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Psychosensory Reactions and Product Development

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Synopsis—The time-consuming, repetitive nature of the product development-evaluation cycle is described. A conscious, planned approach to the psychosensory evaluation of products by the scientist is urged prior to any practical evaluations by nonscientific evaluators. The benefits in terms of anticipating consumer reactions, saving time, and developing novel products having a high degree of sensory appeal are indicated.

INTRODUCTION

During the past decade business interest in the exercise known as industrial research and development has exploded. It has exploded because there is now a full recognition of R & D and the importance of its role in keeping businesses alive and providing an internal mechanism for company growth.

In the minds of company managers, R & D translates into products and profit: the products vital to the defense and expansion of a commercial business; the products vital to the achievement of corporate and business development goals; the products vital to financial success which is the hallmark of the successful business executive. The answer to profit or perish!

With all this recognition of R & D in the business world have come many questions. Implicit in many of these questions is a desire to improve the R & D process, make it more efficient, and get products to the marketplace more rapidly. The purpose of this paper goes in this direction.

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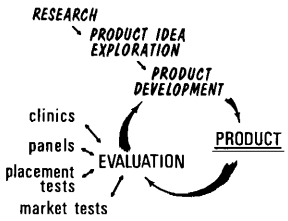

Figure 1. Product development-evaluation cycle

Product development will be discussed from two points of view:

A. The repetitive nature of the development-evaluation cycle.
B. The need for a conscious, planned approach to sensory evaluations.

Although the substance of this paper has broader implications, it is directed to the development of consumer products and more specifically to cosmetic products.

Product Development Evaluation Cycle

The key steps in the product development process are shown in Fig. 1. Research generates information that permits the conception of a good product idea. The idea is explored. If the result is encouraging, a product development program emerges. With the expenditure of adequate time and effort, a product usually appears. It must be evaluated. Common ways to handle practical evaluations involve the use of beauty clinics, consumer panels, placement tests, and actual marketing attempts.

It is a common experience to put product developments through these evaluation procedures many times. When products fail they are returned to development. Some of them never escape from the development-evaluation circle and all too many stay there a long time. Why?

As is well known, the success or failure of a commercial product is involved intimately with consumer reactions. Of course, the only way a consumer can react is through the senses. It seems strange, therefore, that the scientific literature relating to cosmetic products is silent about the sensory evaluation of consumer items. At least, based on several cosmetic literature searches, only a few vague references have been found (1–6). No articles are available that really help the cosmetic scientist think about his product creations in psychosensory

terms. Yet products subjected to practical evaluations fail or succeed based on the sensory reactions of the consumer.

A detailed discussion of the evaluation services available to cosmetic scientists is unnecessary. However, a further word about consumer reactions and their relationship to product development is indicated.

Psychology and the Cosmetic Scientist

Market research people evaluate products in terms of consumer reactions. This indeed is a handy phrase. It embraces all the ways that consumers consciously or subconsciously decide whether a product is good or bad. The reporting of these reactions becomes an auditing procedure based on free or forced responses from the consumer after exposure to a product. Words like satisfaction or dissatisfaction are commonly used in the box score generated by the market research man's galloping poll. Even the most expert market researchers reach product evaluation conclusions with difficulty. Theirs is a most difficult exercise. Nevertheless, their findings are commonly the basis for all major product marketing decisions.

Inherent in all practical evaluations is an acceptance of the consumer as the ultimate judge of product developments. The author contends, however, that cosmetic scientists are using consumer studies to tell them things they should already know about the sensory impact of their products. *Consumer evaluations have become an escape mechanism —a substitute for scientific observations and judgments.*

Practical evaluations are very time-consuming in most organizations. The evaluation work load becomes more awesome with each passing year. The evaluation process becomes more and more an excuse to wait and see. More and more the scientist leans on consumer judgments to guide his product programs. More and more the views of the consumer provide escape from responsibility, creativity, and scientific effort. Practical evaluations of products by the consumer will always be needed. They should be carried out for the purpose of confirming what the scientist has done rather than being used as a means of exposing what he has not done.

The author feels that many product failures can be anticipated by the scientist. The repetitive cycle problems that take products from evaluation back into a new product development program can be minimized. This can be done through a planned approach to the investigation of the sensory implications of products, by failing to fall into the trap generated by premature enthusiasm, by avoiding

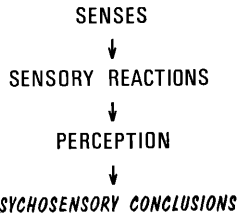

Figure 2. Pathway to psychosensory conclusions

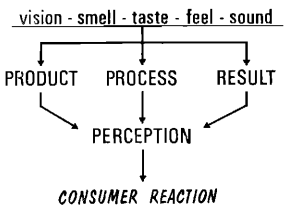

Figure 3. Pathways to consumer reactions

premature practical evaluations of products, by expending the technical product development effort vital to the sound completion of the program, and by accepting the science of psychology as part of the product development challenge.

Application of Sensory Evaluations to Product Development

In Fig. 2, the classic scientific pathway to *psychosensory conclusions* is shown. For the purpose of this paper, these conclusions are based on objective, *conscious* observations and experiences generated by sensory reactions in human subjects.

In contrast with Fig. 2, Fig. 3 moves into the world of the consumer. The major pathways to *consumer reactions* based on the external senses are shown. These reactions are conscious and subconscious in nature. They stem from exposure to the product as an entity, the process or mode of use, and the result. They lead to consumer conclusions of satisfaction, dissatisfaction, or indifference.

From a sensory evaluation standpoint, the scientist should be in the position of personally experiencing, observing, and reporting the sensations generated by his product and his psychosensory conclusions. He should be in this position prior to his delegation of evaluation responsibility to nonscientific evaluators. He should not be carried away by his enthusiasm for the technical excellence of what he has produced. He should not hope that the evaluators will overlook those

few "minor" undisclosed problems dealing with appearance, odor, feel, and the like. Rather, he should face the challenge of using his scientific skills to eliminate all properties that may give rise to negative sensory impressions and most important, consciously research into products' novel properties that have a high degree of sensory appeal.

Underlying what is being proposed is the basic, prejudiced conviction that the scientists should be more perceptive and better observers than the average consumer. The scientist's psychosensory product conclusions, if based on well-designed laboratory and clinical experiments for which he is responsible, should anticipate most consumer reactions and should reduce the time problem associated with the development-evaluation cycle.

Now, what is an orderly approach to sensory evaluation? Let us use the sensory pathways of the consumer that lead to perception and consumer reactions. Let us design experiments that will put the scientist in the position of subjectively and objectively experiencing, observing, and reporting the sensations—good and bad—generated by his product. Let the scientist reach his psychosensory conclusions by applying in an orderly way each of his senses to the product, the process, and the result.

To illustrate further, consider three imaginary shampoo products. Shampoos are a good selection because this is an old and well-established product category. Of course, psychosensory evaluation approaches will vary somewhat depending on the type of product involved. Semantics, too, will vary with the observer. Note also that the observations that follow are illustrative but are not intended to be complete.

"Me-Too" Shampoo

A "Me-too" product represents a product type that is common in the marketplace. The basic product development challenge, if such it be, is duplication. There is no novelty involved, there is no opportunity for an exciting consumer reaction. Nevertheless, some will argue that if this product is put in a good package, if it is heavily advertised and promoted, it might be a great commercial success. Only rarely does such a miracle happen. The common experience with a "Me-too" item is commercial failure.

The attributes with which the "Me-too" product has been endowed will sound very familiar. They are set forth in Table I.

Considering first the sense of vision, it well be noted that this product is a viscous, amber, transparent liquid in a glass bottle. Under process,

Table I
Me-Too Shampoo

	Sensory Reactions		
Sense	Product	Process	Result
Vision	Viscous Amber Transparent liquid Glass bottle	1. Thin Unstable Foams slowly 2. Rich lather Foams and rinses rapidly	Wet Shiny Clean hair and scalp Dry Lustrous clean hair and scalp Flyaway
Odor-taste	Pleasant Floral aroma Taste—nil	Pleasant Light floral aroma Taste—nil	Wet and dry Pleasant Faint clean aroma Taste—nil
Feel	Wet Lubrous No sting or burn Tepid	Wet Lubrous Smooth No sting Tepid Easy distribution and rinsing	Wet Slippery Cool Hard to comb Dry Slick Untangled
Sound	Nil	Nil	Squeaky

two observations are outlined because the established use pattern involves two applications of shampoo to a head of hair. In the first step of the process a thin unstable foam develops slowly as the hair is manipulated. After rinsing, a second application of the product generates a rich lather, lots of foam, and with rinsing this foam disappears. Under results, we also have two opportunities to react visually. One is while the hair is in a wet state and the second when the hair is dry. Wet, the common observations with a "Me-too" shampoo are that the hair is shiny and clean and so is the scalp. The all too common flyaway hair problem is detected during the dry combing and brushing operation.

Next, odor-taste is considered as far as sensory impressions go. These two senses are lumped together because they do indeed complement one another. Under product, we have in the "Me-too" composition the usual pleasant floral fragrance. Its intensity is light and no taste association develops. During the process step, substantially the same sensations are experienced as with the product. Finally, on a result basis, wet and dry, a pleasant, faint aroma remains.

Then, the sense of feel comes into play when the product is poured into the hand: this product feels wet and lubrous. There are no irritation effects. Typically, a tepid heat sensation is felt. During the process steps, wetness and lubricity are again experienced. There is still no discomfort from a skin reaction standpoint. The tepid heat sensation turns to cool as the diluted preparation is distributed through the hair. On a wet basis, the result is slippery, cool, hard-to-comb hair. On a dry basis, the hair feels slick and untangled. If manipulated, both wet and dry hair can give rise to vibrations and fleeting scalp pain sensations.

Sound is not commonly associated with cosmetic sensory evaluations. But, with hair that is left very clean, the descriptive phrase "squeaky clean" is heard repeatedly and indeed there is a squeaky sound as the hair is manipulated. One scientist has observed that 100,000 squeaky clean tweeter strings on a head can turn into quite a symphony!

Summing up Table I, the sensory reaction analysis for the "Me-too" shampoo is one lacking in excitement or novelty. It provides nothing for the consumer in the way of new sensory experiences. With this product development, or duplication, however, the repetitive cycle problems should be minimal.

"Me-Dead" Shampoo

The second shampoo is called "Me-dead" and the reason for this name will become obvious. The sensory properties of this product have been deliberately exaggerated. It is loaded with fatal negatives. On a visual basis in Table II, this product as viewed in the glass bottle is obviously unstable. A dark precipitate has formed. During the process steps, a drippy, runny, poorly foaming treatment is seen. On a result basis, both wet and dry, inflammation of the scalp can be seen. Dandruff scales that have not been removed are also evident. The hair is left without luster because the fibers are coated.

From an odor-taste standpoint this product has a heavy, gamy, decayed protein smell. The product is probably contaminated with pseudomonas. The odor is so high that an unpleasant taste association is experienced. The same observations may be applied to the process steps. From a result standpoint, there remains a lingering, obnoxious odor with an unpleasant taste association.

Based on the sense of feel, this product is wet and sticky; it induces slight burning on the skin yet it feels cold. The product contains

Table II
Me-Dead Shampoo

	Sensory Reactions		
Sense	Product	Process	Result
Vision	Watery Colorless Dark ppt. Glass bottle	1. Drippy Runny Poor foam 2. Drippy Runny Poor foam	Wet and Dry Inflammation Dandruff No luster
Odor-Taste	Odor Heavy Gamy Decayed Taste Unpleasant	Odor Heavy Gamy Decayed Taste Unpleasant	Odor Wet and Dry Lingering Gamy Decayed Taste Unpleasant
Feel	Wet Sticky Slight burning Cold	Poor distribution Nonlubrous Burning Rinsing difficult	Wet Sticky Tangled Smarting Dry Coated Snarled Combs hard Smarting
Sound	Nil	Nil	Dry Raspy sound on combing

ethanol. From a process standpoint, this product distributes poorly. It has little lubricity, gives rise to burning, and rinses out with great difficulty. The results are what you may imagine: sticky, tangled wet hair with smarting of the scalp. On a dry basis the coated hair is still snarled and combs with difficulty. The scalp reactions persist.

Finally, the sound effect associated with the result is one of raspiness on combing the hair. No symphony here.

This "Me-dead" product was beaten to death with fatal sensory properties. Even a few of these could destroy the acceptability of the shampoo from a consumer reaction standpoint. The development programs necessary to make this product acceptable would pose a real challenge. The repetitive cycle implications are obvious.

Obviously, no cosmetic scientist in his right mind would recommend this product for a practical evaluation. It is easy to recognize something that is all bad from a sensory standpoint. Discernment of a few

Table III
Me-Sensational Shampoo

Sense	Sensory Reactions		
	Product	Process	Result
Vision	Opaque	Copious, rich, pink foam	Wet
	White to pink	Foams rapidly	Shiny
	Rich cream		Clean hair and scalp
	Two-compartment	Rinses easily	Dry
			Shiny
			Clean
			No flyaway
Odor-taste	Pleasant vanilla aroma	Pleasant, light vanilla aroma	Wet and Dry
	Pleasant taste	Light, pleasant taste	Pleasant, faint, clean aroma
			Taste—nil
Feel	Wet	Wet, creamy foam	Wet
	Creamy	No sting	Smooth
	No sting	Hot to warm	Cool
	Cold to hot	Easy distribution and rinsing	Excellent combing
			Dry
			Conditioned
			Excellent combing
Sound	Dispenses with soft purr	Nil	Nil

fatal negatives is much more difficult and indeed frequently impossible if the scientist fails to carry out a critical sensory evaluation.

"Me-Sensational" Shampoo

This aerosol shampoo is consciously designed so it is devoid of fatal negatives and rich in desirable, positive sensory properties. The development of this product is technically feasible but admittedly it is a difficult assignment. Here is a product, as shown in Table III, that visually is white and opaque. When it is dispensed, it turns pink before the user's eyes. It becomes a rich pink cream. This product is packaged in a two-compartment system. Under process conditions, this shampoo product is so good that only one application is necessary during which a copious, rich, pink foam forms rapidly. The product rinses easily and cleanly from the hair. On a wet result basis, one sees shiny, clean hair and scalp. The dry result is similar. However, note that a conditioning effect has been delivered. There is no flyaway problem on combing or brushing. No squeaky clean hair.

From an odor-taste standpoint, a pleasant aroma and taste associa-

tion based on a vanilla type of fragrance is experienced. The odor-taste reaction on a lighter scale persists through the process step. Finally, the wet and dry result leaves a pleasant, faint, clean odor associated with the hair.

In terms of feel, the product is wet and creamy, devoid of irritation, and goes from cold to hot in the consumers hand. Under process conditions, the wet, creamy, warm, pink foam generates no sting. The foam continues to stay warm as it is easily distributed through the hair. Rinsing is rapid and effective. The wet conditioned hair is smooth, cool, and has excellent combing properties. The dry conditioned hair also combs with great ease.

Finally, from a sound sensation standpoint the product dispenses with a soft purr.

Summary and Conclusions

The need to improve the product development process, make it more effective, and get novel consumer products to the marketplace more rapidly is apparent to both business managers and scientists. The repetitive nature of the development-evaluation cycle is an important and growing factor from a time standpoint. This is so because scientific people lean heavily on practical evaluations and nonscientific evaluators for guidance.

The technical effort necessary for the development of a sound product is substantial. This effort in total can be segmented, but not reduced, through premature and excessive use of time-consuming practical evaluations.

The scientist is urged to apply the science of psychology to product development. He should carry out, routinely, his own sensory evaluations of products and reach his own psychosensory conclusions.

Using three shampoo products, an orderly approach to the sensory evaluation of consumer products by the scientist is illustrated. These evaluations are suggested as a means of anticipating many consumer reactions. The benefits to be derived are:

1. A significant saving in time in getting products to the marketplace.
2. The elimination of product sensory properties that will give rise to negative consumer reactions.
3. The conscious generation of novel sensory properties that will give rise to favorable consumer reactions.

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References

(1) Elder, T. H., *et al.*, Surfactants in shampoo formulations, *Drug Cosmetic Ind.*, **77,** 622 (November 1955).
(2) Kennedy, A., The psychology of clinical trials, *Pharm. J.*, **128,** 5–8 (January 3, 1959).
(3) Wasson, C. R., What is "New" about a new product, *J. Marketing*, **25,** 52–6 (July 1960).
(4) Marriott, R. H., Consumer research on new products, *J. Soc. Cosmetic Chemists*, **11,** 473–8 (1960).
(5) Marriott, R. H., Looking to the future, *Ibid.*, **12,** 52–6 (January 1961).
(6) Adams, C. F., What makes people buy, *Business Management*, **31,** 85–8 (March 1967).