Optimum Consumer Products

White Paper:
Proven Technology
For Optimizing Products
Using Consumer Preference

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Executive Summary

The following white paper details the new Optimum Consumer Products(OCP) technology, which for the first time makes it *possible to create products that truly achieve maximum consumer preference*. This technology is currently focused on helping the food and personal care product industries.

Optimum Consumer Products is a proven process for consumer product development. It is the response to the common complaint of the consumer product industry that successful new products are extremely difficult to achieve. In the food industry the estimate is that only 1 out of 5 new products prove to be successful. The OCP technology optimizes products for maximum consumer likeability by extracting critical information from untrained consumer input when testing food and personal care items.

This technology includes elements of both in-depth product development and focused market testing. For the first time, the true statistically rigorous optimization of a product for maximum consumer likeability is possible. The synergy of combining the two, often independent, thrusts of R&D and Market Analysis into a joint program can measurably improve overall new product acceptance while significantly reducing the required development time and resources (result - major savings).

Using OCP, the investment in consumer testing is often considerably less than that currently experienced by most Market Analysis groups when releasing a new product. Also the R&D expense is often equal too or less than that currently experienced when using the classical tools. To summarize, by spanning the two discrete organizations, OCP can find a better product in less time and with a reduction in overall cost.

The end result is a rigorous model, which allows you to tune the product for maximum likeability while constraining it to a maximum cost and/or to meet selected demographics.

Based on a breakthrough technology, OCP pushes beyond the rules and measures derived from current "best" practices. You can improve product likeability significantly beyond the limitations currently experienced using classic approaches. OCP increases the quality and quantity of information while reducing the development cycle time and cost - clearly violating the existing paradigms.

The fundamental question is whether the existing tools are sufficient. They may be, as long as you accept competing on a level playing field. If however, your goal is to increase market share and create the ability to balance quality with production cost in a manner superior to your competitors, OCP will be a major competitive advantage in the optimization of your products.

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White Paper on Consumer Products Plus™

1 Introduction

Optimum Consumer Products(OCP) is a technology designed to support the optimization of new or existing consumer products. Although consumer preference does not ensure a successful product, sustained sales cannot be achieved with products which receive low consumer preference scores. OCP provides both a break through technology and the overall methodology to apply it to product design programs.

The technology improves access to calibrated, statistically precise, consumer preference information for all phases of product development. This methodology is a sophisticated, computer intensive technique combined with a revolutionary testing protocol. Its foundations are based on rigorous statistical methods along with state-of-the-art sensory and cognitive psychological principles.

OCP allows you to develop a rock solid, direct relationship between a product's many manufacturing and/or formulation variables (as many as 10 or more), and the consumer preference for the final product. Once the rigorous model is developed, you can determine the optimum product while constraining it to a maximum cost, or to meet selected demographics. Thus the final product and its package can be tuned for maximum customer acceptance and profitability with a precision not attainable with classic tools.

2 Limitations of the Classical Tools

Classical tools force most R&D departments to spend major amounts of time developing a set of product descriptors (e.g. lexicon) and to use trained panels to determine how the description of the product varies as they change the formulation and process.

Some companies use classic design of experiments to present a limited number of product variations to the untrained consumer, bypassing the trained panel. This almost always results in the consumer working with a large number of samples. The hazard in using too many samples, is that the overall calibration of the consumer is affected, and their initial fresh and unbiased response to the new product is quickly lost. This is often referred to as sensory fatigue and is avoided using OCP.

More often the Marketing Analysis group usually only gets involved once a lexicon is well understood and prospective samples have been selected as the candidates for the "best" product. These samples are then taken to the end consumer and tested to determine which one is the winner. Attempts are made to query the consumer as to which attributes make the product "good" and which are "bad". Sometimes the samples will intentionally vary a single descriptor such as "garlic intensity" to try to determine the "ideal" setting for this parameter. However this is determined at a single setting of the other ingredients and the results hold only for that combination of ingredients. Any interactions will cause the ideal setting to move as the other ingredient settings are changed, making the determination of the "optimum" meaningless.

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The process described above is not ad-hoc. It often is the best approach for the pre-OCP tools available today. However it has some major drawbacks. Many of them are the result of compensating for the limitations of the existing tool set. Some of the primary issues with the classical tools are:

Complex Experimental Designs Are Avoided – The only way to learn how the composition and/or process variables affect the overall preference is to use an approach that creates a group of samples, which capture the many potential variations of the product. This usually results in 20 or more variations. Classic tools make it very difficult to test this many variations. Trained panels are almost always used when this many samples are required. This is due to the limitation of the classic tools no being able to get this many samples tested by consumers with out either having any single consumer see too many samples, or the number of consumers increasing to impossibly large numbers.

Avoids Consumer Testing – Most development projects concentrate on how the sample varies as the process and formulation is varied. The typical goal is to create a mapping between process/formulation settings and the product descriptors or lexicon (e.g. garlic intensity in a spaghetti sauce, or greasiness of a hand cream). When trying to determine how the samples change as the process is varied, trained panels give superior understanding Marketing is then presented with a small set of candidate products and uses consumers preference information to "Pick the Winner". The process has a very tenuous feedback on how to improve the product to increase consumer acceptance.

Only Consumers Can Give Preference Information - A fundamental limitation of R&D's trained panels is that they cannot give meaningful preference information. Only untrained consumers can give the unbiased preference response, which is necessary to understand what consumers like. However, untrained consumers are not able to properly express opinions using the lexicon or descriptor language developed for the product by the trained panels. Thus the classic tools have no reasonable way to use consumer preference to tune a product for maximum consumer acceptance.

Controlling Unimportant Variables is Costly – One of the pitfalls of using trained panels is that they can learn to distinguish many different facets of a products sensory experience. However there is no easy way to determine whether, the differences detected by the trained panel significantly affect the overall likeability, or if the average consumer ignores them. Controlling product features, which are unimportant to the consumer, adds unnecessary costs, which could potentially be better applied to the use of a more costly but highly desirable ingredient.

Fundamental Testing Problems with Consumers - Most preference testing either ignores or attempts to average out the Order of Presentation effect. Our data clearly show that the Order of Presentation effect is often as large as the effect of varying the sample formulation, and when ignored, tends to make it very difficult to see the change in preference caused by varying the sample properties. When using a pair test, the order of presentation can be measured as a definite bias of the first sample over the second. When more than two samples are given to a consumer for preference testing, it becomes unclear how the Order of Presentation affects the third and later samples. Thus any classical preference testing which has consumers testing four or more samples, cannot rigorously deal with the effect, and they are forced to assign it to a noise factor.

Consumers Are Often Fatigued by Too Many Samples - In market analyses for product selection, consumers are often presented with more than two samples. There is a limit of how many samples the consumer can test at a given time before sensory fatigue occurs. Also by looking at a group of samples the "preference memory" becomes confused, and the response is usually dominated by any single sample, which is outstandingly better or worse than the overall group. In this case the response concerning the more "average" samples tends to become muddied and unreliable.

Two-Sample Tests Are Powerful But Limited - The classic two-sample test of a single new product against an existing "icon" product is well understood and executed with confidence using today's tools. It is the essence of a pair-wise test. The critical limitation is that with only two-samples total, the only information that is gained is whether one product is "better" than the other. Virtually no useful information is gained to give an understanding of what can be changed to get even better acceptance for the new product.

Surveys Cause Bias – Almost all consumer testing requires a minimum amount of information be collected from the consumer to validate their demographics. Most product related surveys contain leading questions, which if presented before the physical sampling, can strongly affect results. Any survey used prior to consumer testing will set the tone and the focus of the consumer preference responses. This can lead to highly skewed data, and prejudice the output of the study in a manner that makes the results unusable. OCP focuses on extracting the unbiased preference information from the consumer first, and saves the survey for after the testing process.

3 The Consumer Products Plus Approach

3.1 Overview

Consumer Products Plus addresses the product development as a single activity. It avoids the disconnect between the product R&D develops, Marketing approves, and Manufacturing produces. The primary goal is the rigorous definition of the required process and formulation settings that produce a product optimized for consumer likeability and profitability. Too often economic and manufacturing limitations force compromises during the move to the production line that affects the overall likeability of the product. These effects are often hard to measure using standard tools, but OCP can quantify their impact on the likeability of the final product.

Fundamental to the technology underlying OCP is the use of pair-wise testing. This means that an individual consumer needs to only say which of two samples they prefer. The response is a single preference comparison usually on an 8-point hedonic scale. The invention determines how to set up the pairs of samples and do the subsequent analysis so that the simple consumer preference response contains a complex collection of information. The analysis part of the OCP process extracts this information in an independent manner, allowing the researcher to develop a rigorous mapping of the formulation and process changes to the overall likeability of the final product.

It is important to understand that the new invention directly couples the R&D formulation and process development to Market Testing using untrained consumers. Trained panels and their lexicon

may be used for initial screening, or for quality control after the optimum product has been obtained, but they are bypassed for the optimization process.

Consumer Products Plus addresses the following issues:

- Relates Preference Directly to the Making of the Product – By avoiding the descriptors used by trained panels a strong relationship is developed between the process and formulation settings and the likeability of the product.
- Extremely Efficient - The total sample size is between 150 to 250 consumers for a given study involving 20 or more product variations.
- Avoids Sensory Fatigue - Consumers only evaluate a single pair of samples at a time
- Demographics Can Be Included - Consumer demographics can be examined in the same study so that the effect of age, gender, etc. on the optimum product can be determined.
- Allows the Complex Studies – interactions can be easily detected and measured
- Order of Presentation is Quantified – Order of Presentation is dealt with in a straightforward rigorous manner.
- Icon Products Can Be Addressed - Optimization against an existing "icon" product is possible.

OCP intentionally limits its data taking to a preference response. It then rigorously relates this preference to the actual process and formulation variables. The inability of the untrained consumer to describe why they prefer one sample over another is avoided, yet the technique clearly shows where the maximum preference occurs. Once this optimum is identified, the trained panel can be used for long-term quality control.

Key to the application of OCP is the decoupling of the number of samples per consumer from the total number of samples being tested. It is possible to test 40 variations of the product while having each individual consumer only evaluate a single pair. Thus the issue of sensory fatigue is fundamentally avoided. The information is designed into the pairs presented to the individuals, and the results are extracted by a rigorous mathematical technique.

OCP is extremely efficient in its ability to extract valuable information from consumers with a precision beyond that usually found for this type of data. Using between 150 to 250 consumers in a single test, you can predict where the optimum product settings occur and relate these optimum settings to customer demographics[1] - using 40 sample variations or more. In contrast, an often quoted industry "Rule of Thumb" for testing is about 100 consumers for every sample variation. The extremely high efficiency of OCP provides a major edge in creating first-to-market products with a reduction in R&D time and costs. Regionalization of a product can now be accomplished in an affordable manner.

The ability to work with a large collection of sample variations makes it possible to examine the formulation and process for complex interactions. Interactions are fundamental to most formulations. Classical tools cannot deal with this complexity without the use of extremely large numbers of consumers.

[1] The number of required consumers is primarily determined by the size of the effect you are trying to "see", not the number of process variables.

Optimization against an icon product is now possible. This is not trivial. When the customer recognizes an icon product, regardless if it is labeled as such or not, the icon product response will skew the preference data. This added complexity can be directly dealt with using OCP.

3.2 Implementation:

The application of OCP is a 5-step process. The OCP consultant works with a joint team of R&D and Marketing professionals and preferably a program manager. The new technology is the source of major savings in time and resources. Our experience in applying the methodology has shown that the only way to ensure success is to develop a management strategy from the outset, which ensures the investment in resources required by a typical product development program. The 5-steps are:

1. Define a *measurable* goal
2. Determine the magnitude of the program - Go/No-Go decision
3. Design and create the samples
4. Design and run the consumer test
5. Analyze and act on the results

This list is a project management description of the development process. The process is designed to be connected to business goals. Even without the new testing technology, the active teaming of R&D and Marketing professionals has significant impact on creating powerful programs with strong business focus. The remainder of this section details the five steps.

3.2.1 Define a measurable goal

Goal setting is a difficult task. The issue is to turn the generic need for a profitable product into a clear goal that can be addressed by a development team. To say that one wants to increase sales to a certain amount may address the business need, but it does not have a cause and effect measure which can be used to determine whether OCP should even be applied.

Goal setting with OCP must determine whether consumer preference is a significant limitation on the profitability of your product. The easy determination occurs when you are losing to a competitor because their product receives higher consumer acceptance scores. In general, achieving maximum affordable consumer preference is a necessary but not sufficient factor in determining whether the consumer will buy the product. The reality is that if you produce less than optimum product, you are giving your competitor the ability to steal market share by making a better product.

OCP can give you the ability to see how the formulation and manufacturing costs of the product relate to consumer preference. So it is possible for the goal to be, “Create the highest consumer preference while limiting the cost to a specific level.”

Hidden in the goal is the market segment you wish to address. Although OCP can be used to determine the highest preference for both existing users and new user of the product, the cost in

testing can become prohibitive if too many demographic variables need to be independently addressed (e.g. gender, age, location, frequency of use…).

The measure of success attached to the goal is typically stated as, "How much of an improvement there is in the new product versus the existing product, or a competitor's icon product?" In one program the improvement over the existing "best" formulation gave a consumer preference of 87% liked the OCP developed version over the current "best" (usually referred to as an 87:13 improvement). The OCP development program took 6 weeks to execute. The existing "best" product had been in development for several years.

3.2.2 Determine the magnitude of the program

Once the goal and the measure of success is agreed to, we move to Step 2 where the product is examined to identify all of the possible parameters which may affect overall preference. The common factors are the formulation ingredients, but processing and physical properties may also affect the overall consumer preference.

Some problems are intractable – the overall complexity would require man-years of investigation and cannot be justified. In that case the result of the OCP process would be to stop at this point and look for another program which would better use the R&D and Marketing resources

In general, the questions asked during Step 2 initially cause the problem to blossom. This is expected and a sign that the team is paying attention to detail. With the proper coaching by the OCP consultant, the team can often move to a problem of reasonable scale. It is at this point that the team can present to management a clear estimate of the cost of the program and its chance to have significant improvement on the consumer preference.

One of the major benefits of applying OCP is that the feasibility and cost of the development program can be clearly delineated before major investments in R&D and market testing. The Go/No-Go decision as to continuing the program can be made based on a business basis at the end of Step 2 - avoiding programs which do not appear to have the potential to payback the development costs.

The information from the completion of Step 2 concerns how much it will cost to address the problem, not whether the product can be improved. One cannot predict the outcome – only the fact that the best you can discover is as good as is possible short of reinventing the product. OCP cannot make a bad set of ingredients make a high quality product. If the output of the OCP study shows that the preference is too low, the only option is to fundamentally reformulate, not continue to vary the existing formulation.

3.2.3 Design and create the samples

The third step involves the design and creation of a set of samples, which will contain the information of how the product changes as the process and formulation is varied. This stage puts the information into the samples. The R&D team members typically lead this work and manufacture the samples. The biggest challenge at this point is to produce the samples in a timely fashion so that

ageing effects do not skew the results. It is also critical that a clear sample tracking system is implemented so that the true identity of the samples is not lost. Most companies have adequate methods for tracking samples, but attention to detail is critical.

3.2.4 Design and run the consumer test

Step four extracts the preference from the samples using a pair testing methodology. This ability to work with relatively small numbers of consumers and obtain quality information of how the formulation and process variables affect preference is the essence of the new technology. Marketing professionals and sensory scientists typically lead the work at this step. It requires attention to detail in: a) recruiting the test consumers with the proper demographics, and b) the processing and presentation of the samples to the individual consumers in a controlled environment. The difference in this testing from more typical consumer testing is the management of a large number of samples and consumers.

3.2.5 Analyze and act on the results

Step 5 completes the process by analyzing the data and determining the optimum product for the best trade-off for value and quality. Validation of the result is usually accomplished by testing the sample against a reference and seeing how well the optimum fares. Success when testing against the current "best" product would usually consider a 60:40 a good result. This assumes that the products are conceptually in the same "product space", or similar enough that the difference doesn't give the customer the perception that the products are noticeably different, rather that one just tastes better than the other.

In one study a flavoring using a new formulation was tested against the competitors icon product. The two flavoring systems did not use the same ingredients and were by definition is different "flavor spaces". The result was that the new formulation had a 44:56 rating. This means that 44% of the test group preferred the new product over the icon. It is highly unlikely that any new product will do better than an existing icon product. However, in most markets to achieve a potential 44% market share against an icon is a strong success.

The final activity in Step 5 is to document the results so that the new formulation/process can be moved into the realm of a new or improved product release. The true value of OCP is only realized when the results are applied to a consumer product and the sales/profitability are increased.