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OPTIMIZATION OF PRODUCTS' SENSORY AND CONCEPTUAL FEATURES FOR DIVERSE CONSUMERS AND USES

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An optimised brand has physical and symbolic qualities that meet consumers' expectations during end uses. Currently, sensory analysis and market research each collect their own data and lump individuals into a group before modelling preferences. Yet the issue is how the effects of the brand's measured characteristics interact in the mind of each customer to influence choices at the points of purchase and use. Such personal cognitive integration can be diagnosed by normed discrimination scaling of the joint impact of independently varied sensory and conceptual features on rated choice in a test session mimicking a particular use. Such analysis yields each individual customer's ideal range for each sensory and conceptual feature tested in the session. The peak preference for instrumental measurements and marketed concepts can be aggregated across a panel representing the target demography, purchase contexts and end uses, to give jointly technical and marketing specifications of the most profitable branded product and set of subbrands feasible for a particular company.

Sensory and Market Research Inputs to Product Development

The development of existing and new products by major food companies is often guided by sophisticated sensory analysis and market research, plus consumer preference tests to check the proposed new or modified product against existing products. Nevertheless, even the currently recognised best practice for human research input to product development has serious limitations. This was pointed out a decade or more ago (Booth, 1987, 1988) and is now beginning to be acknowledged in some quarters.

The difficulties appear most obvious at the level of communication, even within product development teams, and certainly when different departments of a company or its research contractors are trying to cooperate. These communication difficulties are attributed to different departmental functions, cultures and educational backgrounds. However, this is a superficial analysis: even if a team were communicating perfectly about current research methods and results, there would still be many difficulties in relating the different sorts of data to each other.

The solution that the author was asked to develop by colleagues in public and commercial food research is to use the fundamentals of psychological science to integrate the different sorts of research into a unitary data-gathering operation for one cycle of brand (re-)formulation and (re-)marketing. Contrary to assumptions made for many decades, a single field experiment can measure the company-controllable sensory and marketing influences on individual customers' choices at points of purchase and use among the available offerings.

This contrasts with the series of separate investigations typically involved in one cycle of developing a new or modified product. Two or more tests might be run from the following sequence.

1. *Qualitative market research.* Work on a prospective product often begins with concept research contracted by the marketing department, for example in focus groups. These studies may be designed on a background of surveys intended to count the prevalences of predefined opinions, habits or even broader personal characteristics.

2. *Statistical sensory analysis.* Product variants created in response to marketing concepts or technical developments are assessed by panels who have been selected and trained to varying degrees to describe sensed factors in each piece of material and assess their strengths. These descriptive ratings are usually averaged across the panel for comparisons among test products (Munoz *et al.,* 1992). More advanced statistical approaches seek to arrive at some consensus from the individual panelists' patterns of scores, for example by factor or cluster analyses or multidimensional scaling.

3. *Sensory preference mapping.* When consumers are describing the test products, they are often asked to score also how much they like each variant (in breach of traditional recommendations for sensory evaluation (Stone and Sidel, 1985). These so-called “hedonic” ratings are still often averaged across panelists (Drewnowski, 1993), even though the fallacies for peaked functions were noticed long ago (Pangborn, 1970; Witherley *et al.,* 1980). Panel-average liking ratings can then be plotted into the descriptors' consensus maps or regressed from descriptive scores or instrumental values into panel response surfaces. Individuals' preferences can be represented by vectors or points but without allowing for diversities of structure in the interactions among factors in preference, thereby producing paradoxical results such as anti-ideal points.

4. *Preference tests.* The branded product is often subject to a hall or mall test of preferences relative to other propositions and competing brands. Averaging and consensus fallacies are avoided by identifying just one test brand as the one most often given top place by the panelists. A more sophisticated approach based on brand life cycle theory involves measures of sampling preference and post-use re-purchase intention.

Several problems result from this multi-step approach to one stage of product development. Inter-departmental logistics can be difficult to coordinate. The different types of data are impossible to inter-translate, let alone to merge. Instead, the concept research is related to the sensory profiling in an intuitive manner and how either sort of data relates to the results of preference testing is a matter for speculative discussion. Even when sensory and marketing descriptors are individually generated, a consensus is forced. Typically, no instrumental measures of the product are added nor any models of the marketing stimuli. Therefore, no combination of results from these different tests can generate operational criteria for production or marketing.

Those various barriers to effective product development can begin to be broken down by collecting all types of information about human responses to products in a single test at a particular stage of technical realisation of the marketing concept. This unified testing is what consumer science offers to product development through the new customer psychology.

Sensory and Conceptual Factors in Personal Choices

The basic principle of this radical approach to consumer investigations yields a one-step test that measures all sorts of objective influences on personal preferences among competing offerings, actual and proposed (Fig. 1). First, the quantitative performance structure of each panellist is diagnosed in terms of measurements of influences from factors in the product's processing, formulation, packaging, labelling and advertising. Then, the individuals' ideal points with ranges of tolerance are aggregated to give estimates of the distributions of responses by customers in the sampled segments and of potential positions in the market(s) represented (Booth, 1987, 1988).

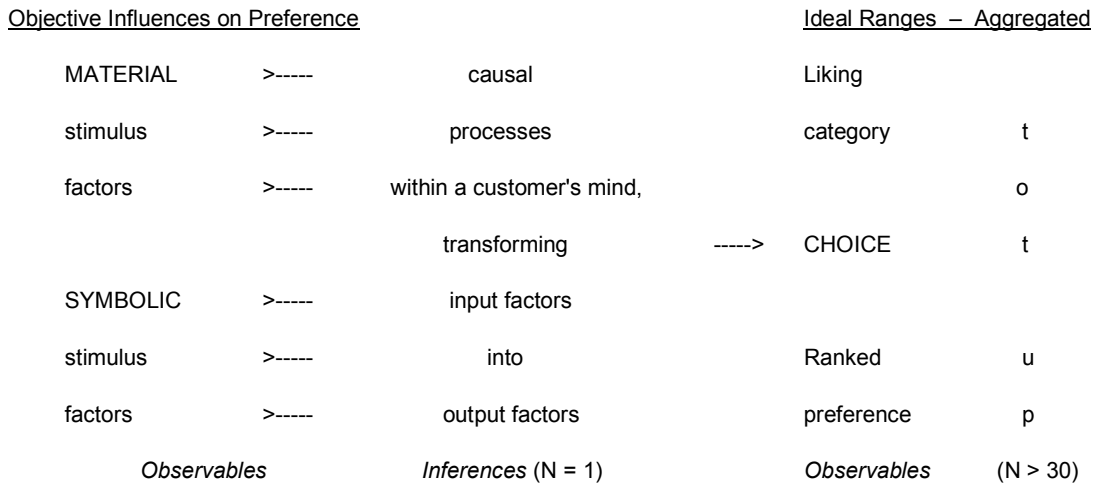

Fig. 1. The scientific approach to preference tests: one step from instrumental measurements and marketing stimuli to user choices Customer psychology is quantitative inference of the conscious and unconscious mental mechanisms that transform observable sources of input into observable outputs that symbolise action (the best being rated likelihood of choice in the situation of use or purchase that has been simulated). From this cognitive model, the individual's ideal range for each monitored factor in the tested situation can be estimated in objective terms, e.g. instrumental measurements, labelled quantities or categories of brand logo or advertising strapline.

This approach remains unique in going "straight through" from supplier-controlled factors, technical or marketed, to behavioural estimates of market response (Conner and Booth 1992). This paper will illustrate how the methodology can integrate the separate parts of consumer guidance to product development. First, the logically and operationally simplest example will be given of the application of science to preference testing. Then, the opportunities in such a test procedure that are seldom exploited will be expounded one by one, with further illustrations from published work on individualised diagnosis of factors in end-user functionality and hence in optimising products for the whole market or different segments of it.

Why are Some Brands Better than Others?

The conventional role for a consumer preference test is to "pick a winner". The results reveal nothing about why that product came out top in the test. This is because the samples to be compared are selected intuitively by the product development, from what is already on the market and what the technologists have produced in response to a marketing concept. The technical side may have conducted sensory analysis. The marketing side may have conducted concept research. However, this information is not incorporated in the design of the preference test in a way that could improve understanding of influences on consumers' choices.

Even the method for deciding which product has won in the test is not derived from a scientific rationale. There may be fierce arguments about how many products to test, how many consumers to recruit, what response formats to use and how to compute the winner from those assessments but these decisions are not validated on considerations of what the business needs operationally. The result is consumer preference tests in market research, picking out a product that may be worth taking further towards the market, but they leave unanswered all the questions about exactly what production or marketing should do.

Suppose that six brands were tested, code lettered P to U and the result was that brand T is the Winner, although brand S comes close. Brands U, R, Q and P are failures by that criterion, but one can not have any idea how badly in consumers' eyes. Even more important, there is no measurement of what it is that the panellists liked about brand T. The results do not help to tackle the key business issue of what needs to be done to get a better product to market.

An earlier study by Conner *et al.* (1994) did in fact test six brands with results in the above pattern. However, the authors provided the simplest possible improvement on the conventional preference test. This was a move in a scientific and operational direction but data were not collected from individuals, as in "pick the winner" tests. The improved test assessed popularity, not preferences as such. The improvement, even of just a popularity test, came from monitoring an influence that was hypothesised to be important. The design tested the causal influence of just one factor (which in this case was sensory). Hence this study provided an absolutely minimum illustration of a sinqle step from a technical operation to the prediction of immediate effects on the market.

The route to scientific answers is of course to construct relevant and testable hypotheses, in this case about psychological mechanisms. The issue is the influences on consumers' choice that arise during purchase and utilisation of existing brands and new entries to the market of the sort being considered. So, the hypotheses to be tested must be based on examination of existing information about the relevant brands. Obviously, it is wiser to construct hypotheses before testing. However, in this case, the hypothetical factor could have been specified after collecting the data because Conner *et al.* (1994) had decided to test the six leading brands. These were low-fat spreads soon after they first became widely available in British supermarkets. The popularity measure was the number of pieces of bread with a particular spread on it that were eaten from a display at a public exhibition. The brand that came top (T) was relatively deep yellow: only U was deeper. Brand S was almost as deep a yellow, and that came a close second in uptake. The brands that trailed some way behind were all paler. However, spread T also appeared to be glossier than the "failures".

That is to say, there were relationships between popularity of a spread and instrumental measures of the saturation of colour and the side-reflectance, while it was expected that there would not be any relationship to hue as all the yellows looked quite similar (see the Table in Conner *et al*., 1994). No instrumental measure had a significant effect in basic ANOVA on uptakes. However, when we tested for a systematic linear trend in uptakes (unfolded between T and S), a highly reliable effect emerged (see Figure in Conner *et al.*, 1994). When (more properly) a normal curve was fitted to the popularity peak, chroma was the most influential factor, lightness next and glossiness far behind; hue did not fit at all.

It was concluded that the wide range of consumers attending the exhibition sampled our spreads on bread most often if they were definitely yellow, although not too deep (like brand U). Thus, even though no individual data were collected, the scientific design of the analysis of data improved understanding of why some products were better than others, as well as picking out the most popular product.

It is worth noting that these brands were all subsequently given a depth of yellow close to the peak between S and T (Conner *et al.,* 1994). Whether or not preference testing was carried out on the initially paler brands before or after first entry into the market, this raises important strategic questions which can only be answered fully by measuring both sensory and conceptual influences on diverse individuals' preferences, which the new cognitive customer psychology does. Whether by intuition or from formal concept or preference testing, did the managers of the light yellow brands hope to boost sales by making the spreads look more like the butters on the British market? Was any segment of consumers who was susceptible to that concept overwhelmed numerically by those who expected margarines and other spreads made from vegetable oils to be darker than most butter?

Diversity Among Consumers and Situations of Use

A popularity measure, such as most frequently consumed or most often ranked top, is therefore inadequate, even if it is used to start asking scientific questions about the bases of consumers' preferences. Picking the winner not only fails to provide operational specifications; it also masks any diversity among consumers in the influences on their choices, and indeed as well the diversity in influences among product uses. For example, it is theoretically possible (and sometimes actually occurs) that a peak of popularity or the highest average preference score represents relatively few individuals and is an artefact of overlapping shoulders of two peaks some distance apart.

A more complex example is diversity among consumers in the structure of the mental interactions among different influences on preference. Advanced statistical approaches to consumer research consider only quantitative differences between individuals within a single qualitative structure, i.e. positions on a statistically generated consensus map. This forced consensus may be bogus: at best, a more or less large minority do not fit the consensus model at all (stress error). In multidimensional estimation of individual's ideal points in the sensory space, some assessors are represented by anti-ideals, which have no clear interpretation.

It is therefore highly paradoxical to collect individuals' data in preference tests but then to lump them all together straight into a grouped analysis without first looking for differences in style among consumers. Concept research considers prevalent opinions or agreement within a focus group. Sensory analysis uses differencing or descriptive data as panel frequencies or mean scores (even using *p* values regardless of their dependence on panel size). Mapping of sensory descriptors and/or marketing concepts onto preferences uses just one set of hedonic contours on Procrustes factors, one polynomial multiple regression to obtain a Response Surface, and quasi-individualisation in multi-dimensional scaling, conjoint analysis and other non-metric modelling – all with weighting factors suited only that that set of data, ungeneralisable to any other data.

All this fails to apply the scientific method to the business problems and opportunities. Quite simply, causal mechanisms are ignored.

In short, the only fully scientific basis for product development is to characterise consumers' personal styles before seeking to predict market responses to different propositions by counting up the prevalences of different structures in choice, such as ideal points.

Response Patterning Versus Stimulus Patterning

It follows that a fundamental scientific requirement is not just to observe responses but also to measures the stimuli hypothesised to control them. Products cannot be taken as featureless items. They cannot measured only on factors that can be verbalised. Statistical mapping of patterns in panel responses does not provide operational specifications of the material or symbolic influences. The patterns (e.g. latent factors) extracted from responses need to inspire hypotheses as to the causes of those patterns - in the case of product development, what material or symbolic inputs affect the factor scores, MDS dimensions or whatever.

Some sensory scores are set by standards, which in properly set-up cases represent particular instrumental values. Alternatively, instrumental values and panels score can be related within the same statistical model. However, these instrumental values are still related to a popularity measure only and are incapable of allowing for qualitatively different interactions of influences on the individual user's response in a situation.

Requirements for Integration of Product Development

We can sum up these different points by considering their implications for building bridges between the several

disconnected steps in consumer research for product development (such as those numbered 1-4 above) and eventually integrating them into a single science of food consumer psychology. All four types of test collect data only on responses, whereas what is needed is measurement of the real causal effects of stimuli on responses. Also, even though data are collected from each person separately (except in focus groups), the raw data are routinely grouped before any analysis.

The peaked nature of responses to sensory factors prevents grouped data from generating monotonic average functions as descriptive data readily do. This has generated the myth that preference data are subjective, inaccurate and unrelatable to instrumental measurements (Stone and Sidel, 1985). Responses relative to ideal are monotonic (Booth, 1988) but confusion has been created by using this principle in category frequencies (such as "just about right"). In fact, properly handled, preference responses are as precise as descriptive responses and directly relevant to technical requirements as well as to business objectives (McBride and Booth, 1986; Conner and Booth, 1992).

What precisely are the actual sources of the influences on consumers' choices? Then, how do those influences operate in each consumer to affect decisions in a particular type of situation? For example, are sensory descriptive ratings estimating sensations and 'hedonic' ratings scaling affect, as commonly assumed? Are marketing concepts tapping the mental triggers or drivers of purchase? Or are all three sorts of response reflecting the same sort of mental process, such as the assessor's verbal construction of the situation? Or, as Freeman *et al.* (1993) pointed out, are both sensory and marketing descriptive techniques disposing assessors to verbal processing, while action-related preference ratings allow more opportunity for pre-conscious cognitive processing to an overall reaction, with or without an emotional overtone or thrill of pleasure?

How do these mental effects of different influences interact? Do those interactions of influences on preference vary among consumers? Then, which influences are strongest in the way that they actually operate in the consumer's mind while responding to the situation? Most crucial of all, what level of each source of influence is most preferred by each potential customer in a sample of the target market? These are operational criteria needed by both Production and Marketing (Fig. 2).

Optimisation of a Single Factor

The basic scientific principle of customer psychology can be illustrated in the simplest possible way by a commercial research contract which optimised a single influence on preference. This influence happened to be sensory, i.e. a part of the material formulation. It could have been conceptual, i.e. part of the symbolic attributes of the product brand from labelling and advertising. The feasibility of concept optimisation will be illustrated to conclude this paper, within an optimisation of two factors liable to interact in their impact on preference, one sensory and one conceptual.

As well as being simple in scientific principle, this example of product development was particularly simple to execute. It has been amply demonstrated that the methodology is not limited to such constrained cases (e.g. Booth, 1988; Freeman *et al.,* 1993); however, there is not the space here to elaborate.

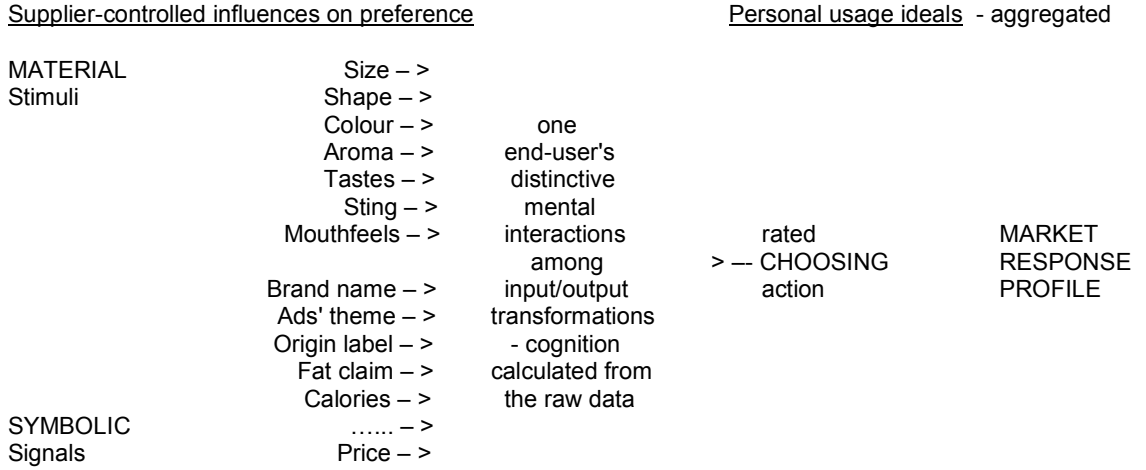

Fig. 2. The multisensory, multiconceptual cognitive psychology of the individual food user re-orients sensory analysis and market research into an integrated biosocial science for product development. Mental processes transforming monitored environmental input patterns (some sensory and conceptual modalities listed on the left) into observed environmental output patterns (e.g., overall preference, on the right) are diagnosed by scaling each source of input in the output's discrimination distances from the user's norm (personal ideal or usual brand) for the situation tested. Booth and Freeman (1973) give formulae for interacting processes which have aspects that are the same (summed) or are different (sq rt SoS) and are driven directly by inputs or by analytical concepts (not shown in this Figure) or indirectly by the relation between an input and an output, i.e. description. Deeper indirect control can be estimated too, by for example a sensation/percept (described stimulation) or an intention/emotion (response-oriented description).

The sensory factor was the amount of sugar placed in the cups from which a vending machine made sweet white coffee when a customer bought a cup from that channel. One of the neat simplifications in this example is that the point of purchase is also the point of use: customers are buying to use the product on the spot. In contrast, most product development has to deal with a series of choices, the first purchase. the first use or uses if multiple items were bought, the second purchase and its uses and so on. In the end, we may need to measure the determinants of each choice separately. However, a sound strategy is to start with the determinants of preference during practised uses of the product range. This was the approach we took to individualised optimisation of the sodium caseinate content of yellow fat spreads for consumer-assessed spreadability on bread and overall preference (Conner *et al.,* 1994). In the case of vended coffees, the author in collaboration with Mark Conner studied practised users on the spot at the moment they had spontaneously come to buy and use the product.

Our sampling of customers was much like many commercial preference tests. To make sure that the diversity in the market was identified in reasonably realistic proportions, tests were carried out at two contrasting sites - one a campus department, the other a factory – on 50-60 users at each vending machine. The two patterns of results were virtually identical.

A free drink was offered to each selector of (instant) coffee with creamer and sugar, to choose each of 4 or 5 variants of that sort of coffee after trying a mouthful of it. The variants had the usual amounts of coffee solids and creamer in them but the concentration of sugar was varied evenly above and below the individual's preferred level in units of just discriminable differences in sweetness (log concentrations).

The assessors were asked to indicate where for them personally each coffee sample lay between "Always choose" and "Never choose". By presenting a sugar level first that was close to the marketed level and moving the second and third tests moderately below and above that level, a range of sugar concentrations was identified and kept within that person's range of tolerance, between just too sweet or not quite sweet enough.

In theory and practice, a plot of these choice ratings,from one individual in a session in a single product use, against the 50% discrimination (JND) scale of any influence of preference gives an isosceles triangle. The peak preferred level of sugar (always-choose transept, or ideal point) can then be interpolated by linear regression through the unfolded data. Indeed, the least squares regression provides an estimate of the ratio of sugar concentrations which is 50%-discriminable by the always-never choice response (Conner *et al.,* 1988a,b). If the rest of the formulation (or the concept) is not ideal for an individual consumer, the acceptance triangle becomes a conic section, the formula for which can be used to correct parameters derived from the regression function and to estimate the multidimensional discrimination distance of that contextual defect (Booth and Freeman, 1993).

These characteristics of the influence of sugar on preferences among variants of this coffee can be aggregated across the panel to provide estimates of market response (which could be disaggregated by any customer measure required, e.g. site of purchase, gender, age, what other coffees were used etc.). The range from too little to too much gives boundaries for active rejection of the product: these rejection aggregates are illustrated for spread's casein on spreadability by Conner *et al.* (1994) and salt in bread by Conner *et al.* (1988). More important for optimisation, a customer's levels 50%-discrimination above and below the ideal point provided that person's ideal range for that preference factor in that use situation (Booth, 1994).

It was found that the then-marketed loading of sugar was in the ideal range for 94% of the users in our two test panels together, but three-quarters of that level was just about discriminated from ideal by 96% (Booth, 1992a). As a result, the producer decided to save costs by cutting the sugar loading by a quarter. Sales were unaffected and the research contract paid for itself very quickly.

Two or More Sensory or Conceptual Factors

Individualised optimisation was initially developed for single sensory factors within the context of a familiar and broadly acceptable product which can readily be reformulated in the factor in question (Booth *et al.,* 1983; Conner *et al.,* 1986, 1988a,b, 1994). However, it was then generalised to multiple factors and to conceptual (symbolic) as well as sensory (material) factors. Furthermore, material stimuli include those to the viscera, as well as those to the head senses, as in hunger and the satiating effects of ingested food and drink (Booth, 1992b; Dibsdall *et al.,* 1996*).*

In addition, the individualised methodology can be extended by various techniques to products where even laboratory reformulation is impracticable but a range of variants is available on the market or from production line rejects. The thinking processes operative in a particular eating situation can also be diagnosed within an individual, although this has so far been done by path analysis (Booth and Blair, 1989; Booth *et al.,* 1992), not by discrimination modelling of nodes within the cognitive

network.

Also, the overall integrative response to be explained does not have to be personal preference. It can be recognition of top quality or the expected characteristics of a brand. It can be a complex sensory or conceptual attribute, such as creaminess (Richardson and Booth, 1993) or crunchiness, or brand image or price (which for some products is a signal of quality as well as expense).

Up to 5 factors have so far been optimised in a session, e.g., described components of a vegetarian dish (Santos, 1998). Quaternary mixtures have been modelled, two sugars and two acids in an orange drink by Freeman (1996) and four odorants having their own notes in strawberry aroma by Kendal-Reed and Booth (1992) and Freeman *et al.* (1993), Four textural features have been modelled in the creaminess and jUdged the fat contents of milks and creams - viscosity and three geometrical measures of the fat globules (Richardson and Booth, 1993).

However, all the principles of diagnosis of the cognitive interactions among three or more factors are demonstrated by a two-factor case. So, the final examples involve one sensory factor and one conceptual 'factor with which it might well interact in consumers' minds. These two examples are a commonly used sugared drink and fat spread, as in the commercial work above, but this time each was investigated as an academic case (Booth *et al.,* 1996; Freeman, 1996). The first of these illustrations was a vended orange drink, varied in sugar levels and labelled either "Sugar" or "NutraSweet - a low-calorie sweetener" (although also sugar-sweetened for experimental purposes) and tested by tasting. The second case was a low-fat spread, covering pieces of bread at various thicknesses and labelled with percentage content of fat from 5% to 80%, orthogonally to the thicknesses: these variants were displayed in a systematic oblong array and tested purely by viewing. In each experiment, a specific description of each stimulus feature (an analytical response) was either elicited from the assessor or provided from previous elicitations and was rated in addition to the choice ratings.

Running at least two stimulus features, each with an analytical response, enables cognitive diagnosis between a variety of cognitive processes by which these two influences might interact to influence preference. These different dimensionalities and "depths" of cognition may not have a substantial effect on the aggregated response surface of ideal ranges. Nevertheless, variations in distribution of cognitive processes among popularities could be highly relevant to the coordination of production and marketing strategies.

Some consumers reacted to thickness of spread and fat % label as meaning the same thing for choice (a one-dimensional model) - presumably the amount of fat on the piece of bread. Others, however, choose on the basis that thickness and % fat operated in different ways (on two dimensions), e.g. nice taste and bad for health.

Sometimes, the multidimensional discrimination scaling showed that the analytical responses were the most predictive of choice. If many consumers are using such verbal concepts (or even using them to reason about brands), then it may well be important to inform consumers accurately what to expect on tasting or as conceptual attributes of a good product (e.g. healthy, costly high in quality, natural). On the other hand, choice can instead be driven by the sensory stimulation or symbolic signalling. When that is the case, it may be more important to get the right combination to the right consumer by less analytical and broader pointers in advertising and package labelling. Another possibility is that the relationship between stimulus levels and descriptive ratings is most predictive of choice. Such a finding might inform a subtler advertising strategy or indicate the feasibility of wider tolerances in both production and marketing factors.

Nevertheless, the findings most immediately relevant to optimisation are the aggregated ideal ranges for the factors tested. This illustrated by an aspect of the results from the sweetening of the orange drink.

In consumers who professed to use sugar drinks rather than diet versions of soft drinks. the relative popularities of different sugar levels and the sweetener labels forms a single major peak including the vended level of sugar and close to the "Sugar" label. In other words, most drinkers of sugared drinks indeed went for the sugared orange drink.

However, the panel of consumers who reported that they used diet drinks showed multiple peaks for formulation and labelling. The largest peak unsurprisingly was for a relative low level of sweetness (unknown to them, always provided by sugar in this experiment) and for a sweetener labelled as zero in calories, or even for negative calories - a fat-burning sweetener! Nevertheless, some of those who preferred a diet sweetener liked high sweetness. Also, there are two kinds of "sweet teeth" in Britain (Conner and Booth, 1988; Conner *et al.,* 1988b): those who liked sweetness in snack foods and drinks and those who liked sweeter pieces of fruit and vegetable-based foods such as tomato soup.

Many foods and ingredients as well as sugar and fat have both strong sensory impact and important conceptual implications for consumers, e.g. beef, pork, fish, bread, beans, gene-modified tomatoes, and so on. Both international brands and locally competing varieties of a category of food are likely to rely on segmentation and positioning. The only way that to provide realistic, specific and precise information for optimisation to consumer acceptance and supplier economics and logistics is through aggregation of individualised cognitive diagnosis of the interaction between features thought to be influential at the point of purchase or use. It may look complicated but then so to are the facts relevant to what consumers need from the food supply and the industry can provide. Do companies and the academic research base want to know what is going on or not?

Product Development and Fundamental Research

This paper has focussed on consumer research input to product development. However, diagnosis of the sensory and conceptual causes and their cognitive interactions in individual end-users' preferences is also very important for using consumers' skilled responses to foods and drinks to identify and pursue crucial "top down" contributions to the "bottom-up" molecular biology and neurophysiology of the senses and the social science of food and drink (Freeman *et al.,* 1993).

Individualised cognitive analysis is a powerful tool for such fundamental research into human behaviour. The new methodology bridges between qualitative and quantitative approaches to the social sciences (Santos, 1998), including cultural contexts of food choice. It also links the cognitive neuroscience of perception, action and emotion to all the other parts of psychological science, including the effects of foods on the body and brain in satiety (Dibsdall *et al.,* 1996), mood (Booth *et al.,* 1995), motivation (Conner *et al*., 1988b) and memory (Knibb *et al.,* 1999). Also, it links the social and the biological sciences. This implies that the new customer psychology has an important role among all the established research approaches to human life. This in turn is highly relevant again to the future of the food industry. As elsewhere, successful innovation and even the adequacy of existing technology depends on a rich background of strategic exploratory research into the anthropology and physiology of eating and drinking, as well as the research strategies to solve generic problems arising from improved understanding of the uses of particular products.

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