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The consumer in product development

Consumers are the centre of product development in the food industry, directly in the design of consumer products and indirectly in the design of commodity products and industrial products. In industrial product development, the emphasis is on the immediate customer, but consideration needs to be given to the acceptance of the final product by the consumer. It is important in product development to understand basic consumer behaviour and food choice as well as the individual product/consumer relationship (Earle, 1997). Differences among the individual consumers and variations in their environments influence their buying, preparing and eating behaviour. These differences cause variations in food choice and in the degree of acceptance of individual foods. The consumers' total concept of a food is related to their individual characteristics and to the environment in which they buy and eat food.

Consumers are, and will remain, the final arbiters on food product acceptance. The consumer of the new food product gives the ultimate decision on the product development project and therefore it is crucial that the consumer is a major player in critical evaluation throughout the project. But it is even more important to incorporate the consumer in the creative processes in product development. It is wrong to assume that the product designer, the process developer and the marketer know who are the target consumers and what they want and need. The consumers have to identify themselves, and help to create a product that fits into their life styles and also leads them into their desired future.

The consumer needs to be involved in all stages of the product development project. At one time, this seemed an expensive, theoretical and time-consuming activity, and was often ignored in the company. Today, consumer research is more easily coordinated into product development, with the use of modern consumer research techniques to study behaviour and attitudes, develop product

concepts and attributes, test product prototypes; and with the use of information technology to set up consumer databases and analyse consumer data.

5.1 Understanding consumer behaviour

Consumer behaviour can be defined as ‘those activities directly involved in obtaining, consuming and disposing of products and services, including the decision processes that precede and follow these actions’ (Engel *et al.*, 1995). There are environmental influences affecting this behaviour such as ethnicity and culture, social group, regional preferences, as well as food availability and household technology. There are also differences among individuals, not only their age and sex, their education, their standard of living, but also their physiological and psychological make-up. Individuals have their own food choice, which to a greater or lesser extent overrides preferences defined by culture or religion. In the last 30 years, multidisciplinary social science research has increased knowledge of food consumer behaviour and food choice.

Consumer behaviour occurs in sequential stages and at each stage there is a use of knowledge to make decisions. General consumer behaviour has six action stages as shown in Fig. 5.1 (Engel *et al.*, 1995). This sequence can be followed by a further divestment stage where, with food products, the consumer chooses between the options of disposal or recycling of the waste and the packaging. Parallel to these seven consumer actions is the information processing conducted by the consumer. When the consumer recognises the need, there is an internal search in their memory and may be an external search of the supermarket shelves, the menu, and information from other people, media or consumer reports. They may also have been exposed to TV advertising or to promotions in the supermarket; or even to the aroma of bacon sizzling or bread baking in the retail outlet. Engel *et al.* identified five steps in the use of information by the consumer for knowledge building:

1. Exposure to information, communication, the product.
2. Attention given to the information.
3. Comprehension of the information, as it is analysed against the knowledge and the attitudes stored in the memory.
4. Acceptance or rejection of the incoming information.
5. Retention of the new information in the memory as knowledge.

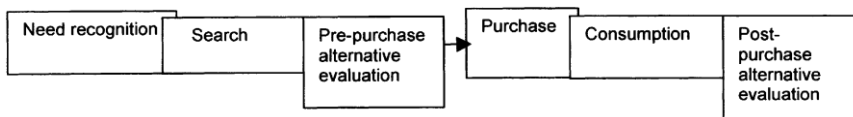


Fig. 5.1 General consumer behaviour in buying and consumption (Source: After Engel *et al.*, 1995).

This knowledge is used to judge the different products; the consumer builds up criteria to judge the products and to compare the different brands and products. These criteria are an important basis for product development. The consumer then decides whether or not to buy the product. After preparing, serving and eating the food there is satisfaction or dissatisfaction, and the decision is made to stay with this product/brand or to look again, as nutrition is a continuing need and the questions for consumers are differential ones related to choice.

Individuals have to be considered in their society: the culture, the social norms, the social structures, and also as part of a group – the family, the home group, the work group, the leisure group. Food eating, even in the case of the individual eating alone, is strongly influenced by other people, indirectly by social influences or directly with the type of foods available. Different cultures and social groups have different values that are recognised in designing products for different markets. Perhaps the reason why American products can be easily accepted internationally is that it is a new country combining many nationalities and food products are designed/promoted so that they are generally accepted by this wide variety of people.

Think break

The core American values have been identified in two textbooks as:

(Engel *et al.*, 1995)

Material well being

Good/bad moralising

Work more important than play

Time is money

Effort and success are related

Mastery over nature

Egalitarianism

Humanitarianism

(Peter and Olson, 1999)

Achievement and success

Activity

Efficiency and practicality

Progress

Material comfort

Individualism

Freedom

External conformity

Humanitarianism

Youthfulness

Fitness and health

1. Study these two versions of American core values, and identify the values that are similar and those that are different. From this develop what you think are your core values. Are your core values different from these lists?
2. Choose two major markets for your company and identify the core values of the consumers in these markets.
3. Compare the core values for the two markets and identify the similarities and differences

4. For each of these markets set up a core value checklist to be used throughout future product development projects.
5. Discuss how the differences in the core values could lead to different strategies for future product development in the two markets.

When buying food, the consumer usually wants to keep the decision process as simple and quick as possible. Food is consumed two or three times a day, and may be bought every day, so the consumer does not want to spend a great deal of time in buying and today even in consuming food. It is only the special occasion, the special meal or the special food that is given detailed analysis. But it is important for the food designer to recognise that there is detailed and critical thought at certain points of time. Consumers receive a great deal of information on food through the media and advertising as well as by word-of-mouth; gradually and often imperceptibly this information changes their knowledge base and therefore their food behaviour. If there is a great deal of information on saturated fats in the diet, they will consider and may gradually change to low-fat foods. Sometimes their behaviour is changed by a jolt; this could be a food poisoning scare, or it could be food poisoning affecting them directly. These can cause long-term changes in food behaviour, for example reduced meat-eating triggered by reports of BSE ('mad cow disease'), and complete rejection of shellfish caused by a bout of shellfish-related food poisoning.

In the past ten years, food brands in basic food areas have had very similar features and competed mainly on price, so that they have degenerated into commodity products – no brand being distinctive. Also there has been a proliferation of products with very little difference between them – for example in the small New Zealand market, there are about 157 breakfast cereals under the national and retailer brands. Can the consumers differentiate adequately between these, even if they read a consumer magazine? No wonder they choose the easy way out and buy on price, choosing the specials; or keep on buying their familiar product. Foods can be bought on impulse to relieve food boredom or as a treat. A new snack or a new takeaway can be bought to see if it lives up to its promotion; if it satisfies the consumer it can become a regular food.

The food designer needs to be aware, in the target market, of the general consumer behaviour towards foods and eating, and how this is slowly changing with time, but also needs to recognise the sudden change. This can be caused by either new information giving an attitude change, or new foods giving the consumers some greater advantage for safety, nutrition, convenience or attractiveness. Companies that have a long-term relationship with their target consumers build up knowledge about the trends in changes of their behaviour, which is invaluable in product development.

Food consumer behaviour can include the growing of the food but usually in the urban environment it concerns obtaining food from the supermarket, restaurant or takeaway. In the future it may be more distant with food being

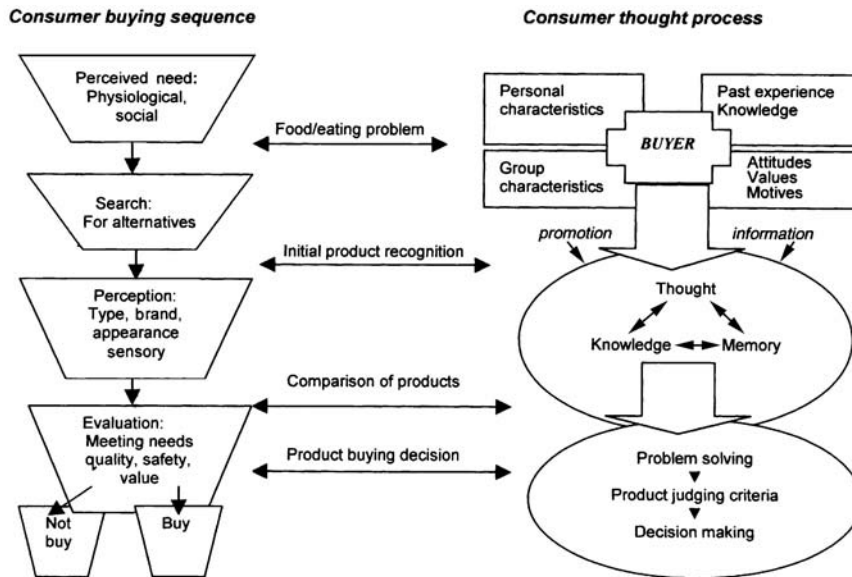


Fig. 5.2 Consumer food purchase patterns.

ordered through the Internet. Food companies must realise that although their food behaviour often starts with the selection of food at the retailer, consumers have an interest in how food is produced and they have their concerns about production and processing. Stages in the consumers' buying sequence and the related consumer thought processes are shown in Fig. 5.2. Recognition of the stimuli that start the buying sequence, the product judging criteria that are used in comparing products during the buying decision, and the level of consumer involvement with the product throughout the purchase and post-purchase sequence, are important in product design.

5.1.1 Stimuli to buy and eat

Stimuli to buy and eat are many, for example the demands of the family or home group, individual hunger, the array of products on the supermarket shelves, the dishes on the menu or even the weather. The influence of family members on the buying of cereals is illustrated in Table 5.1. This shows the strong influence of the child on all stages of the buying action, and in particular on what kind and brand to buy – long a basic premise in promotion by the breakfast cereal manufacturers.

The stimuli to buy and eat can occur before and after entering the supermarket or the restaurant. When buying bread baked in the supermarket, the stimuli may be hot bread aroma, or the known great flavour of the bread. Consumers can identify other bread characteristics such as ease of cutting, calories, free of additives, but may not be stimulated to buy by them. Because

Table 5.1 Breakfast cereals: family-member influence on buying

	Stages in buying		
	Initiation	Search and evaluation	Final decision
Husband	2.64	2.51	2.60
Wife	3.64	3.66	3.88
Child	3.91	3.42	3.62

	Buying decisions		
	Husband	Wife	Child
What kind to buy	2.60	3.81	3.95
What brand to buy	2.42	3.90	3.68
What size	2.16	4.20	2.84
Where to purchase	2.07	4.43	2.29
When to purchase	2.14	4.37	2.75

Each score represents the average of the husband's, wife's and child's perception of family member influence, on a scale where 1 = no input and 6 = all of the input.

Source: After Lawson *et al.*, 1996.

there are so many stimuli the individual does not react to them all on a conscious level, and probably has a basic set used for each type of product. The depth of study in comparing food products and buying is usually not very great; the consumers do it everyday and they want it to be simple and not take time. The product stimuli to buy or not buy include:

- strong 'not buy' factors such as the smell of deteriorating fish, bruising of fruit, unusual colour of bacon;
- strong 'buy' factors such as value for money, sensory attractiveness;

Table 5.2 Consumer actions after buying the food product

Action	Sub-actions	Decisions for and against
Preparation	Transport, store, prepare, cook, serve	<i>Easy/difficult</i> <i>Quick/time-consuming</i>
Eating	See, feel, smell, bite, savour, swallow	<i>Enjoy/neutral/dislike</i> <i>Easy/difficult</i> <i>Clean/messy</i> <i>Quick/takes time</i>
Post-eating	Digest, general feeling, feeling in stomach	<i>Comfortable/indigestion</i> <i>Well/sick</i> <i>Pleasant/unpleasant after-taste</i>
	Dispose of waste	<i>None/large, clean/messy</i>
	Compare with other foods	<i>Like/dislike</i> <i>Repurchase/never buy again</i>

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- important 'buy' factors such as the size of a loaf and the thickness of the slices may not stimulate buying because they accept quite a wide variation in them;
- weak 'buy' factors which do not stimulate such as the nutritional value and the ingredients list on the label.

In developing the product concept, it is important to recognise these aspects of stimuli for the new product – strong buy/not buy, range of acceptable variation in important factors, and the low importance factors.

The consumer actions after buying the food, in preparing, eating and post-eating, are important in building up long-term attitudes and behaviour. The decisions that can be made, shown in Table 5.2, can lead to strong acceptance or dislike of the food.

Think break

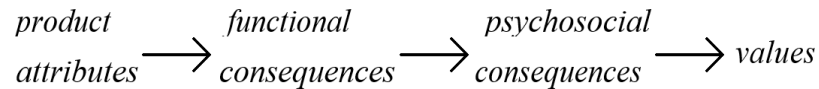
Compare the complete consumer behaviour from the initial perceived need to buy food to the post-eating actions for the following:

1. A teenager feeling hungry and deciding to buy a takeaway snack
2. A person buying the week's food for a household of adults and children under ten years.
3. A wealthy person deciding to go out to a high-class restaurant.

5.1.2 Product judging criteria

Product judging criteria during the buying and use of the product are important; for example for bread, they may be judging on: colour of the crust, shape of loaf, fibre content and price. When a person is faced with a food, they perceive its physical and social attributes through the senses of sight, feel, smell, hearing and taste. These in turn arouse the central control unit (the brain) to make a comparison between the perceived sensory properties and the acceptable criteria for the food based on personal preferences and past experience. The result of this comparison is acceptance or rejection of the product. This can occur at any stage of the food behaviour process. The product may be rejected at the search stage, because it does not fit the cultural pattern, someone in the household dislikes it, or it does not suit the eating occasion. It can be rejected during the buying stage because of the pack appearance, the nutritional information, the price, or because the product appears soft to touch, has an unpleasant odour. Similar judgements will take place throughout the preparation, cooking and eating stages.

The **level of involvement** that a consumer has with a product varies with product and environment. Involvement has several facets: perceived importance of product and buying/eating situation, perceived symbolic or sign value, perceived pleasure value and perceived risk (Laurent and Kapferer, 1985). Consumers' product knowledge is based on a chain (Peter and Olson, 1999):



Some attributes are related to strong core values of the person; others are unimportant and get little response from the consumer. Consumers can believe that product attributes are strongly related to their goals or values, for example that diet foods will help them to achieve their goal of losing weight, and therefore they feel strongly about the low-calorie attributes of the product. Values include **instrumental values**, the preferred modes of conduct, and **terminal values**, the preferred states of being. Consumers also recognise functional product attributes, which are important but not related strongly to either their goals or values; for example that dried soup powders mix easily with water. Finally there may be product attributes that are of no importance to them and these attributes will not gain their interest in the product. These three levels of attribute involvement by the consumer can occur in one product, and lead to the hierarchy of attributes used in product design. The consumers' product knowledge can recognise a number of product attributes, a number of product benefits and also their value satisfaction from the product.

5.1.3 Consumer/food relationship

The consumer and food relationship is important throughout the food behaviour process; both the food and the consumer have attributes and it is the compatibility of these attributes that determines acceptance or rejection of a food product. In product development, consumers' needs and the related products' attributes need to be considered together at each stage of the food behaviour process as shown in Fig. 5.3 (Schaffner *et al.*, 1998). The consumer decision in the post-action to not buy the new product, if widespread, will necessitate a redesign of the product. If it is decided just to drop the product, it is important to determine what caused the failure in the consumer/food product relationship and to store all the information for a later time. The consumer/food product relationship is the basic relationship in food product development and it is important that it is considered in all the steps in the food behaviour process.

Think break

In studying consumer/product behaviour for the development of new product concepts, there are four important stages:

1. Identify the consumer/product relationships for each action stage of the complete consumer food behaviour process
2. Relate the specific consumer needs/wants with specific product attributes.
3. Rank the specific product attributes for consumer importance in three levels: important, functional, not important.

4. Identify the most important product attributes on which to base the total product concept for the design of new products.

Now study the following buying situations using the above four stages

- Middle-aged man buying choccdates for a partner's birthday.
- Vegetarian buying a frozen convenience meal for their own consumption.

Identify the important product attributes for the product concepts of a new choccdete product and a vegetarian convenience meal.

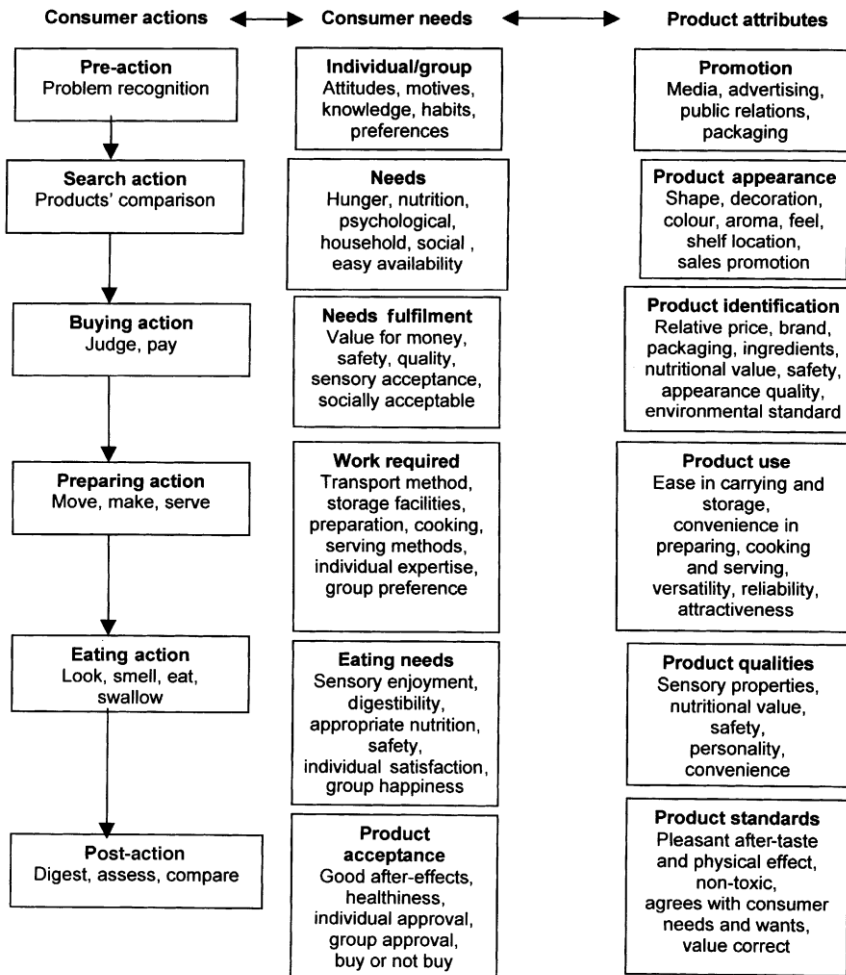


Fig. 5.3 Comparing consumer needs and product attributes in the food behaviour process.

There are three levels of understanding the consumer/product relationship: as an individual product, as a meal and as an eating pattern. The bar of chocolate could be eaten alone, but many food products are eaten together. For example the hamburger is in a bun with lettuce, tomato, a sauce, and it is sold with French fries and a soft drink. Sometimes this juxtaposition of foods is ignored in product development. The consumers also have eating patterns, which do change with time, and the foods have to fit into this eating pattern. So the consumer behaviour is more complex than the single product action model, as each model is interrelated with other product models. The success of the takeaway industry is based on its understanding of these interrelationships. In some cases it has also been used in the supermarkets, for example relating pasta and meat to sauces.

5.2 Understanding food choice

Food choice is an area of research that has expanded a great deal in recent years and whose findings need to be brought into product development. Food choice is caused by the interaction of the person and the buying or eating environment, both the state of the environment and the individual affecting the choice (Bell and Meiselman, 1995). Buying fish and chips served on fine china in a high-class fish restaurant, or buying them wrapped in newspaper from a fish and chip shop changes the interaction between the consumer and the product. Consumer food choice is complex; some of the variables are shown in Fig. 5.4.

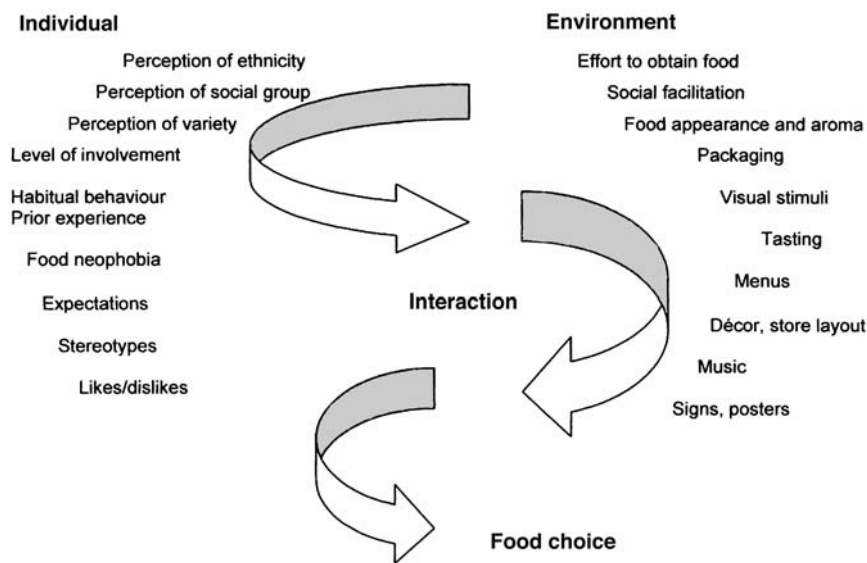


Fig. 5.4 Interaction of the individual and the environment in food choice (Source: After Bell and Meiselman, 1995).

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Food choice can be broken down to the pattern of purchase or rejection of a product, the needs and wants underlying this choice, the psychological attitudes underlying the needs and wants, the effects of the society and the culture. Some important factors for the individual consumer are:

- perception of ethnicity and social group;
- involvement with food;
- habitual behaviour;
- food stereotypes, expectations, likes/dislikes.

5.2.1 Perceptions of ethnicity and social group

Individuals' perceptions of ethnicity and social group, and the relation of these perceptions to the environment and the food, is a basic consumer variable. The term 'situational ethnicity' is used to show that there can be a change in food choice according to the environment except for strongly held taboos. In Box 5.1, the changes occurring in food eating in China are described to illustrate how the change in the environment changes the food choice. Changing the proportion of ingredients but in particular changing the spicing and sauces and the ethnic name can vary a product's ethnicity. This can be used for simultaneous food product development for domestic and export markets. For example, Thai and Australian consumers examined 18 Thai and 18 Australian meat products to determine if meat products acceptable in both Thailand and Australia could be developed (Nantachai *et al.*, 1992). They were asked to identify the context in which each product was used to determine common perceptions of meat products. The common dimension for Australians and Thais was 'social occasions'. Two groups of products satisfied social occasions for both the Australians and Thais – fermented sausages, such as Australian salami, pepperoni and Thai nam, and emulsified sausages such as Australian cabanossi and Thai frankfurter.

5.2.2 Involvement

Involvement, the importance of the food to the individual, can also affect their food choice; for example one consumer may have tea just as a warm drink, and will buy the cheapest tea; another person is very interested in the flavour and will buy on type and brand. There are consumers who are happy with their present range of foods with only an occasional change; other consumers are not strongly involved with the present products and are seeking variety. Much of food product development in the food industry in the 20th century was based on the premise that people want variety, but some products have lasted over 80 years. There is a need for more research to confirm the level of consumer involvement in different types of food products, and the need for variety in all product areas.

Box 5.1 Culture and fast food in the People's Republic of China (PRC)

Chinese cuisine has a long history, a rich culture, and enjoys worldwide popularity. Because Chinese food takes time to prepare even when cooking time is short, most work units (danwei) serve three inexpensive, relative low-quality meals each day. With economic reform and rising living standards, it has become fashionable and affordable for average PRC consumers to consume more time-saving services and to demand food that is different in taste, culture and quality. As happened earlier in Hong Kong and Singapore, demand for time-saving services is increasing faster than income. 'Face' ('mianzi', reputation, prestige obtained through one's efforts or conduct) is related to tangible and intangible personal success. 'Face' makes the Chinese risk-averse and slower to accept new products, and more loyal than Westerners once brand image is established.

Culture can influence consumers' food choices. The Chinese diet contains more rice, noodles, chicken, pork, vegetables and fewer sweet desserts compared with the American diet of bread, beef, cheese, dairy products and sweet desserts. Therefore, chicken and beef noodle fast-food restaurants are more popular in PRC than pizza and burger restaurants. Beef is scarce, and considered very nutritious in traditional Chinese medicine. The older a person is, the more difficult it is to adapt to the new diet. Therefore older PRC consumers eat burgers for nutrition, and younger consumers eat burgers for taste. Younger persons are more likely to try new foods. Many young, one-child families in urban Beijing take children to McDonald's about once a week. Young people seek novelty and material progress. Although they do not like pizza, Chinese teens sit at Pizza Hut to be seen, older Chinese like low-fat food; all go to McDonald's to be served, enjoy friends and listen to music.

Source: From Anderson and He, 1999, by permission of Haworth Press.

5.2.3 Habitual behaviour

Habitual behaviour is common in food buying – people go to the same supermarket, the same restaurant; shop in the same way – only buying specials, buying at the same time, buying the same brand. Over the years there are trends in buying foods, sometimes because of the availability of new products, and sometimes because of changes in life style. It is important to follow developing trends; for example the sales of frozen foods changed over 15 years in the UK with a gradual decrease in the pioneering frozen products, peas and beans, and the growth of potato products and convenience foods as shown in Table 5.3.

These trends of course are caused by many factors such as availability, life-style changes; but they do show how consumers change their habits gradually

Table 5.3 Frozen food consumption in the UK 1974–1989

	1974	1979	1984	1989
	ounce per person per week*			
Convenience meats	0.73	1.31	1.85	2.26
Convenience fish products	0.68	0.81	1.02	1.02
Peas	1.29	1.75	1.70	1.63
Beans	0.44	0.56	0.47	0.49
Chips/potato products	0.48	0.80	1.87	2.82
Other vegetables	0.45	1.01	1.15	1.76
Fruit/fruit products	0.05	0.08	0.03	0.03
Convenience cereal products	0.19	0.44	0.78	1.19

* 1 ounce = 28 g.

Source: From *Consumer Behaviour in the Food Industry* by J. Bareham, 1995. Reprinted by permission of Butterworth Heinemann.

over time in the types of food they buy. These trends, for example the buying of frozen potato products instead of fresh potatoes, have occurred in many Western countries such as the USA, Australia and New Zealand. Habits in food choice do change and the important thing in new product development is to identify what causes them to change – poor products, boredom, new foods which better satisfy consumer needs and wants or new information.

5.2.4 Food stereotypes

Food stereotypes, expectations and liking/disliking, are very important personal factors in food choice. Imagine the surprise on an aircraft when a snack of yoghurt, fresh fruit and muesli is served – it seems wrong because the stereotype for air travel food is ‘not fresh and over-processed’. Is your product a stereotype? The important thing in new product development is to break the stereotype and tell the consumer the new product is different, just as British Airways did with its new healthy menu. Consumers also have an expectation of the food. If the actual food is in the direction of their expectation, then the expectation is reinforced for the next time they consider the food – if they expect it to be very sweet which they dislike, and it is very sweet, then they will dislike it more. If they expect the drink to be refreshing and it is, then this will reinforce their expectation for the future. Information is important in expectation – when soups are branded for sensory testing, consumers will have expectations for different brands and their scores will vary from their scores if the soups were not identified. These expectations are an important consideration in product development, and emphasis in developing the total product concept is a basis for product design. And of course there is the basic liking/disliking of products – people have their preferences and it has long been a part of food product development to identify the likes/dislikes of the target consumers.

Think break

A dairy company has developed a line of new nutraceutical products, a range of biologically active dairy-based drinks, and wishes to market through supermarkets, where it is already selling dairy products.

1. Discuss the consumer needs and problems that could be met by these new products.
2. Discuss what prior experience and previous practice would lead to easy acceptance of the new products.
3. What are the types of socio-economic conditions and also social norms that would help the consumers to accept these products?
4. From the knowledge that you have found in 1, 2 and 3, describe the consumers for these products – their food expectations and liking/disliking. Also discuss the food stereotypes that they could have for yoghurts and how the new products relate to these stereotypes.
5. Discuss how you would design the packaging and the in-store promotion to give a total product concept for the new products so that the consumers have the knowledge to trial the products.
6. Where would you position the new products in the supermarket and display them to make the consumers aware of the products?

5.3 Consumers' avoidance and acceptance of new products

Consumers tend to avoid new foods – a phenomenon called *food neophobia*. This is the reason for free samples or in-store tasting of new products; and also a great deal of information with new products. In a Swedish study (Koivisto-Hursti and Sjoden, 1997), fathers avoided new foods more than mothers, and children more than their parents, generally younger children avoided new foods more than older children. Neophobia is related to the marketing classification of consumers in relation to new products as adopters and non-adopters, or innovators, influentials, followers and diehards. *Innovativeness* is the degree that a consumer will try new products, that is how venturesome they are and how prepared they are to take risks. They recognise a perceived risk in the new product as well as the product attributes and benefits that relate to their needs and problems. Other consumer conditions affecting adoption of new products are previous practice and prior experience with new products. Prior experience has an effect on new food choice, leading to early acceptance or rejection of the new product. Some people may take the risk of not liking the food or even of safety, and try the new food; other people wait to hear reports on the product. Some consumers are actively looking for new foods and try many new products. In product development, it is important to identify the different types of consumers and to provide the knowledge in the total product concept to overcome their perceptions of risks.

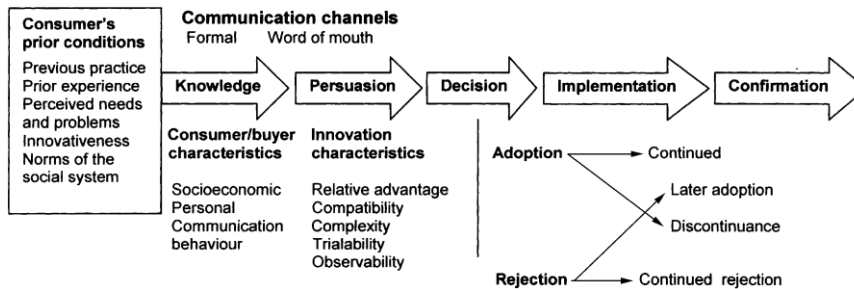


Fig. 5.5 Rogers' model of the innovation–decision process. (Reprinted with permission of the Free Press, a Division of Simon and Schuster, Inc., from *Diffusion of Innovations*, Fourth Edition by Everett M. Rogers. Copyright © 1995 Everett M. Rogers. Copyright © 1962, 1971, 1983 by the Free Press.)

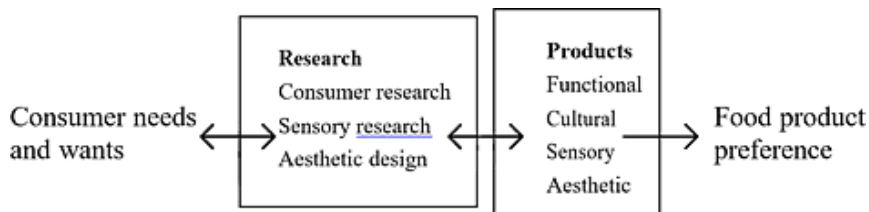
Consumers' prior conditions are an important basis for the diffusion of new products through the target market. If the company understands the different types of people and how they can be encouraged to try new products, then it can plan the product launch to give the optimum diffusion of the new product through the target market. The stages in the adoption process can be summarised as (1) awareness, (2) interest, (3) evaluation, (4) trial and (5) adoption or rejection (Schiffman and Kanuk, 2000). A more detailed innovation–decision process (Rogers, 1983) is summarised in Fig. 5.5.

The total product concept can be designed to give controlled diffusion by understanding the diffusion variables (Engel *et al.*, 1995; Schiffman and Kanuk, 2000):

- Innovation type: continuous innovation, dynamically continuous innovation, discontinuous innovation; related to the increasing level of disruption of the consumers' behaviour patterns.
- Characteristics of the total product concept to the consumer: relative advantage, compatibility, complexity, trialability, observability.
 - (a) Relative advantage is the perceived superiority to existing products.
 - (b) Compatibility is the relation to present needs, values and practices.
 - (c) Complexity is the difficulty in understanding and using the product.
 - (d) Trialability is the degree to which the product can be tried on a limited basis.
 - (e) Observability is the ease that the product and its benefits can be observed, imagined or described.
- Communication: from marketer to consumer through media, public relations, opinion leaders, sales promotion, shows, Internet; and from consumer to consumer by word of mouth.
- Time for adoption: the time for problem recognition, knowledge, persuasion, implementation (buy and use), confirmation and re-buy.
- Social system: ethnic, social, education, literacy, upward social mobility, commercial, size of units, technological level.

5.4 Integrating consumer needs and wants in product development

Food product preference is based on consumer needs and wants. There are a large number of consumer needs and wants, but four important areas to be understood for product development are functional, cultural, sensory and aesthetic. In the past, consumer research and sensory evaluation were two separate areas of research in product development, but today they are combined in an overall analysis of consumers' product preferences (Meiselman, 1994).



Consumer behaviour and food choice are basic research areas for product development. In the product development project, research is focused on identifying and evaluating specific needs, wants, sensory properties, cultural/social values and aesthetics, so that specific product attributes can be identified in the product concept and used as a guide in product design.

5.4.1 Identifying consumer needs and wants

As we have seen, there are many factors influencing how and what people eat and buy from the basic hunger pangs to the need for prestige, health. They can be summarised as shown in Fig. 5.6, which has been adapted for food eating from Maslow's hierarchy of needs (Bareham, 1995). In Fig. 5.6, the basic physical needs are shown in the two blocks, holding up the two wants of belonging and love, and esteem. Above these are values or intellectual needs. What is defined as a need and a want varies from person to person, once the physiological, safety and convenience needs have been fulfilled. In Fig. 5.6 a division is shown between the physical needs and the psychological wants, which may not be true for either individual products or individual people. Some people's wants are other people's needs, for example some mothers may feel a need to prepare/serve rich food that indicates care and loving for others; other mothers may see no need for food that gives energy as the children are already overweight and have a sedentary life style. Deciding what are the relevant needs and wants is a difficult decision in building the product concept. Also having satisfied the basic needs, some people may want belonging and love and some esteem. These are shown side by side in this diagram because neither is more important than the other in food eating. The top need is based on acquiring knowledge so that both the eating pattern and the selection of specific foods is based on knowledge of all the needs and wants in Fig. 5.6. This is gaining in importance as people acquire more nutritional and health knowledge.

Lindeman and Stark (1999) studied with young and middle-aged women in Finland:

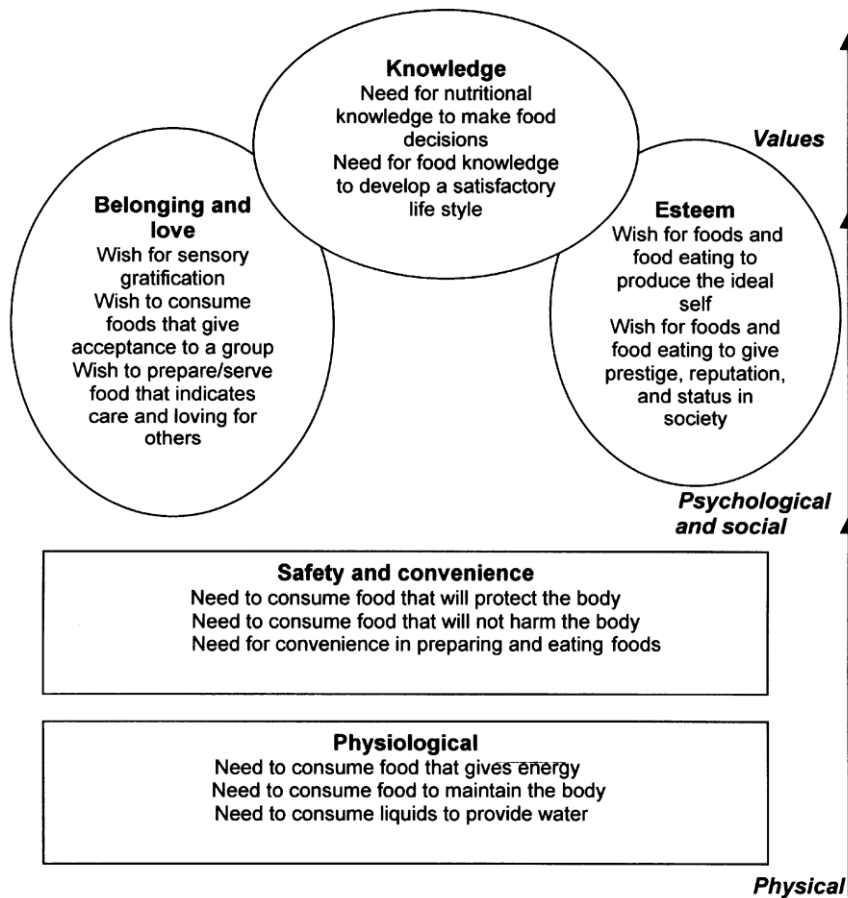


Fig. 5.6 Consumer needs and wants in foods (Source: After Bareham, 1995).

- food choices (health, weight control, pleasure, ideological reasons);
- personal strivings (understanding the world, ecological welfare, slimness, appearance);
- magical beliefs (lay concepts on food contamination and other everyday food problems);
- appearance and weight dissatisfaction, and symptoms of eating disorders.

These consumers clustered into six groups: gourmets, health fosterers, ideological eaters, health dieters, distressed dieters and indifferents. Health concerns were of moderate importance for gourmets and indifferents, whereas the remaining four clusters rated health as a very important factor in food selection. Ideological reasons were high for ideological eaters, health fosterers and distressed dieters. Ideological food choice motives were best predicted by vegetarianism, but also included magical beliefs about food and health, and strivings for self-

understanding and environmental welfare. Pleasure was high for the health fosterers and the gourmets. The health fosterers are an interesting group for the future as they are combining pleasure with health and ideological reasons. In a study of adult men, Tepper *et al.* (1997) found that dietary restraint was a consistent predictor of food choice. Restraint influenced the reported consumption of all food groups except desserts; nutrition and food beliefs played only modest roles in food choice. Men showing high restraint were less likely to consume whole-fat dairy foods, eggs, beef and cured meats, fast foods, fats and oils, and regular soda. There have been and will continue to be changes in consumers' concerns about food and health (Ruff, 1995), and it is important to differentiate between the long-term changes and the fashions stimulated by the media.

In the case of the Asian consumer, the top three needs are affiliation, admiration and status. Personal needs in Asia are subordinate to social needs; as a consequence the highest level of satisfaction is derived not from the actions directed at the self but more from the reactions of others. Affiliation is the acceptance of an individual as a member of a group, admiration is earned through acts that demand respect of others, and status comes from the esteem of society at large (Schütte and Ciarante, 1998).

An example of all levels of needs and wants is shown in Table 5.4, which outlines the reasons given for not eating meat. This is an interesting list as it covers practically all the general reasons why people do not eat specific foods. In product development, the meat industry has attempted to reduce these reasons for not eating meat by dealing with the following problems:

- Animal welfare – change from caged to free-range chickens.
- Environment – reduction in forests cleared for animal rearing.
- Health – fat-trimmed lean meat; organic meat.
- Social priorities – barbecue steak, frozen turkeys.
- Displeasure – absorbent pads in meat trays, plastic wrapped trays, meat tenderisation.
- Metaphysical – halal killing for Muslims, small pigs for Samoan celebrations.
- Expense – reducing costs of chicken production and therefore price.
- Inconvenience – easy-to-cook products such as stir-fry chicken, minced pork.

This list shows the variety of consumer needs that trigger changes in the total product concept. The factors in food choice are complex and vary according to consumer and product. In developing a model for food choice, Furst *et al.* (1996) found that ideals, personal factors, resources, social contexts and food context were major influences on food choice. These influences led to the development of personal systems for making food choices that incorporated value negotiations and behavioural strategies. Sensory perception, price considerations, health and nutrition, convenience, social factors and quality were all considered as part of value negotiations, and strategies were developed to simplify food choice. The variation with different product types was shown in a retail study in Britain (Beharrell and Denison, 1991) which found the attribute importance from highest to lowest was as follows:

Table 5.4 Reasons for reduced meat consumption during the 1980s and 1990s

Animal welfare	Moral reasons associated with the view that modern animal production is ethically unacceptable.
Environment	Moral concern that certain features of animal production harm the environment and have undesirable ecological consequences.
Health	Concern about one's own health (1) avoiding natural compounds: cholesterol and saturated fats, (2) avoiding added compounds: hormones, antibiotics, pathogens, (3) avoiding specific health problems: cancer, hypertension.
Social priorities	Conform or adapt to the life style or standards of friends, relations or other influential people. One's own body image is an important example.
Displeasure	Rejection from sensory qualities: sight of meat and associated blood or blood-like drip; sticky texture of meat; taste and elastic mouth-feel of meat when eaten.
Metaphysical	For spiritual, religious, doctrinal or ethnic reasons.
Expense	Abstain because of cost.
Inconvenience or inappropriate presentation	Do not fit into 'light' informal meals, difficult or slow to cook at home, inappropriate for takeaway trade.

Source: After Gregory, 1997.

- Preserves: brand and quality; price; variety and size.
- Bakery products: health; freshness, brand and price; variety.
- Dairy products: health; brand and quality; price; variety.
- Cereals: health and brand; price, size and variety.
- Soups: brand; variety; price; health.
- Fresh meat: quality; presentation, variety, health and price.

Health was of major importance for bakery, dairy and cereal products, but very low for soup and not at all for preserves. Fresh meat was different from the other products – quality was supremely important, other attributes were considerations with little between them. But as described in Table 5.4 in reasons for not eating meat, there are other factors not included in the retail study, which do affect meat buying.

Introducing completely new foods can present problems. For example, Buisson (1995) stated that consumers do not understand functional foods, and they needed to be led gently into such products and the medical benefits not stressed. 'The relative naiveté of the consumer over the links between diet and health is a major impediment to product development of functional foods.' He stressed that great care is going to be necessary in involving consumers in such developments. This is true of all major technological developments in the food

industry; the new products based on it need to be developed so that the consumer sees a major health benefit without any major worry about safety.

These various studies show some of the complexity of identifying the consumer needs and wants as a basis for product development.

Think break

In the USA and some other Western diets, the level of fat is too high. Much product development in the past 20 years has been to reduce fat in the diet either by developing low-fat products (Nestle *et al.*, 1998) or by fat replacement (Mela, 1996).

1. Compare the needs and wants of the consumer when buying and using butter and low-fat margarine. What attributes in low-fat margarine could cause the consumer to change or not change their food choice from butter?
2. Butter is often used as flavouring in foods, for example vegetables and sauces. Discuss why it is a popular flavouring, and what attributes a new flavouring would need to replace butter.
3. Some meat is being replaced with tofu in a hamburger to reduce the fat content and the meat content for consumers who are decreasing their meat consumption. Identify the needs and wants of the consumers and relate these to the attributes of the new style of hamburger.

5.4.2 Cultural needs and wants in foods

Broad consumer characteristics such as nationality, religion, race, age, sex, education and socioeconomics are the basis for consumer attitudes, motivation and behaviour. The relationship of some basic consumer characteristics with food may change only slowly if at all, for example religious taboos and requirements such as Hindus not eating meat, Jews not eating pork. Other foods can be replaced by new foods quite quickly, for example fried potato chips replacing rice for young people in SE Asia. With the internationalisation of the food industry, it is important to study these relationships in some depth in introducing new products. There are products that have penetrated the international marketplaces, such as instant coffee, Coca-Cola, Kentucky Fried Chicken and McDonald's hamburgers, which are not related to local foods, but have been very successful introductions. This has been achieved by marketing activities and also by an understanding and use of the market systems to reach the target consumers. Very often new distribution systems have been introduced which may have revolutionised the local food market, in particular bypassing wholesalers and delivering products directly to the retailers, or indeed setting up a new retailer system such as Kentucky Fried Chicken and McDonald's. Some food manufacturing companies with a wide range of products have cooperated in the building of supermarkets and convenience stores, which then have the facilities to accept the companies' new products. This again emphasises that the

new product is not just a food but the total product and must be regarded as this in product development.

Acceptance can also be obtained by using a long-established and popular local brand name. But there is still often a need for modification of the products, particularly as regards flavours, and sometimes the packaging and the brand so that the new product agrees with the preferences, attitudes and habits of the new consumers. The size of packaging can be important; for example, the introduction of small pet food packs for the Japanese market where both the houses and the pets are small and the standard can was too large. It can also be a question of price; the pack size can be reduced to a size that is affordable to the target market. New products must relate to the economic level of the target consumers. The culture can also dictate the type of raw materials and processing methods acceptable for the new product. The effects of the culture on product development are summarised in Fig. 5.7 (Bareham, 1995).

Sometimes, the cultural resistance to new product development is too great. Culture is the foundation that underlies all food choices and people use the rules or habits of their specific cultures, and also ethnic groups, to decide what are acceptable and preferable foods, the amount and combination of foods, and ideal foods and improper foods (Nestle *et al.*, 1998). The growth of ready-to-eat cereals in Thailand was slow because the cereals did not fit into the breakfast eating pattern and also because milk was not generally available at breakfast. Steamed rice, fried rice and rice porridge were common at breakfast, often eaten with pork, fried egg or a savoury sauce. Cold cereals did become accepted as snacks for children between meals. This shows the need to understand consumer behaviour in food eating.

To have a food product accepted by a number of cultures, it can be designed with sensory characteristics that are generally acceptable but not distinctive. This often works but if there is an expectation in a culture for specific sensory properties it can be unacceptable. For example in the introduction of instant noodles into Thailand, noodles with international flavours were very slowly

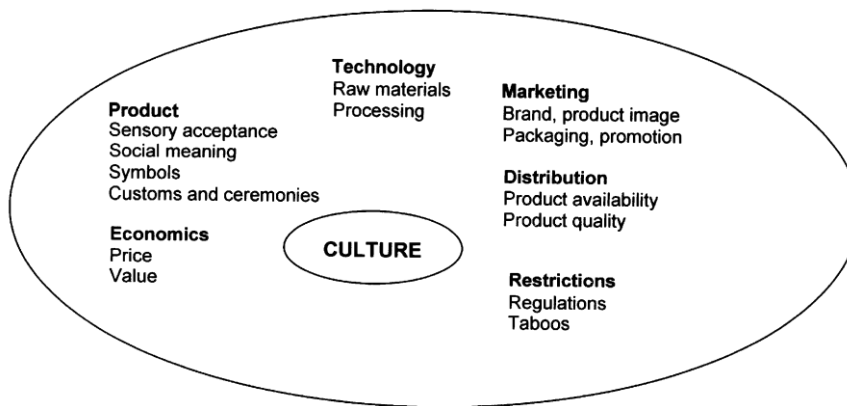


Fig. 5.7 Cultural effects in new product development.

accepted, but when noodles with sachets of Thai sauces and chilli powder followed, sales grew rapidly. When going international there is also a need to understand the geographical situations, climatic conditions and the food industry in the country including processing, marketing and distribution. The local situation must be understood, particularly through cooperation with local people. Raw materials can influence acceptance and there may be a need to replace the foreign raw material with local products. New products need to be seen as superior in some way to the local products, and the marketing has also to be creative. The advertising and promotion needs to be related to the target consumers; for example it may be useful to have cooking demonstrations and video films to show people how to use the product.

The unique functions of the product need to be stressed but also the advertising must fit with the cultural beliefs and practical needs of the consumers. To achieve a 'universal' product, the product must serve a unique but common human need that is seen to improve the life of people in general. Coca-Cola serves a need to have a cheap, safe, refreshing drink, but it is also related to the American life style that is economically higher than in many other nations. So consumers quench their thirst but also hope to raise their living standard to what they see in American films and TV shows. Coca-Cola is adjusted to meet different sensory preferences such as sweetness and acidity in different countries.

Think break

Bring together a group of six to eight people to form a focus group. These people should eat potatoes as part of a meal and also buy potato products sold in the supermarket. Conduct two discussion groups with them:

1. When, how and why do they eat potatoes?
 - (a) When do they eat potatoes in a meal and as a snack?
 - (b) How often do they eat potatoes?
 - (c) Where do they eat potatoes – at home, in a restaurant, as a takeaway?
 - (d) What form of potatoes do they eat – boiled, roasted, fried, etc.?
 - (e) Why do they eat potatoes?
 - (f) What are their general perceptions of potatoes, their experience with potatoes, the stereotype of potatoes, their expectations, their likes/dislikes, good things/bad things about potatoes?
2. When, how and why do they buy potato products in the supermarket?
 - (a) What potato products do they buy in the supermarket?
 - (b) For what occasions do they buy potato products?
 - (c) What are the reasons that they buy them?
 - (d) What do they like/dislike about the products?
 - (e) What are the advantages/disadvantages of the products?
 - (f) What new potato products have they bought?
 - (g) What kinds of people buy the different products?

From these discussions, build up a picture of the buying and eating of potatoes and how this is changing. Clearly identify the consumer needs and wants in buying potatoes and buying potato products, including any cultural factors in potato eating. What directions for potato product development does this indicate?

5.4.3 Aesthetics, foods and consumers

There have been over many centuries discussions on the relationship between taste and Taste, that is respectively the tasting part of eating and the faculty of discerning and enjoying beauty or other excellence, especially in art. Is the gourmet, the connoisseur of food and wine, appreciating the *artistic beauty* of food and showing their Taste? Korsmeyer (1999), discussing taste, said:

The objects of taste not only are fleeting, they participate in the necessary repetition of the practical world of daily life. Eating and all the work that is required to make it possible is a repetitious and perpetual exercise. But this practical fact does not mean that when eating is conducted with reflection and grace it manages to be only pleasant, nor does it mean that its pleasures do not reach beyond themselves to anything more profound.

Eating has always been a symbolic part of culture and society. Particular foods are symbols of:

- religions, for example bread and wine for Christians;
- countries, for example artistically cut vegetables of Thailand;
- celebrations, for example Easter with hot cross buns, Easter cakes;
- marriage, for example wedding cakes.

But the symbols change, their significance changes and they even move their culture. Example of developing symbols, the pretzel and the croissant, are described in Box 5.2.

Food can be representational symbols such as the pretzels, croissants, hot cross buns, but it can also be abstract symbols, for example fresh vegetables can be the symbol of health, chocolate a symbol of indulgence. Some modern symbols are the golden arches of McDonald's, which in many countries symbolises the affluent American society, and Coca-Cola, which for many teenagers symbolises fun and socialising. There can also be products that are symbols of part of the culture, for example beer is related to rugby, an important part of New Zealand culture. Foods can also be related to art, for example in former times a still life with game birds and fish or baskets of fruit signified good living; and in the 20th century the Campbell's soup can became a well-recognised art icon.

Gourmet chefs of course regard their craft as art, both for the visual effect and the eating qualities. They create food for high-class restaurants and at ceremonial dinners, with a great deal of thought and knowledge, to give an aura of

Box 5.2 Pretzels and croissants: changing symbols

The pretzel is said to have been invented by a monk in the early seventeenth century, who twisted a string of dough and baked it into the curved outline of a brother at prayer, to dispense as a reward for his pupils who recited their catechism correctly. This was called bracciatelli, which translates as 'folded arms'. In some parts of Europe, pretzels are a Lenten food, again the arms resembling the folded arms of the monk. But what are pretzels symbolic of today – the USA and casual living, as snack foods for that social occasion? By understanding the symbols of the pretzels, they take on a new expressive dimension, and the aesthetic apprehension of the pretzel expands.

Croissants were invented in Vienna in 1683. In celebration of the successful defence of the city against the Ottoman Turks, Viennese bakers crafted little buns in the shape of the crescent moon on the flag of their enemies. In this case, not only the crescent shape was recognised as denoting the foreign enemy, but also the fact that one devours the crescent re-enacts the defeat of the invaders, and perhaps also represents Christianity overcoming Islam. But today with its expansion through many countries it is seen as representative of France and French breakfasts.

Source: Reprinted from Carolyn Korsmeyer: *Making Sense of Taste*. Copyright © 1999 by Cornell University. Used by permission of the Publisher, Cornell University Press.

wealth, sophistication as well as unusual eating qualities. They of course do create for vision alone in ice sculptures and sugar confectionery. Their creations can be related to the current art climate or earlier art such as art nouveau. Chefs are increasingly being integrated into the product development process by food manufacturers, ingredient companies and supermarkets to develop complete meals and also to develop new food experiences and taste sensations (Hollingsworth, 2000).

Food can mean beauty. It can be identified as outstanding, for example the gourmet and the wine buff have built up their knowledge so that by looking and tasting they can identify the attributes that identify outstandingly beautiful food and wine. At this level, food has an aesthetic value which can be described and admired. Often the product has been developed over many years, such as French wines; but it can also be developed by new technology as has been seen in the wines, developed in the last 20 years in Australia and New Zealand, which have won many medals and can command high prices. Food products can also be associated with beauty; for example all the diet and special foods which are claimed to give beauty to the eater.

Like all art, food does go through fashions, but may not be so directly connected with fashions as clothing, houses and furnishings. A Victorian menu for an important event is very different from the menu at a ceremonial dinner today; the three tier, iced Victorian wedding cake is very different from some of

today's wedding cakes, shaped in the form of two hearts, which have soft icing on carrot or chocolate cake. Food fashions do not change very quickly, unlike clothing; except for the gimmick foods associated with a TV programme or a film. But today there seems to be much faster changes, for example in coffee shops, ethnic restaurants and special foods where promotions and advertising are persuading the consumers that there is a new fashion in eating places and they need to change. An example is the recent expansion internationally of coffee houses, which have changed the plain cup of coffee into a range of coffee types, and made it fashionable to go to a coffee house for that casual hot drink. Fashion changes thrive in a group that accepts change (Zelaneck, 1999); so with the fast-moving international changes occurring today, one would expect fashions in food to become more important.

But what does aesthetics mean in product development? The design of food packaging through the past 50 years has been very much related to developments in art. The graphics on the can of soup have developed from the simple, plain, printing, through the cartoon type illustration, the representational picture of the food, the inclusion of the consumers with the food, to the showing of raw materials and the ready-to-serve. There have also been some abstract designs during the years. However, food products in general have not tended to go along the aesthetic path and there have been some disasters where main-line food companies have tried to branch into gourmet foods. Perhaps this is the time to join aesthetics with modern technology in designing what are called more customised new products, identified more clearly as foods with Taste and not just taste. The success of wines and cheeses as aesthetic products could be expanded to other product types and in particular to future new products.

Think break

1. Identify five foods that are religious symbols.
2. Study five paintings, one from each of the 16th, 17th, 18th, 19th and 20th centuries, that show foods and decide what they are saying. How has food changed over the years?
3. How has art changed during the past ten years? What direction could this give to food design?
4. Identify foods that symbolise today: health, fun, luxury, good company, wickedness. How could you build up a new diet food to symbolise the ethics in your market?
5. Contrast the aesthetics of a wine with the aesthetics of a fruit juice, using two products with which you are familiar. How could the juice be given an aesthetic value the same as the wine? Who could be the target market for the new fruit juice?

5.5 Sensory needs and wants in food product development

The importance of the sensory properties of the food in acceptance or rejection of the food has long been recognised. The appearance, colour and sometimes aroma of the food are influential in buying; aroma, flavour and texture in eating the food. However, in buying behaviour, taste is not the only crucial determinant, and in some cases is well down the priority list (Raats *et al.*, 1995). Therefore, it is important not only to recognise the sensory properties but also the interaction between them and other product attributes.

5.5.1 Sensory product attributes

A food can be defined at different levels (Cardello, 1996) when considering the sensory properties. There are basic properties of the food that can be recognised by the individual's sensory system and then, by using learning and memory, these sensations are changed into the sensory product attributes perceived by the individual. Taste and aroma are combined in an overall flavour, e.g. an acidic taste with a citrus aroma are combined into an orange flavour; and the mouth feel, biting and chewing are combined in an overall texture – for example consider sticky toffees and hard toffees. Having identified the sensory product attributes, the individual can score them on a liking (hedonic) scale from dislike very much to like very much. Bringing the like/dislike scoring together with other properties of the product brings the consumer to acceptance or rejection of the product. The stimulus, sensation, perception and the response are combined in the individual and the product as shown in Fig. 5.8. The core is physical and chemical properties of the product, which are the basis for sensory properties. But in a food these sensory properties interact with each other, and the consumers have perceived sensory reactions.

Sensory product attributes have to be firstly identified before measurement and hedonic testing. Classifying the sensory product attributes is complex when one moves beyond shapes, sizes, basic tastes of sweet, salty, bitter, sour; and the colour standards of lightness, hue and chroma. Texture can include the finger feel and the mouth feel; the finger feel including firmness, softness, juiciness; mouth feel including the mechanics of chewing such as hardness, cohesiveness, viscosity, elasticity; the geometrical characteristics such as particle size, shape and orientation; and other mouth feels such as moistness and greasiness. These are in a simultaneous or sequential effect during eating, and give a total final reaction on swallowing. For example in testing the texture of black beans (Watts *et al.*, 1989), the descriptions in Table 5.5 were used by a trained texture panel. The magnitudes of these biting and chewing attributes, and also the duration of chewing were determined.

Developing terms for flavours and aroma is much more complex. For example one can take four or five representative commercial samples of the product type (category) or some of the product prototypes with different levels of ingredients, and ask a sensory panel to list the flavour characteristics, then in discussion try to

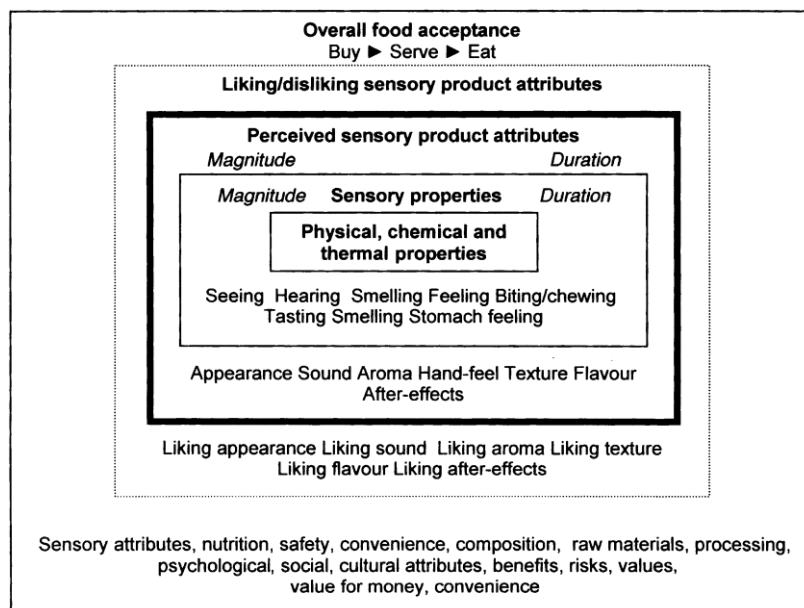


Fig. 5.8 Building sensory attributes for consumer acceptance.

organise the different descriptions into flavour types and use a reference list to group them into categories, as in Civille and Lyon (1996). A reference substance (usually a chemical compound but can be a simple substance) is found for that particular flavour category and used by sensory panels in the future. Flavour terms have been built up as shown in Table 5.6 for some specific foods. These terms have standard descriptions, for example *burn* is ‘chemical feeling factor associated with high concentrations of irritants to the mucous membrane’, *heat* is ‘chemical burning sensation in the mouth and throat’. To explain the difference, the reference sample for burn is vodka and for heat is red pepper.

Table 5.5 Measuring the texture of black beans

Hardness: bite down once with the molar teeth on the sample of two beans and evaluate the force required to penetrate the sample.

Particle size: chew the sample (two beans) for only two or three chews between the molar teeth, and then rub the cotyledon between the tongue and palate and assess the size of the particles which are most apparent.

Seedcoat toughness: separate the seedcoat from the cotyledon by biting the two beans between the molar teeth and rubbing the cotyledon out between the tongue and palate. Then evaluate the force required to bite through the seedcoat with the front teeth.

Chewiness: Place a sample of beans (two beans) in your mouth and chew at a constant rate (one chew per second), counting the number of chews until the sample is ready for swallowing.

Source: From Watts, Ylimaki, Jeffrey and Elias, 1989, by permission of IDRC, Ottawa, Canada.

Table 5.6 Descriptions of flavours of vegetables

Corn	Cucumber	Eggplant (aubergine)	Red peppers	Parsley
Cardboardy	Astringent	Bitter	Bitter	Barny/barnyard
Grassy	Bitter	Cooked	Burn	Bitter
Legumy	Cucumber	Heat	Heat	Fishy
Metallic	Green	Metallic	Pungent	Grassy
Salty	Sour	Mouth numbing	Raw	Green
Starchy	Sweet	Raw	Sweet	Hay
Sweet	Watermelon	Sweet		Salty
Woody				Sweet

Source: From Civille and Lyon, 1996, copyright ASTM, reprinted with permission.

Other sensory characteristics are temperature, pain and sound. A product such as ice cream has its own temperature effect, and there are effects of temperature on the sensitivity of the consumer to flavours and aromas as well as on the volatility of the aroma materials. Consumers expect a certain temperature of foods for eating. Although a canned stew is safe and edible if eaten from the can, can designers have gone to great lengths to design methods of quick heating to make the stew acceptable. Some pains are expected for example in eating very hot curries, drinking a 'straight' whisky, licking an ice block, but some are unacceptable such as finding a hard nut that hurts your teeth. Sound affects the acceptability of many products, for example the snap of raw celery and the crack of a biscuit indicate freshness. Some important factors in the overall sensory character of the product are the order of appearance of the attributes, the magnitude of the attribute and the duration of the attribute.

5.5.2 Interactions of sensory product attributes

Clear definition of the desired sensory properties by the consumer may be difficult because of their interaction in consumer acceptance. The consumer may not be able to separate the sensory attributes that influence their liking or disliking of the food. It is this interaction of even simple tastes such as acidity and sweetness, colour and fruit flavours that can make sensory testing and product design complex. An example of interaction was shown in a study by a trained Canadian sensory panel which showed that the perceived intensity of sourness in lemonade decreased with increasing levels of sucrose added as in Table 5.7.

Table 5.7 Sourness of lemonade with increasing sucrose

Sucrose (%)	0	2	4	6	8
Mean sourness score	13.5	11.0	4.5	3	2.5

Source: After Poste *et al.*, 1991.

Another problem is the interaction of the sensory testing with other consumer characteristics; for example consumers may have a stereotype of the product that disagrees with the sensory properties of the new product, or they may be slimming and therefore will downgrade creaminess and their acceptance of a new ice cream. Also there are differences in national preferences for sensory properties, even between what one would think are similar groups – such as Australians and New Zealanders (Cooper and Brown, 1990). Australian products (potato chips and canned soups) were found to be saltier than New Zealand products; New Zealand products (chocolate biscuits, fruit juices) sweeter. There appeared to be genuine differences in the types of products desired by consumers on opposite sides of the Tasman. Cooper and Brown suggested that one should always regard the consumers' 'norm', what they are familiar with, as a very powerful factor in product acceptability. For example 'tropical' flavour – a mixture of pineapple, passionfruit and orange and having a strong yellow-orange colour – is very popular in New Zealand in many products because it was one of the earliest juices introduced onto the New Zealand market in 1981 and became very popular. But it is much too sweet a flavour for Australians; they like their juices more sour and often lighter in colour.

Sensory acceptance and its relation to overall product acceptance is not predictable from a straightforward simple sensory panel, but needs a more complex research of consumer needs, wants and behaviour (Cardello, 1996). The total product has a strong effect on acceptance. The advertising, the information given, the appearance, the aroma or smell all lead the consumer to expect certain sensory qualities in the food and they will rate their acceptance against this. If it reinforces their good expectation, then the sensory properties will be acceptable; if it is better than their bad expectation, they may even score the sensory properties more highly. In Table 5.8 are shown the consumer scoring in Germany of one sample of Dutch tomatoes with different labels, to show the effect of labels and information on quality determination by consumers (Vesseur, 1990).

Another important factor is the amount of a food product eaten and how often it is eaten. Consumers may become tired of a product and stop buying it – they

Table 5.8 Taste of one sample of Dutch tomatoes with different labels

Label	Average judgement*
German organic	2.5
German open air	2.5
Dutch open air	2.6
Mediterranean	2.8
German greenhouse	3.0
Dutch greenhouse	3.0

* Based on a scale 1 = very good, 6 = inadequate.

Source: Adapted from Vesseur, *Acta Horticulturae* 259, 1990 by permission of ISHS (International Society for Horticultural Science) Leuven, Belgium.

may find it boring or may find some sensory aspect overwhelming when eating a large quantity. Köster (1990) tested two kinds of tomatoes with 200 families over four weeks, one group using product A and one using product B. Product B had a higher liking score than Product A at first sight, but from their diaries:

- More of Product A was used than Product B.
- More of Product B was thrown away than Product A.
- More outside tomatoes were bought when they had Product B than when they had Product A.

In developing a new product, it is important to test for several times with the consumer and with the amount that they normally eat. In home-testing it is useful for them to keep diaries to show how much they use.

Think break

Contrast the sensory product attributes when consumers buy, serve and eat

- fruit juices;
 - fresh porterhouse steak
1. List the sensory product attributes that you identify from buying to after eating.
 2. What sensory attributes interact in buying, eating and serving?
 3. Identify all the sensory attributes that affect your sensory liking/disliking.
 4. What other product attributes would you include in determining your acceptance of the two products?
 5. Are there any interactions between these and the sensory attributes?

The consumers' liking and disliking of the sensory properties are complex because they are bringing their product stereotypes, expectations, past experiences, and some of the other product attributes that influence their acceptance of the product.

The problem in product development is how to relate future consumer and market needs, wants and behaviour to product, production, processing and marketing technologies; and also how to relate new technologies to future consumer and market needs. This interrelationship is important in every stage of the PD Process. Therefore the consumer needs to be involved at every stage either directly or through their recorded needs and wants. The product development is focused on the consumers or in the case of the industrial and food service product development on both the customers and the consumers.

5.6 Consumers in Stage 1: Product strategy development

In developing the product strategy, there are seven steps (Linnemann *et al.*, 1999):

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1. Analysis of socioeconomic development in the target markets.
2. Translation of consumer preferences and perceptions into consumer categories.
3. Translation of consumer categories into product assortments.
4. Grouping of product assortments in product groups in different stages of the food supply chain.
5. Identification of processing technologies relevant for specific product groups.
6. Analysis of the state of the art in relevant processing technologies.
7. Matching the state of the art of specified processing technologies with future needs.

This study sets up a new product strategy based on the consumers. As Linnemann *et al.* stated, the beginning is a study of consumer trends. For example, is the life style of consumers changing? What are the trends in food buying? How are their economic standards changing? This gives the background to the choice of new product areas. In category appraisal, consumers study the company's and competing products in a product category to investigate the acceptance and standing of the company's products against competitors. Product prototypes can also be studied with the commercial products. Consumers can describe their concepts of the products, and the key product attributes leading to consumer acceptance. They can give opinions on their 'ideal' products. From this information, opportunities for new products in the category can be identified. It may also lead to changes in positioning of the company's products.

After the product strategy development, the consumers need to be involved in the generation of product ideas, screening of product ideas, development of the product concept and finally the product design specifications, so that their needs and wants are brought into the product concept which is the basis of product design, as shown in Fig. 5.9. The activities in Fig. 5.9 show the importance of the consumer involvement in Stage 1 of the PD Process, which lays the basis for the product development project. The most important activities are product idea generation and screening, consumer survey, product concept development, product acceptance predictions and development of the product design specifications.

5.6.1 Product idea generation and screening

Consumers have taken part in product idea generation for 50 years. Initially the individual in-depth interview was used in motivation research to find out why people bought particular products, and product features were built up based on this information. The interviews were usually conducted by psychologists or psychology-trained interviewers. Later consumer discussion groups became more common as the new product ideas were found to be more creative because of the synergy between the members of the group. These small consumer panels are representative of the target market segments; they can be a focus group with



Fig. 5.9 Some consumer activities in Stage 1: Developing the product strategy.

free discussion using techniques such as brainstorming and lateral thinking, or a nominal group with a more formal session using questionnaires, which consumers answer individually followed by general discussion. There are usually 6–10 people in each group discussion, but this can be repeated several times to give a total of 60 consumers or more. These consumer group

Table 5.9 Observation form for making choux paste in the home**SETTING**

Baker: male female **Date**
No. in family **Day**
Quantity of choux paste per mix **Time to start**
Quantity of choux paste per month **Observer**

INGREDIENTS**Selection: please state type or brand of ingredients used**

Flour Eggs: fresh frozen pulp chilled pulp dried other
 Fat: butter margarine branded fat other
 Salt Sugar Flavourings
 Other ingredients

Preparation: please describe

Flour: sifted not sifted other
 Eggs
 Fat
 Water

METHOD

First mixing
 Order of adding ingredients: 1st 2nd 3rd 4th 5th
 Equipment used: hand whisk electrical whisk cake mixer
 Method of mixing
 Time of mixing

First heating

Mixture heated Mixture not heated
 Equipment used: steamer bowl over pan bainmarie other
 Method of heating
 Temperature of heating
 Time of heating
 Any other comments

Second mixing as above, note any other ingredients added

Second heating as above, note any other ingredients added

Third mixing as above, note any other ingredients added

Third heating as above, note any other ingredients added

Depositing

Piping bag Spoon Other

Baking

Type of oven: electric gas other
 Temperature of baking
 Time of baking

Time out of oven

Complete time for making the choux paste

Products made

Eclairs Cream puffs Other

Any other comments

discussions are faster than individual interviews, cheaper, more flexible and reduce distance between company and consumer. They can develop ideas when little is known about a product area, and investigate the trade-offs the consumers are making. The most important aspect of consumer group discussions is that the results are in a ready form for developing the product concept and the whole basis of the product design. The criticisms are that the groups are small and not statistically representative of the target market, and that some consumers are influenced by other members and the group leader. At this time in the project, quantity of information is important in building up the ideas and the product concept.

Observing the behaviour of the consumer from buying to disposal of waste can also generate ideas for new products. Table 5.9 shows an observation form on the baking of choux paste by a home baker to aid the development of a complete baking mix for choux paste. Observation is a useful technique to study consumer behaviour, but it must be used carefully and wisely. An unusual happening in the environment or even the observation itself can lead to unusual behaviour. It is very useful to study how the consumer prepares/serves the product and the method of eating. Observation can provide a first hand, authentic picture and is the best method of studying consumer behaviour, but usually it can observe only public behaviour. The consumers can record their own behaviour, if it is not possible to observe their actions.

Think break

1. Making chouxpaste can be a long and difficult procedure, not always successful for the new baker. Can you suggest new products that could make this process quicker and easier and would guarantee success for the household baker?
2. Using a focus group develop ideas for new products to solve the following problems for consumers:
 - (a) improve the nutritional value of ice cream,
 - (b) increase the safety of oysters.

The consumer groups also screen the new product ideas, in combination with technical and company screening. The initial stages of idea generation and screening (Roberts, 1997) for a food service new product are shown in Table 5.10. In this case there are three groups – the supplier, the menu planning decision maker and the consumer. Roberts explored all three in the initial stages. Table 5.10 shows the interactions of the suppliers (meat processors), the menu planners (usually chefs) in the motels and hotels, and the consumers (the customers of the motels and hotels). It is important to combine the needs and wants of the consumers, the technical staff and the company in building up the product descriptions.

Table 5.10 Multistage idea generation and screening for a meat product for hotels and motels in Melbourne, Australia

Activities	Participants	Techniques
Preliminary idea generation	Food technologists, caterers	Nominal group technique Brainstorming Synectics
Preliminary screening	Researcher	Qualitative: fulfil consumer requirements, offer benefits for menu planner, value for money, competitive advantage Outcome: 30 product ideas in categories
Development of ideas	Menu planners Consumers (beef eating)	Focus group on list of product ideas Focus group on a list of product ideas Outcome: 30 ideas with benefits, attributes needed by consumers and menu planners
Technical feasibility screening	2 meat technology experts	Interview on technical feasibility, technology availability, competition, demand volume Outcome: 32 technically feasible products
Checklist screening	4 food technologists	Individual scoring on marketing and technical factors Outcome: 14 product ideas in 5 categories
Development of product descriptions	Menu planners Consumers	Focus group Focus group Outcome: 14 product descriptions
Suppliers' company specific screening	Managers Food technologists	Individual scoring Individual scoring Outcome: 5 Agreed product descriptions for development
Raw beef product untreated – tender beef in thin slices. Raw beef product treated – flavoured pickled beef. Prepared ready-to-cook product – fricadelle (new beef burger), coated beef product. Pre-cooked beef product – precooked meat loaf.		

Source: From Roberts, 1997.

5.6.2 Consumer survey in the early stages of product development

When more quantitative data are needed, for example in determining the target market and predicting the sales to the target market, a consumer survey using a randomly selected sample of the population is needed. Consumer surveys are usually personal interviews using a formalised questionnaire, but sometimes a qualitative unstructured interview can be used where there is little information

about the new product. Methods of organising a consumer survey in product development projects are described in West and Earle (1987).

The consumer survey usually compares three or four new product ideas that have been generated. The information sought can be past and intended behaviour; general opinions and attitudes on eating characteristics, nutritional value, safety, cooking/serving/eating needs, size of packs and related cost; and demographic data such as socioeconomic characteristics and level of knowledge. It is useful to identify the usage patterns for products at present on the market and to assess consumer attitudes and opinions on particular types of products, as well as seeking information on the new products. The information can be analysed to give market share by consumer classifications, method of purchasing products, frequency of purchase and ways of using products. The researcher defines the market segments and forecasts the market potential. From consumers' opinions, attitudes and general comments, assessment can be made of product needs and the inadequacies of present products.

With information from the consumer survey, new product descriptions can evolve to product concepts, with definition of basic product attributes such as size, storage life, function, price range, ingredients, desired eating characteristics and cooking method. The target market segment(s) are identified, so that the choice of representative consumers for developing the product idea concept for the product design can be made. Consumers in the original focus groups are probably chosen as representative of the segment that the researcher believes will accept and buy the product. But there is a need to confirm this is correct in a larger survey. Target consumers can be identified on demographic factors such as age and education, but target segments based on such factors as usage of product, life style, personality and social groups can be more directly related to the product.

5.6.3 Product concept definition and optimisation

The product concept is built up in stages – attributes identification and screening, attributes measurement, complete product concept, product concept evaluation. Saguy and Moskowitz (1999) said 'Innovative products possess spatial and temporal limits' and what is attempted in product concept development is to outline these limits and in the product design specifications to give them quantitative values. Development of the product concept and the product design specifications are outlined in Fig. 5.10, showing the consumers

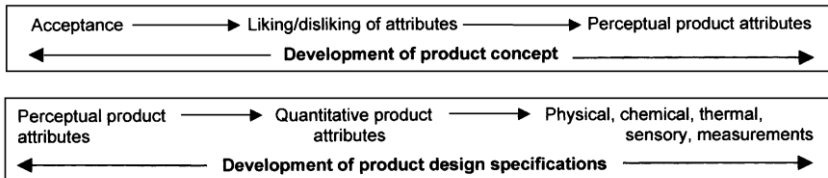


Fig. 5.10 Attributes in product concept and product design specifications.

after their acceptance of a new product description, identifying the product attributes important to them in the product. The product designers with consumers and analytical technologists build up metrics, that is quantitative measurements of the product attributes, as the basis for the product design specifications. Often, these activities are not sequential from consumers to food technologists but they are cycling backwards and forwards between the three groups, as the concepts of the product characteristics identified by the consumers gradually become the physical and chemical testing of the food technologists.

The consumers who take part in developing the product concept are category users or, if it is an innovation, the predicted category users. The consumer focus group is invaluable for building up the product concept. Usually 30–60 but sometimes up to 200 consumers take part in small discussion groups of six to eight people. The discussions are usually free ranging so that the consumers can discuss their own attitudes and behaviour towards the products and identify their needs in the product. The consumers are using as models the company's present products, competing products and early product prototypes.

In identifying product attributes for the product concept, it is important to discover from the consumers everything they recognise in the product so as to discover all the product attributes. The consumers combine what they identify as similar attributes into one attribute; then they develop a description of this attribute. The attributes are grouped by the consumers into core values, functional attributes and unimportant attributes. The core values are what consumers wish to feel/achieve when they buy/eat the food and after the food is eaten, for example feeling healthy, happy, not hungry. The functional attributes are the qualities of the product needed for use. The essential attributes, the 'benefits' that consumers identify to differentiate the products and also the 'risks' that they identify with the product, are recognised. Included are all the different types of attributes – basic product, package, use, psychological, social, cultural and environmental.

Think break

A simple product description given to a focus group of women with children was:

A new fruit salad topping is to be produced, using fruit, and containing no synthetic flavours and colours. It is to be used like other toppings on ice cream and other desserts.

The focus group identified some important product attributes:

- Target consumers: bought by families, used by children.
- Functional: packed in 300ml 'squeeze' plastic container, same viscosity as present toppings on market, used on ice cream, pancakes etc.
- Values: natural, real fruit, low calories.
- Economics: price £1–1.50 for 300ml.

1. Study the product attributes identified by the focus group. Can any of these attributes be combined? What other product attributes can you identify in the new product? Are they unimportant or could they have significance to the mother, the company, the retailer?
2. This type of product is eaten mainly by children. What product attributes would be important to children? If possible discuss this with a child who eats this type of product.
3. Develop a product idea(s) from all the information.
4. Write a product idea concept to be given to new focus groups. This time there will be separate focus groups for mothers and children. How would you organise the focus groups to give more detailed attribute information for the development of the final product concepts?

It is important that the consumers examine the attributes together, as they often interact with each other in the product. Consumers may not be able to describe new products, especially radical innovations that they have never seen, but they can compare different combinations of product attributes and select what suits them. The next step in the development of the product concept is to test different combinations of the identified attributes. The attributes are brought together as a variety of combinations in separate product concepts and assessed for acceptance (or purchase intent) by the consumers. The different product concepts can also be compared with competing products to see how they perform competitively. Using statistical modelling such as conjoint analysis, the product designer can identify the crucial attributes, recombine them (adding any new attributes that the consumers have identified as missing) and gradually optimise the product concept. Concept screening not only helps to select the best concept and determine the contribution of individual attributes, but also shows how concepts can be restructured.

The multi-attribute approach for product concept generation and evaluation has led to a systematic method instead of the old 'try it and taste' method. It has increased the basic knowledge of food products, and their relationships to each other both on product platforms and positions in the market. It has identified the common attributes related to types of products, and also the differences between specific products. The use of statistical techniques with their associated computer software has given a quantitative base for product and attribute identification. The techniques include factor analysis, clustering methods, multidimensional scaling (MDS), conjoint analysis (Shocker and Srinivasan, 1979; Martens *et al.*, 1983; Green *et al.*, 1988), and in sensory studies, descriptive sensory analysis and principal components analysis (Gacula, 1997; Meilgaard *et al.*, 1999). These methods have been widely used in the food industry (Schutz, 1988; Moskowitz, 1994; Saguy and Moskowitz, 1999).

Multivariate analysis is used in grouping attributes. Ninety-two New Zealand consumers compared 45 meat cuts, including beef, lamb, hogget, mutton, pork,

Table 5.11 Grouping of product attributes for meat quality

On buying	Meat quality	
	On cooking and serving	On eating
Stringiness	Prestige value	Acceptability of flavour
Spicing requirements	Number of dishes	Acceptability of colour
Convenience of meat	Cooking time	Value for money
Wastage	Expense of meat	Preparation time
Bone content of meat		Flavour strength
Fat content of meat		Nutritional value
Tenderness of meat		
Juiciness of meat		

Source: After Wilkinson, 1985.

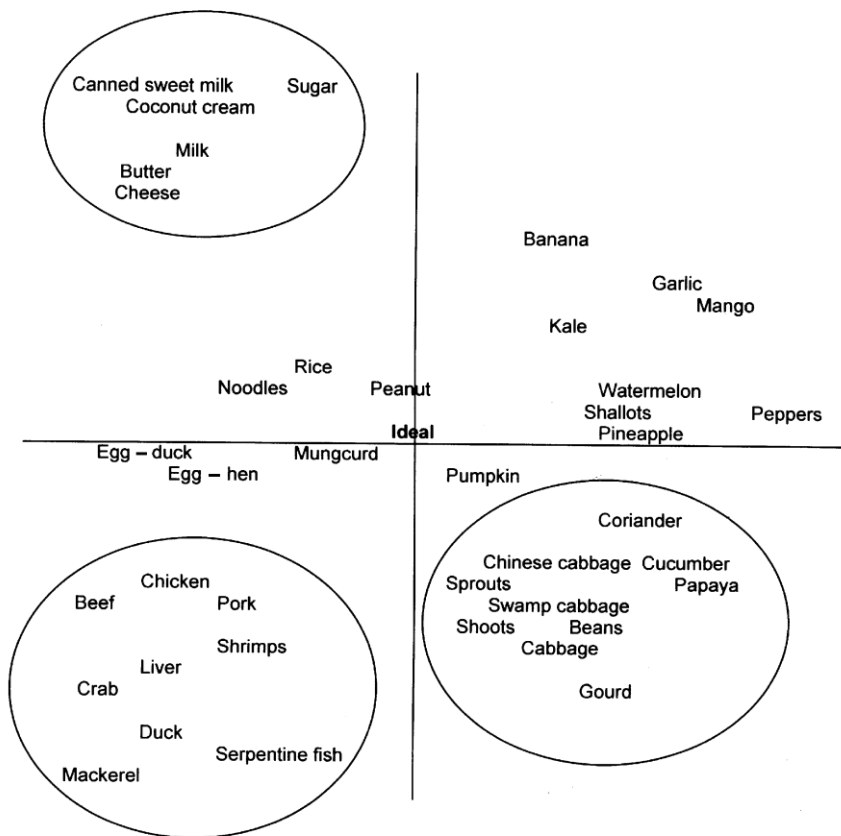


Fig. 5.11 MDS for Thai raw materials and dairy products (Source: From Anderson, 1974).

ham, bacon, sausage products, offal cuts and white meats using 18 product attributes that had been identified by consumers. Wilkinson (1985) grouped the attributes, using factor analysis, into three main groups – on buying, on cooking and on eating. The consumers regarded each meat cut as having a unique ‘blend of appeals’ under these three general groups shown in Table 5.11. He concluded that the individual product profiles he developed for the 45 meat cuts using these attributes had very important implications for new meat product development. To produce a more desirable mutton cut, one objective could be to improve the negative aspects of mutton while not affecting the attributes that identify the product as a mutton cut. To produce a beef-like product from mutton, the new mutton product would have to mimic the specific attributes of beef if the consumers are to be convinced that the new product, based on mutton, is indeed like beef.

MDS and clustering techniques can be used to place the product concepts with products already on the market, to confirm the positioning of the product concepts with the competing products. Anderson (1974) in developing a quantitative model for the design of nutritious and acceptable foods in Thailand, used MDS to compare dairy products with Thai food raw materials in Fig. 5.11. Groupings of vegetables, meat and fish and dairy products with coconut cream and sugar can be seen. The position of an ideal product can also be determined using MDS.

Principal components analysis can reduce the number of attributes, as it identifies the smallest number of latent variables, called ‘principal components’ that explain the greatest amount of observed variability in products. It can show the relationships of the products to each other and also the associations among the attributes. In testing a number of orange drinks, the original attributes were sweetness, pulpiness, colour, thickness, natural colour, sourness, bitterness and after-taste, and these were represented by two principal components. The branded orange drinks were in roughly four groups, with four orange drinks grouped around the ideal (Cooper *et al.*, 1989).

As the product attributes are identified and the product concepts developed, there may be a need for further evaluation, a comparison of the final product concepts. For the specific product concepts, there should be a comparison by the consumers with:

- ideal product on attributes;
- competing products on attributes;
- competing products on buying predictions at different prices;
- competing products on relative positions in the market.

There could be a need for more detailed analysis of the product concept for the feasibility study, with predicted sales volume, sales revenue, market share, probabilities of product success and market success. For the general food type these can be predicted through reference to statistics of food distribution, sales records and supermarket data. For example the sales of a product that has been accepted by consumers, and has been on the market for some years, may be used to predict the sales of a new product with similar properties. Consumer diary

Table 5.12 The product concept for design

-
- Product – category, image
 - Consumers' market segment(s)
 - Behaviour of consumer with product – buying, preparing/serving, eating, disposal
 - Consumers' perceptions of the product type and new product
 - Consumers' positioning of the product in the market
 - Consumer-identified product attributes
 - Consumer-identified product values, benefits, functional attributes
 - Packaging – colour, symbol, style, information
 - Pricing, value for money – consumer pricing, competitive prices, price position
 - Availability – distribution and retailing for consumer
 - Consumer concerns about raw materials, production and processing
-

Source: After Earle and Earle, 1999.

records and pantry surveys may also be used to predict consumer acceptance of new products. But there can be a need for a consumer survey on the new product concept, particularly for the innovative product with no related products on the market. Predictions of market behaviour are made under a range of possible future environments predicted from trends in consumer and social changes.

The product concept is then detailed for the product design specifications and the product design. The sections in the product design concept (Earle and Earle, 1999) are shown in Table 5.12.

5.6.4 Developing the product design specifications from the product concept

An adaptation of the profile test – the optimum location profile – can be used by the consumers to identify firstly the important product attributes, and then define their ideal point for the product on each attribute. The consumer panel needs to be representative of the diversity among potential customers in the targeted segment. If there is more than one segment, then panels are organised for each segment. Of course the consumer cannot score some imaginary product but can only compare their ideal with some real products. So they have to be presented with either the company's present product, competitors' products, a home recipe or early samples of the new product. There is a need to choose samples with differences in the magnitudes of the attributes, so that the consumers can identify their ideals (Booth, 1990). The product designer can try variations of the new product, altering ingredients to give variations in some attributes, so that the consumer is relating the changes to their preference at the same time that the designer is starting the creation of the new product. This is a valuable interaction, and cuts down a great deal of time later in the development. The consumer response is directly linked to the stimulus (McBride, 1990).

The optimum product profile identifies the 'strength' of each attribute in the product concept. The consumers score the product concepts usually with competing products, on each attribute using scales, for example, for viscosity:

Thin, runny Very thick

It is difficult for the consumers to do this in the abstract and prototype or commercial products are tested. The mean scores of the consumers are used to derive an attribute profile, as shown in Fig. 5.12 for three baked beans products, a standard, one with increased tomato and one with increased beans. Other attributes for the bean products could be availability (difficult/easy), convenience of use (difficult/easy) or product image (everyday food/special food). The consumers rank the attributes from most important to least important, and note any attributes that are missing. There is constant checking throughout the build-up to the product design specifications. The consumers can also score their overall acceptance for each product to find the effects of the product changes on acceptance. Product profiles are normally identified by product type, but it is important to realise that the brand and the packaging can have an effect on the rating of products. The next step is to ask the consumers to score their ideal product on the same scales. This gives an ideal product profile for the product design specifications.

The consumers' definitions of the attributes and their magnitude can be related to an expert panel's sensory analysis of the product (Moskowitz, 1997) or to measurable physical properties such as viscosity and colour, microbiological standards, nutritional value and chemical composition. It is this correlation of the consumers' attribute scaling with either analytical sensory testing or standard product testing (Muñoz, 1997) that has changed the product design and process development method.

In developing the product design specifications, there are difficulties in measuring sensory properties on an objective basis and correlating these with consumer panel data. The complicated interaction of sensory properties, both

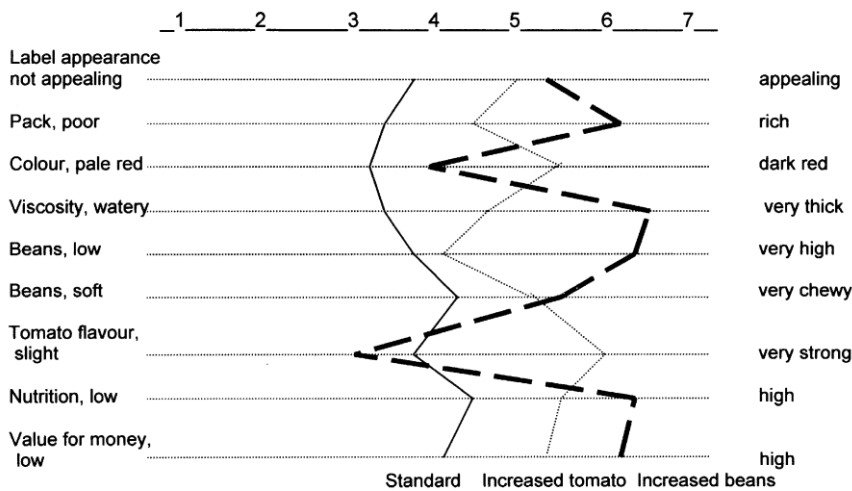


Fig. 5.12 Profiles of three baked bean products.

within the same sensory property, flavour with flavour, or between different sensory properties, flavour with texture, has made the setting of design specifications difficult. Sometimes, it is not possible to identify objective measurements for the consumers' ideals and it can be necessary to have the consumers test the experimental products. As consumers may have problems remembering their ideals, they can score on how near the new product prototypes are to their ideal; this consumer testing during design can also identify any unknown factors that may be affecting their acceptance of the product.

The product qualities are directed mainly by the consumer but of course they must conform with any legal regulations and with defined company policy. The product design specifications also include marketing, production, distribution and environmental factors (Earle and Earle, 2000); these are mainly technical but there are also consumer needs and wants on raw materials and processing methods which are incorporated.

Think break

Develop an optimum product profile for your new product ideas in the following product categories:

- extruded shaped snackfood
 - canned sardines,
 - refreshing drink.
1. Write a description of the new product.
 2. Identify the product attributes for the new product.
 3. Develop scales for each attribute.
 4. Score two competing products on the scales.
 5. Score your ideal product on the scales.
 6. Compare your optimum product profiles for the three products.

5.7 Consumers in Stage 2: Product design and process development

During the early stages in developing the product prototypes, consumers may not test the product, but whenever the prototypes are coming near to the standards set in the product design specifications, consumers' needs are brought into the product testing.

5.7.1 Including the consumer in product design and process development

It is important that the experimental techniques and objective tests related to the consumer attribute standards are used to connect the study of the different levels

of the processing conditions, or different proportions of raw materials, with the rating of the product attributes by the consumer (Saguy and Moskowitz, 1999). Sometimes, it is not possible to identify objective measurements for the consumers' ideals and it is necessary to have the consumers test the experimental products. As consumers may have problems remembering their ideals, they can score on how near the new product prototypes are to their ideal; this consumer testing during design may also identify any unknown factors that may be affecting their acceptance of the product.

There is consumer involvement in the packaging design, and in studying the relationship of the product prototypes to the food behaviour – what are often called 'use' tests. As the designer is reaching the stage of optimisation, the product prototype (or two to three product prototypes) is tested by a larger number of consumers in central location tests. From this the product is optimised and the final prototype developed. This is usually tested for acceptance in a large random consumer test. This building up of the consumer testing in product design and process development (Earle and Earle, 1999) is shown in Table 5.13. This scheme is only an indication of the techniques to be used at each stage.

Table 5.13 Consumer testing in product design and process development

Steps	Activities	Techniques
'Getting the feel' Consumer panels	Ideal profiles	Profile tests Descriptive sensory analysis Multivariate analysis
	Product 'Mock-ups'	
'Screening prototypes' Consumer panels	Product comparison	Difference testing Ranking
	Elementary product prototypes	
'Ball park studies' Consumer panels	Acceptability of attributes	Attribute scoring to ideal
	Acceptability of products	Preference panel Hedonic testing
Acceptable product prototypes		
'Optimisation' Central location test Consumer panels	Product improvement	Acceptance testing
	Competitive comparison	Hedonic comparison
	Food behaviour study	In-home use tests
	Packaging testing	Ergonomic testing
Optimum product prototype		
'Scale-up' Random consumer test Small buying experiments Consumer panels	Buying predictions	Acceptance testing
	Commercial product concept	In-depth interviews
Semi-commercial product		

Source: After Earle and Earle, 1999.

Generally the numbers of consumers taking part increase as the development progresses; there may be only 30 at the 'mock-ups' but gradually building to 200 or more at the last step of scale-up. At this time, samples can be made on pilot plant or semi-production plant so there is product for large-scale consumer testing. It is important that the knowledge about consumers is being built up with the design so that the large-scale testing is a confirmation rather than an unknown. It is possible to measure the design's impact on consumers' product perceptions as the design is developing, so that the product/consumer relationship is known and is optimised. As the product attributes are being built into the design, the consumer is reacting to them and is conveying their perception of them – which may be quite different from that of the designers (Veryzer, 1997)!

5.7.2 Product attributes evaluation

The problem in product development is identifying what are the critical attributes of a food to the consumer and then measuring them in the design process. Three questions can be asked:

1. Is there a difference between two food samples? Used when trying to duplicate a product or to see if there is a difference between product prototypes. Difference tests such as triangle tests, paired comparisons can be used.
2. Is the product acceptable? How acceptable? Used for the optimum prototype products when testing by large consumer groups or smaller, representative panels.
3. What are the characteristics of the products? How strong are they? Used when building up the product concept and also in designing the product prototypes. This can be called descriptive analysis or product profiling. The profile method is designed to give a profile of the overall sensory properties by describing and determining the relative magnitudes of the attributes.

The sensory attributes of the product are designed to find not only the ideal magnitude (*'bliss point'*) for the individual sensory attribute, but also the combination of sensory attributes and their magnitudes for the optimum combined sensory attributes, which gives a high hedonic acceptance (Moskowitz, 1994). After optimising the sensory attributes, there is still the acceptance test to see if the total product concept has been achieved. Formerly in product development, there were many hedonic tests with consumers in developing the product, but with today's analytical sensory and other techniques, the product design specifications can be detailed so that much testing can be done with physical, chemical, thermal tests or with analytical sensory testing. Perception tests such as ideal product profile tests are conducted with consumers at a set stage in the product design, and then total product testing when all the specified consumer attributes in the product are nearing optimum.

Having identified the attributes, the method of testing must be selected. Sensory science has developed a great deal in the last 30 years and there are many techniques which have been tested and recognised (Meilgaard *et al.*,

Table 5.14 Attribute evaluation in product development

Product stage	
<ul style="list-style-type: none"> • Product description • Product concept • Product design specifications • Basic product • Product prototypes 	<ul style="list-style-type: none"> • Unidentified final product • Identified final product • Commercial product
Type of respondent	
<ul style="list-style-type: none"> • Expert judges • Trained panels • Company staff • Focus consumer panels • Representative consumers 	<ul style="list-style-type: none"> • Randomly selected consumers • Target market
Measurement procedure	
<ul style="list-style-type: none"> • Attribute selection • Quantitative measurement of attributes • Hedonic measurement 	<ul style="list-style-type: none"> • Total product acceptance • Buy/use intention • Sale/use

Source: From Moskowitz, Benzaquen and Ritacco, 1981, by permission of Business News Publishing, West Chester, PA.

1999). Descriptive analysis techniques are used in product development because they describe and measure the multiple attributes in the product, and determine the magnitude of the attribute – in other words they are quantitative. The results from a trained panel can be replicated and therefore can be used in the statistical analysis of data, using linear relationships, which can be used to optimise the product prototypes. The use of ideal profile for following design is useful in determining whether the optimum product prototype is being achieved. ‘Just right’ scales are also used to determine if the product is nearing an optimum. The selection of type of stimuli, type of respondent and measurement procedure (Table 5.14) is important in ensuring the validity of the sensory results (Schutz, 1993).

Think break

In developing a new tomato pork sausage a product developer had five prototypes which are being tested by a small 30 member panel of the target consumers – teenagers. The sausages had two levels of salt and two levels of pepper. A simple 2 x 2 experimental design was used with Product A low salt, low pepper, Product B low salt, high pepper, Product C high salt, low pepper, Product D high salt, high pepper, Product E medium salt, medium pepper. The panellists were asked to study the flavour level, whether any flavour is dominant, and the level of salt.

	A	B	C	D	E
	Number of people				
Flavour level					
Too high	3	5	15	18	11
Just right	10	14	8	5	7
Too low	17	11	7	7	12
Flavour balance					
Some very dominant flavours	3	7	10	11	8
Some slightly dominant flavour	2	5	5	10	7
Rounded/balanced flavour	25	18	15	9	15
Harshness					
Very harsh flavour	0	3	5	7	3
Slightly harsh flavour	1	5	3	9	3
Mild flavour	29	22	22	14	24
Saltiness					
Too salty	1	2	10	12	8
Just right	12	11	11	10	14
Too low	17	17	9	8	8
They identified the dominant flavours in each product as:					
Product A – meatiness, Product B – spiciness, pepperiness, Product C – salt, Product D – salt, pepperiness, Product E – spiciness					
Study these results and discuss what is happening with increase of salt and pepper. What levels of salt and pepper would you use in optimising the sausage formulation? Discuss how you would experiment further with the sausages.					

5.7.3 Ball park experiments

In many studies it is important to relate the characteristics of the raw materials to the final product qualities so that in product formulations, raw materials can be varied to achieve the optimum product. For example the sensory properties of the raw materials can be related to the sensory properties of the products which in turn are directly related to the consumer acceptance of the final product. The sensory properties of each available raw material and its competitive and compensatory actions need to be identified either from recorded information or from experimental work. A linear function can then be used, within a linear programming model, to select subsets of raw materials, which can be combined through processing to have attributes acceptable to the consumer (Chittaporn, 1977). Moskowitz (1994) showed how products can be built up and optimised by studying the effects of ingredients in the acceptance of the product prototypes; sometimes the relationships between the formula ingredients and the

sensory attribute ratings are non-linear, and there are interactions occurring, so that the relationships can be complex.

During the preliminary design and process development, a wide range of ingredients may be screened and the processing and cost limits are identified. Product testing at this stage is better done internally (Wilton and Greenhoff, 1988), but once the limits of the design are identified and optimisation of the product quality starts, it is useful to bring in consumer testing. Sometimes internal development is completed before consumer testing is started, but this may lead to recycling of the design and accompanying delays. If factorial experiments or mixture designs are used to follow changes in processing variables and proportions of ingredients, then consumers can test the products and not only show how overall acceptance varies but also how critical product attributes change (Schutz, 1993). From their responses can be predicted the optimum area for further development. By regression of the results from the factorial experiment, an equation relating acceptability scores or ratios of attribute scores to the ideal product, to the ingredient and processing variables is obtained, which can be used to predict the optimum processing point. If this is a linear relationship, it can be used in linear programming with other factors such as nutritional compositions and costs.

An alternative method is to use expert optimisation where the consumer sets their ideal points on the product characteristics in the product design specifications and then a small group of trained panellists can follow the changes of the specific product attributes and relate these to the consumer ideals. Physical tests can be used which are correlated with the consumer measurements of a product. Use of trained panellists quickens the design and development. Care must be taken to bring in the consumers when the prototype products are nearing the optimum to check if the ideals are still related to acceptance by the consumer and that no rogue characteristics have crept in which are not wanted by the consumers.

In developing a nutritionally balanced snack product for urban Thai children, Sinthavalai (1986) developed a formulation by linear programming based on nutritional needs and costs, and developed some preliminary product prototypes by interacting expert sensory testing with the linear programming choice of ingredient levels. A consumer panel tested the final prototype from this experimentation. The magnitudes of the attributes and also the ideal scores for each attribute were recorded. The ratios of the experimental scores to the ideal score (1.0) are shown in Fig. 5.13. It was found, shown by the distance from the ideal, that the prototype was rather crumbly and gritty, and had a rather strong mungbean flavour and weak fruit flavour. Crumbliness in particular was not ideal. This initial prototype set the direction for further experimentation in processing and raw materials, these new prototypes being tested by large panels of Thai children.

5.7.4 Optimisation

In the optimisation stage, there are several types of activity taking place which need a combination of consumer panels with larger-scale consumer testing in

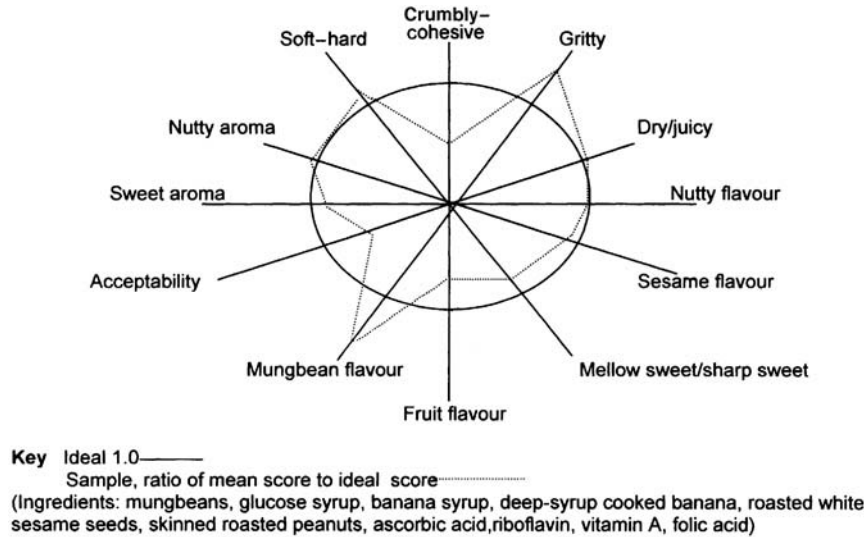


Fig. 5.13 Thai snack bar profile, ratio to ideal by small consumer panel
 (Source: From Sinthavalai, 1986).

central location tests and use tests. The product itself is now perceived 'right' by the designers, but has to be checked by consumers to see if they perceive any improvements. There is a need to confirm consumer acceptance of the product and the individual product attributes. Different aspects of the product can be tested from the basic product to the total product with packaging and sales promotion.

The unidentified product prototype(s) is often tested in large-scale central location tests held in a shopping mall or a movable, testing caravan, which can be taken to a central spot in the city. A single sample or pair of samples or sometimes multiple samples are used in the central location test to determine if the product is better than the competitors' products. When increasing the numbers of consumers testing the product, the first decision is are you testing the product only or are you testing how the consumer cooks, serves and eats the product? If you wish to test the product only, then one needs control of all the 'use' factors; these are standardised so that the product preparation, the temperature and the serving are all the same. Central location tests are used to test the product and also to gain information from the consumers about their attitudes to the product and their predicted behaviour towards the product, as well as identifying the acceptance of different characteristics of the product. The cooking and presentation procedure is absolutely standardised. The type of information gained from a central location test is used for directing the final stages of product design and early stages of product commercialisation. The response of the consumer is immediate and the results can be analysed very quickly. They can be used to compare different prototypes to direct further development. Packaging and information can also be tested and even the total

product with advertising. Central location tests are standardised, informative, speedy and usually cheaper than randomly selected 'use' testing. They give individual responses either in a one-to-one interview or by using a self-completion questionnaire. They can have from 50 to 200 consumers.

In-home, better called in-use tests, are related to how the consumer or the household or the food service chef fits the product into their eating pattern, and into their cooking and serving facilities. If the product has to be prepared, it gives the acceptance of the 'cook' as well as the acceptance of the people eating the product. It gives the marketer and the developer the sure knowledge that the commercial product is acceptable to the target market. It is the assurance before the launch that the product and the package are accepted. It can also show what the designers and their consumer panels have forgotten or ignored! One major defect or asset can influence the acceptance. An important aspect, which is found by in-use tests, is the emergence of changes that occur over time, that is with the usage or the eating of the product over a week or two. This is an important aspect when an unusual product is being tested, which may be rejected at the first test but is gradually accepted. For example in introducing an oil-based mayonnaise to target consumers who were used to eating a condensed milk-based mayonnaise, the oil-based was rejected in the first test but accepted in the second test.

The packaged product is tested in a 'use' situation to see how the combined product fits with consumers' food preparation/eating behaviour. This can range from the basic question 'can the consumer pick up the pack and open and use the product?' to the more complex 'how does the product fit the consumers' need to show they care for their family?' The study is usually made by allowing a panel of consumers to use and eat the product at home or at the place of eating the product, and then interviewing them. It can also be done by an observation test in a central kitchen.

Because of the need for confidentiality, consumer panels often test the total product with brand, packaging design and in-store promotion material. These are usually focus groups that study all aspects of the product to confirm that the different attributes are related to the consumers' needs, wants and behaviour. The aim of optimisation is to discover the best product overall, and to determine if it will beat the market leader or the company's direct competitor.

5.7.5 Scale-up

This is the last time before commercialisation to check if the product is accepted by the target market segments, that it has the attributes wanted by them and that they will buy the product at the suggested price. Acceptance of the final product prototype can be tested in a large randomly selected consumer test, and consumers can be asked the probabilities that they will buy the product at different prices. But buying predictions are more accurate if consumers are presented with the product in a buying situation.

The tests can be by representative panels with in-depth discussion for the initial products from the scale-up experiments. The final product is tested either in a large

survey of the target consumers or by a small buying study and sometimes even a town/city market. Acceptance scoring, hedonic (like/dislike) scoring, ranking and scoring of acceptance on different characteristics are all used. Hedonic scores will differ among different groups of consumers, for example in testing a grilled steak some people may like it rare and others like it well done and will score differently for hedonic scores. Therefore it is important also to score the attributes so that the designer can know why the consumers are accepting the products in a different way. It is important to have a homogeneous group of consumers. If there are two groups of consumers with different needs, then the scores can be bimodal, that is split into two groups. It is wise to look at the distribution of the scores and to see if there is clustering of scores, which indicates that there are specific groups within the sample reacting in different ways to the product.

Consumers can be asked their prediction of buying the product at different prices – how much they will buy, and how often they will buy. There are problems in asking the consumers if they will buy the product, which can be overcome by using small buying tests. The product can be sold in a supermarket or in another type of retailer, for example a few restaurants or takeaways; or a pseudo retailer can be developed by the company to sell products, including the new product.

In this scheme, there are some important decisions on timing – when is the product to be identified with a brand or company name, when is the price to be introduced, when are the products to be compared with competitors' products? It is important to introduce these quite early to small consumer panels, although there may be problems of secrecy. It can be a disaster if they are only introduced in the last major tests to confirm buying predictions. In Table 5.15 are shown some effects of branding snack bars on acceptance of the sensory characteristics (Moskowitz *et al.*, 1981). In the same test, one brand, Snickers, had a 124% increase in liking; the other brand, Milky Way, had 54%.

The validity of consumer testing in predicting the outcome of the product development project improves as the product goes from product concept to prototype product to commercial product, the product measurement goes from

Table 5.15 Effect of branding on sensory scores

Product	Inside chewiness	Chocolate flavour	Sweetness	Overall quality
Snickers				
Not identified	60.21	36.85	53.0	65.84
Branded	62.35	53.17	62.2	84.16
Change on branding	4%	44%	18%	27%
Milky Way				
Not identified	59.68	50.59	74.8	88.20
Branded	67.26	64.03	76.1	104.96
Change on branding	13%	27%	2%	19%

acceptance to buying and more consumers become involved in product testing. The involvement of consumers in focus groups in the building of the total product concept, and their acceptance of the prototype product and their predictions to buy and use during product design, increase the validity of the predictions for product success at the end of product design. This can reduce the need for large-scale consumer and market testing during commercialisation.

Think break

A company is developing a new liquid breakfast for adult consumers between 20 and 40 years old. The consumers have identified product attributes that they wish the product to have: nutritional value (high fibre, low fat, low sugar, low salt, calcium, folate, iron and vitamins), health value (sustainable but not weight increasing); value for money, easy to pour; portion about 250ml; not sticky or sickly sweet; mild roasted cereal flavour.

1. Outline the steps in designing the product.
2. How would you organise the testing of the product prototypes at the different steps of the ball park experiments, optimisation and scale-up so that the consumer needs and wants are evaluated at each step?
3. How would you test the various attributes identified by the consumers during the design steps?
4. How would you test the final product prototype for commercialisation?

5.8 Consumers in Stage 3: Product commercialisation

The consumer is involved in two parts of the product commercialisation: commercial design of product and marketing, and the commercial testing of the total commercial product (Earle and Earle, 2000) as shown in Fig. 5.14. Figure 5.14 shows only the steps in the commercial design and commercial testing where consumers may be involved.

The final design of the commercial product is interwoven with the design of the marketing – the market channel, the promotions and advertising, the selling method and the pricing. The consumers are involved in various aspects of these designs – usually in focus groups or other types of consumer panels such as advertising panels.

5.8.1 Final consumer product concept

The product prototype is built up to the total product concept, which is accepted by the consumer and the society. The company core product with its attributes and packaging has been optimised in the previous stage, but the final aesthetics of product and packaging, the brand, the name, the price, the advertising and the

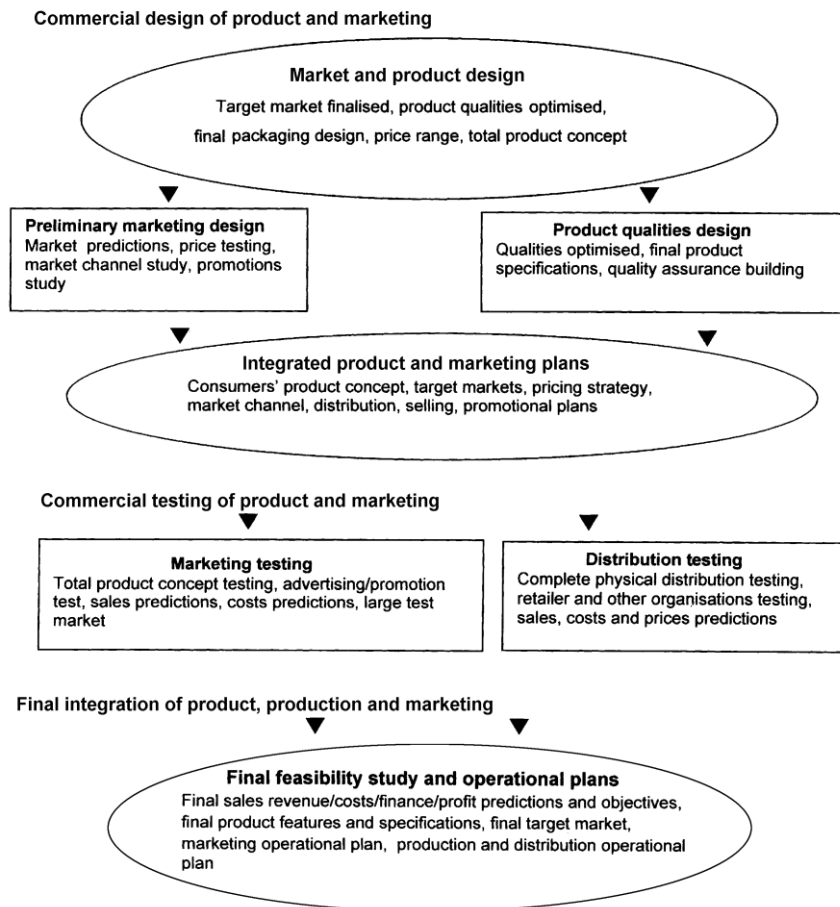


Fig. 5.14 Steps involving consumers and their needs in product commercialisation
(Source: After Earle and Earle, 2000).

promotion are added to give the commercial company product. In other words the marketing attributes of the product are added to give the final product image. The raw materials from the primary production, the ingredients from the primary processing, and the processing during manufacturing of the consumer products, are included, as these are important areas of concern for the consumers and the society. In building the final consumer concept, it is important to include the consumers' environment, what is happening and predicted to happen. The consumer's product concept is influenced by:

- competitors;
- social, political, economic, physical environments;
- media and communication;
- consumers' own behaviour towards the product.

The consumer product concept is designed to convey to the consumer that the product satisfies the consumers' eating needs and wants, nutritional requirements, availability, use of appropriate materials, reliability, maximum safety, good appearance, low cost and psychological acceptability. But this has to be located in the environment surrounding the consumers, and has to be related to the correct target consumers. The product is rated with the competitors, showing product leadership, product parity or product loser. The relationship between price and the user-perceived quality is carefully evaluated to fit the consumers' perceived value for money. They may accept a high price indicating high quality, or a low price indicating ease of purchase, or they may have in-between attitudes trading off quality and price.

5.8.2 Consumers in marketing and production design

There can be some involvement of consumers with production as production builds up the product qualities for the production specifications, at the same time as they are involved in marketing design (Earle and Earle, 2000), as shown in Fig. 5.14. The marketing design includes, together with the product:

- market information – market research and analysis, particularly the targets to be set for the launch and post-launch and the methods to monitor these;
- market channels and distribution – choice, control and development of market channels, transportation, storage;
- pricing – price range, relation of price to demand, margins, discounts, specialising;
- promotion – retailer and consumer promotion, advertising, public relations;
- sales – methods of selling, terms of sale, sales reporting, analysis and forecasting.

Consumers can be involved in several of these marketing decisions. There could be consumer surveys to predict the buying of the product, and from these the prediction of sales for the sales targets. The market channel must make the product available to the consumer at the right place, the right time, the right price and the right quality, so there is research on where the consumer buys the product, how often, and how they store the product and for how long. They can be involved in retail surveys and also in shelf-life trials. Lack of shelf-life testing with consumers may show up as unwanted deterioration of the bought product in the household refrigerator. Shelf-life testing is usually done by a trained sensory panel using descriptive sensory analysis. The critical product attributes are measured over time and the changes in the retail outlet and the home storage are measured. The consumers set the acceptance levels of stored products and these tolerance limits are used as a guideline by the trained panel.

Often consumers are involved in promotional design, particularly in development of the visual material for sales promotion and the video/film for TV advertising. Focus groups or promotional consumers take part in developing the product image, slogans and educational material. Promotional material is

tested with consumers to compare the various designs using measures for awareness and persuasion to try, and also to examine the clarity of the information about the product.

5.8.3 Commercial product testing

The types of consumer testing on the final product and marketing designs vary according to the type of new product and the amount of consumer research in the previous stages. If it is an incrementally improved product, there is already a great deal known of the market and, if it has already been tested in a consumer test, then there will likely be no need for a test market and it can go straight into a launch. But if the new product is a major innovation, it can justify in-depth studies with consumers on the final consumer concept, and large-scale consumer tests as well as a final test market. There can be new products within these two extremes. It is a case of balancing the risk of failure through lack of knowledge with the costs of time, money and other resources. Delay may cause failure because of launching at the wrong time or loss of confidentiality allowing competitors to launch ahead. Lack of knowledge can also cause failure because misunderstanding consumer perceptions may lead to an uninviting product image in the promotion. Some questions to be answered in the testing of the commercial product are shown in Table 5.16. The questions needing answers lead to the type of testing required.

If a great deal of information on the product and the relationship of the consumer with the product were needed, it would be a consumer use-test of the total product. Consumers would be interviewed, using in-depth questioning, on their reactions to the product, and their predictions of their future behaviour

Table 5.16 Questions in commercial product testing

Marketing

- What will be the consumers' purchasing/repurchasing behaviour?
- What will be the consumers' reactions to the prices, the promotions?
- What are the predicted pessimistic, most likely and optimistic sales units and revenue over the next months, years?
- What are the predicted competitive reactions?
- What are the predicted market shares?

Product

- Is the product what the consumers want?
 - Does the product have the benefits wanted by the consumer?
 - Does it have the desired attributes wanted by the consumer?
 - What are the consumers' concerns about the product?
 - Is the package acceptable, right size?
 - Are the product and packaging attractive at point-of-sale?
 - Are the product and pack ethical, legal?
 - Do the brand and the product image relate to the product?
 - What is the consumers' total concept of the product?
-

towards the product. In the consumer test, a statistically representative sample is chosen from the target market(s) so that an indication can be obtained of the opinions and attitudes of the consumers in the market. Usually a single sample presentation (a monadic test) is used and the complete commercial product is tested with appropriate sales promotion and public relations material. The product can be delivered by mail or hand delivery. Information is best obtained by interviewing either personal or telephone, but sometimes self-administered questionnaires are used. Using consumer tests to predict buying behaviour can be inaccurate as consumers have trouble themselves in predicting future behaviour.

If information on the marketing methods and their effects on consumer buying behaviour is needed, a test market would be used. The consumers would have the opportunity to buy the product in a supermarket, restaurant or other relevant retail outlet. This could be in one or two supermarkets or restaurants or takeaways, using only the in-store promotions, or it can be in a market area with the media advertising and public relations. The consumers who are buying the product and perhaps some of the consumers not buying the product are interviewed, to determine the acceptance, competitive difference, uniqueness, aesthetic worth, brand attitude and product worth. It is important also to determine consumer reactions and consumer buying behaviour in the test market, by interviewing consumers about their purchase and repurchase of the product, their use of the new product and their opinions on the new product. The sales data are found from the computer sales records of the retailers and from this, national sales can be forecast. Companies can still be experimenting with different options during the test market, for example different prices and different displays (Hisrich and Peters, 1991). The interactions of the variables in the marketing mix can be determined.

Ethical product testing is an area that is increasingly important today. This is relating the product and the marketing to the ethics of the society. Ethical testing is related to a particular society; but basically, in most societies, people want to be able to trust the company not to harm them or use fraud and deceit against them (Earle and Earle, 2000). In the food industry, this is even more important than in other industries because people consume all the products and their health depends on them. For a mutually satisfactory future, all the product testing must be truthful and encompassing so that the company earns a good reputation in launching new products.

During product commercialisation, not only has there to be testing of the product to build up the knowledge about its benefits and defects, but plans developed for both short- and long-term consumer testing after the launch.

Think break

Chilled salmon is being developed in New Zealand for marketing in Europe. The salmon are grown in the same environment in the clean seawater of the Sounds in New Zealand, eating the same food, so their quality is consistent. They are harvested in a rested state (anaesthetised before harvesting), so the flavour and texture during

storage are assured. They are packed in a regulated gas atmosphere in special packs to slow down the ageing process in the chilled fish. The aim is to send the salmon by sea which will take 60 days but there is a need to test the market before the final development of the package and containers. The fish will be flown to Europe for the test market.

1. Discuss the problems in test marketing this chilled product which is to be sold in supermarkets.
2. Describe how a test market could be set up in one supermarket. Which country and which type of supermarket could be used?
3. How long would a test market need to run to give a reliable prediction of sales?
4. Outline how consumers buying the product could be surveyed and what information would be asked from them.
5. How would you relate the product to the competing products?
6. If the test market is successful, what problems do you identify in organising a product launch?

5.9 Consumers in Stage 4: Product launch and evaluation

The involvement of the consumer can be divided into the consumer launch and the consumer evaluation after the launch.

5.9.1 Consumer launch

The launch to the consumer depends on the type of product, the innovation level of the product, the budget and the general organisation in the company for product launches. The aim is to achieve the diffusion of the product through the target market as set in the launch targets. Products vary in terms of newness and therefore the education needed to make the consumer aware of the product's values and benefits, and the 'learning' needed by the consumers to try to adopt the product. The consumer also sees risks and costs in trying the product, which need to be predicted and the correct reassurances given. At one end of the product spectrum is the line-extension and the improved product, which are easily accepted by the consumer, and at the other end is the absolutely new food of which the consumer has little understanding. The company's launch plan has to consider the needs of the consumer in adopting the product and the time it will take for the consumer to accept the product (Earle and Earle, 1999). There are high-learning and low-learning products. For the high-learning products, the marketing strategy is based on a prolonged market development effort during which special attention is given to sales and distribution as well as constant examination for any product weakness and any unprecedented consumer reactions (Hisrich and Peters, 1991). Advertising and public relations need to make the consumer aware of the product; trialing of the product needs to be

encouraged by free samples and tasting of the product. Low-learning products are usually improvements on competitors' products and the introduction there is emphasis on the competitive advantage. There is less time needed for education and it is mostly just awareness by the consumer of the product and encouragement to buy through the extra benefits of the product.

Another feature of the market to consider is the growth rate in the market. If it is a market growing fast with many new products, then it is important that the consumers who are adopting the new products are recognised and targeted in the marketing. If they can be encouraged to buy the company's new product and the product does have the needed values and benefits, then they could stay with the company's products and ensure a growing share in a growing market.

The timing of the launch is also important to the consumer – is it the right time of the year to eat the food? Is it the right time of the month for consumers to have the money to spend on a new product? Are they becoming bored with the competitors' products? Often the timing is dependent on the type of consumers in the target market; if they are highly receptive to new products, then the products can be marketed aggressively; if they are fearful or antagonistic to new products, then the launch is slower with much more education and trialing.

5.9.2 Consumer evaluation of the launch

Whenever the product is launched, the consumer's buying behaviour is studied, who is first-buying and who is re-buying; how much are they buying at each purchase and what is the time between purchases? Buyer diaries can be used, where the consumers record their purchases, not only of new foods but also of other foods, especially in the product category. The company can determine who is buying, the re-buying pattern, the timing and the amounts for each purchase. They can also determine from what particular brands it is gaining customers, to what other brands the product is losing customers.

When a new product enters a market, there will be a gradual shift in consumer perceptions of the product category and the competing products. The factors on which consumers make their decisions may change and the positioning of the product in the market may change. Therefore after the launch, the marketers need to test at regular intervals the whole category and whether the positions of the competing products are changing. This is particularly necessary where the new product is a major improvement or a new product.

There is also a need for information on the consumer's perceptions of the new product and the product values and attributes. It is necessary to ask them how they found it at all stages of the food behaviour sequence from buying to consumption and disposal. It is important to test the product attributes on which the product was designed, and also to see if consumers identify new product attributes that are influencing their acceptance of the product. The consumers can be contacted outside the supermarket, just after they have bought the product, and then interviewed, when they have eaten the food product, either by telephone or by face-to-face interview. This survey will indicate not only how

the product can be improved but also how the marketing mix is performing. Two important attributes to discuss with the consumers are nutrition and safety, as well as any environmental reactions to the product.

The product quality is also followed with the consumers to see if they are noticing any variations or defects. Any products returned to the company by consumers need to be examined carefully. Raw materials/ingredients may change after the launch and the product may need to be reformulated; also there may be processing changes to make the process more efficient. The products from these changes need to be consumer tested to confirm that the changes have not lowered the acceptability of the product. Difference testing, in the form of triangle, duo-trio or paired comparison tests, can be used to see if the product change is significantly different. If there is a noticeable difference the product needs to be tested by consumers in an acceptance test. For example in launching an instant drink mix, the full-scale production had temperature control problems so that the solubility of the final powder varied, sometimes taking some time to dissolve. This made the product unacceptable for the market and caused a product failure. Quality audits need to be done after the product launch at various points in the distribution chain. These are usually done by trained panellists using descriptive techniques; but the consumers again need to set the standards for the trained panellists, or consumer acceptance tests need to be done on the retail product. Trained sensory panellists will probably do trouble shooting in the distribution chain, for example for a distinct off-flavour and will be backed up by instrumental analysis to identify the compounds. This may be the basis for an insurance claim or a legal case and therefore has to be a quantitative test.

Despite all the brainstorming, technology, streamlining of operations and large amounts of money spent on promotion that go to make up a new product, and the best efforts of management to predict what the market should want, what really matters is what the customer wants. The gap between hopes and reality reduces as the customer is better understood. Consumer research has made great advances in recent years, and many of the results of the research can be applied directly in the food industry. The progressive and successful food business should look very carefully at them. The potential losses on unsuccessful new foods create a very substantial pool from which even quite major investments in time and effort in consumer research can be profitably funded if they lead to real improvement in predictability. The evidence suggests they do. This chapter has introduced the very active literature, and set out avenues that lead towards increased precision in understanding the needs of the customer who actually buys the food and eats it.

Think break

1. Review the consumer research methods available and discuss their use in product development if your company is:
 - (a) a specialised ingredient supplier to the baking industry,

- (b) a manufacturer of dried soups in small consumer packs for convenience stores,
 - (c) a large-scale sugar refiner marketing individual packs of sugar to coffee shops
 - (d) a manufacturer of consumer margarine products for supermarkets.
2. Consider your company's consumer research budget in relation to that for advertising and promotion, and set out your view of their relative significance on overall profitability.

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