended to give a flavor for some of the tactics used through the presentation of a number of examples and a couple of "minicases". Materials presented in the next chapter will form the foundation for the development of a greater number of tactics. The methods to be discussed below include:

- Product Withdrawal And Reintroduction  
*Minicase: New Coke.*
- Feature Withdrawal And Reintroduction
- Quality Without Quantity  
*Minicase: Coors Beer*
- Multifunctional Products
- "Safe" Threats
- Subjective/Uncertain Features
- Summary: Need Induction In The Real World Tends To Be Related To Either Scarcity Or Stimulation

### **Product Withdrawal And Reintroduction**

The best known examples of product withdrawal and reintroduction occur in the fashion industry. Fashions can be divided into short and long cycles. We normally think of fashions in terms of one to ten years. But "styles", such as appear in architecture (e.g. Ranch, Colonial, Cape) can also be thought of as fashions.

Product withdrawal and reintroduction is also common in the direct mail catalog business. Besides seasonal variations, direct mail companies will often "cycle" through some products to keep their offerings fresh. Brookstones, in particular, is known to vary their offerings of multifunctional tools and gadgets. [68]

#### *Minicase: New Coke*

Perhaps the most interesting and best known case of product withdrawal centers around Coca Cola's efforts to introduce New Coke. In 1985, Coke replaced its 99 year old

formula with "New Coke" claiming that "the best has been made even better". After only three months, Coke realized it had made a major mistake and reintroduced Classic Coke.

The decision to replace Coke with a new formula was based primarily on a competitive threat from Pepsi. Between 1975 and 1984, Coke's market share lead over Pepsi had dropped from 6.8% to 2.9%. And between 1979 and 1984, Coke's overall market share had dropped from 23.9% to 21.7%. This loss in market share came at a time when Coke was outspending Pepsi in advertising by \$100 million, had twice as many vending machines, dominated fountain sales, had more shelf space and was competitively priced.

Much of Pepsi's success was due to the widely publicized taste test known as the "Pepsi Challenge", in which comparative taste tests showed a clear preference for Pepsi. Coke's own taste tests showed the same result. After extensive market research (over 200,000 interviews) and product reformulation, Coke discovered a formula that consistently beat Pepsi in taste tests. The results of this research indicated that Coke could boost their sales by \$200 million. After deciding that bottlers would not accept two Cokes, New Coke was released in April of 1985 -- and old Coke was withdrawn.

New Coke initially received positive market acceptance. In May, 53% of consumers said they liked New Coke. However, after extensive negative media coverage (including coverage of a class action suit by the "Old Coke Drinkers Of America"), only 30% of consumers said they liked New Coke by July. With unimpressive sales of New Coke, Coke reintroduced old coke as Coke Classic.

Most of the blame for the New Coke "mistake" was leveled at the market research. Bias was partly due to the fact that sweeter products tend to perform better in taste tests but less well in the marketplace. However, most of the bias was due to the fact that the market research did not probe the feelings and emotions that people had toward old Coke.

In many ways, however, the "mistake" was not a mistake at all. In fact, the positive results of the New Coke fiasco were dramatic:

- Every evening news show covered the story
- Coke's stock rose to its highest level in 12 years
- Within 3 months, Coke Classic was outselling New Coke by 2:1

- For the full year of 1985, operating sales rose 10% and profits rose 9% (in spite of heavy advertising expenditures related to the introduction of New Coke)
- Supermarket chains, which would have resisted adding another cola to their shelves, added Coke Classic immediately.
- The event re-energized the company and resulted in a plethora of new products (Diet Coke, Cherry Coke, etc.) which have returned Coke to a pre-eminent position in the marketplace. [9], [17]

Given their previous performance, it is not likely that Coke could have accomplished these same results without having first induced a need for Coke Classic.

### **Feature Withdrawal And Reintroduction**

It has been estimated that 25% of the cost of a new car is a direct result of the need for novelty [3]. With these enormous expenditures on the development of new product features, one might suspect that companies would be interested in realizing cost savings through the reintroduction of features that have already been developed.

In fact, this is precisely what happens in the detergent business. Periodically, detergent manufacturers refresh their products by adding a new feature and subtracting an old feature. As one marketer puts it "if a product remains unchanged too long, customers come to feel they are being taken for granted". Borax, lemon scenting, and brighteners are all examples of features that are periodically reintroduced. [21], [29]

Producers of ski equipment have also learned this lesson. From the 1960's to the present, top-of-the-line ski materials have evolved in the following sequence:

Wood --> Metal --> Wood/fiberglass --> Foam/fiberglass --> Wood/fiberglass

Similarly, top of the line plastic ski boots have evolved as follows:

Simple front entry --> Rear entry --> Front entry with many features --> Simple front entry [62]

Were product evolution to follow the common notion that "... every artifact is somewhat wanting in its function and this is what drives its evolution", we would not expect to see feature withdrawal and reintroduction. [61] Rather, the profit motive also drives the evolution of products. And it is the satisfaction produced through needs induced through feature withdrawal that drives profitability in the cases outlined above.

### **Quality Without Quantity**

The quality without quantity tactic refers to the parallel development of extremely high quality products and limited distribution. Though need induction occurs through limited distribution, the tactic will not work unless it is accompanied by a parallel ultra high quality product development strategy.[17] No one cares if a low quality product is hard to get.

Perhaps the best known applications of this strategy are related to aesthetics. Lithographs and stamps are often issued in limited quantities in order to influence value. The Daily Catch, one of the most popular seafood restaurants in Boston's North End, only seats about 24 people. The wait for a table on a cold winter night can be well over 2 hours. As we will see in the following case, the strategy can also work for larger companies.

#### *Minicase: Coors Beer*

In the 1960's and 1970's, Coors Beer experienced tremendous growth and popularity. Throughout the 1960's, it grew at an average of 10%/year. Between 1968 and 69, it experienced 19% growth and became the fourth largest producer in the country while still only distributed and produced on a regional basis. In 9 of the 11 states where it had distribution, Coors topped all other brands in sales. Of the 11 states, it averaged 30% market share -- with 41% in California and 70% in Oklahoma. Not only were sales impressive but so was the Coors image. Celebrities such as President Ford, Henry Kissinger, Clint Eastwood and Paul Newman all publicly and voluntarily endorsed Coors. 300,000 followers toured their brewery annually. In markets where Coors had no distribution, such as the East, the beer sold for 3 times its retail price.

This phenomenal success was achieved despite the fact that Coors did everything "wrong". As an example of some of its unorthodox business and marketing strategies, Coors:

- Produced only one kind of beer
- Produced all its beer in one factory and refused to build branch plants closer to its biggest market in California
- Did not change its slogan ("brewed with pure rocky mountain spring water") or its advertising for 33 years
- Avoided pasteurization -- which meant that the product had to be shipped in expensive refrigerated trucks
- Required distributors to pull cans off shelves within 30 days (to avoid fading of its flavor)
- Spent only 1/4 as much on advertising and promotion as its major competitors
- Built all its own machinery and facilities with inside staff
- Refused to go to a bank for a loan -- financing all plant expansion from cash flow

Coors success is generally viewed as a result of its ultra-high quality standards. Though the beer was low priced, its production and distribution systems were clearly superior to competitors. The single plant ensured better quality control. Hops were imported from Germany. And barley was specially bred by a Coors geneticist. [17]

But it is unlikely that ultra-high quality alone accounted for all its success. Two years after Coors began an aggressive geographical expansion in 1973, sales growth and profitability began to slow. As shown in the following table, profits and sales both began sliding in 1976 and profits continued their decline until 1978. Market share over the same period dropped from fourth to sixth (where it remains).

	1973	1974	1975	1976	1977	1978
Sales (million \$)	378	467	520	593	593	624
Profits (million \$)	47.5	41.1	59.5	76.5	67.7	54.8
Return On Sales	12%	8%	11%	11%	11%	8%

Coors problems may have been aggravated by a 15 month strike. And, it is unlikely that Coors could have continued a successful high quality low quantity tactic in the face of

the ultra high quality microbreweries that became popular in the mid 1980's. But, from 1973 to the onset of the microbreweries, Coors could probably have retained its profitability and market share with the pursuit of a slower more limited roll out plan. [17]

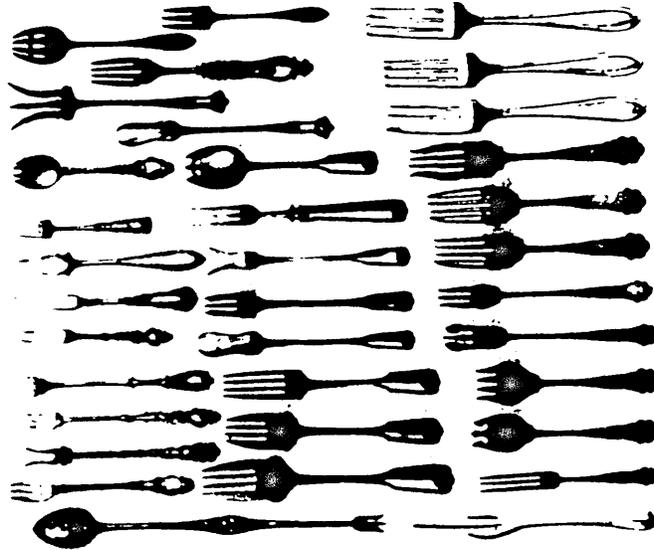
### **Multifunctional Products**

Multifunctional products provide interesting examples of need induction for two reasons. First, like feature withdrawal and reintroduction, applications can be withdrawn to induce needs and reintroduced to satisfy needs. Second, since many multifunctional product designs are based on "lowest common denominator" design compromises, they often require skill in use. That is, they challenge rather than satisfy customers.

Unlike feature withdrawal and reintroduction, a change in applications of a multifunctional product requires no change in the underlying product. Nor does the new application necessarily make use of need induction. What changes instead is the message sent to customers. But, customers can become easily confused by messages that advertise too many applications. And customers occasionally become bored with an application. So the remarketing of a product with a new application is usually accompanied by the withdrawal of a previous message.

Perhaps the best example of this phenomenon is Arm and Hammer Baking Soda. Baking Soda had traditionally been sold for use in baked goods. However, it has long been known that baking soda can be used for many other applications as well (in fact, 1000 applications have been identified [20]). With the decline of home baking, due to the entrance of women into the workforce, came a decline in baking soda sales. In a brilliant remarketing campaign, Church and Dwight (the parent company) began to promote baking soda for refrigeration deodorization. Within one year of the campaign, half the refrigerators in the US. contained a box of Arm and Hammer baking soda [21]. Velcro, faced with a similar decline in sales, developed a number of specialty products (e.g. Velcro buttons and hooks) that were used to help direct customer thinking to a specific application. [23]

The "challenge" of a multipurpose product is best illustrated through the example of tableware products. The photo below illustrates an almost absurd proliferation of highly specialized products that resulted from the "oversatisfaction" of customer needs.



[61]

The proliferation of silverware pieces can be contrasted to the everlasting simplicity of the chopstick. Part of the popularity of chopsticks is undoubtedly related to their symbolic/historic significance. However, chopsticks also present a challenge. Forks and knives satisfy our needs. Chopsticks stimulate us. Assuming a modicum of skill, chopsticks are more fun than forks and knives.

### **"Safe" Threats**

The popularity of many products can be attributed to their ability to allow the customer to be stimulated by a "dangerous" activity in a safe way. Roller coasters are an early and obvious example of this type of safe threat. Video games are also popular for this reason. Some of the most popular video games involve auto racing, fights with dangerous enemies and/or flight simulators.

Many recreational products do not make threats "safe" -- but do make threats "safer". Ropes for ice and rock climbing, flotation vests for whitewater boating, and helmets for bicycling are all examples. These products allow us to experience the arousal of dangerous activities while reducing the risk of bodily harm to an acceptable level.

## Subjective/Uncertain Features

The well known Japanese futurist and social commentator Taichi Sakaiya in The Knowledge Value Revolution has argued that we are entering an age in which subjectivity will play an increasingly important role in our value system. He cites the growth and superior margins of intangible products (e.g. services) as an example and predicts that we will be entering a high tech version of the middle ages. Futurists Daniel Bell and Alvin Toffler have made similar arguments. [22]

The recent rise of an album of Gregorian Chants to the number one position on the popular music charts may be indicative of this trend (though, it may also be a fad). A more significant indicator, though, is the diversification of many former industrial companies into services. General Electric's diversification into financial services and Harnischfegger Corporation's diversification into engineering services are two recent examples (Harnischfegger is one of the world's largest manufacturers of heavy earth moving equipment). [26], [27]

By inducing uncertainty, subjective products are very closely related to safe threats. In general, consumers can be said to value the subjective product in relation to the extent of uncertainty that the product can induce while still remaining safe. Among other means, safety can be created through credibility/reputation, word of mouth and pricing.

Examples in which the "threat" of premium pricing can be balanced by the "safety" of credibility can be clearly seen in the sales of consulting services. Consultants at "big name" consulting services typically cost \$300/hour. Consultants, with similar backgrounds, at less well known consulting firms typically from from \$50 to \$100/hour. [16] [25]. Similarly, clothing with a high perceived knowledge/subjective content can be priced much higher. A Hermes necktie sells for \$135 while a regular necktie sells for \$27 -- presumably due largely to the fact that a Hermes necktie does more to guarantee that the wearer will be fashionable than does a regular necktie. [18], [19]

### **Summary: Need Induction In The Real World Tends To Be Related To Either Scarcity Or Stimulation**

The previous examples illustrate some of the ways in which need induction can be used to create greater feelings of satisfaction within customers and greater levels of profitability for companies. As can be seen in the following summary table, the nature of need induction appears to fall into two distinct categories related to scarcity and stimulation. The dynamics behind the relationship between scarcity, stimulation and satisfaction will be fully developed in the next two chapters.

<b>Method</b>	<b>Nature of need induction</b>
Product withdrawal and reintroduction	Scarcity of product
Feature withdrawal and reintroduction	Scarcity of features
Quality without quantity	Scarcity of features
Multifunctional products	Challenge/stimulation
Safe threats	Challenge/stimulation
Subjective/uncertain attributes	Challenge/stimulation

## **Chapter Four**

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### **A MODEL OF OPTIMAL SATISFACTION**

The previous two chapters showed how a slightly improved understanding of satisfaction, particularly the role of need induction, might be applied to the development of profitable new product and new business development tactics. The following three chapters will develop a more comprehensive understanding of satisfaction based on the most recent findings of psychobiology. The objectives of each chapter are as follows:

Chapter 4 -- Develop a general model of optimal satisfaction

Chapter 5 -- Use the model to understand how products create feelings of satisfaction

Chapter 6 -- Apply the model of optimal satisfaction to the new product development process

The outline for the rest of this chapter is as follows:

- The Original Optimal Arousal Theory Of Satisfaction May Need To Be Modified
- There Is Much Evidence Supporting The Optimal Arousal Theory
- There Are Several Critical Challenges Facing The Optimal Arousal Theory
- A Working Model Of Satisfaction Must Integrate Evidence For And Against Optimal Arousal And Include Underlying Physiological Elements
- A Number Of Important General Concepts Related To Satisfaction Can Be Derived From The Model

#### **The Original Optimal Arousal Theory Of Satisfaction May Need To Be Modified**

The optimal arousal theory was briefly introduced in the discussion of theories of satisfaction in chapter 2. It will be recalled that the theory postulates a level of arousal (typically measured by brain wave activity via an EEG) at which organisms are optimally comfortable. An analogous optimal stimulation theory was also introduced. Pleasure is

created through movement towards this optimal level. According to this theory, satisfaction can be created either through comfort or pleasure or some combination of the two.

The idea of an optimal arousal level and its relation to emotion was originally developed by psychologists Berlyne, Montgomery and Hebb in the 1950's, 60's and 70's. Their theory arose largely out of the inability of drive reduction theories to adequately explain behavior related to curiosity or risk taking pursuits. In an enormous number of experiments conducted over a 30 year period, they found that, in general, both underarousal and overarousal were found to be unpleasant. At high levels of arousal, the animal feels stress or anxiety and attempts to reduce stimulation. At low levels, the animal feels restlessness and attempts to raise stimulation. At an optimal level of arousal, the animal was found to feel comfort.

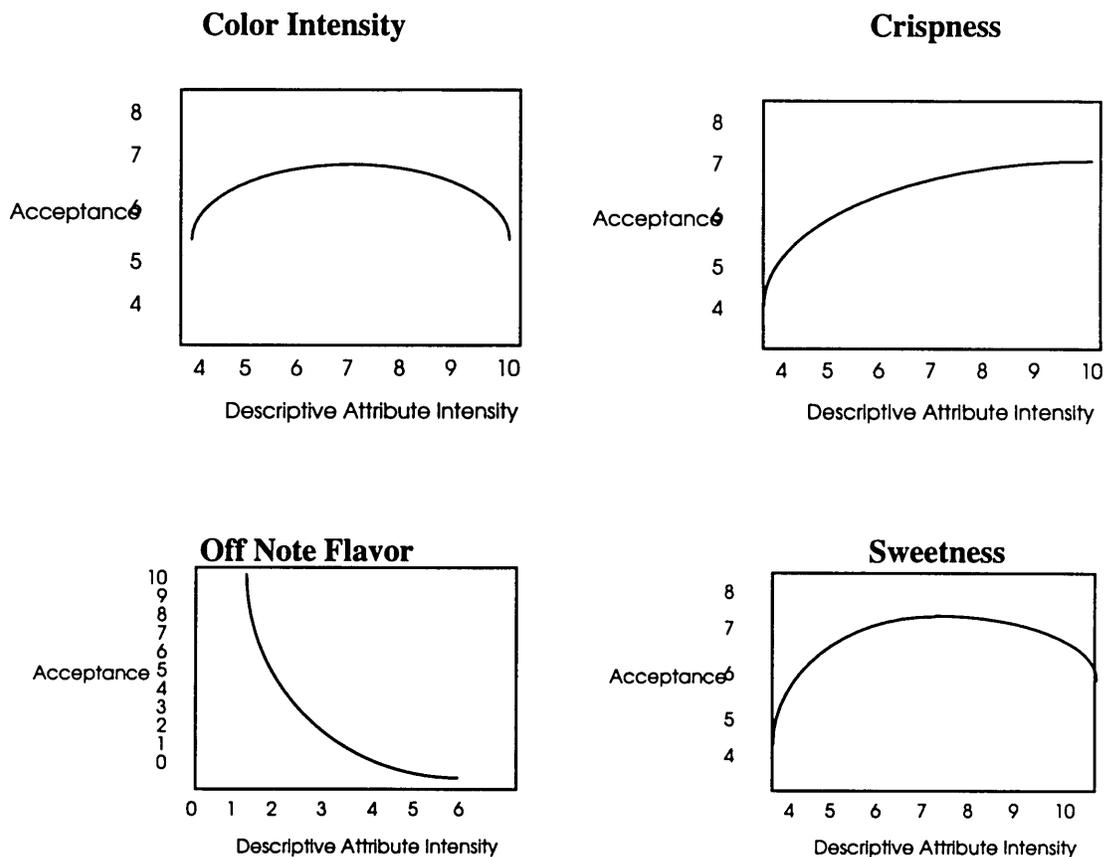
Though no acceptable substitute has been advanced, the optimal arousal theory, and similar optimal stimulation theories, have been little developed since the 1970's. Part of this lack of attention has been due to the fact that the optimal arousal theory is a "global" theory while much of the recent work in psychobiology has been focused on highly detailed studies of specific behaviors and neurological processes. [47] And part of the lack of development has come from challenges regarding its validity. Thus, the following two sections will present evidence for and against the optimal arousal theory. The objective of reviewing this evidence is the development of a working model of optimal satisfaction that can be applied to business problems.

### **There Is Much Evidence Supporting The Optimal Arousal Theory**

That tasks are best performed at specific levels of arousal has been confirmed numerous times and is little debated. [43] However, the ways in which these optimal levels of arousal are related to emotion is not quite as clear. The following are representative samples of some pieces of evidence that were found in a review of biological, psychological, aesthetic and marketing texts:

- Animals intravenously self administering a drug such as cocaine appear to regulate their drug intake. The average hourly intake of cocaine is the same despite changes in the amount of drug delivered with each infusion. [52]

- Under controlled conditions, it has been possible to predict optimal levels of arousal for both bodily and mental stimuli [48]
- The following graphs, based on actual consumer data, show that attribute intensity and acceptance are related to an optimal stimulation curve for many stimuli (color intensity, crispness and sweetness). In the case of off note flavors, it would appear that the curve is related to a "part" of the optimal arousal curve:

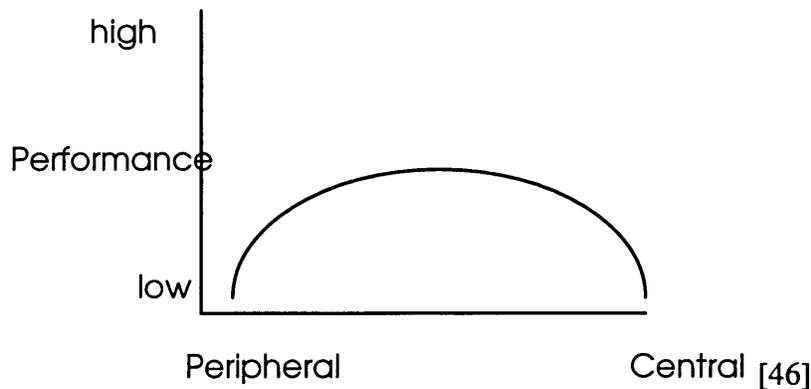


[49]

- Studies of neurophysiology show that there is an optimal strength of stimulus which produces the highest number of lever presses in animals that are self stimulating the pleasure centers of their brains. As the current is decreased, the animal slowly stops pressing the lever. As the current is increased beyond the optimal, the animal begins to exhibit aversive behavior. It is thought that the over arousal of the pleasure center is probably affecting nearby pain centers. Similarly, animals given a choice between

an "increase" lever and a "maintain" lever will increase the stimulus up to a point and then begin pressing the maintain lever [45]

- It is likely that optimal levels of arousal are related to attention . At low levels of arousal we tend to be attentive to too wide a range of stimuli. At higher levels, we overly restrict our attention -- as shown in the following diagram



- Abruptness of stimulus change has been found to be proportional to intensity of feeling (corresponding to the idea that pleasure and displeasure are related to the rate of change towards an optimal) [46]
- Subjects of sensory deprivation studies show spontaneous mental arousal (e.g. hallucinations) as well as abnormal development (e.g. when monkeys are reared without mothers) and bizarre behavior. At these extremely low levels of arousal, people and animals become restless and agitated. At excessively high levels, people experience first pain and then sensory overload. When levels are extremely high, sensory overload will lead to unconsciousness or even coma. [45]
- Under normal conditions humans prefer stimuli that elicit moderate levels of arousal over those that evoke very high or low levels. [43], [44]
- Fondness for complex stimuli is found to increase with increased familiarity. [43], [44]
- Students are found to prefer quiet study places for complex tasks and louder study areas for simple tasks. [43], [44]

- Evidence to support the "opponent process" theory of affect, as developed by Solomon and others, shows that states of positive affect are found to follow states of negative affect. The opponent-process theory postulates that the following sequence of events occurs after a stimulus is detected:
  1. peak in interest
  2. adaptation phase
  3. steady level
  4. opposite hedonic state peaks
  5. decay of opposite state

The theory postulates the existence of a homeostatic mechanism underlying behavior. The mechanism attempts to extinguish pain when pleasure is experienced and extinguish pleasure when pain is experienced. Thus, the homeostatic set point can be thought of as an optimum. [43], [44]

- Sacher and Singer found that emotion appears to be related to both the level of arousal and the "labeling" of that arousal with a positive or negative attribution. The intensity of the emotion is related to the level of arousal. The positive or negative attribution is related to the perceived cause of the emotional state and is based on cues available in the environment. These results are based on findings that success at a difficult task and failure at an easy task produce the greatest level of pleasure and displeasure respectively. [43], [44]
- The findings of gestalt psychology suggest that we are motivated at all time to organize our information from a dissonant/disorderly state (characterized by high arousal) to an orderly state (characterized by lower arousal). [43], [44]
- According to Zuckerman, in a detailed study of "sensation seekers", the optimal level of arousal does exist but it varies "depending on the pharmacological characteristics of the limbic reward system". [46]
- Studies of attention have shown a positive correlation between the ability of a person to block out stimuli and a lowering of arousal. [7]

## There Are Several Critical Challenges Facing The Optimal Arousal Theory

Despite a great deal of evidence supporting the optimal arousal theory, there have also been a number of challenges. The most important include:

- Whereas all known intense stimuli are known to create displeasure, many mild stimuli are also known to create displeasure [45]
- Different parts of the pleasure centers in the brain seem to have different sensitivities to different types of sensory stimuli (though it appears that mental stimuli have a generalized effect on arousal of all systems) [48]
- Some investigators have found that skin conductance varies in response to pictures that have different emotional affect and intensity. Arousal was related to intensity of emotion but not affect. Others have found that both heart rate and skin conductance increase more with anxiety than with happiness [48]
- In many cases there appears to be "stimulus/response specificity" (also known as "directional fractionation"). That is, rather than create a general level of arousal, different bodily systems will show different arousal levels (e.g. increased heart activity is often associated with decreased cortical activity). It should be noted, however, that in any given situation, the same pattern of a wide range of physiological responses will always occur. It is thought that perhaps a specific emotion will always show the same response pattern [48]
- Direct stimulation of the pleasure centers causes pleasure without regard to level of arousal. [7]
- Artificial induction of an aroused state does not necessarily lead to an emotional feeling or motivated behavior. Subjects report feeling "as if" they should be feeling an emotion (this finding was the basis for Sacher and Singer's "attribution" model).
- Generalized arousal levels can not explain different types of emotion -- such as joy, contentment, sorrow etc. These appear more closely linked with activation of specific parts of the brain through specific neurotransmitters. [43]

- Some stimuli are always considered pleasant and some always unpleasant -- no matter the intensity [46]

### **A Working Model Of Satisfaction Must Integrate Evidence For And Against Optimal Arousal And Include Underlying Physiological Elements**

A working model of satisfaction must address the "challenges" presented above as well as account for the various elements of the biological system it is supposed to represent. As will be seen, a more detailed understanding of the elements of the system will go a long way towards explaining the various challenges listed above.

#### *The relation of the brain to satisfaction*

The study of brain structure has uncovered separate but closely linked centers in the brain for pain and satisfaction. The three parts of the limbic system most involved in pain and satisfaction are the amygdala (amygdaloid nucleus), the septum (septum pellucidum) and the hypothalamus. More recent work has shown that a part of the hypothalamus called the ventral tegmental dopamine system has by far the largest effect on reward.[52]. The following diagram shows the location of those parts of the human brain that are most directly involved in satisfaction.

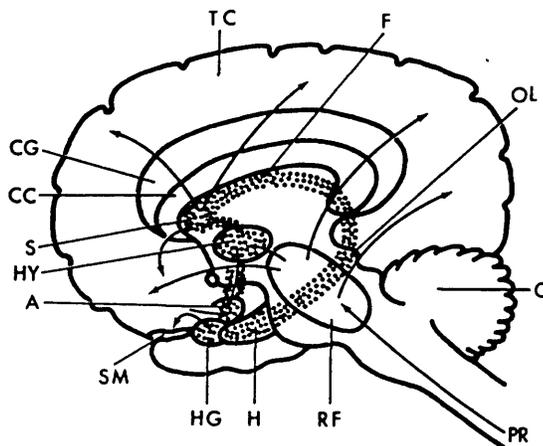


DIAGRAM 2  
Simplified section through human brain, across midline.  
A, amygdala; C, cerebellum; CC, corpus callosum; CG, cingulate gyrus; F, bundle of nerve fibers ("fornix") connecting septum with hippocampus; H, hippocampus (archicortex, id); HG, hippocampal gyrus (palaeocortex, ego); HY, hypothalamus; OL, optic lobe; PR, pathway from peripheral receptors; RF, reticular formation; S, septum pellucidum; SM, smell brain; TC, tertiary areas (neocortex, superego).  
Pleasure areas are dotted.

[45]

The satisfaction centers are composed of a primary and secondary reward system. The primary reward system seems to respond most to increases in arousal over the adaptation level. As arousal increases too much, the pain centers are activated and cause dissatisfaction. The secondary reward system comes into play when activities are undertaken to reduce this dissatisfaction i.e. to reduce stimulation levels such that arousal returns to its optimal.

The fact that all three of these regions are connected suggests that arousal of one will also affect arousal of others. It has also been found that all these satisfaction centers are connected directly or indirectly with all other parts of the brain.

### *The relation of neurochemicals to satisfaction*

The neurochemicals that are thought to have some relation to satisfaction are those that control the transmission of nerve signals to various parts of the limbic system. These chemicals are known as neurotransmitters. In addition to this "direct" effect, other neurochemicals are found to have an "indirect" effect by controlling neurotransmitters. The neurotransmitters of interest include the catecholamines (norepinephrine and dopamine), the indoleamines (serotonin) and the endogenous opiates (endorphins). Dopamine is thought to be released in the incentive process (e.g. the formation of expectations). Norepinephrine is thought to be released in the learning process [45]. Endorphins are endogenous opiates that were evolved as a mechanism to dull pain. Receptor sites for endorphins are located throughout the brain but are most dense around the satisfaction centers. Endorphins gained much publicity in the 1970's when it was discovered that much of the pleasure that comes from strenuous aerobic activity, e.g. "runner's high", was a direct result of the release of endorphins. It has been postulated that endorphins are released as a result of need satisfaction. [45]

The neurochemicals that control neurotransmitters are enzymes and hormones. The Monoamine Oxidases (MAO) are one of the more important classes of enzymes that regulate the activity of these neurotransmitters. Gonadal hormones such as testosterone are also known to have an effect. Specifically the presence of either gonadal hormones and/or MAO inhibitors is found to increase arousal levels. Not surprisingly, animals with low MAO levels are found to engage in more activity and play.

### *Sources and measurement of arousal*

Arousal is the measurement of electrical activity of various parts of the nervous system. When parts of the brain are subject to electrical activity as a result of neurotransmitter activity, brain waves are created. Large synchronous slow waves correspond to a state of low arousal. Rapid asynchronous waves correspond to a state of high arousal. The part of the brain that controls the overall coordination of electrical activity is called the reticular activating system (RAS). The most common method of measurement of the activity of the RAS is the electroencephalogram (EEG) and is achieved by connecting electrodes to various parts of the scalp.

However, the brain is not the only system that can be measured. Advances in the field of psychophysiology have created a wide variety of techniques that can be applied to the measurement of nervous system activity in virtually any bodily system. Common techniques with applications are presented below

<b>Type</b>	<b>Applications</b>
Electroencephalogram (EEG)	Nervous system disorders, biofeedback
Magnetoencephalogram (MEG)	Nervous system disorders, biofeedback
Event Related Brain Potential (ERP)	Retardation, Psychiatric disorders
Electromyography (EMG)	Biofeedback, neurological disorders, psychiatric disorders, asthma
Electrodermal Activity (EDA)	Deception detection, behavioral disorders, hypertension, migraine
Pupillary Response/Eye Movement	Neurological disorders, Attention, Ergonomics
Heart Activity (rate)	Behavioral disorders, Job design, biofeedback, circulatory disorders
Blood pressure and volume	Job design, migraine
Electrodermal	"Lie Detection"

[48]

### *Sources of stimulation, sensation and habituation*

A stimulus is anything that causes a change in the level of arousal or sensation. As previously mentioned, sources of stimulation not only include the external environment but also the "internal" environment. The sources can be broken down into three categories:

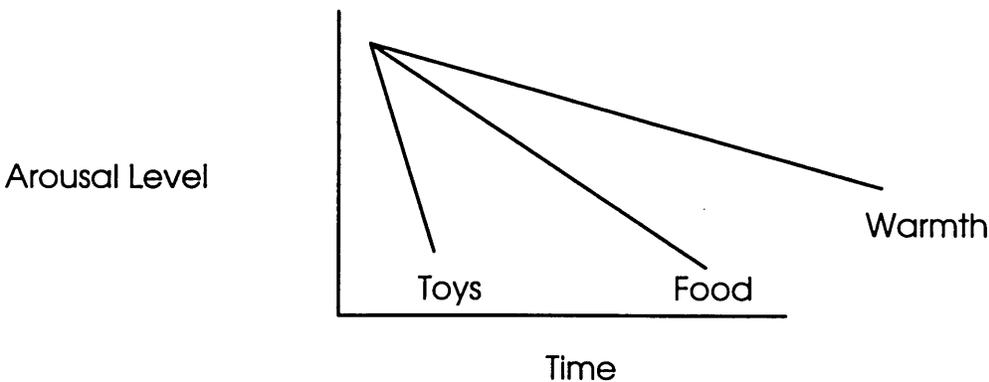
**Mental.** Resulting from mental processing (e.g. the resolution of "cognitive dissonance")

**Bodily.** Originating in the muscles (e.g. physical activity) or organs (e.g. hormones)

**Environmental.** Originating from one of the 5 senses of touch, taste, smell, vision or hearing

It is a well known fact that repeated exposure to any given stimulus will cause diminishing marginal arousal response. This effect is known as habituation or adaptation. It is habituation that gives rise to the famous law of diminishing marginal utility. Chemicals that control habituation to stimuli are located in the brain and chemicals that control adaptation are located at nerve receptors (i.e. in the skin). Thus, mental and bodily stimuli are subject to control only by habituators in the brain. The impulses from stimuli at nerve receptors are habituated twice -- once locally and once again when they reach the brain. [45]

Different stimuli can be shown to have different adaptation periods. Warmth and food, for instance, have relatively long adaptation periods (i.e. arousal drops only slowly). Toys at Christmas would seem to have a shorter adaptation period

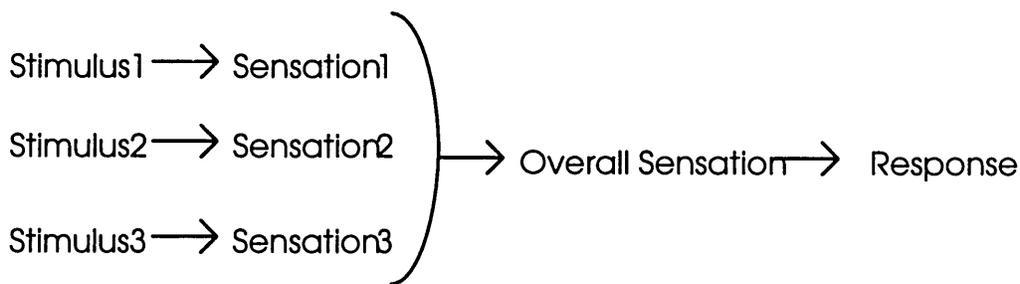


According to both behavioral and neurobiological studies of habituation, it appears that the growth and decay of arousal levels are controlled by two distinct physiological

processes. The growth of arousal in relation to a stimulus is controlled by chemicals that affect stimulus sensitivity. The decay of arousal is controlled by chemicals that affect stimulus habituation. [65]

*A working model of the structure of stimulation, sensation and arousal*

In the past, behavior was understood largely through correlations of stimulus and response. Recent work has focused more on the revealing the workings of the "black box" to understand the synergistic effects of stimuli and their resultant internal manifestations. For example, a model known as "integration psychophysics" has recently been proposed.



[67]

Since the model was developed for the food industry, "stimuli" are typically thought of as environmental or physical stimuli. But stimuli can also be understood to include mental and bodily stimuli. Thus, for instance, Coke Classic will lose to Pepsi in blind taste tests yet will typically win when the brand names are revealed. In the latter case, the symbolic stimulus of the Coke name has been included.

"Sensation" is the effect of isolated stimuli on perceptions, feelings and physiology. Sensations can be measured either subjectively through survey questions or objectively through physiological measurements (more detail on these methods will be presented in chapter 6).

"Overall sensation" refers to the synergistic effects of sensations. The measurement methods are identical to those used for isolated sensations. Overall subjective sensations are very frequently used by market researchers. Overall objective sensations are occasionally used.

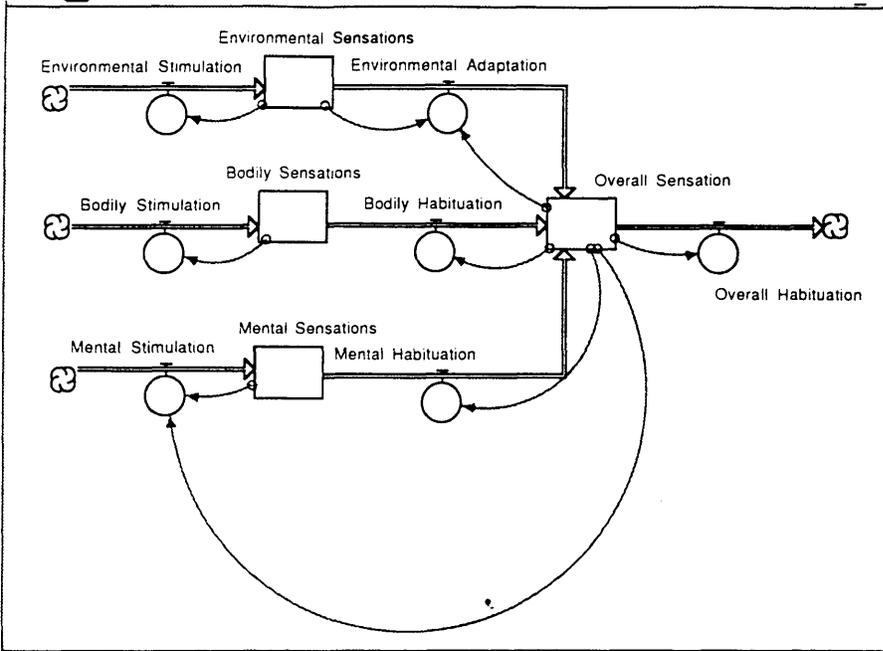
"Response" is most commonly used to refer to behavioral response or overt observable activity of the entire organism. However, we will use the term to refer to both behavioral activity and the overall activity of the central and peripheral nervous system. This treatment is justified by the fact that overt behavioral response requires increased activity of various parts of the nervous system e.g. the purchase of lemonade requires coordinated muscular activity which, in turn, requires activity of the nervous system. In relation to the simplified model of satisfaction presented earlier, response is synonymous with arousal.

As shown above, the system that controls satisfaction is extremely complex. The model presented here is a simplification of the underlying biological system -- but captures most of the important interrelationships. The model diagrammed below uses the "plumbing" symbolism common to system dynamics models. Each of the three satisfaction centers of the brain can be thought of as a "satisfaction system". Each system has different capacities for sensation and arousal and different optimal fill points. The optimal level of arousal is the point at which any change in arousal causes a "need" to emerge. Need satisfaction is the closing of the gap between optimal and current arousal levels. Need induction is the opening of the gap.

Arousal over the optimal causes the arousal center to "overflow" and, either directly or indirectly, to create the experience of pain or anxiety. Arousal below the optimal causes us to experience restlessness. The overall capacities of the systems may be genetically determined and varies from individual to individual. The optimal fill point is a moving average of past levels of arousal and is bounded by homeostatic regulatory mechanisms.

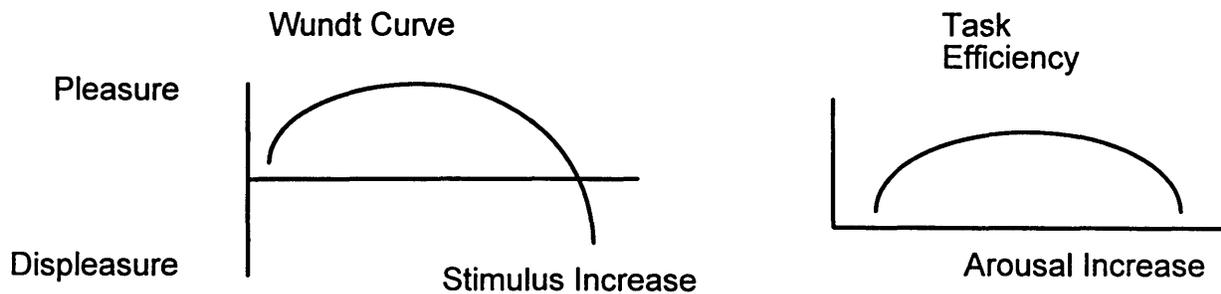
The various "buckets" in the system are filled by "stimulation pipes" and emptied by "habituation or adaptation pipes". The rate of flow of each of these pipes is determined by both the quantity of incoming stimuli and a "valve". Feedbacks based on the fill level of each bucket control the opening of the valve on the stimulation pipes and habituation pipes. For instance, when the bucket is too full, the stimulation valve is closed and the habituation valve is opened. The opening of the valve on the outgoing pipes corresponds to the action of hormones and habituation chemicals. All neurochemicals are genetically determined.

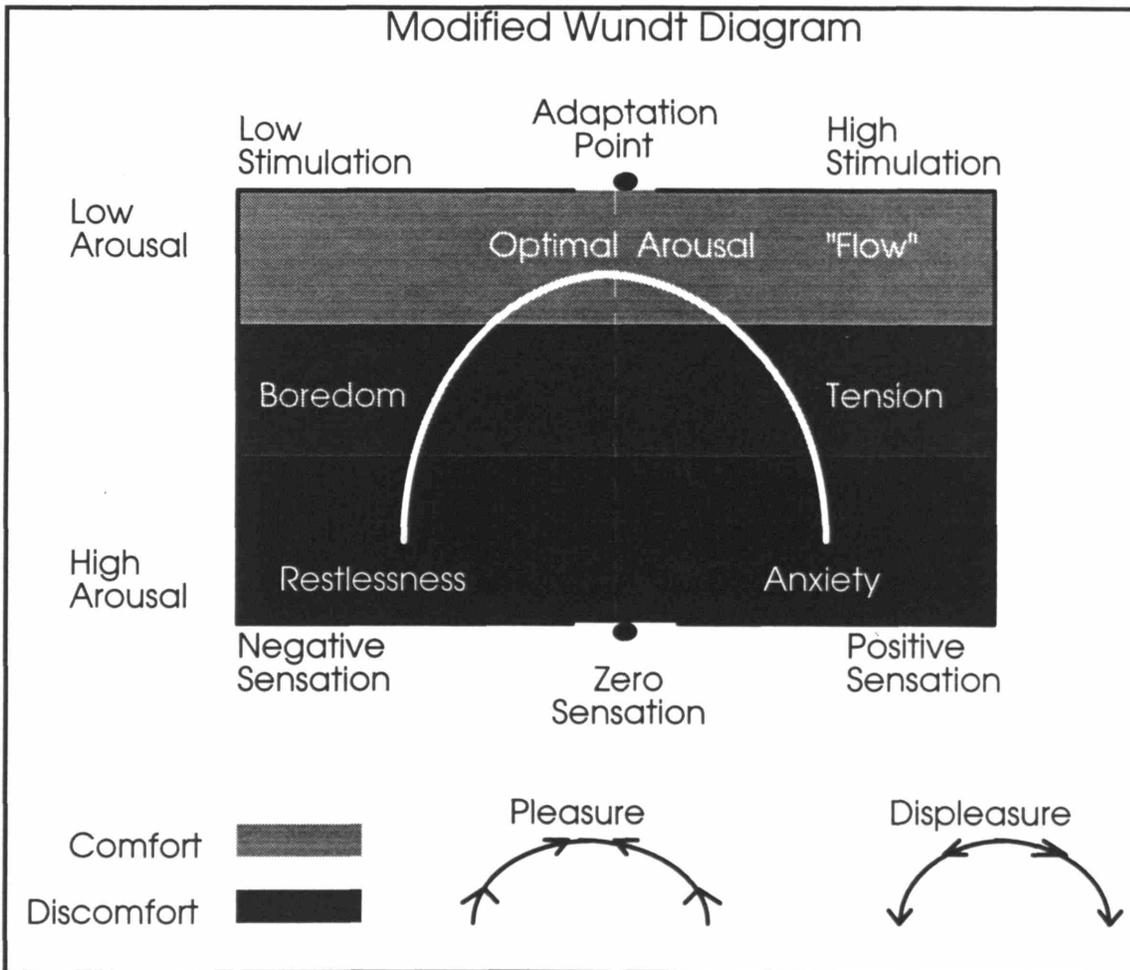
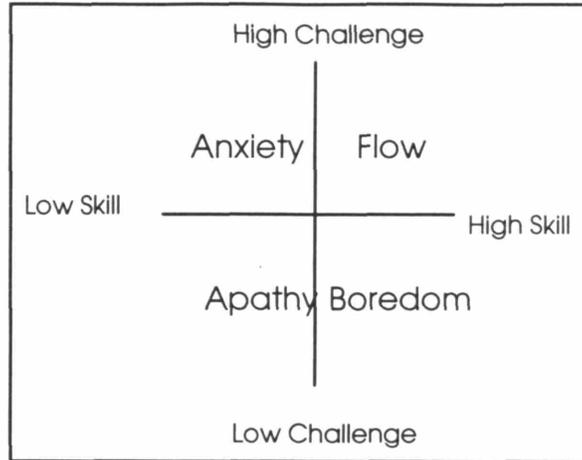
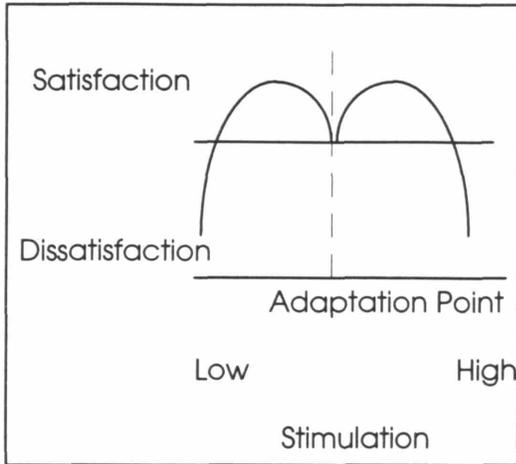
The following diagram illustrates these relationships:



*A working model of the dynamics of satisfaction*

As the reader may recall, a number of researchers have created diagrams that share a number of common elements. The diagrams have been reproduced below as a reminder. By integrating these diagrams with the satisfaction system presented above, a single chart can be created. The chart is intended to be a general representation of the dynamics that would result from the system presented above. The chart will be referred to as a "modified Wundt diagram".





*How the working model addresses evidence for and against the optimal arousal theory*

The table below shows how the models presented above address challenges to the optimal arousal theory. It should be noted that some of these concepts will be developed in more detail in following sections.

<b>Challenge</b>	<b>How Addressed</b>
Mild stimuli displeasurable	Level of optimal arousal varies. Low optimum plus movement away from optimum.
Brain areas have different sensitivities	Satisfaction systems exist for each satisfaction center in the brain
Arousal not related to affect	Pleasure/displeasure add or subtract to comfort
Stimulus response specificity	Chain of feedback loops
Direct pleasure center response always pleasurable	Direct stimulation enables a positive feedback loop to be engaged without regulation
Arousal not related to emotion type	Different satisfaction systems for different brain parts

**A Number Of Important General Concepts Related To Satisfaction Can Be Derived From The Model**

Given the proper parameters, the model presented above could be "run" to approximate various emotional states. However, the determination of those parameters is beyond the scope of this paper. The goals of the following section is to relate various dynamic patterns that would probably result from running the model.

*Though not strictly correct, for purposes of concept development, the model will be simplified by the assumption that there is a single satisfaction system in the brain*

The phenomenon of "stimulus specific arousal" can be accounted for by a model that includes multiple satisfaction systems. However, we can derive a number of important conceptual results without introducing the added complexity of multiple satisfaction

systems. Further, there is a biological basis for using this simplifying assumption in our concept development:

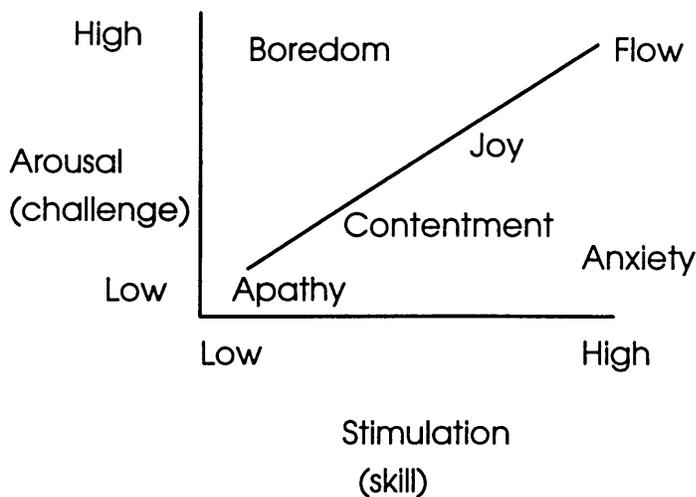
"The fact that lateral hypothalamic brain stimulation, psychomotor stimulants and opioids can all activate this system [the reward/pleasure part of the hypothalamus] is very significant for theories involving the organization of brain reward systems. These data suggest that *distinct* reinforcing events can involve *common* brain reward systems, and opens the possibility that additional reinforcers may also be capable of activating this system" [52]

Thus, we will assume that there is only one satisfaction system that includes three incoming stimulation pipes and one outflowing habituation pipe.

*Comfort is maximized at optimal arousal -- or the top of the modified Wundt curve*

When arousal is at its optimum, we are at the top of the modified wundt curve. Thus, the rate of change of comfort and/or  $da/ds$  is zero.

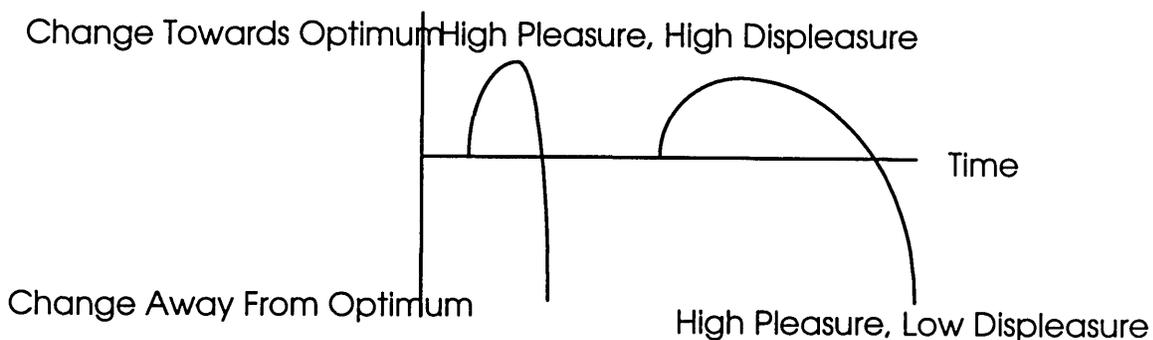
The point of optimal arousal may be seen as the "flow" line of Csizsentmihaly. A range of positive emotional states is represented by a "comfort" line that corresponds to an optimal level of arousal. Deviations from optimal, i.e. discomfort, result in either boredom or anxiety



*Pleasure is maximized with maximum rate of change towards the optimum. Displeasure is minimized with minimum rate of change away from the optimum.*

Unlike comfort, pleasure is created as one moves toward optimal arousal. Likewise, displeasure is created as one moves away from optimal arousal. The amount of pleasure and displeasure is directly related to its quantity in any given time period. Thus, the greater the rate of movement towards optimal the greater the pleasure. The greater the rate away from optimal, the greater the displeasure. This hypothesis is supported by evidence from a variety of studies that show that very slowly changing levels of stimulus can not be detected. Rapid changes over the same stimulus range are felt much more strongly. [49]

These relationships are illustrated in the diagram below



*Satisfaction at a point in time is optimized when  $da/ds$  and  $da/dt$  are both minimized*

Satisfaction is optimized when:

- The rate of change in comfort with change in arousal is as close to zero as possible
- The rate of increase of comfort towards optimal arousal is maximized ( $-da/dt$ )
- The rate of decrease of comfort away from optimal arousal is minimized ( $da/dt$ )

Expressed mathematically:

$$\text{Optimal satisfaction} = \min (da/ds) + \min (da/dt)$$

*Restlessness reducing behavior is caused by underarousal and habituation*

Due to the fact that the habituation outflows from the sensation and arousal buckets are constantly draining whereas the inflows are not guaranteed, there is a natural tendency for the buckets to empty to below the optimal. This tendency is negated by search behavior that seeks out new sources of stimulation in the form of novelty. This search can take place in any of the three stimulus domains. If, for instance, the search occurs in the brain, we might look for an appropriate sized problem ("dissonant structure") to stimulate us. If the search takes place in the marketplace, we might reach into our pockets to buy something. It is important to note that whereas arousal reducing behavior is tied to a specific source of arousal, arousal increasing behavior is not. Arousal increasing behavior is often known as exploratory behavior.

"Adaptation, habituation, and the centrifugal control of receptors all insure that in time those particular receptors send less and less impulses into the pleasure areas and a point is reached where so little activation occurs that the behavior ceases to be rewarding and the animal changes its behavior in order to stimulate some other receptors. " [45]

*Anxiety or pain reducing behavior is caused by overarousal and stimulus sensitivity*

Higher levels of stimulus sensitivity will cause the stimulation valves to open wider -- thus increasing the likelihood that satisfaction buckets will overflow. As a result, a mental and/or bodily search will take place to reduce arousal towards the optimal. The process is typically known as problem solving behavior and is exactly opposite exploratory behavior in its objectives.

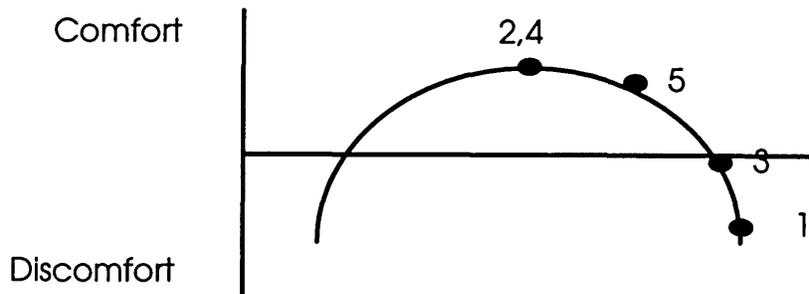
*A satisfaction system stuck at optimal arousal causes a "paradox of satisfaction" and explains the law of hedonic contrast*

The increase or decrease of a stimulus toward an optimal level of arousal gives rise to a "paradox of satisfaction". For once a person is at a peak of comfort, "there is no way to go but down". That is, while comfort can be maintained, pleasure disappears. Or, in the

words of Scitovsky "comfort crowds out pleasure" [3]. This result gives rise to the law of hedonic contrast -- discomfort must precede pleasure. In the previous two chapters, we have been referring to the active induction of this discomfort as "need induction".

*The rapid return of satisfaction systems to their optimum causes a "paradox of pleasure" -- and may be related to the pain of drug withdrawal*

The more rapid the return towards optimum, the greater the pleasure. But pleasure itself creates stimulation of the mental sensation system -- creating a positive feedback loop. Thus, a rapid change in arousal to optimum will be immediately followed by a rapid increase in arousal away from optimum.. If the increase in arousal is too great, the individual could move back into the "anxiety/pain" zone -- which may correspond to the pain of withdrawal from drugs (perhaps subsequent return/retreat cycles could be related to the cycles of the reticular activation systems (RAS)). These dynamics are shown on the modified wundt curve below:



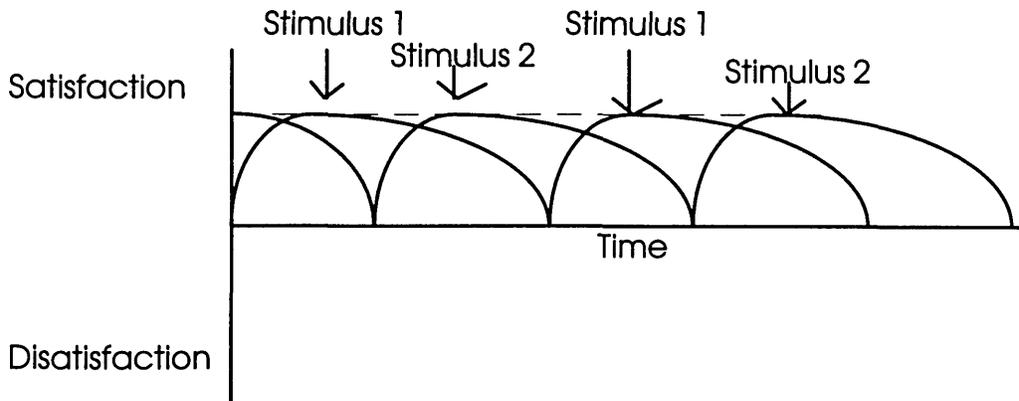
Process steps

1. Anxiety is introduced
2. Optimal arousal is restored
3. Pleasure causes arousal to increase again. If it increases too far, pain/withdrawal may occur
4. Optimal arousal is restored
5. Pleasure is created and causes arousal to increase again

*Over time, a pattern of pleasure that includes rapid need satisfaction and slow need induction in multiple satisfaction subsystems will give rise to optimal satisfaction*

The model of optimal satisfaction presented above suggests that by rapidly satisfying needs one can maximize pleasure while at the same time approach optimal comfort. However, once at the optimum, comfort crowds out pleasure. Thus, one must induce needs in order to attain a position that results in another pleasurable change in arousal towards the optimum. In order to avoid displeasure, one would want to induce needs as slowly as possible.

In most cases, habituation is the mechanism whereby needs are slowly induced. In fact, one might think of habituation as the primary constraint to pure "lever pressing" pleasure. Our bodies have developed habituation mechanisms in order to ensure that our attention is occasionally focused on issues of survival. Variation is the antidote to overhabituation. One can use variation to circumvent the constraint by alternating the sensation buckets one is satisfying over time. The resulting optimal pattern of pleasure is illustrated below:



One would expect that the more often gaps can be opened and closed in any given time period, the greater the opportunities for pleasure. If gaps are opened and closed too often, however, arousal may be raised to a level of pain that gives rise to the paradox of pleasure presented above.

Examples of empirical support for this theoretical result can be found in research from the food, recreation and fashion industries and from biological studies:

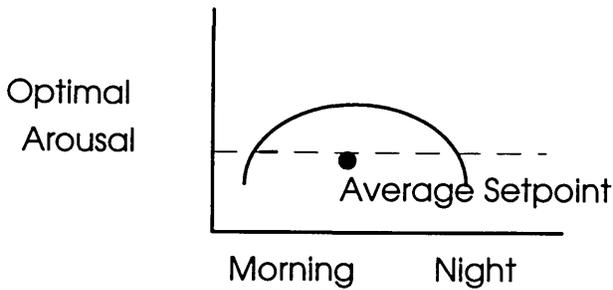
- "A related terminology is 'sensory specific satiety', a term used to emphasize that the decrease in the pleasantness of the food eaten is greater than any decrease in the rating of foods, which have not been eaten. This leads to the prediction that variety of acceptable food items results in greater food consumption than if one single type of food were available". [52]
- " Cabanac and his colleagues provided evidence that individuals ratings of pleasantness of olfactory or gustatory cues, associated with food, diminished after consumption of a sucrose or glucose solution". [52]
- Studies of self stimulation of the brain have shown that animals will show aversive behavior to constant levels of stimulation of their pleasure centers. Rather than seek constant stimulation, animals will seek varied stimulation levels (e.g. varied lever pressing rather than constant lever stimulation). [54]
- These patterns have also been used to explain thrill seeking among the wealthy. As one becomes more and more comfortable, one begins to get bored as arousal is and sensation are both reduced. In order to derive pleasure from life, one must seek out threats or danger. [3]
- The patterns of pleasure are not in the form of sine waves because it is not clear that oscillations will occur in all cases. In some cases, it would appear that optimal arousal can "die out" without oscillations. This supposition is supported by evidence on fashion life cycles. "It is probable that a true graphic representation of the fashion cycle is not a pure sine wave, but a series of partially over-lapping product life cycles". [64]

*Optimal arousal levels are probably different for different time periods*

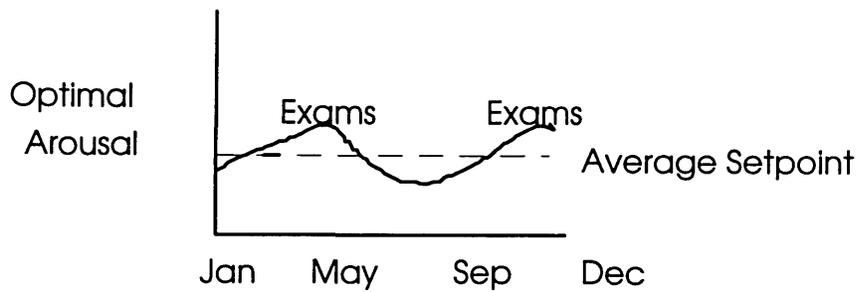
The moving average that determines optimal arousal levels is based on the butterfly diagram presented above, the "adaptive expectations" of the subjective well being researchers and evidence that shows that taste thresholds vary with change in moods, time of biorhythm, hunger and satiety. [49] The upper bounds of optimal arousal are determined by physical limits of any bodily system to absorb electrical stimuli. The lower bounds are determined by the electrical activity needed by the system to maintain itself

(at zero arousal we are dead. At zero sensation we are not). The moving average can be viewed on any time dimension. Thus, for instance, optimal arousal may vary by day, year or lifetime as follows :

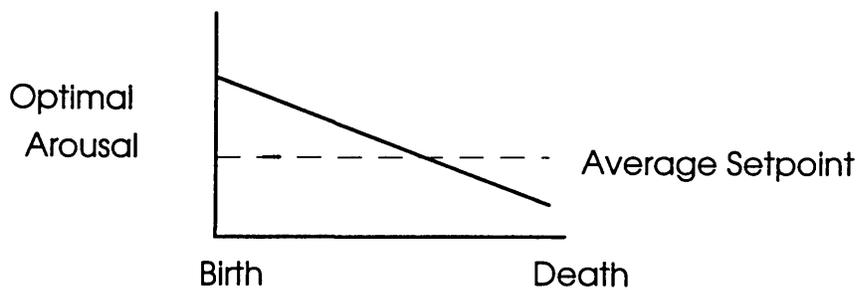
Daily changes in optimal arousal



Yearly changes in optimal arousal for a student

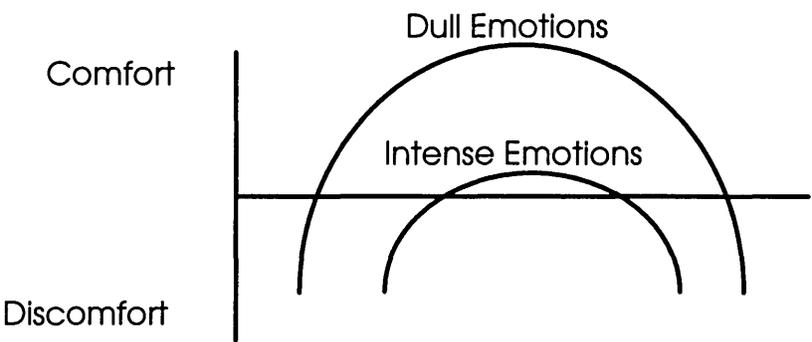


Lifetime changes in optimal arousal



*The intensity of our emotions is probably related to our level of optimal arousal.*

We have seen that optimal levels of arousal can change over time. At high levels of optimal arousal, we will feel high levels of pleasure (e.g. ecstasy) if we are moving towards the optimal. At low levels of arousal we will feel lower levels of pleasure (e.g. contentment). Similarly, at high levels of arousal, we will feel high levels of displeasure if we are moving away from optimal (e.g. extreme anger). At lower levels, we will feel less displeasure (e.g. annoyance).



*Cognitive processes can have the same effects on arousal as can overt observable behavior*

Optimal arousal, particularly as it relates to mental systems, may also vary around "artificial" constructs. Evidence of the existence of this artificial construct is particularly strong in the arts. In music, literature, painting and many other arts, the use of theme and variation is found to cause pleasure [57]. In music, one might think of the theme as the artificial creation of an optimal level of arousal that persists throughout a piece of music. The famous industrial designer Raymond Loew advocated design that was "Most Advanced Yet Acceptable" (MAYA) -- not too different from Panasonic's famous tag line "just slightly ahead of our time". Other researchers in aesthetics have suggested that pleasing designs "strive for a delicate balance between innovation in order to create interest and reassuringly identifiable elements" [61].

Cognition and behavior can both be seen as methods of achieving optimal arousal levels. Thus, when we encounter a problem, arousal rises to an uncomfortable level. Our ability to imagine a solution to the problem through cognitive activities can reduce the level of

arousal -- even if we take no observable actions to reduce the arousal. Thus, thinking can have the same effect of reducing arousal as behavior.

<b>Stimulus increasing arousal</b>	<b>Source of arousal reduction</b>
Expected problem	Probability of achieving expected solution
Actual pain	Behavior to reduce pain

*Stimuli can be classified according to the way in which they affect our arousal levels*

Stimuli that raise arousal levels will be called positive stimuli. Stimuli that lower arousal levels will be called negative stimuli. In one is on the anxiety side of the modified wundty curve, positive stimuli increase sensation whereas negative stimuli decrease sensation. If one is on the restlessness side, positive stimuli decrease sensation while negative stimuli increase sensation.

### PRODUCTS AND SATISFACTION

Having developed a general model of optimal satisfaction in the previous chapter, the goal of this chapter is to explore the specific ways in which products are related to satisfaction. The section will cover the following topics

- We Can Distinguish Three Types Of Satisfaction Created By Products
- The Satisfaction Of A Product Is Related To Optimal Arousal
- Products Can Be Classified In Relation To Their Method Of Creating Satisfaction In Purchase
- Product Attributes Can Be Classified In Relation To Their Method Of Creating Satisfaction In Use
- "Bias" Plays A Critical Role In Determining Product Satisfaction
- The Physiology Of Satisfaction Might Be Measurable
- Many Traditional Marketing And Economic Concepts Can Be Understood In Light Of The Model Of Satisfaction

The principles developed in this section will then be applied to the product development process in the next chapter.

#### **We Can Distinguish Three Types Of Satisfaction Created By Products**

The term "satisfaction" in relation to products, can refer to satisfaction over any time dimension. However, three time dimensions will be of most interest:

**Satisfaction In Purchase.** The satisfaction a customer receives from activities related to the purchase of a product.

**Satisfaction In Use.** The satisfaction a customer receives from activities related to the use of a product.

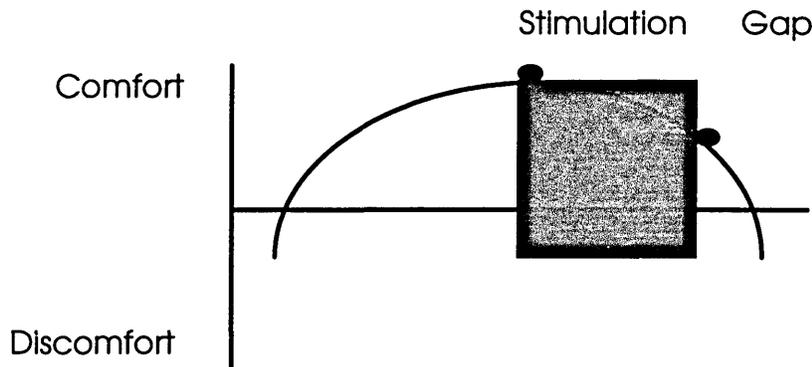
**Satisfaction In Evolution.** The satisfaction a customer receives from purchasing an evolving line of products.

Unless otherwise noted, the term satisfaction will be used to refer to all three of these time dimensions.

### **The Satisfaction Of A Product Is Related To Optimal Arousal**

*Products help customers achieve their optimal level of arousal*

Most existing products do not merely close a stimulation gap to create comfort. New products create a certain amount of uncertainty. This uncertainty results in tension and can thus be viewed as need inducing. Nevertheless, one may view products, in general, as helping customers approach optimal arousal.



*Products contribute to changing the customer's optimal level of arousal*

Products not only help customer's achieve an optimal level of arousal, but also contribute to the determination of a customer's optimal level of arousal. We have seen that optimal arousal is a moving average of arousal levels defined over any time period and bounded by underlying physical constraints. Thus, if all available products tend to move our thirst arousal to a level "3", then our optimal arousal will also tend to move towards 3. In the review of theories of satisfaction presented earlier, we saw evidence of this phenomena in the "expectation drift" of the subjective well being researchers. A similar phenomenon,

known as "goal drift" has been identified by Senge and others at the organizational learning center. [69]

Similarly, different moving averages for different time periods will all exert their own "gravitational" forces on the customer. For example, the table below illustrates that short term and long term optimal arousal or sensation product "goals" can be quite different.

<b>Time Of Day</b>	<b>Current Arousal Level</b>	<b>Moving Average Arousal</b>	<b>Yearly Average Arousal</b>	<b>Difference From Short Term Optimum</b>	<b>Difference From Long Term Optimum</b>
8	1	1	4	0	-3
9	2	1.5	4	+0.5	-2
10	3	2	4	+1	-1
11	4	3	4	+1	0
12	5	4	4	+1	+1
1	6	5	4	+1	+2
2	5	5.3	4	+0.3	+1
3	4	5	4	-1	0
4	3	4	4	-1	-1
5	2	3	4	-1	-2

*Methods of creating optimal arousal vary with customer type*

Just as customers can be segmented according to their preferences for products, so too could they be segmented according to their preferences for type of satisfaction. For instance, the exact same product can produce feelings of satisfaction in some people and not others. A book on mathematics may produce feelings of "beauty" to a mathematician and "dread" to a humanities student who is trying to fill a requirement.

This intuitive understanding is backed up by numerous experimental results. Experiments on alpha waves have shown that they may be related to temperament. For instance, people with fast alpha rhythms are characterized as quick, impulsive and variable in

behavior. Slow are characterized as cautious and steady. [46]. Additionally, the concept of "Individual Response Specificity" has been shown to be widely applicable. Individuals subject to psychophysiological testing are found to exhibit characteristic response patterns to a wide variety of stimuli. [48]. Finally, a number of studies of personality type have shown that introverts and extroverts differ in their preference for arousal. Introverts tend to have a relatively low average levels of overall arousal and a high sensitivity to stimuli. Thus, they need, and tend to seek, less arousing stimuli. Extroverts are found to have exactly the opposite characteristics and thus tend to be characterized as "sensation seekers". Zuckerman reports neurochemical bases for these distinctions. [3], [47]

*Overall sensation of a product is probably the sum of the sensations caused by each of its attributes*

The satisfaction system model presented earlier shows three sensation pipes leading into one overall sensation bucket. Thus, sensations can summed to give the overall sensation level of the product. From this observation, one can see that any given product attribute will have a "sensation contribution" (e.g. a percent of total sensation derived from that attribute). Note that the sensation contribution of each attribute is analogous to, but quite different from, the weighting of attribute values achieved in traditional multiattribute methods.

Returning to the lemonade example, we could determine the overall sensation and arousal level of lemonade with a table such as the following. For simplicity, the numbers in the table have been keyed to changes in amplitude and/or frequency of brain waves. Thus, for instance, a "5" might indicate a change in brain waves from slow synchronous alpha waves to higher frequency gamma waves. Conversely, a "-5" would

indicate a change from beta to alpha.

<b>Attribute</b>	<b>Value</b>
<b>Environmental</b>	
Sweet/sour flavor	+5
Yellow color	+1
Cold glass	+2
Lemon scent	+2
Sound of crushed ice	+1
<b>Bodily</b>	
Thirst quenching fluids	-10
Cold glass	-1
<b>Mental</b>	
Sweepstakes game on label	+3
Contains nutrasweet	-4
Certified by the NFL	-2
<b>Overall arousal</b>	<b>-3</b>

**Products Can Be Classified In Relation To Their Method Of Creating Satisfaction In Purchase**

*Arousal varies with product type*

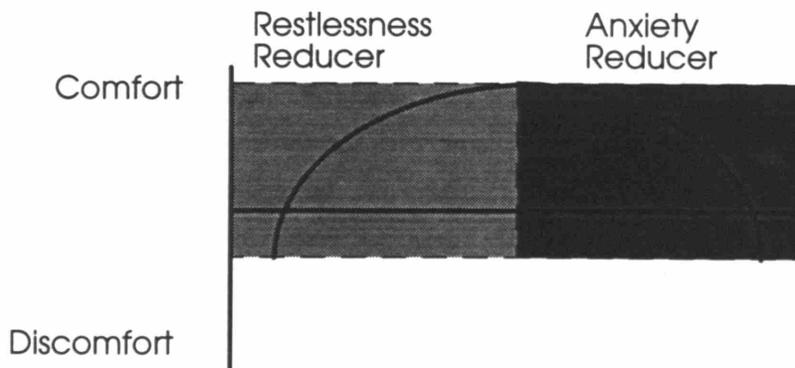
Scitovsky, citing the work of economist Sir Ralph Hawtrey at the beginning of this century, describes a categorization of products based on whether the overall arousal and sensation goal is to reduce restlessness or reduce anxiety. He calls these products

"creative products" (reduce restlessness) and "defensive products" (reduce anxiety). [3]  
He quotes Hawtrey as follows:

"It will be convenient to distinguish two broad classes of objects of consumption: on the one hand, those products which are intended to remedy pains, injuries or distresses and on the other those which are intended to supply some positive gratification or satisfaction...The same product often fulfills purposes of both kinds. Food, for example, is needed to guard against hunger, weakness, and ultimately death by starvation, but at the same time different kinds of food are designed to give the consumer positive satisfaction...it is not easy to draw the line between products which prevent pain and those which promote physical pleasure, because it is characteristic of any physical need, which causes distress while it is still unsatisfied, to cause positive physical pleasure as soon as it is in the course of being satisfied"  
[28]

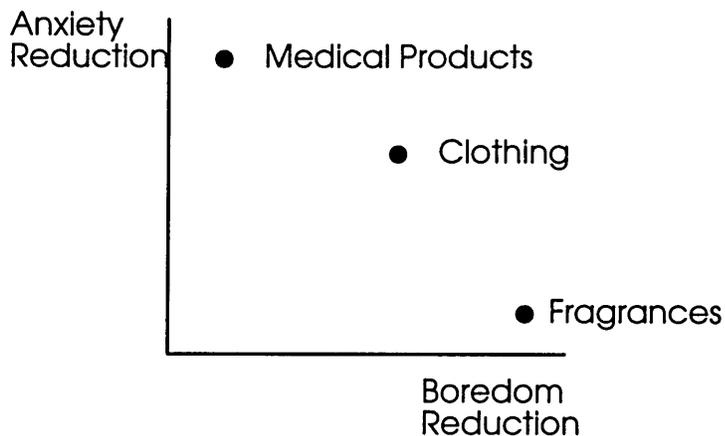
In order to maintain consistency, we will use the terms "restlessness" and "anxiety" to describe these classes of products. Products that are intended to decrease negative sensation will be called "restlessness reducers". Crossword puzzles are one example. Products that are intended to decrease positive sensation will be called "anxiety reducers" Medical products are a well known example. Even though most products are aimed at reducing boredom and tension rather than restlessness and anxiety, I use the more extreme terms in order to be all inclusive.

These relationships are mapped on the modified Wundt curve as follows:



*Products can be mapped according to their relative level of anxiety or restlessness reduction*

As we will see when we consider the dynamics of product satisfaction, at some point over the purchase or use cycle, most products will vary sequentially between restlessness reduction and anxiety reduction. In practice, there are very few pure anxiety reducers or restlessness reducers. For instance, clothing will both reduce anxiety related to warmth or privacy but will also reduce restlessness related to fashion. Nevertheless, most products will have a tendency towards either restlessness or anxiety reduction. Thus, we can map products on restlessness reduction and anxiety reduction axes as follows:



*One must be careful in mapping products based on existing classifications*

Though possible, one must be quite careful in using SIC or product codes to classify products in the restlessness or anxiety reducing axes. Within any product class, some products may be anxiety reducing and some may be restlessness reducing. For instance, stimulating novels are restlessness reducers whereas reference books typically are not. In general, though, it can be said that industrial products tend to be anxiety reducers whereas consumer products tend to be combination anxiety and restlessness reducers.

*Different product types will have different overall patterns of pleasure*

Pure restlessness reducing products will tend to have a different pattern of pleasure than a pure anxiety reducing products. Anxiety reducing products tend to create pleasure primarily through purchase and initial use. For instance, a customer may buy a floppy disk for her computer and feel a small amount of pleasure at the time of purchase. On a larger scale, she may buy a new roof for her house to stop the water from leaking. After an initial sense of relief, she would not feel much lasting pleasure from the purchase. However, in both cases, she has achieved optimal comfort.

On the other hand, restlessness reducing products tend to produce satisfaction over a longer period of use. A new pair of skis will enable a customer to feel many hours of satisfaction. Classes in ballroom dancing or fly fishing will similarly produce feelings of satisfaction over a relatively long period of time.

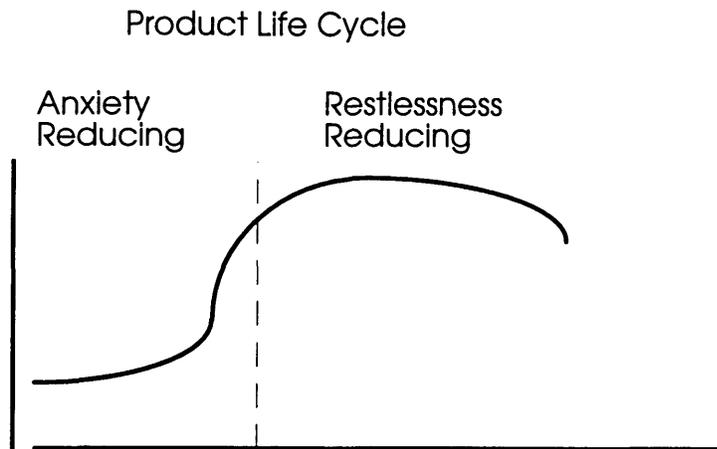
*Product type probably varies from anxiety reducing to restlessness reducing during the course of its lifecycle*

We might expect overall products types to migrate from anxiety reducing to restlessness reducing during the product life cycle. For products that become replaced with better substitutes, the migration is completely into the restlessness reduction domain. For instance, horses were first used as a means of solving transportation problems/anxieties. With the introduction of the automobile, the horse became a restlessness reducer. Woodworking with hand tools, fly fishing, knitting and many other hobbies are all examples of this migration.

Despite its obviously central role, the place of restlessness reducing products in the evolution of products is rarely understood by those who study technology evolution:

"Many of the most contemporary [silverware] patterns appear to be designed more for how the pieces look than for how they work, and this would appear to contradict every rational expectation of technological evolution".[61]

As the previous study of habituation/adaptation has shown, relief from restlessness is not only "rational" but necessary.



**Product Attributes Can Be Classified In Relation To Their Method Of Creating Satisfaction In Use**

*Like products, product attributes can be classified according to whether they add to or subtract from sensation*

The following example illustrates how some of the attributes of lemonade could be classified if we could obtain the appropriate physiological measures. These attributes can be classified according to whether they reduce positive sensations/increase stimulation (positive attributes) or reduce negative sensations/decrease stimulation (negative attributes). They can also be classified according to the source of the stimulus (bodily, environmental, mental).

	Positive attributes	Negative attributes
<b>Environmental</b>		
<b>Taste</b>	Sweet/sour flavor	
<b>Vision</b>	Yellow color	
<b>Touch</b>	Cold glass	
<b>Smell</b>	Lemon scent	
<b>Hearing</b>	Sound of crushed ice	
<b>Bodily</b>		
<b>Organs</b>		Thirst quenching fluids
		Cold glass
<b>Mental</b>		
	Sweepstakes game on label	
		Contains nutrasweet
		Certified by the NFL

The example illustrates several important points:

- Some attributes can be both positive and negative depending on the context in which they are evaluated. The cold touch of a glass of lemonade could contribute to decreasing our overaroused thermoregulatory system on a hot day -- and is thus a negative attribute. But it could also serve to stimulate our underaroused sense of touch had we been working on a computer for many hours.
- We can easily match all the negative attributes with a specific problem or need (e.g. "nutrasweet " matches "I don't want to get fat"). Matching the positive attributes with a specific need is more difficult.
- The classification of attributes into positive and negative categories depends entirely on the precise point in time at which the measurement is taken. We may not be aroused by a fear of being fat until we are reminded of that fear via the presence of the "nutrasweet cue" in the product.

*Positive and negative attributes can be mapped to engineering characteristics*

Each of the attributes presented above could be mapped to one or more underlying "engineering characteristics" of stimulation sources. Thus, for instance,

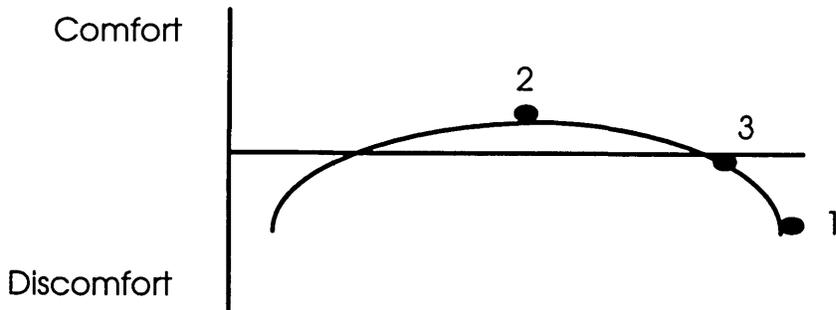
<b>Attributes</b>	<b>Engineering Characteristics</b>
Sweet/sour flavor	Lemon juice, food flavor, nutrasweet
Yellow color	Lemon juice, food color
Cold glass	Glass temperature
Lemon scent	Lemon juice
Sound of crushed ice	Ice quantity
Thirst quenching fluids	Water content, mineral content
Sweepstakes game on label	Label and print
Contains nutrasweet	Nutrasweet content
Certified by the NFL	Licensing agreement

*Product satisfaction can be classified and understood according to characteristic patterns of pleasure*

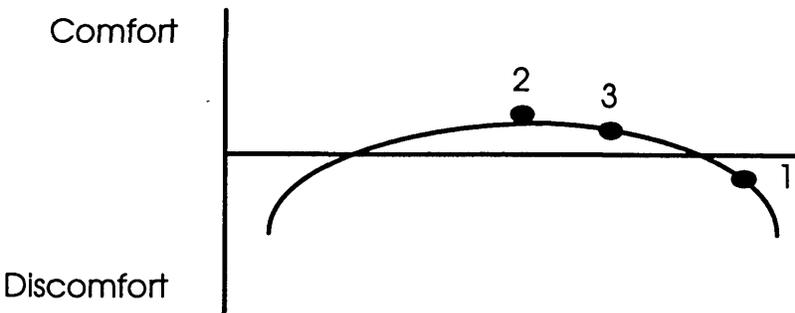
The fact that most products are both restlessness and anxiety reducers provides a basis for classifying different types of products according to the dynamics of their methods of producing satisfaction. The four examples below will be called dissonant products, self limiting products, satiation products and addictive products.

**Dissonant products** . The phenomenon of post purchase dissonance has been well documented [9]. Dissonant products are typically high involvement (i.e. high arousal or sensation) products which, after purchase, leave the customer feeling uncomfortable or dissatisfied. The phenomenon is most common with expensive durable goods such as cars or appliances. The process at work is illustrated below and essentially consists of the purchase of a product that decreases sensation over a large range towards optimal comfort (from 1 to 2). In so doing, the purchase releases pleasure which, in turn, raises sensation back to an uncomfortable level (2 to 3). In effect, dissonant products suffer from the paradox of pleasure presented in the previous chapter. A follow up letter is

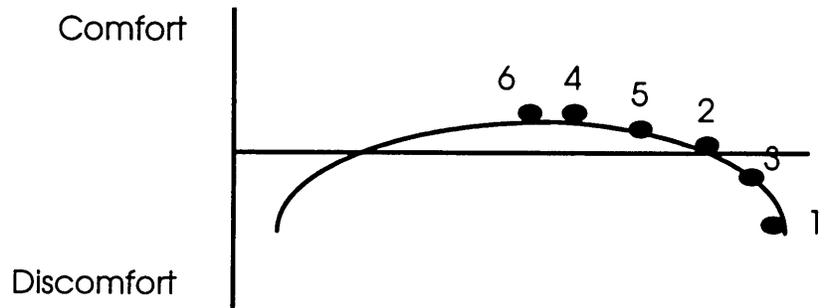
often sent after the purchase of a dissonant product in order to reduce sensation to an acceptable level.



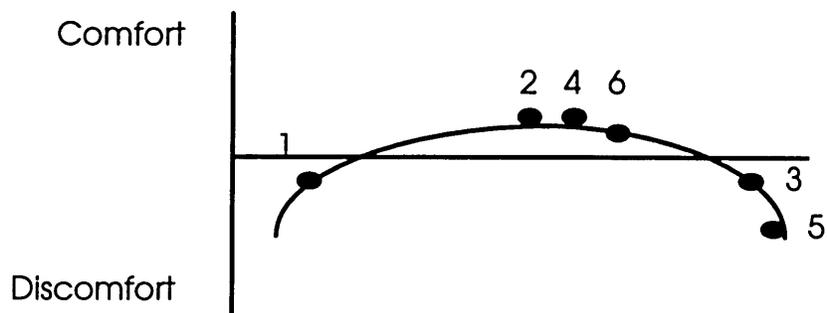
**Self Limiting Products.** Self limiting products are similar to dissonant products in that a single purchase is made (from 1 to 2). However, the "rebound" from the purchase or use of a self limiting product is not great enough to cause discomfort (from 2 to 3). Examples of self limiting products are low involvement anxiety reducers such as floppy disks.



**Satiation Products.** These are products that progressively reduce sensation levels over time. The process involves the consumption of a series of products each of which helps move the customer closer to an optimal level of comfort. The closer the customer moves to an optimal level of comfort, the less pleasure is created. These products best illustrate the phenomenon of diminishing marginal utility. An excellent example is snack food -- each potato chip both moves the customer towards a feeling of satiation and releases pleasure in its consumption.

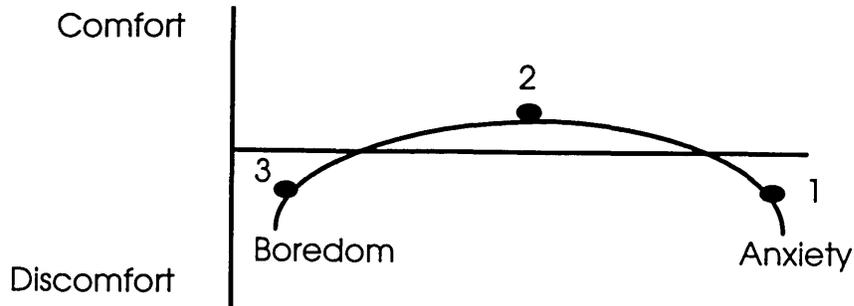


**Addictive Products.** Addictive products are characterized by the fact that pleasure in use is greater than comfort created -- due to the creation of anxiety from lack of use. Addictive products usually start out as restlessness reducers (from 1 to 2). But after a habit has been established, withdrawal causes progressively more anxiety (3 and 5). Tobacco and some recreational drugs (though not all) are thought to cause these feelings.



*Product attributes involved in satisfaction probably migrate from negative to positive over the use cycle of an anxiety reducing product*

From the brief study of habituation/adaptation, we can see how relevant product attributes will tend to migrate from negative to positive through the purchase and use cycle of an anxiety reducing product. At first, we buy an anxiety reducing product to solve some problem. If the product successfully delivers us to the top of the optimal arousal curve (from 1 to 2), we become comfortable. However, shortly after our comfort is achieved, habituation/adaptation sets in and tends to decrease our sensation (from 2 to 3). Thus we slip down the restlessness side of the curve and become needful of a restlessness reducing product or attribute.



### "Bias" Plays A Critical Role In Determining Product Satisfaction

*In the "real world" products are one of many contributors to sensation*

Just as attributes contribute to overall product arousal and sensation, so too do products contribute to overall customer arousal and sensation. Scitovsky has identified 4 classes of stimulation. I have summarized his analysis in the table below

Category	Type	Examples
Self sufficient stimulation		
	Exercise (bodily and mental)	Running alone
	Working at home	Doing laundry alone
Mutual stimulation		
	Conversation	Arguments
	Bodily	Lovemaking
	Games	Tennis
Products	Numerous	Numerous
Non-market products		
	Public (i.e. social norms)	Volunteer firefighting
	Private	Do-it-yourself activities
Externalities		
	Beneficial	Clean air
	Nuisances	Polluted air

[3]

Thus, to understand the effect of a product on overall arousal or sensation level of the customer at a given point in time, we must also take into account any of those other sources of arousal or sensation that may be present.

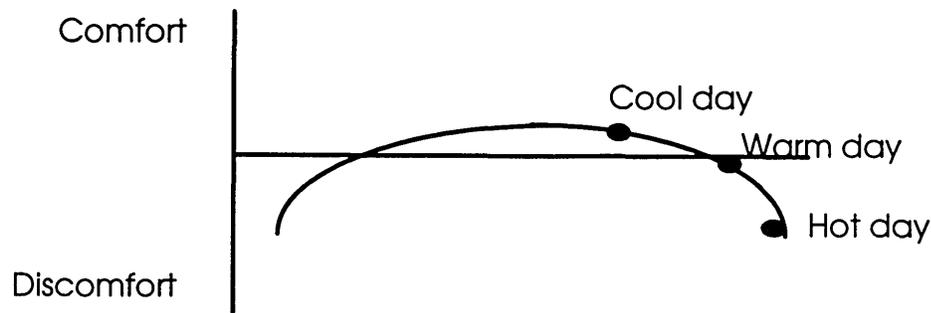
Returning once again to the lemonade example, and assuming that we are purchasing the lemonade on a hot day at a neighborhood lemonade stand, we might view the primary influences on a customer's overall arousal and sensation levels as follows:

<b>Stimulation Source</b>	<b>Ambient Arousal Values</b>	<b>Product Arousal Values</b>	<b>Overall Arousal Value</b>
Air temperature	+3		+3
Conversation with others at the stand	+2		+2
Credibility of the lemonade salesperson	+1		+1
Thirstiness	+3	-3	0
Problem at the office	+5		+5
<b>Total</b>	<b>14</b>	<b>-3</b>	<b>11</b>

Thus, without the product, the customer might be feeling anxious at an arousal level of 15. With the product, her arousal is reduced to 12 and she feels somewhat less anxious. More specifically, the arousal caused by her thirstiness is reduced completely to 0.

*Arousal levels vary with purchase and use environments*

The idea that arousal levels can vary with purchase and use environments can be easily seen in the case of lemonade. A cool lemonade on a cool day would create less change in stimulation level than a cool lemonade on a hot day. Thus, a cool lemonade on a hot day will close a bigger gap and throw off more pleasure than cool lemonade on a cool day.



### *Arousal levels vary with prior experience*

The work of Sheffield in the 1960's suggests that animals learn to induce needs (i.e. raise or lower arousal away from optimal) in response to "cues" which have been learned through prior experience. In many experiments it has been shown that food, when preceded by "cues" to their arrival, raise arousal levels. In fact, according to his work, products can be viewed as cues that induce a need. Thus, the appearance of an anxiety product will initially raise our arousal level as we recall the anxiety that it represents. Our subsequent purchase and use of the product will decrease anxiety back to optimum. [43]

Cues other than the product itself can also raise our arousal level in order to "prime" us for a purchase. Advertising is perhaps the best known example. Packaging and merchandising can serve to amplify the effects of the product cue. Research on "anchoring and adjusting" as it relates to the way in which we evaluate prices suggests that prices that seem "too high" can also induce needs through their arousing effect. [19]

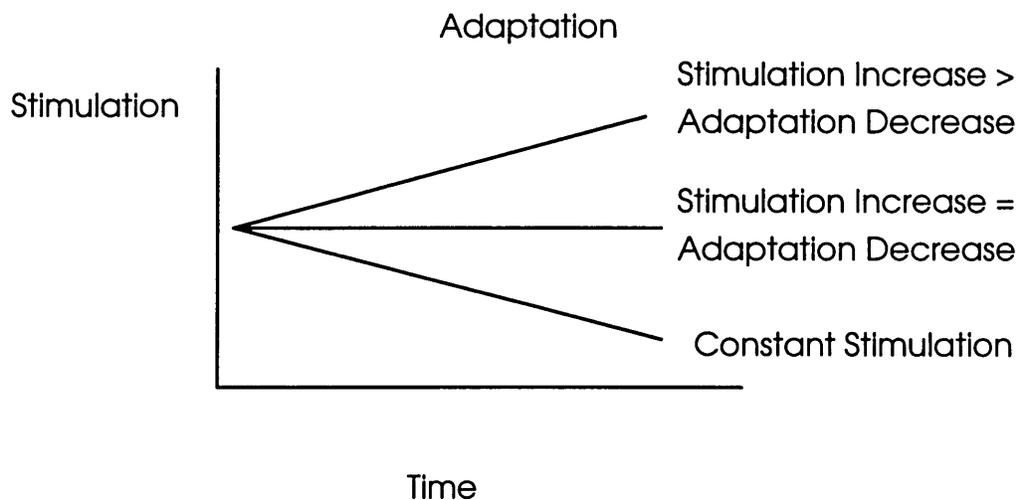
### *Arousal levels vary over time*

We can control habituation rates by controlling the extent to which a product reduces anxiety. If a product permanently reduces anxiety such that we become "comfortable", we will tend to habituate more rapidly. If the product causes us to "dip" into anxiety occasionally, we will habituate less rapidly.

Additionally, it has been shown that other attributes can either reinforce or decrease the rate of habituation. As an example of reinforcement, aspartame is found to be less sweet

after sugar has been consumed. As an example of a decrease, quinine is found to be more bitter after sucrose has been consumed. [49]

Due to the forces of habituation and adaptation, the ways in which a product arouses us must change over time. For instance, in order to maintain the same level of arousal over time, it would be necessary to increase the quantity of stimuli such that the rate of decline of arousal due to habituation/adaptation exactly equals the rate of increase of arousal due to the added stimuli. In order to increase stimulation over time, the rate of stimuli increase must exceed the rate of habituation/adaptation decrease. These relationships are shown in the diagram below



### **The Physiology Of Satisfaction Might Be Measurable**

*Evidence from the food industry illustrates the satisfaction system*

It has only recently been recognized in the food industry that attributes must be evaluated together in order to gain a good understanding of actual customer mental processing. For instance, in order to develop more orange flavor in a drink, traditional approaches would use a correlation between orange flavoring and perceived orange flavor. The more orange flavor desired, the more orange flavoring should be added. However, it was recently found that the perception of orange flavor could be much better controlled by varying the quantity of sugar rather than the quantity of orange

flavor. [66] Similarly, it has been found that the perception of the flavor of nacho cheese on Dorito Tortilla chips has more to do with the packaging that says "nacho cheese" than to the addition of nacho cheese ingredients [67]. The New Coke mistake could be viewed as another example in which the sensation caused by individual stimuli is different than the overall sensation. Thus, the measure of overall arousal may be both simpler and more relevant than multiple measurements of multiple sensations.

*A great deal of experimental evidence exists to illustrate how the arousing effects of attributes can be measured*

To demonstrate the feasibility of creating an arousal table (like that in the lemonade example), the experimentally determined arousal effects of the attributes of a number of products has been compiled from a wide variety of sources. Note that "increase" and "decrease" refer to changes in either frequency, amplitude or quantity of the various arousal metrics that are used.[48]

<b>Measure</b>	<b>Bodily Attributes</b>	<b>Arousal effect</b>
EEG	Stimulants	Increase
	Depressants	Decrease
	Gonadal hormones	Increase
	MAO inhibitors	Decrease
	Oxygen increase	Increase
	Body temperature increase	Increase
ERP	Stimulants	Increase
	Depressants	Decrease
	thyroid increase	Increase
EMG	Caffeine withdrawal	Increase
EDA	Progesterone	Decrease
	Sex (males)	Higher
	Body temp	Increase
Pupil Size	Drugs	Increase and decrease
	Ambient increase	decrease
HR	Nicotine	Increase
	Caffeine	Increase

<b>Measure</b>	<b>Environmental Attributes</b>	<b>Arousal effect</b>
HR	Stimulus deprivation	Increase
	Noise increase	Increase
EEG	Red increase over green	Increase
	High and Low Pitches	Increase
	Information complexity	Increase
	Novelty	Increase
Semantic	Low humidity	Increase
	Air speed	Increase
	Small temp increase	Decrease
	Large temp increase	Increase
Activity level	Light intensity	Increase
	Music loudness	Increase
	Noise increase	Increase
EMG	Noise increase	Increase
EDA	Noise increase	Increase
	Pleasant odors	Increase
	Novelty increase	Increase
Respiration rate	Exciting music	Increase
Pupil diameter	Pleasant flavors	Increase

[50][48]

<b>Measure</b>	<b>Mental Attributes</b>	<b>Arousal effect</b>
EMG (facial muscles)	Imagined joy	Increase
HR	Imagined joy	Increase

[52]

## Many Traditional Marketing And Economic Concepts Might Be Understood In Light Of The Model Of Satisfaction

*Value or price of a product is probably related to overall arousal for restlessness reducing products*

For those products that are pure restlessness reducers, one would expect the extent to which the product raises overall arousal toward the optimum to be highly correlated with the value or price of the product relative to the competition. This occurs because restlessness, unlike anxiety, is non-specific. When we undertake exploratory behavior, we don't know precisely what we are seeking -- except relief from restlessness.

*Value or price of a product is probably related to sensations for anxiety reducing products*

On the other hand, for those products that are pure anxiety reducers, we would expect the extent to which the product reduces sensations to be highly correlated with the value or price of the product relative to the competition. This occurs because pain or anxiety is highly specific. We know well how to express needs related to problems. We are much less capable of expressing needs related to restlessness.

*Products can also be classified according to their dominant source of stimulation*

We have seen that stimuli come from three sources. Most products stimulate us primarily through one of these sources. For example:

Stimulus Source	Examples
Environmental	Music, pillows, lighting
Bodily	Athletic equipment, pharmaceuticals
Mental	Books, software, TV

*The extent to which a product is an anxiety reducer or restlessness reducer may be related to elasticity*

Economists classify products into "luxuries" and "necessities" based on income elasticities. Necessities are products with an income elasticity of demand less than one (products whose consumption either does not rise with income or rises in lesser proportion to income). Luxuries are those products with an income elasticity of demand greater than one (whose consumption increases in proportion to income or in greater proportion to income).

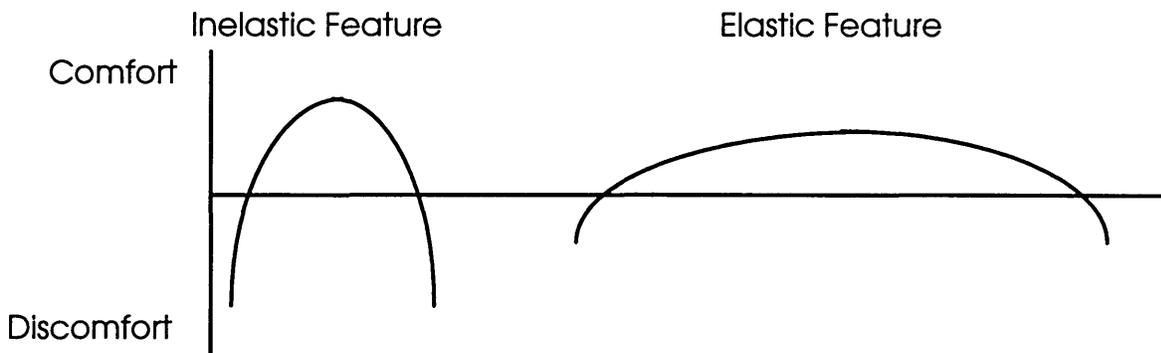
The assumption behind this classification is that the demand for necessities is satiable. Thus, after one attends to the basic problems of living (e.g. food, clothing, shelter), one can focus on the enjoyment of life. In this sense, products with an income elasticity of demand less than one would almost certainly be anxiety reducing. Those with an elasticity greater than one would tend towards restlessness reduction. [3] The following table would seem to support that hypothesis (it should be noted that the inelasticity of tobacco is related to the anxiety created by withdrawal from the product).

<b>Commodity</b>	<b>Income Elasticity</b>
Automobiles	2.5
Housing, owner occupied	1.5
Furniture	1.5
Books	1.4
Restaurant Meals	1.4
Clothing	1.00
Physicians services	0.75
Tobacco	0.64
Eggs	0.37
Margarine	-0.20
Pig Products	-0.20
Flour	-0.36

[5]

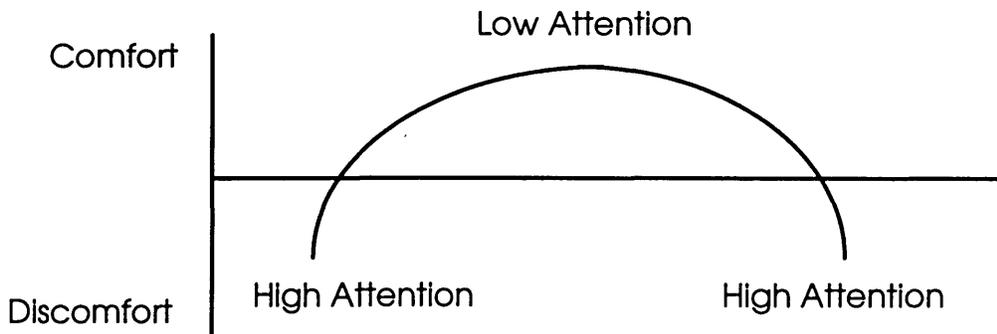
Just as the extent to which a product reduces anxiety or restlessness may be related to overall product elasticity, so too might the extent to which features reduce anxiety or restlessness be related to whether the feature is a "core" attribute or a "peripheral" attribute.

The following diagram illustrate these differences:



*The extent to which a product induces anxiety or restlessness may be related to attention*

Products that induce high levels of anxiety or restlessness (particularly anxiety) will tend to induce a high level of attention. Thus, for instance, because the high price of a house induces a high level of anxiety we tend to pay more attention to our purchase. The following diagram illustrates these relationships:



### CREATING SATISFACTION

The satisfaction development process presented below is based on the assumption that by maximizing feelings of satisfaction generated by a product, a company can maximize its sales volume and perceived value of its product. This assumption is based on evidence presented in this paper as well various models of new product dynamics developed by others:

- Evidence presented in chapter 2 suggests that satisfaction is the most powerful of the motivating forces
- Case studies from chapter 3 demonstrate that need induction can be used to create levels of profitability beyond those that would be created simply through need satisfaction.
- Models of the dynamics of new product diffusion by *word of mouth* as developed by Bass and others suggest that by optimizing the feelings of satisfaction created by purchasing a product, a company can increase the likelihood of trial. [70] According to the model, satisfied customers will tend to spread positive word of mouth. As a result, trial will increase exponentially.
- Models of learning suggest that by optimizing feelings of satisfaction created by the product in use, a company can increase the likelihood of repeat purchase. [9] After having had a satisfying experience with a product, the reward value of the product will become a "cue". The presence of the cue will cause a need to be induced. The presence of the cue will also limit the search for the satisfaction of the need to the product that has caused the need to be induced. The cue can induce needs either through distribution (e.g. the product is seen in the store) or promotion (e.g. the product is seen in an advertisement)

Because the process presented below does not yet exist, some of the suggested activities are unproven. For the most part, the suggested approaches and techniques merely await transfer from applications in psychobiology to applications in business.

### **Satisfaction Development Would Differ From Traditional New Product Development In A Number Of Ways**

Existing methods of understanding the ways in which products create feelings of satisfaction and/or value are typically based on multiattribute models. The overall concept is that the value of a product will be equivalent to the sum of the value of its underlying attributes. Similarly, the overall satisfaction of a product is assumed to derive from the extent to which each customer need is satisfied.

However, the multiattribute method has not been found useful in many cases. As will be recalled, some of these challenges include:

- Subjective assessments of customer needs and product attributes can be unreliable
- Many products, such as services and "image" products, can not be specified as distinct bundles of attributes
- Revolutionary products that satisfy latent needs can not be reasonably assessed
- The measurement of customer needs is often distorted by biases
- "Problem needs" are easy to articulate whereas "excitement needs" are not

In order to address some of these challenges, the process presented below differs from the traditional process along a number of important dimensions:

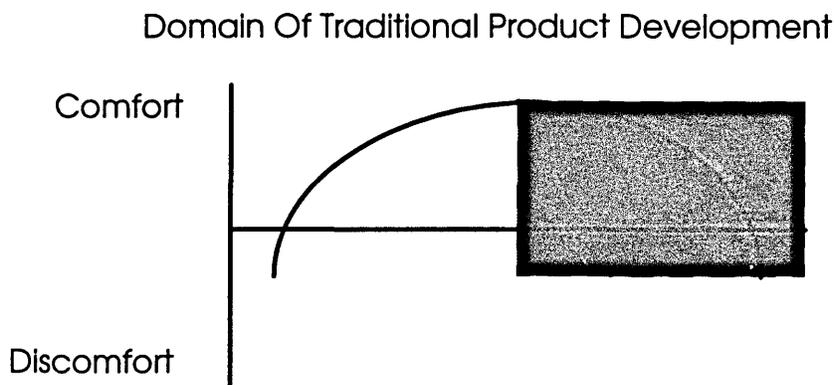
- The focus is on creating internal feelings of satisfaction. It is not on the satisfaction of needs, purchase behavior or even the development of physical products. It is not a product development process but a satisfaction development process.
- The type and relative weighting of customer needs is assumed to be fluid rather than static throughout any time dimension (i.e. purchase and use cycle, product life cycle etc.)
- Products would be viewed as need inducing as well as need satisfying over their use cycle

- The process includes restlessness reducing products and integrates restlessness reducing attributes with anxiety reducing attributes
- Traditional methods of product development tend to be focused on comfort maximization at the expense of pleasure maximization. This method seeks to optimize both comfort and pleasure.

Several of these points are self evident and/or have been explored in earlier parts of this paper. However, other points can be understood more clearly by viewing traditional methods of product development in light of the model of satisfaction developed previously.

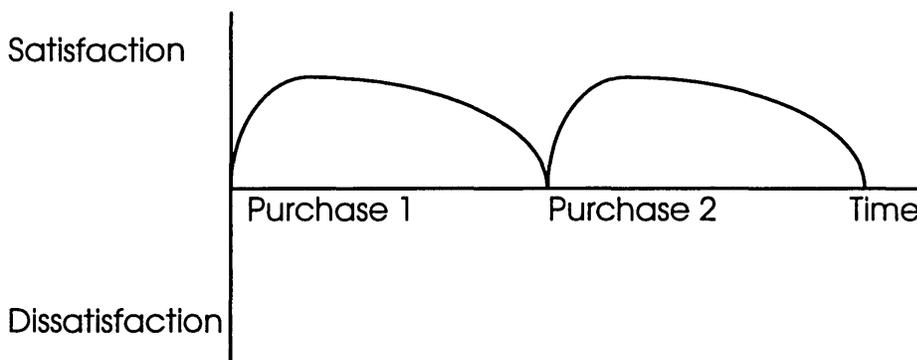
*The process includes restlessness reducing products and integrates restlessness reducing attributes with anxiety reducing attributes*

We can readily see that current methods of product development are most effective at producing anxiety reducing products. In measuring the type and magnitude of specific customer needs, traditional multiattribute methods work most effectively for the development of those aspects of a product related to the removal of anxiety. Due largely to the influence of fashion and industrial designers, the range of products on the market is not restricted to the anxiety reducing domain. Also, quality function deployment can be used to uncover "excitement needs". [73] The methods used, however, tend to focus the most attention on anxiety reduction (i.e. problem solving). We can view this range of applicability on a modified Wundt curve as follows:



*Products would be viewed as need inducing as well as need satisfying over their use cycle*

Since the reduction of anxiety or restlessness releases a certain amount of pleasure as a byproduct, traditional methods of product development do produce satisfaction. However, because the design of satisfaction in use is typically aimed at need satisfaction rather than need induction, products are not optimally satisfying. The result of this process is a product that tends to maximize satisfaction at the time of purchase rather than through use. Rather than the rich model of stimulation presented earlier, we typically end up with a pattern of pleasure such as the following:



**The Overall Satisfaction Development Process Would Be Identical To The Overall Product Development Process. The Details Would Be Entirely Different**

The general outline of a new product development process that makes use of need induction is similar to one that relies solely on need satisfaction. Both start with market research, follow up with customer segmentation and end with concept generation and development and commercialization. But the processes are quite different in the details -- as shown by the following outline of this chapter:

- Product Planning And Competitive Strategy Could Be Based On Satisfaction
- Relevant Sensation Subsystems And Overall Arousal Levels Would Be Identified And Measured Using A Combination Of Existing And New Methods
- Optimal Arousal Levels For Each Subsystem And Overall System Would Be Determined

- Successful Satisfaction Design Would Depend On Careful Attention To Mental Dynamics

## **Product Planning And Competitive Strategy Could Be Based On Satisfaction**

*Satisfaction based strategies would be related to at least four key considerations*

The term "satisfaction strategy" will refer to any product development strategy that will increase the probability that a companies' products will provide more satisfaction than the competitions' products. Though satisfaction can be thought of in any time dimension, we will most commonly refer to satisfaction in purchase, satisfaction in use and satisfaction in evolution.

Like traditional approaches, these strategies involve both offensive (e.g. product line design) and defensive (e.g. barriers to satisfaction) maneuvers. Unlike traditional approaches, the entire discussion is limited to customer feelings related to products. In actual practice, satisfaction based product strategies would have to be integrated with broader corporate strategies.

The overall factors that would probably have the greatest influence on the development of satisfaction strategies would be:

- Defining satisfaction strategies based on the product life cycle
- Defining satisfaction strategies in relation to the breadth of the product line
- Defining satisfaction strategies in relation to internal capabilities
- Creating barriers to satisfaction

*Satisfaction strategies would be strongly related to the product life cycle*

We have previously seen that a product type will tend to migrate from anxiety reducing to restlessness reducing during the course of its lifecycle. Given a traditional product lifecycle, we would, in general, seek to develop products that decrease customer arousal during the "development phase", induce needs during the "mature phase" and increase the level of a customer's optimal arousal during the "decline phase". These relationships

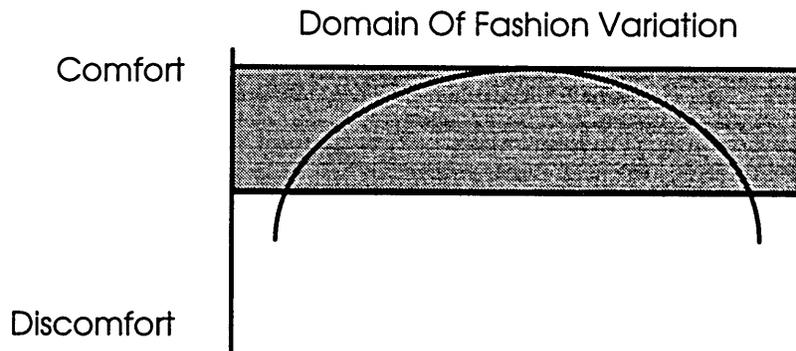
are shown in the following table. The table is based on Wasson's classic study of the product life cycle. [63]

<b>Period</b>	<b>Dominant Customer Feeling</b>	<b>Arousal Goal</b>	<b>Product [63]</b>
Gestation	Anxiety	Define optimal arousal, decrease arousal	Reduce learning, avoid defects, limited models, define themes
Market development	Anxiety and Pleasure	Define optimal arousal, decrease arousal	Modular design, architecture development, establish dominant design
Rapid Growth	Pleasure	Decrease arousal and increase pleasure	Refine core, introduce variation
Maturation	Comfort	Increase pleasure, induce needs	Increase variation, create barriers to satisfaction
Decline	Restlessness	Increase arousal and pleasure or define new optimal arousal	New architecture

The evolution of traditional anxiety reducing products yields both pleasure and comfort during the growth phases. It is in the mature and decline phases that most products begin to experience a "satisfaction crisis". In the mature phase, as design limitations are approached and core benefits are realized, comfort crowds out pleasure. In the decline phase, new methods for arousing customers must be identified.

One "solution" to this satisfaction crisis is the fashion cycle. Typically "fashion trends involve the fringe functions not the core functions or the use system". [64] The core functions follow a trend evolution. Thus, one can think of fashions as inducing needs up

to, but not over, the comfort/discomfort boundary.



Fashion cycles are most common in products in which functional tradeoffs exist. Thus, for example, nails do not experience any fashion cycles because they are primarily a single function product without any tradeoffs. Therefore, in order to induce the added satisfaction that can accompany fashion cycles, a goal of the producer of mature products can be to imbue the products with additional functions and tradeoffs -- either psychological or technical. The producer then alternates from one function to the next over time. An imaginary scenario involving the nail, and a real scenario involving laundry detergent, are illustrative:

**Technical.** Design a nail that screws into a board as it is hammered. The pitch of the threads will determine the rate of penetration. Conversely, the pitch of the threads will determine the strength with which the boards are held together. Thus, a fashion cycle could be induced between "rapid assembly" and "high strength".

**Psychological.** The image of a laundry detergents can either be "tough" (i.e. cleans well) or "gentle" (i.e. makes clothing softer). Detergent manufacturers frequently alternate between the two images

The effectiveness of fashions will vary with customer orientation towards the product and customer personality. Customers for whom need induction produces only mild effects with regard to the product, will be less likely to derive added satisfaction from the induction of a fashion cycle. Fashion cycles will also be less effective for "self reliant" or "independent" personality characteristics. For these customers, design compromises, rather than tradeoffs, should be pursued. The goal of the compromise will be the design of a "classic". Classics will typically produce less short term change in

arousal (i.e. more comfort) and more long term change. Wasson offers the following insightful analysis:

"[A classic] ... is always pleasing but never exciting...serves to the fullest the core functions [of the product]...[and appeals to]... a person who is emotionally independent and self assured and who feels little need for the reinforcement of mass emulation. Although the purchase of a classic design contains some elements of economy, such buyers generally are not in the market for low end goods. Indeed, they often tend to buy well towards the top of the price lines. They are clearly people who do not need strong stimuli, since they shun the extremes. This is a characteristic of the well informed and well educated. All of these characteristics parallel closely the description of people who are likely to be innovators in the case of functionally new offerings."  
[68]

*Satisfaction strategies would be related to the breadth of the product line*

In the previous section, it was shown that the overall types of satisfaction that products should provide will vary at different points in the product life cycle. In this section, I will briefly consider the influence of breadth of product line on satisfaction strategy.

The following table summarizes the factors that guide decisions of breadth of product line.

<b>Conditions Favoring A Broad Line</b>	<b>Conditions Favoring A Narrow Line</b>
Economies of scope across multiple brands	Blocked entry with multiple current producers
Threat of entry by newcomers	High product development costs
Distinct consumer tastes	Economies of scale in production and/or distribution

[63]

In reviewing the table, it is apparent that breadth of product line is related to the time span over which need induction could be applied. For instance, those conditions favoring a narrow product line are also favorable to the use of need induction over the

evolutionary cycle of the product (e.g. product withdrawal and reintroduction). High product development costs favor the use of previously developed products. Blocked entry implies that customers typically have no other source of product -- and thus scarcity can be induced. Economies of scale in production and distribution suggest limited variations in product features.

Those conditions favoring a broad line would be most favorable to the use of need induction over the purchase and use cycle (e.g. feature withdrawal and reintroduction). Economies of scope across brands suggests that word of mouth and the learning of cues related to the product will be most effective if the product produces high feelings of satisfaction in use.

*Satisfaction strategies would be related to internal capabilities*

Internal capabilities will influence the type of satisfaction strategy by constraining the methods of arousal variation that can be used. For instance, the chemical industry and other continuous process industries will typically be restricted to the induction and satisfaction of needs via variations in new product introductions carried out over periods of many years.

Job shops or companies employing flexible manufacturing, on the other hand, can introduce variations daily. Flexible or modular architectures will also allow companies to vary products without undue variation in underlying processes. For example, Black and Decker uses a single modular motor design for most of its power tools. Finally, as was demonstrated in the case of Baking Soda, a product line that includes multifunctional products will allow companies to vary the marketing message sent to consumers.

Types of satisfaction will also depend largely on the composition of the product development team. Engineers are typically involved most heavily with the design of negative attributes while Industrial Designers are typically involved with positive attributes. Ideally, through the use of cross functional teams, variations that lead to satisfaction in use will be well integrated. However, imbalances in the strength of either of these functions will lead to imbalances in the resulting product.

The following table summarizes the effect of internal capabilities on satisfaction strategy.

<b>Type of satisfaction</b>	<b>Internal capabilities/strengths</b>
Satisfaction in use	"Balanced" design engineering
Satisfaction in purchase	Flexible production
Satisfaction in evolution	Continuous flow manufacture

*Barriers to satisfaction could be created*

The creation of optimal feelings of satisfaction requires the sequential satisfaction and induction of customer needs. In a monopoly, producers have the ability to induce customer needs at will. And, in fact, monopoly theory suggests that supply be restricted. [4] However, in more competitive markets, competitors have the ability to satisfy those needs that a marketer is attempting to induce. Thus, in these markets, the creation of barriers to satisfaction becomes critical.

Before discussing methodology, the difference between barriers to satisfaction and barriers to entry should be clarified. Most importantly, barriers to entry usually refer to strategic barriers created to keep companies from entering industries, markets or product categories. The goal of creating barriers to entry is generally to reduce competition in order to enhance profitability. Barriers to satisfaction include all these strategies but also include the creation of barriers to induced needs.

The distinction is important because in modern market settings, the use of traditional barriers to entry as a strategic weapon is becoming increasingly difficult. The following table summarizes some of the most important generic barriers to entry and various trends that threaten their use. Note that the purpose of this table is not to question the enduring logic of the use of many barriers to entry (e.g. economies of scale in the

chemicals industry) but rather to suggest that, in many cases, their use has become more difficult.

<b>Barrier To Entry [63]</b>	<b>Threatening Trend</b>
Specific assets (assets specific to an industry)	Flexible manufacturing
	General purpose information systems
Economies of scale	Increasing market segmentation
	Mass customization [37]
	Multinational production
Excess capacity	Just in time production
Regulations	Deregulation
High exit costs	Flexible manufacturing
	General purpose information systems
Licenses and patents	Improved reverse engineering
	National variations in patent/license protection
Branding	Every day low price
	Widespread quality initiatives

In general, it will be simpler for a company to erect barriers to satisfaction in use than satisfaction in purchase or satisfaction in evolution. Thus, this brief discussion will be concerned primarily with satisfaction in purchase and evolution. A longer discussion to follow will cover barriers to satisfaction in use.

Chapter 3 illustrated several ways in which barriers to satisfaction in purchase and evolution might be achieved. In general, barriers to satisfaction in purchase and evolution can be classified as either "optimal arousal strategies" or "variation strategies".

Optimal arousal strategies have to do with the establishment of a level of optimal arousal within some relevant dimension of the customer's mind or body. Whenever a company establishes a desirable core, theme, image, brand name, standard, dominant design etc. it can employ an optimal arousal strategy. For instance, for companies with a powerful brand name (e.g. Coke), it may be possible to "stimulate" the market by inducing a "safe" threat to the brand. Thus, rather than remove the product from the market, Coke could have "threatened" Classic Coke through the introduction and heavy promotion of New

Coke. In much the same way, the sales of black telephones were found to increase when color telephones were introduced into the market. [64]. Feature introduction and withdrawal and fashion cycle strategies, require the establishment of a well established "core" product. In the case of feature withdrawal and reintroduction, the product must have a strong and distinct reputation (e.g. "All" for all water temperatures). From this core reputation, peripheral features can be varied (e.g. All with fabric softener). In the case of fashion products, the line should include several defining classic styles. The quality without quantity strategy of Coors can be used when the firm has a monopoly on a desired image -- even if not a monopoly on a desired type of product.

Variation strategies have to do with the development of unique flexibility in production or product design. Patented product architectures, such as that developed by Black and Decker, provide a protectable platform from which product variations can be uniquely created. Unique flexibility in manufacturing equipment is another possibility. For instance, Motorola has developed a system to customize the manufacture of its cellular phones such that over 2000 different combinations can be produced. The design of multifunctional products that can be marketed in a wide variety of ways is a third variation strategy. It would be dangerous to assume that the simple incorporation of flexibility into production is a variation strategy. Rather, the nature of the variation must contain some uniqueness in order to remain valuable.

### **Relevant Sensation Subsystems And Overall Arousal Levels Would Be Identified And Measured Using A Combination Of Existing And New Methods**

*Sensation measurement for bodily and environmental subsystems would be relatively straightforward through either "subjective" or "objective" methods*

The categorization of sources of stimulation provides a good overall framework within which to identify and measure relevant subsystems. Thus, we might seek to identify optimal and existing arousal levels in our senses, our bodily systems and our minds. The following table shows how, for a glass of lemonade, we might circumscribe broad ranges

of stimulation for various bodily and sensory sources of arousal using subjective descriptions.

<b>Source</b>	<b>Too Much</b>	<b>Too Little</b>
<b>Environmental</b>		
Smell	Overpowering	No smell
Taste	Too strong	No flavor
Vision	Too bright	No color
<b>Bodily</b>		
Thermoregulatory system	Too hot	Too cold
Satiety system	Too thirsty	Too full

Ranges could be refined to finer levels of detail within each of these sources. If we were to focus on taste, for instance, we might use comparison tests, hedonic scales or classification schemes to rank sweetness, sourness, bitterness etc.

The subjective assessment of environmental and, to a lesser extent, bodily satisfaction systems is already well advanced in the food, health and beauty aids and fragrance markets. Yet, as we saw in the discussion of the various transformations that occur as stimuli become converted into overall responses, subjective assessments suffer from "cognitive" bias. For instance, our assessment of sweetness may be heavily dependent on the color of the lemonade. Other sources of bias in subjective tests include the fact that human subjects are variable over time and variable among each other (e.g. sensitivities vary up to 10 times for some substances). Further, extensive training of panelists can be costly. [49]

Less well advanced are objective methods of evaluation. Objective measures are based on changes in psychophysiological measures that relate to arousal of various parts of the

body. For instance, the following table matches sources of environmental and bodily arousal with some of their relevant psychophysiological measures.

<b>Source</b>	<b>Relevant Measure [48]</b>
Vision	Pupillary Response/Eye Movement
Touch	Electromyography (EMG), Electrodermal Activity (EDA)
Muscles	Heart Activity (rate)
Cardiac system	Blood pressure and volume

Many of these measures may serve as proxies for measures of other systems. Most well known, and controversial, is the use of electrodermal data in "lie detector" tests. More reliable data can be obtained from other tests. For instance, according to a concept known as the "Cardiac Somatic Concept", changes in cardiac function always occur prior to, and during, some form of overt behavior. Thus, in assessing whether someone will reach into their pocket to pay for a product or get into a car to drive to a store, one can expect to be able to record changes in heart rate that accompany the activity. Thus, cardiac measures might serve as a good proxy for buying behavior. Of course, the use of proxies is less desirable than the use of more direct measures. [48]

*Measurement of relevant mental stimuli and sensation subsystems would be more challenging -- though not impossible given recent advances in information processing theory*

The measurement of relevant mental satisfaction systems is quite different from the measurement of relevant bodily or environmental systems. Like the bodily or environmental systems, each part of the brain has some range of arousal outside of which we become uncomfortable. For instance, if the part of our brain associated with speaking becomes underutilized (i.e. restless), we develop a need to talk with someone. If it becomes overutilized (i.e. anxious), we withdraw from conversations. However, the environment around the body contains a finite number of stimulation sources each of which could be measured independently. In the brain, the number of relevant stimulation sources is not finite. For instance, we may develop "cognitive structures" around the utilization of a foreign language, the theory of finite element analysis, the work of

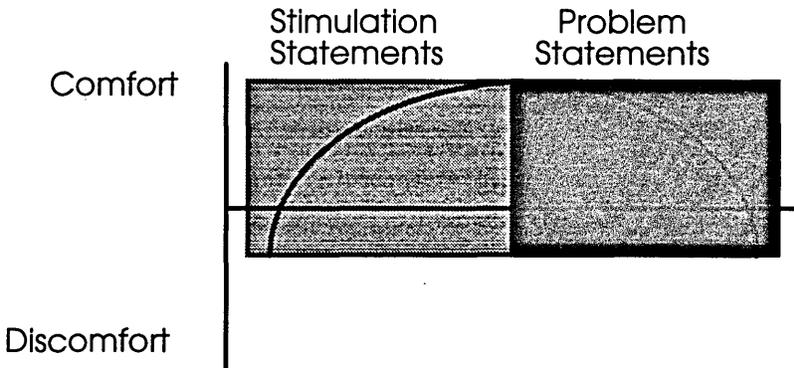
Mozart, the history of the Red Sox or an infinite number of other topics. Under or overarousal of any of these cognitive structures will cause either restlessness or anxiety.

There are at least three other challenges to the measurement of cognitive structures. First, the "stimulus" is not easily separable from the "response". By cognitive stimulus, I will be referring to dissonant cognitive structures residing in the cortex. By response, I will be referring to mental sensations and/or overall mental arousal in the limbic system. For instance, do we feel that our collection of Beatles CD's is incomplete because we know, a priori, that we lack Abbey Road? Or do we feel that our collection is incomplete only when we see Abbey Road in a CD store? Second, mental stimuli can often not be varied continuously. Unlike sugar concentration in lemonade, for instance, we can not continuously vary the amount of Abbey Road that we have in our collection. And finally, many have argued that the satisfaction we derive from rational processes may be of a different type than the satisfaction we derive from other sources. [1]

We can most easily identify relevant cognitive structures through subjective questionnaires or objective data on purchase behavior. In traditional multiattribute methods, such as quality function deployment, we seek to identify relevant cognitive structures based on a series of "problem statements" elicited from customers. As we have seen, these methods work best for anxiety reducing products and the generation of negative attributes. They do not, however, work particularly well for positive attributes or restlessness reducing products. Factor analysis and conjoint provide more useful tools for identifying relevant cognitive structures related to restlessness reducing products. However, as has been seen, neither method contributes to our understanding of the dynamics that underlie the satisfaction we derive from products. Nor do they typically take into account the influence of purchase and use environment, consumption rate, prior experience or any of the other variables known to affect arousal.

As we saw in the previous section, a combination restlessness reducing and anxiety reducing product will include both positive and negative attributes. Thus, one approach to these problems would be to add positive statements to the negative statements most commonly generated by voice of the customer research. These positive statements, perhaps called "stimulation statements" (referred to by Hauser as "Excitement Needs" [73]) would include descriptions of specific forms of stimulation/restlessness relief provided by a variety of existing products on the market. Since the reduction of anxiety creates pleasure and pleasure, in turn, causes arousal to increase, many positive attributes

will be merely reflections of problems solved (e.g. "it felt great to quench my thirst with that lemonade"). These attributes can be converted into negative attributes (e.g. "needs to quench thirst"). However, others will bear no relation to a particular problem/source of anxiety (e.g. "I really like the dinosaurs on the package"). These statements can be viewed as stimulation statements. The following diagram illustrates the domains of stimulation statements and problem statements on the modified Wundt curve:



The use of existing products to identify relevant cognitive structures, however, dramatically limits the satisfaction producing potential of products. Products have the capacity to appeal to cognitive structures seemingly unrelated to the products' intended purpose. For instance, cognitive structures relevant to the intended purpose of Rolex watches might include accuracy, toughness, waterproofness etc. However, Rolex has found that by including the cognitive structures relevant to "success" in their watches, they can dramatically improve the feelings of satisfaction created by their product. As a general rule, the more cognitive structures that can be optimized in a product, the greater will be the resulting overall satisfaction.

The objective measurement of the arousal of the brain is primarily accomplished via the EEG because of its simplicity and ease of use. Event Related Brain Potential (ERP) and Magnetoencephalograms (MEG) are two other possible measures. By positioning electrodes on various parts of the head, activity in large regions of the brain can be measured. Thus, for instance, electrodes could be positioned to measure the activity of areas of the brain where the 3 satisfaction centers are known to exist. Its important to note that, so far, simple and inexpensive methods have not been developed to measure arousal in specific locations in the brain. None of these methods have yet been widely used in market research. However, the methods have become well established in psychology and neurobiology.

Objective identification and measurement of cognitive structures could be derived either directly or indirectly. Direct measures might involve the prompting of a customer with the mention of an experience of a particular type of need (e.g. "how would you feel if you were at a baseball game on the hottest day of the summer"). The amplitude and duration of arousal levels resulting from the prompt would then be determined. Prompts could be varied along all the dimensions previously described (e.g. time, prior experience, purchase and use environment, customer type, etc.). Variations in prompts could allow a researcher to conduct factor analysis to reveal underlying cognitive structures. Because the technique could be conducted in virtually any setting, it would be relatively inexpensive and simple in application. A more accurate, but more costly, method could involve the monitoring of customers in simulated purchase and use environments (e.g. drinking lemonade on a hot day).

### **Optimal Arousal Levels For Each Subsystem And Overall System Would Be Determined**

In this section, I will discuss how levels of optimal arousal may be measured in each part of the satisfaction system at a given point in time. It is important to remember, however, that levels of optimal arousal are "charged", that they are constantly being pushed and pulled by optimal arousal levels in other subsystems and other time dimensions. The example presented in Chapter 5 of the difference between short term and long term optimal arousal gaps illustrates charges arising out of differences in time dimensions. Thus, while it is important to determine optimal arousal levels at a given point in time, it is also important to remember that the measurement may become rapidly out of date.

*Subjective and objective determination of optimal arousal levels for environmental and bodily subsystems could probably make use of existing measurement methods*

Subjective determination of optimal arousal levels for environmental and bodily satisfaction systems is relatively straightforward -- not too unlike hanging a picture on a wall. For instance, food chemists will test how food acceptance will change with changing concentrations of some ingredient. Typically, an ingredient (e.g. sugar in lemonade) will be added in increasing concentrations until a "bliss point" is reached.

Beyond the bliss point, acceptance will start to fall. The bliss point is the point of optimal arousal. Interpolation can be used to reduce the number of experiments that must be conducted in order to determine the bliss point. The same techniques can be used for the determination of optimal arousal levels in many bodily satisfaction systems. For instance, temperature of a room can be varied up or down to determine an optimal comfort level for our thermoregulatory system.

Objective physiological determination of optimal arousal levels for environmental and bodily satisfaction systems is also relatively straightforward. For instance, we can measure changes in EEG with changes in ambient air temperature. At very low levels, arousal will be high (since we are cold). As temperature increases, arousal will drop until we are comfortable. As the temperature continues to increase, arousal will once again begin to increase as we get too hot. In this case, the minimum point of arousal change corresponds to our optimal level of arousal.

*To determine optimal arousal levels for mental satisfaction subsystems, one of three approaches could be used*

The determination of optimal arousal for cognitive structures is not quite as straightforward (in fact, some have said that "you can never have enough success or money"). To determine optimal arousal levels in cognitive structures, we could use at least one of the following three approaches:

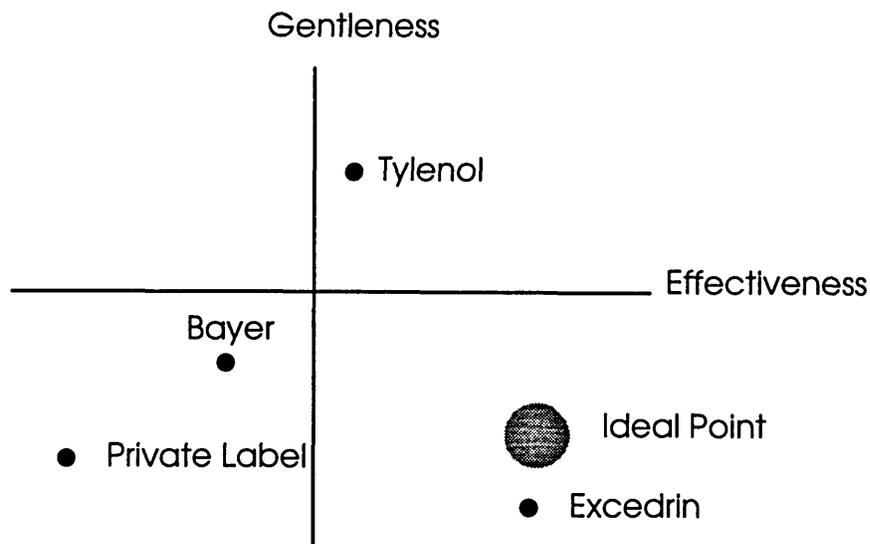
**Perceptual mapping.** The optimal level of arousal is the "ideal point" for a customer segment

**Marketing scales.** The optimal level of arousal is a point on the scale that matches a customer's ideal point on the scale

**Information processing.** The optimal level of arousal is determined by the relative information load of various stimuli

*Perceptual mapping is well proven but probably not highly accurate for determining optimal arousal levels*

Perceptual mapping is a technique for reducing the many benefits provided by a product into two or three "core" benefits. Core benefits are typically determined through factor analysis of market research results. Any given customer segment can then position its "ideal" combination of benefits on a two or three dimensional scale. Companies can plot the perceived closeness of their product to the customer ideal point (since ideal points will tend to migrate over time, they are often construed as a vector rather than a point). As shown in the following diagram, Excedrin comes closest to matching the ideal point for this particular customer segment:



Derived from a diagram in [11]

Based on my own experience, perceptual maps are most useful for low involvement and/or relatively simple products, in which the customer reduces purchasing considerations to two or three core considerations (though Urban and Hauser present evidence to the contrary [11]).

*Any of a variety of marketing scales related to information processing would probably be more accurate than perceptual mapping*

For more complex or high involvement products, a variety of marketing scales might be used. We have seen previously that scales can be based on rankings, hedonics or classifications. The point of optimal arousal using one of these scales would be determined as follows:

**Rankings.** Optimal arousal is the attribute of a product that is ranked highest for acceptance along a dimension (e.g. Country Time Lemonade is ranked highest along the "ease of use" dimension)

**Hedonics.** Optimal arousal is the attribute of a product that is most strongly liked

**Classifications.** Optimal arousal is the class of products or attributes with the highest rating

A step in the direction of finding a better measure for optimal arousal is the use of generic marketing scales. Over 100 scales have been developed to measure personality traits, values, involvement and information processing, reactions to advertising stimuli, attitudes towards the marketplace, sales management issues and job satisfaction. [24] For purposes of identifying levels of optimal arousal, the scales related to information processing and involvement are most applicable. Over 30 scales have been developed to measure involvement with a specific class of products (e.g. fashion), general involvement, purchasing involvement and information processing. These categories of scales suggest application to satisfaction measurement as follows:

<b>Type of satisfaction</b>	<b>Type of scale</b>
Overall satisfaction	Information processing
Satisfaction in evolution	Involvement with specific class of products
	Information processing
	General involvement
Satisfaction in purchase	Purchasing involvement
Satisfaction in use	General involvement
	Information processing

Any of the scales could be used in the determination of optimal arousal. But, because of its simplicity, the "Dimensions Of Emotion" Scale developed by Mehrabian and Russel serves as a good illustration. This scale measures the three emotional dimensions of pleasure, dominance and arousal. The arousal scale is determined by pairs of opposite terms that are thought to correlate with level of mental activity. In general, optimal arousal will correspond to their "low arousal". Because it is likely that those low arousal states with negative connotations (e.g. "dull") are caused by processes of displeasure while those with positive connotations (e.g. "relaxed") are caused by processes of pleasure, I have added a third column to include the presumed "pleasure component" of the emotional state. Additionally, one might want to add the word pairs "very comfortable -- very uncomfortable".

<b>High Arousal</b>	<b>Low Arousal</b>	<b>Pleasure Component</b>
Stimulated	Relaxed	Pleasure
Excited	Calm	Pleasure
Frenzied	Sluggish	Displeasure
Jittery	Dull	Displeasure
Aroused	Unaroused	?
Wide awake	Sleepy	?

The researchers suggest the use of the following lead-in statement:

"Each pair of words below describes a feeling dimension. Some of the pairs might seem unusual, but you may generally feel more one way than the other. So, for each pair, put a check mark (Example: \_\_\_\_: **X** \_\_\_\_:\_\_\_\_) to show how you feel about \_\_\_\_\_. Please take your time so as to arrive at a true characteristic description of your feeling."

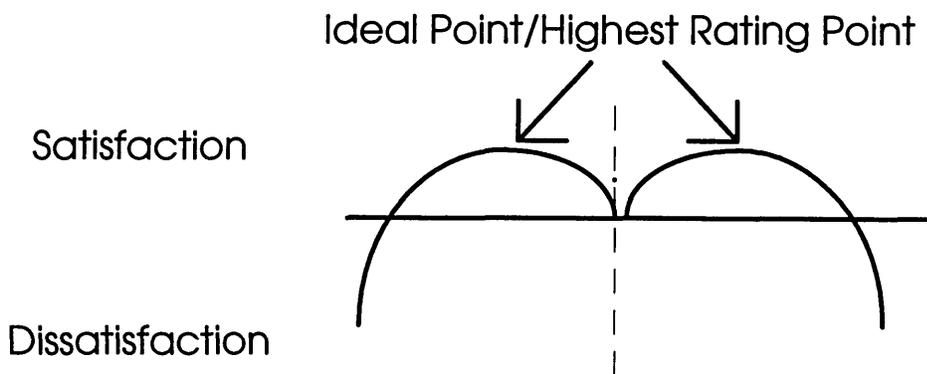
[24]

To determine optimal arousal level of some mental stimulus, a researcher would choose the stimulus type/quantity etc. that is considered most relaxing, calming, unarousing or comfortable (e.g. packaging on a lemonade container that says "certified by the NFL" vs.

packaging that says "endorsed by Madonna"). Customers could then be segmented according to their choices.

*The determination of information content and information processing capacity will probably prove to be the most useful technique for measuring optimal arousal*

The acceptance and ease of use of both perceptual maps and scales are quite high. However, because they measure the amount of positive affect, it is likely that the optimal point corresponds to one of the peaks on the butterfly diagram of McLelland --rather than a point of optimal arousal on the modified Wundt curve. That is, it is likely that these optimal points are measures of overall satisfaction rather than measures of optimal comfort. These relationships are illustrated in the following diagram.



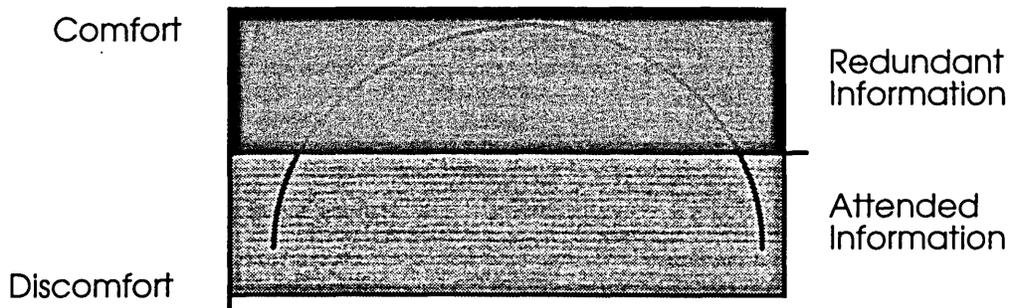
Thus, it is likely that the techniques described above will be most useful for the identification of levels of optimal arousal for those products that produce relatively low levels of pleasure (i.e. whose greatest component of satisfaction comes from comfort rather than a combination of comfort and pleasure).

Because it relies on an objective continuously variable measure, perhaps the most promising possibility for determining optimal arousal originates in theories of information processing. It has been estimated that an adult's information processing capacity is 16 bits per second. Sources of information that require more than 16 bits per second of processing capability will cause anxiety. Very low rates of information processing will cause restlessness. At some point below 16 bits per second, we reach an optimum. The fact that we tend to feel most comfortable with information content that is somewhere between highly sterile and highly novel has been demonstrated in numerous experiments

with humans and animals. As with any other optimum, this level will vary with personality type, time of day etc. Nevertheless, it would seem that by determining the information content of a stimulus we could determine its relation to the optimum. [3].

This seemingly simple measurement is complicated by the fact that the information content of the "outside world" and the content of information processed by our "inside world" are typically quite different. This difference arises out of a number of mechanisms we have evolved for reducing the information content of the outside world (i.e. to reduce "information overload"). These mechanisms include selective attention, redundancy (i.e. use of memories rather than external stimuli) and the use of general concepts (e.g. the general concept of a "car" reduces the need to process information related to "Hondas", "seat belts", "drive in movies" and everything else we relate to cars).

The field of information processing as it relates to consumer behavior is still young. While the use of precise methods to determine optimal arousal levels from information content awaits further development, we can use information content to point us in the proper direction. For instance, it has been found that attention is related to the extent to which we find information "uncertain", "threatening" or "anxiety provoking". Conversely information that is redundant is found to be "boring". [3] Thus, we might develop a framework in which we vary the redundant and attended content of information, in order to arrive at the optimum for a given person, time and place.



### **Successful Satisfaction Design Would Depend On Careful Attention To Mental Dynamics**

According to the model developed in the previous chapter, the extent to which a product creates satisfaction will be a result of the following factors:

- The extent to which a product influences a customer's optimal level of arousal as determined for a variety of time dimensions (e.g. by the minute, day, week, lifetime etc.).
- The difference between the customer's existing level of arousal and their optimal level of arousal in any given time dimension. The greater the gap, the greater the opportunity.
- The extent to which the product helps customers close the gap between optimal and current arousal. The more, the better.
- The rate at which the product closes the gap (i.e. needs are satisfied). Faster is better.
- The rate at which gaps are opened (i.e. needs are induced). Slower is better.
- The number of times that gaps are opened and closed during any time period. Higher is generally better.

The number of ways that levels of optimal arousal and pleasurable variations can be created is as infinite as the number of ways that a musical score can create pleasurable variations around a theme. Thus, in this section, I will provide several ideas that are intended to stimulate designers seeking to incorporate greater satisfaction into their products. The concepts are suggestive not prescriptive.

*After segmenting customers, products could be designed to close a stimulation gap*

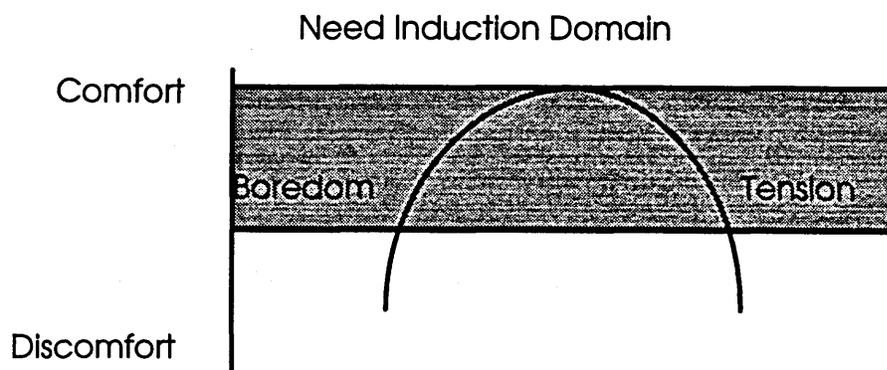
The gap between optimal and existing levels of arousal provides a framework around which all other design considerations can be developed. Closing the gap is a strength of existing products and product development methodologies. Attention to the way in which the gap is closed and reopened differentiates the design process suggested here from more traditional design processes.

In thinking about the way the gap is closed, it can be useful to think of a relay race. Comfort is determined by the speed with which the team runs the race. Pleasure is related to the rate x time of all the acceleration and deceleration that occurs. Satisfaction is the average speed of the team plus all their accelerating. A team with 10 people may run the race at the same average speed as a team with 2 people. But the team with 10 people will experience more acceleration and deceleration -- and thus more satisfaction.

For restlessness reducing products, the goal is to rapidly add to, and slowly decrease from, optimal arousal. For anxiety reducing products, the goal is to rapidly reduce, and then slowly add to, customer arousal.

*Needs should be induced in the comfort zone between boredom and tension -- unless counterbalancing sources of pleasure can be created*

If needs are induced beyond the levels of boredom and tension, the discomfort experienced by customers would subtract from the overall sensation of satisfaction. This would generally be considered problematic. However, if pleasure can be created by the satisfaction of needs in some other satisfaction subsystem such that pleasure counterbalances discomfort, needs might be induced beyond boredom or tension.



*Many methods could be used to induce needs or raise arousal*

We know that need induction is as necessary for creating feelings of satisfaction as need satisfaction. Fortunately there are as many, or more, ways to induce needs as to satisfy them. The following is a short list. Chapter 3 provides additional examples.

**Add information content well above or below optimum.** Complex objects that create information overload will induce anxiety.

**Take advantage of the halo effect.** Bundling the product with a large purchase (e.g. a car) will tend to make the marginal expenditure seem smaller. A need is induced by the arousal raised through the purchase of the expensive product. [19]

**Create sunk costs.** Sunk costs cause customers to feel that they have not reached their optimal point until a product has paid for itself. Thus products could be designed such that their use requires a large initial investment (many buyers evaluate sunk costs in their future purchase decisions -- despite finance theory). [19]

**Find new anxiety or restlessness needs to tie to the product.** One of the most common unmet needs is the "ego need" -- catered to by prestige products. Similarly, prestige products can be used to induce anxiety about the quality of lower priced products. A good example is car wax -- higher priced car waxes claim to do less damage to a car than lower priced car waxes. [19]

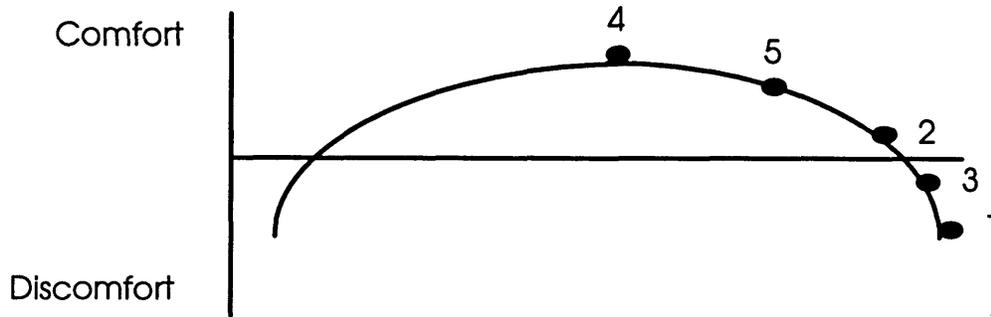
**Look to lead users** -- Lead users are those with highest anxiety/restlessness. Their environments are full of cues that could be applied to nonlead users.

**Disturb emotional equilibrium** -- General classes of emotional disturbance are; physical (doesn't feel good), mental (doesn't make sense) and cultural (doesn't fit norms)

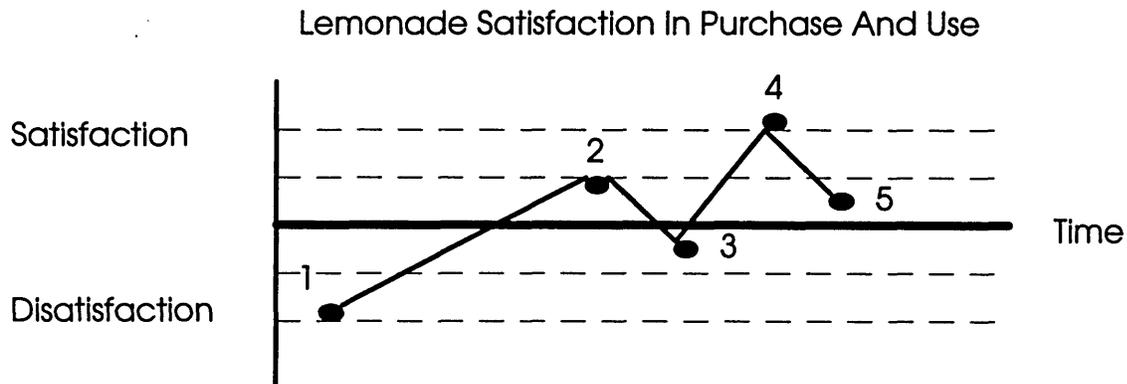
*The modified Wundt curve could be used to understand patterns of pleasure over time*

Design goals can be articulated by influencing behavior as predicted by the Wundt curve. For instance, one might imagine the following pattern of pleasure for satisfaction in purchase and use of lemonade:

- The customer feels too hot and sweaty (1)
- The lemonade stand is sighted (2)
- The customer sees the price, thinks its a little high, but pays for the Lemonade (3)
- The customer drinks Lemonade (4)
- The reduction in arousal towards the optimal level of thirstiness creates pleasure and raises arousal (5)

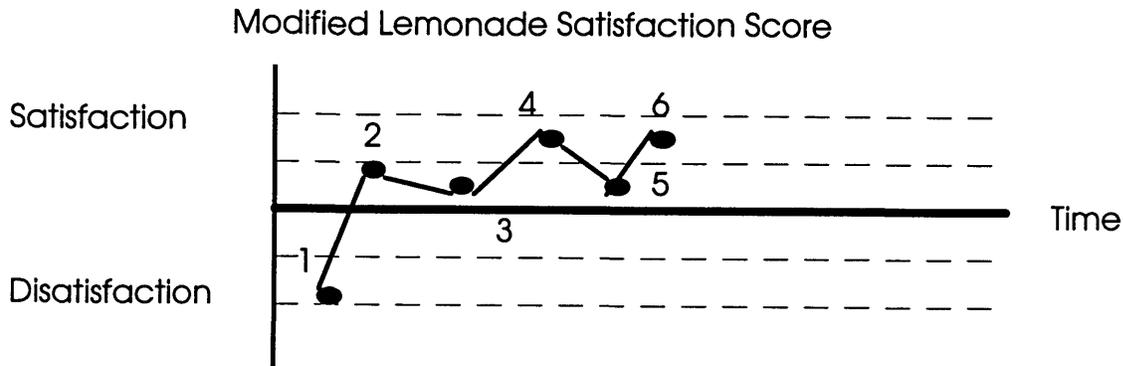


Based on the Wundt curve, we can then "score" the customer's feelings of satisfaction over time (as one would score a piece of music).



*The modified Wundt curve could be used to improve satisfaction*

Several points can be made to illustrate how this type of analysis can be used to increase satisfaction. First, at point 5, the customer has been left less satisfied than at point 4. We might be able to leave the customer more satisfied, and make an additional sale, by suggesting at point 5 that she take some lemonade to the office for her boss. Second, we can see that the customer spends about one quarter of her time in dissatisfaction. By stocking vending machines with lemonade, we might move the sequence of points 2 through 5 closer to point 1 and reduce her dissatisfaction time. Third, we might be able to raise point 3 by installing a sign that says "made with fresh lemons, not a mix" directly over the price. The effect of all these activities is shown below:

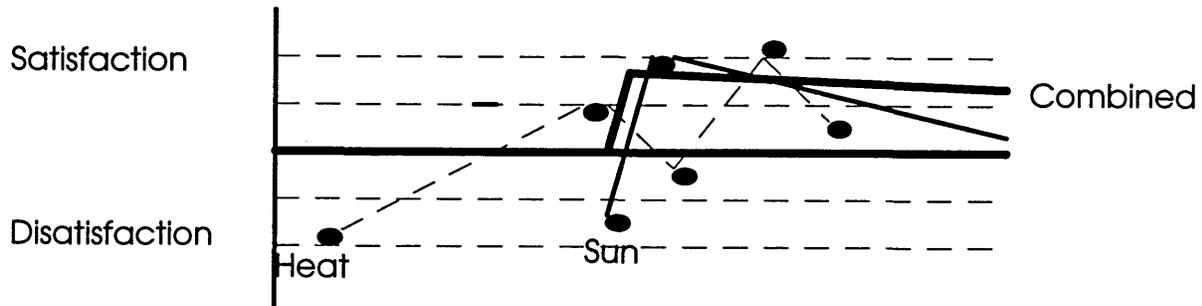


It will be noticed that though dissatisfaction time has been reduced, so too have points 4, 5 and 6. This has occurred because the distance from point 3 to the optimum has been reduced -- and with less positive change comes less pleasure. Whether the original lemonade satisfaction score or the modified lemonade satisfaction score ultimately gives more satisfaction could be determined by taking the area under each of the two curves. The greater the area, the greater the overall satisfaction of the product.

*A satisfaction score could be used to understand the additive effects of multiple sensations*

Rather than modify the satisfaction score in a single satisfaction system, periods of negative satisfaction in one system can be counterbalanced by periods of positive satisfaction in another. In this way, needs can be induced without deleterious effects on overall satisfaction. Thus, for instance, the dissatisfaction of the high price might be counterbalanced by including satisfaction relative to a "sun exposure" cognitive structure. The lemonade stand owner might, for instance, give customers a free paper hat to guard their heads from the sun at roughly the same time as point 3. The combined satisfaction score would be higher than either alone.

## Lemonade Satisfaction In Purchase And Use



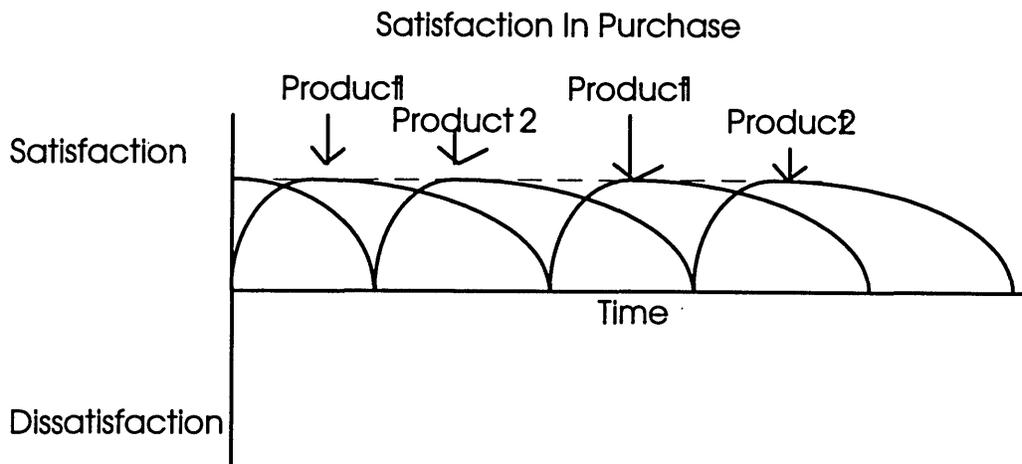
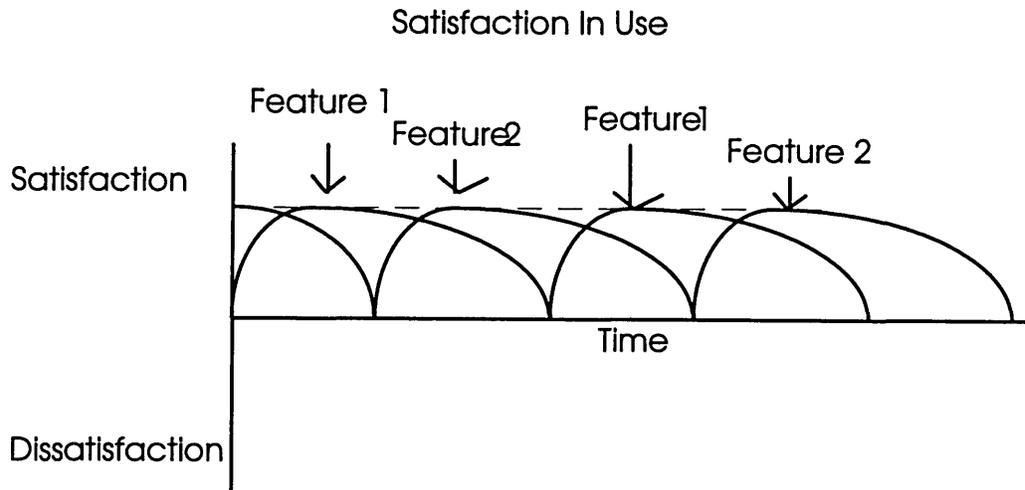
*Satisfaction could be cost optimized using "satisfaction arbitrage"*

The concept underlying the general pattern of pleasure developed in chapter 4 is that a product designer, in designing both satisfaction in use and satisfaction in purchase, should constantly be on the lookout for new satisfaction systems that provide greater satisfaction "opportunities" than that provided by the current set of satisfaction systems.

An added level of refinement would be the inclusion of a measure of the cost of satisfaction. Ultimately, the designer must deliver the most satisfaction/dollar -- not the most satisfaction.

*A satisfaction score could be used over a variety of time dimensions*

The patterns of pleasure described in chapter 4 could be applied to any number of time dimensions. Thus, there can be a pattern of pleasure in use, a pattern in purchase and a pattern in the product evolution.



*In optimizing satisfaction, one would probably have to be careful to avoid sensory overload*

We have seen that cycling of negative and positive attributes in different satisfaction systems can create enhanced levels of satisfaction. However, stimuli are additive in their effects. If too much overlap occurs, there is a danger of increasing arousal above its optimum. This may be particularly true of "multi-modal" products -- products that stimulate through a wide variety of stimuli (e.g. multi-media, vacation tours etc.).

The sum total of all features of a product can be varied such that the overall target level of arousal for the customer remains constant. To see how this might be accomplished,

assume that we can assign a number to the contribution of various attributes (i.e. stimuli) to changes in arousal for a given product, customer type, environment etc.

Attribute	Quantity Of Arousal Change
A	-2
B	-10
C	-3
D	5
E	-5

Were the stimulation goal of a product to reduce customer arousal by 5, we might cycle through the following "stimulation sets" in order to create variation while at the same time avoiding overload:

- A, C
- E
- D,E,A,C
- D,B

*The controlled introduction of bias in the market research process could be quite useful*

"There are two main strategies we can adopt for improving the quality of our life. The first is try making external conditions match our goals. The second is to change the way we experience external conditions to try to make them fit our goals better"  
[7]

Food technologists go to great lengths to train food experts in order to eliminate all possible biases in their tests. While these methods have yielded a tremendous amount of useful data, there is also a tremendous danger in using correlations of taste preference with product preference. The fact that New Coke won in taste tests but lost in the marketplace is perhaps the best evidence for the danger of ignoring the importance of mental processing of sensory information. For it is in the sources of bias that we can

discover how our perceptions of products can be changed. And in many cases, it is more cost effective to change the perception of a product than its underlying reality.

Changes in the perception of the product can be achieved through advertising, promotion, merchandising and packaging. However, it may also be possible to change the perception of the product through the design of the product itself. The following list contains some examples:

**Differentiate.** Isolate the product from surrounding stimuli to allow increased attention to it. Conversely, include the product in a "busy" environment to cause decreased attention [7]

**Integrate.** Allow the product to gain meaning by integrating it with other aspects of the customer's life. [7]

**Set expectations.** E.g. beer known to be old will taste "aged".

**Habituate.** Slowly increase or decrease stimuli to determine the rate at which the change can not be noticed.

**Add other stimuli.** Include irrelevant criteria that may influence judgment e.g. wine in a screw top will be viewed less favorably than wine in a cork top.

**Associate.** Include two or more attributes that are commonly associated e.g. darkness and flavor in beer.

**Vary order of presentation.** Contrast effect, group effect, error of central tendency, pattern effect, time error/position bias can all alter product arousal levels.

**Encourage mutual suggestion.** Have other panelists influence each other.

**Demotivate.** Motivate and demotivate customer panels [49]

Each of these "errors" can be used to advantage to understand the ways that the arousal caused by various product attributes can be modified by modifying customer perception of the product. Thus, to increase arousal caused by the yellow color of lemonade without changing the product, one could introduce the following biases:

Bias	Method Of Introduction
Personality	find customers sensitive to color
Mutual suggestion	Have others complement yellow
Halo effect	Make yellow part of a more liked product
Logical	Add yellow lemon bits
Habituation	Use green or blue background
Expectations	Suggest that yellow indicates perfect ripeness

*One would not only aim to close a stimulation gap but also to influence changes in the level of optimal arousal*

The successful design and implementation of a point of optimal arousal is an art -- not unlike that involved in setting a theme in music:

"Our musical thought does not wish to wander all over the scale; it remains associated always with one particular note, the tonic or key note, which we somehow think of as giving a fixed and central point. Just as the traveler thinks of each point of his journey in terms of its distance from his home, so we moderns think of each note of a melody in terms of its interval from the key note. The skillful composer contrives to make us conscious of the key note from the very beginning of his music, and keeps our minds conscious of its position through all the notes that are played. In general, for instance, we expect the music, or at least the bass of it, to end on the key note, just as the traveler expects his journey to end at his home."

[74]

While setting a key note is almost entirely an art, there are some general guidelines that can be followed. We saw previously that the establishment of a classic can help a company define an optimal point. Another approach to defining an optimal level of arousal is the use of redundancy. The hood ornament on a car serves as an example. The hood ornament is an important "cue" reminding us of the theme of the car and its maker. Through redundancy, we remember best the hood ornaments of those car manufacturers, such as Jaguar and Mercedes, who have retained the strongest core design themes.

## Chapter Seven

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### IS SATISFACTION ETHICAL?

The answer to the question posed above might seem obvious at first -- of course satisfaction is ethical! However, given the power of satisfaction as a motivating force described in Chapter 2 and given the extent to which this paper has discussed how producers can gain control of that satisfaction process, the techniques described in this paper may be subject to ethical debate. The purpose of this brief chapter is to surface the more important ethical pros and cons of satisfaction. The chapter will explore these issues from the perspectives of customers, producers and society as a whole.

#### Potential Problems

##### *Satisfaction could make our economy inefficient*

By inducing scarcity where no scarcity need exist, the purposeful induction of needs might create a situation in which our economy becomes less efficient than it could be. Marketing, in particular is often accused of creating customer needs that would not otherwise exist. Further, because marketing allocates resources based on ability to pay, some think that "luxuries" (i.e. boredom reducing products) are produced at the expense of "necessities" (i.e. anxiety reducing products). [9],[33],[34] Just as economic principles suggest that monopolies raise prices above marginal cost and restrict quantities, so too would companies practicing satisfaction optimization raise prices and lower quantities of desirable attributes. In this way, these companies may be thought of as harming society in much the same way as monopolies are thought to harm society. We have laws to restrict the formation of monopolies -- why not laws to restrict the creation of feelings of satisfaction through need induction?

### *Satisfaction optimization is manipulation*

To what extent do companies have the right to determine the level of happiness of customers? Many would argue that it should be the role of a company to make products available and the role of the customer to purchase and use those products to their best possible advantage. If companies gain control over customer satisfaction processes, then customers lose autonomy. Over dependence on companies would lead to a weakening of individuals in our society which, in turn, would lead to a weaker society. Do we really want to become like the rats that are dependent on scientists for their pleasure levers?

Many of the arguments regarding manipulation have been explored in ethical considerations of advertising. In a paper on advertising ethics, a philosophy professor comes to the conclusions that advertising is, overall, ethical. He looks at four considerations:

1. **Autonomous desire.** Advertising does not create desires that are not truly our own because we repeatedly purchase products without remorse.
2. **Rational desire and choice.** In that we seek happiness via our purchases and in that advertising may help us to achieve appreciation and pleasure from our purchases, advertising does not distort rational choice.
3. **Free choice.** Since we purchase for a reason, advertising appeal is not so strong that we are incapable of resistance.
4. **Control or manipulation.** Advertising influences rather than controls purchases. Usually advertising aims at inducing a desire for a product given that the basic desire already exists. [42]

### **Potential Benefits**

#### *Satisfaction optimization might reduce consumption*

As we have seen in chapter 4, adaptation causes us to consume ever higher quantities of stimuli, (i.e. products) in order to maintain a constant level of satisfaction. In studies such as The Limits To Growth, Meadows and others have postulated that increasing

population growth combined with increasing consumption, will cause environmental catastrophe. [36]

Satisfaction optimization offers a possible way to break our consumption addiction. By restricting supply of certain products or product features, we could derive more value from a lower quantity of any given material stimuli. Furthermore, satisfaction optimization gives us a framework for understanding how non-material products (e.g. video games) cause satisfaction. By encouraging the use of non-material products at the expense of material products, satisfaction optimization may also help reduce consumption.

Satisfaction optimization also offers the possibility of reducing the resources consumed on new product development. We have seen in chapter 6, that satisfaction optimization offers an opportunity to reduce the risk and cost of new product development activities by using features and products that have already been developed.

*The overall level of satisfaction in society may become greater*

Satisfaction optimization offers the possibility of the achievement of greater "appreciation" from the products that we consume. Similarly, satisfaction optimization gives the producer a tool for fine tuning products such that they are more closely matched to customer's optimal level of comfort and pleasure. If this satisfaction could be increased sufficiently, it may be possible for non addictive and "legitimate" products to serve as substitutes for drugs and other addictive products.

### **We Can Conclude That Control Of Customer Satisfaction By Producers May Be Unethical**

In a paper entitled "Frameworks for Analyzing Marketing Ethics", Gene Lacznik develops a series of questions that marketers can ask to determine the ethics of any potential marketing activity. The list of questions is based on major ethical works by William David Ross (The Prima Facie Duties) framework, Garrett (The Proportionality Framework) and John Rawls (The Social Justice Framework). As can be seen in the following table, it does not appear that need induction definitely violates any of the tests

questions listed by Laczniak. However, the "manipulation" and "inefficiency" issues raised above might violate some of the guidelines articulated below.

<b>Principles</b>	<b>Violated By Satisfaction Optimization?</b>
Does action A violate the law?	No
Does action A violate any of the following moral obligations:	
Duties of fidelity (i.e. keep promises)	No
Duties of gratitude (i.e. obligations to others)	No
Duties of justice (i.e. rewards based on merit)	No
Duties of beneficence (i.e. improves others)	Maybe (dependency)
Duties of self improvement (i.e. improves ourselves)	No
Duties of nonmaleficence ( i.e. does no harm)?	No
Does action A violate any special obligations stemming from the type of marketing organization in question?	Maybe (inefficiency in economy)
Is the intent of action A evil?	No
Are any major evils likely to result from or because of action A?	No
Is a satisfactory alternative B, which produces equal or more good with less evil than A, being knowingly rejected?	Maybe (traditional marketing)
Does action A infringe upon the inalienable liberties of the customer?	Maybe (manipulation)
Does action A leave another person or group less well off? Is this person or group already relatively underprivileged?	No

### THE PRODUCTION OF PLEASURE

The material presented previously has been exclusively concerned with the act of consumption. This chapter briefly speculates on the integration of these concepts with new trends in production. In particular, I will discuss the relationship between continuous improvement/lean production, flexible/agile production and satisfaction optimization. The chapter ends with a "scenario" that more fully integrates new production technologies with the concept of satisfaction and addresses some of the ethical concerns raised in the previous chapter.

#### **Continuous Improvement/Lean Production Probably Results In Increased Comfort -- At The Expense Of Increased Pleasure**

From the customer's point of view, continuous improvement/lean production results in products with incremental improvements in quality and, occasionally, lower prices. On the modified Wundt curve, these incremental improvements can be seen as a relatively slow and constant movement towards an optimal level of comfort -- with each incremental improvement throwing off a small amount of pleasure. The pattern of pleasure in evolution becomes similar to the pattern of pleasure in use of satiation products (e.g potato chips).

The extent to which incremental improvements produce feelings of pleasure compared to larger changes depends on the time over which the incremental changes occur and the relative size of the change in arousal provided by the incremental and large change. For example, one might imagine a scenario involving a lottery that pays \$100,000. The winner can get the winnings either all in one day or over a 100 day period. Assume that the winner receives 50 units of change in arousal towards the optimum for \$100,000 and only 5 units of arousal change for \$1000. The pleasure thrown off in a one day period will be greater for the day in which the winner receives the full amount than any of the

days in which the winner gets \$1000. But, assuming no "overshoot" of the optimum, the total pleasure would be greater by taking the winnings over a 100 day period (i.e. the winner would receive  $100 \times 5 = 500$  units of arousal change). By varying the relative arousal changes and time of payout, these results can be reversed -- showing that the winner would get more satisfaction over a short period of time. Thus, without direct measurements, it is impossible to quantify the relative impact of small incremental changes versus larger changes. However, one might suspect that, because of its "slow and steady" approach, continuous improvement would tend to be comfort maximizing and pleasure minimizing.

### **Flexible/Agile Production May Lead To More Pleasure And A More Rapid Migration Of Optimal Levels Of Arousal**

Flexible/agile production allows producers achieve efficiencies in flexible production similar to those of mass producers. While much of the application has been in manufacturing, the managerial concepts can be equally well applied to services. [37]

Whether in services or manufacturing, the most important effects of flexible/agile production on customers are that:

1. Customers have far greater variety of choice of both product type and product features.
2. Product development cycles are shorter and products are evolving at ever increasing rates.

One would suspect that wider product choice would allow customers to find products that come closer to their optimal comfort level. However, the effects of wider product choice on feelings of satisfaction are not at all clear. For instance, National Bicycle Company uses flexible production to produce bicycles that are custom designed for the specific dimensions of each customer. Due to the use of highly advanced flexible production techniques, a customized bicycle will be delivered at a price equal to the price of a standardized bicycle three days after the order. But National Bicycle has discovered that about 80% of customers account for 20% of the designs. After a year of experimentation, National has returned to standardized production of many designs -- offering flexible production services as a special capability. [37]

Shorter product development cycles could be expected to speed up the migration of both optimal levels of arousal and the speed with which customer's reach the optimal. In reducing the time it takes to reach optimum, we might expect shorter product development cycles to allow customers to release more pleasure in a shorter period of time. Through "product proliferation", there will also be a proliferation of optimal arousal points. The effect of more "gravitational forces" are less clear than the effects of shorter product development cycles.

### **How We Might Produce Satisfaction With, Or Without, Advanced Manufacturing And Information Technologies**

The purpose of this section is to formulate a scenario of the future based on the parallel implications of an improved understanding of human satisfaction and the development of advanced manufacturing and information technologies. In drawing on the sometimes vague thoughts of artists and philosophers, this collage of impressions may seem a bit unrealizable and utopian. Oscar Wilde provides justification for this treatment:

"A map of the world that does not include utopia is not even worth glancing at, for it leaves out the one country at which Humanity is always landing. And when Humanity lands there, it looks out, and seeing a better country, sets sail. Progress is the realization of utopias". [58]

Many have speculated that developments in manufacturing technology will ultimately enable customers to produce most of the products that they currently consume. New technologies that allow products to be produced directly from CAD data (i.e. "desktop manufacturing" technologies) are a prime example of the development of this capability. With continued improvements and price reductions, the development of a "multifunctional product produce"r over the next fifteen years is not inconceivable. [72]

In light of the theory of optimal satisfaction presented earlier, how might we expect customers to react to these capabilities? What would we want if we could have anything?

The history of art, as described by Art Historian Albert Elsen, may serve as a model:

"Once society had come to know political and intellectual liberty, perhaps spurred by art, and artists were supposedly free of external constraints, they have acted on their own to circumscribe freedom by imposing external and internal braking systems. Modern art has involved successive exchanges of one set of constraints for another" [57]

In a world where we could have anything, we would need to seek out constraints. We would need to induce needs. The cubist painter George Braque provides a clue to the type of constraint that we might seek:

"In art, progress does not consist in extension, but in the knowledge of limits. Limitation of means determines style, engenders new form and gives impulse to creation". [57]

Similarly, William Leiss, a philosopher at NYU, has speculated:

"The abundance we have created is deceptive...The possibilities for satisfaction that might be drawn from different forms of productive activity...can minister to our needs far more effectively than can any new assortment of goods. In orienting ourselves towards these suppressed possibilities we can discover some of the abundant sources of satisfaction that have lain untapped for so long." [59]

According to Braque and Leiss, we would choose "limited means" in our lives. We would likely shun some of those production processes that would enable us to have whatever we desire. Considering that products evolve from anxiety reducing to restlessness reducing, we might expect work to be transformed into an art form or hobby and certain automated processes to become manual. Unlike many of those who advance the concept of an electronic cottage, automated home or a "life of leisure", we would not expect satisfaction optimizing people to choose the anxiety of isolation in an electronic cottage or the boredom of leisure. Perhaps a more likely scenario is the development of community work centers where people come together to perform pleasurable work in groups.

Like Atila the Hun, who abstained from capturing Rome just at the point at which the capture was most assured, we would likely also find value in abstinence. For, it is through abstinence that we obtain the benefits of "limited means" with losing the benefit of self control. Henry Marcuse, a philosopher of economics, has speculated on this loss of control in relation to our current economic system:

"... the goods and services that the individuals buy control their needs and petrify their faculties. [these products] ...divert their attention from the real issue which is that they could ... determine their own needs and satisfactions". [48]

If we learn to determine our own needs and satisfactions such that each object around us contains a far greater capacity for satisfaction, what will be the effect on consumption? If it currently takes us \$30,000 per year to derive sufficient satisfaction and, by maximizing the satisfaction from each object we own, we learn to derive the same amount of satisfaction from only \$200, we might expect to see consumption decline.

In fact, that is precisely the message of a best-selling book entitled 14,000 Things To Be Happy About:

"Words and the images they create can be a great source of pleasure...as you read through these pages, give yourself time to conjure up your own images...I hope you will find, as I did, that happiness comes from noticing and enjoying the little things in life".

The book is a 600 page list of little things that give pleasure. Some of the objects contained in a typical page include:

- antique irons, cameras, radios
- leather hiking boots
- peanut butter makers
- reading a lot of strange books
- plaid cotton flannel
- soap balls
- tea towels
- wrap coats
- baseballs signed by famous players

- Aladdin and his wonderful lamp
- crackly skinned all beef kosher hot dogs
- a glass hors d'oeuvre server with a spot for the dip
- grapefruit sliced bananas, berries corn flakes and poached eggs for breakfast
- hearthside
- lab smocks
- rubber or plastic door runners.

[56]

Clearly, it is not the satisfaction inherent in the lab smock, door runner or soap ball but the satisfaction in the mind that is important. Through the use of advanced technologies, we may learn to play out theme and variation in product use and evolution such that we are able to derive as much, or more, satisfaction from an economic product as we currently derive from music. But papers in the future may not attempt to teach us how home improvement can increase our satisfaction with the house that we're in. Rather, future papers will probably attempt to teach us how mind improvement can increase our satisfaction with the house that's in us.

If we learn to derive more satisfaction from the products in our minds, it might seem that there would be less need for products that exchange hands. Would we continue to produce things for each other? While it may not be necessary to continue to exchange products in order to obtain products, it is likely that we would continue to exchange products in order to obtain satisfaction.

"I think the pleasure we feel when we acquire an object of value is not the pleasure of the bargain, but the pleasure of the gift. A truly valuable object is outside the realm of commerce, however moderately priced it is. More important than the money that changes hands is the buyers and the sellers shared appreciation -- often unspoken and sometimes unique to them -- of the special qualities of the object. The money becomes almost benign, almost just a symbol of the deep exchange" [40]

The satisfaction inherent in the exchange process will likely remain a challenge to, and "habituator" of, the evolution of technologies of self satisfaction. Virtual reality, nintendo and recreational drugs may provide extraordinarily pleasurable sensations to those under their influence. But a society that is structured such that it encourages activities that provide no benefit outside the mind of the user will have as poor a prospect of surviving

as the rat that can't pause from its lever pressing in order to eat. In the future, we may rediscover Aristotle's "activity of the soul in conformity with virtue". For a healthy society would nudge its citizens away from a greater dependence on the technology of satisfaction and towards a greater dependence on the satisfaction of each other.

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## **Biographical Note**

Prior to attending the Sloan School, Doug Lamm worked for 8 years as a consultant in new product and new business development with Innotech Corporation. Projects involved opportunity area identification, market research, product design, marketing strategy and identification of new applications. Clients spanned consumer, commercial and industrial markets and included Frito Lay, ITT, PPG, Union Camp, Velcro, McCormick, Blue Cross and Ciba Geigy. He also spent two years in Tokyo, Japan starting up a joint venture with a Japanese new product development consulting firm.

Prior to Innotech, he worked for 2 years as a Geologist in Alaska. He earned a B.S. in Geology and Geophysics from Yale University in 1982.