

# 1

## Keys to new product success and failure

The aim of this chapter is to identify the important factors in food product development to be studied in detail in the succeeding chapters. Firstly the different groups of food products are identified as a basis for organising product strategy. Then the published research on the factors in product failure and product success in all types of industries is used to identify the key factors in food product development. This leads into the management of product development at three different levels:

1. Business strategy.
2. Product development programme.
3. Product development project.

Finally specific aspects of food product development are identified as the basis of the book, and the structure of the book is outlined.

### 1.1 Food products – the basis of innovation

What are food products? What are new food products? Everyone agrees that a food is material eventually consumed by humans to satisfy physiological and psychological needs, but the food company and the consumer can have quite different descriptions of the food product presented for sale. The company defines a basic functional product to which it has added packaging, aesthetics, brand, price and advertising, to give a total company product. The consumer describes the product as a bundle of benefits, relating its tangible and intangible attributes to their needs, wants and behaviour. For a basic food product, for example flour, the description can be simple and pragmatic, but for products

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such as a meal at a restaurant, it can be complex and emotional. The company defines a new product as having some difference in the basic functions and aesthetic presentation; but consumers compare it with the 'old' product and competing products and if they recognise a difference then it is a new product to them (Schaffner *et al.*, 1998). Product development is all about reconciling these two points of view.

There are many thousands of food products and they can be grouped together into product categories according to:

- food system position;
- market they serve;
- processing technology used to manufacture them;
- basic common characteristics such as nutrition and health;
- product platforms;
- level of innovation.

Grouping products is a useful method of developing new product ideas using techniques such as product platforms, product morphology and gap analysis. One can identify spaces for new developments, methods of product improvement and indeed innovation related to changes in food system or technology.

### 1.1.1 Food products and the food system

Products interact with every part of the food system from primary production to the consumer as shown in Fig. 1.1. The new cereal, high in protein, may go to the processor to produce a specialised protein product for bakers, or to a food manufacturer to make a high-protein breakfast cereal, or to a vegetarian fast-food outlet as a meat replacer, or to a supermarket as an ingredient for home-prepared muesli or directly to the consumer for use in a home breadmaker. A new product in one part of the food system can cause new products in other parts.

There is a need to distinguish the three groups of products:

1. Primary products from sea and the land.
2. Industrial ingredients from food processors.
3. Consumer products from food manufacturers and food service.

They basically have the same product development process, but there are activities and techniques specific to each area.

There is a need to recognise the total product in each case. There is a formal product with its associations such as service, know-how and image as identified by the company (Crawford, 1997), and then the product concept of the consumer or customer. A McDonald's hamburger may seem a simple product but it has strong associated benefits such as convenience, price, fast service and hygiene, along with a very powerful allure especially for young people of the good things in American life. Food service products usually have a high proportion of services, but so do industrial products and increasingly primary products.

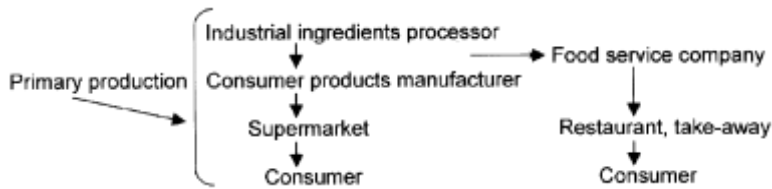


Fig. 1.1 The food system.

The industries upstream from the food manufacturer are important contributors of innovation (Rama, 1996). Both the ingredient suppliers and the equipment suppliers can have a pivotal role in innovation in the food industry. Agricultural and now marine farming are also major sources of innovation both of fresh products, and of materials designed for processing. So the innovation spectrum broadens and deepens.

### 1.1.2 Food products and the markets

The basic principle of product development is to identify the needs of the buyers and the users, and design the products towards meeting these needs. This means that the market segments for the products are an important basis for grouping products. There are five main market segments:

1. Consumers: mainly branded products.
2. Retailers: branded products, ingredient mixes.
3. Food service: partially prepared meals, meal ingredients.
4. Industrial processors and manufacturers: differentiated ingredients.
5. Primary processors: commodities, undifferentiated raw materials.

It is important to recognise that there are major differences in the development of products for these different segments. If a company moves from differentiated ingredients for food manufacturers to consumer products to be sold through retailers, there is a need for new knowledge and new resources in the company.

Each of these five main segments can be divided into further segments. There are five common consumer market-segmentation categories:

- Geographic.
- Sociocultural.
- Demographic.
- Psychographic.
- User behaviour.

Regions, social classes, ethnic groups, households, age, sex and income are typical groupings for which statistical census data can be found, but consumer targeting can be more accurate if psychographic segments based on life style, behaviour, personality and attitudes are used. User behaviour segmentation on usage rates, brand loyalty status, purchase occasion and benefits sought are useful for targeting product development. In industrial segmentation, two stages

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can be used: firstly companies are grouped according to location, size and type of processing, and secondly by company factors such as technical expertise, product needs and service needs. It is important that both the product and service needs are recognised in segmentation for industrial product development. Food service is divided into two broad groups – commercial and institutional; but of course there are important internal segments in these such as large chain fast-food companies, fine food restaurants, family restaurants (Schaffner *et al.*, 1998). The segmentation strategy depends on the company's overall business and marketing strategies. But it is important that the market segments are clearly recognised in developing groups of products for product strategy.

### 1.1.3 Food products and processing technology

Food products in the past have often been grouped according to their preservation technology – frozen foods, canned foods, chilled foods, dried foods, ambient foods. For example milk products are grouped as 'fresh', UHT (ultra-heat treated), canned, dried; fruits as 'fresh', canned, dried, frozen. The main reason for this grouping was that the preservation method was dominant in processing, distribution and retailing; and therefore to change the preservation method was a major undertaking in resources. The first three, freezing, canning and chilling, are thermal processes controlling food quality by temperature and time. Non-thermal processes, controlling water activity, atmospheric gases and packaging, preserve dried and ambient foods. In recent years, there has been increased interest in non-thermal preservation of food for example by irradiation and by high pressures (Knorr, 1999). Both processes have arisen in an effort to avoid damage to food quality in processing, but both have their own difficulties.

Products are also grouped according to processing technologies such as baking, extruding and fermentation, and according to the form of the food such as liquids, emulsions and powders. This is useful because it recognises the basic technologies and the knowledge of them in the company. If the greatest knowledge in the company is in emulsions, then the product groups include, cooking oils, salad dressings, margarines, ice creams, sauces, and new products can be developed from basic emulsion knowledge. Other typical groupings are bread, rolls and cakes; biscuits and crackers; confectionery; sauces and pickles.

A new process technology can start a family of products and indeed several families of products. For example, extrusion technology was the basis for many new snack products from flavoured, puffed snacks to muesli bars. Knowledge of products and processing is important in product development because it can lead to major innovations – the 'new-to-the-world' products.

### 1.1.4 Nutrition and health

An important grouping is related to the function of the products in nutrition and health. Provision of calories has dominated the food industry for many years: firstly the basic need was to provide calories and then in recent years, the push to

reduce calories. Early products in small groceries at the beginning of the 20th century were bread, butter and margarine, sugar, jam, bacon, beef suet – all high-energy foods. In contrast at the end of the century, supermarkets now sell low-fat milks, diet colas, trimmed pork and so on. There will always be ‘calorie’ foods but the question is what calories they should provide in the next 50 years? Together with calorie foods, came protein foods – legumes, dairy products, meat and fish. It has taken some time to raise the amount of protein in the diet and even in the developed countries there are poor people who are not getting adequate amounts of protein. Legumes and cereals are the cheapest protein foods and these may be stronger areas for protein product development, but of course dairy products, meat and fish will remain major areas for product development for more affluent consumers. There are many more nutrients needed as well as the basic calories and protein, and there have been specific foods designed with fibre, vitamin and mineral enrichments. There is recent re-emphasis on what might be termed the older deficiencies such as calcium, iodine and iron. There will always be foods designed with this supplementation as there have been in the past (Deutsch, 1977).

Recently, the emphasis has shifted from foods supplying the essential nutrients to sustain life and growth to foods for prevention or indeed curing of disease; what have been termed nutraceutical or functional foods (Sloan, 1999). These functional foods have expanded from the health-food stores to the supermarkets, but there is some difficulty in defining what they are. One British definition is ‘processed foods containing ingredients that aid specific bodily functions in addition to being nutritious’ (Alldrick, 1997) and an American definition is ‘foods that encompass potentially healthful products, including any modified food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains’ (Platzman, 1999). These definitions are very broad and cover a wide variety of products. If functional foods are to survive in the future they need to be based on scientific evidence and not emotional effects.

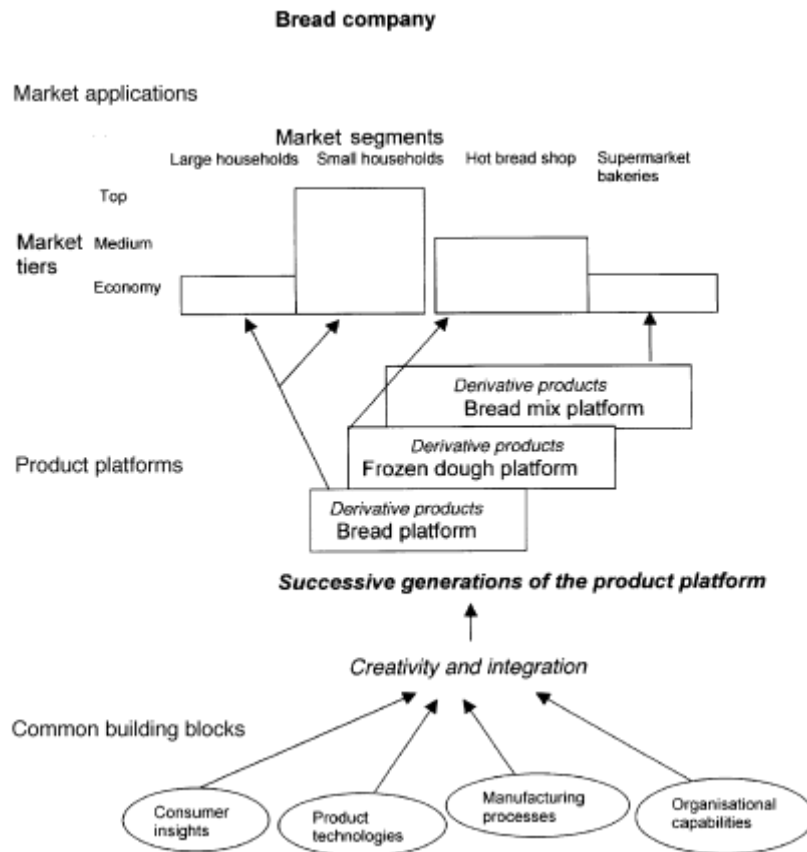
### **1.1.5 Product platforms**

A useful method of organising food products is to link them on product platforms (Meyer and Lehnerd, 1997). This is based on the fact that families of products can be grouped together because they have a common architecture or common morphology (Schaffner *et al.*, 1998). Product morphology is the breakdown of a product into the specific characteristics that identify it to the consumers, by analysis of the product family and the individual product. A product platform is formed by a set of linked products, which are distinctive but also have a strong common linkage, such as fresh fruit juices, nutritional breads, cold breakfast cereals for children. The product platform is defined as ‘a set of subsystems and interfaces that form a common structure from which a stream of derivative products can be efficiently developed and produced’ (Meyer and Lehnerd, 1997). Product platforms are a useful basis for developing a product strategy for the company, and also for creating ideas for new products. If a new platform is started, derivative products can be based on this platform, and then

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the next generation of products is started on a new but related platform. They can be considered as Generation 1, Generation 2, Generation 3 of the Product Family. In Case Study 1, Chapter 7, the development over 15 years of a new product platform in the apple industry is described.

The first stage is to identify the present product platforms and to show how they have developed in the past; clearly showing the generations of product platforms and the derivative products on each platform. It would be useful if these were identified as successful and failed product changes, so that a historical picture could be built up as a basis for the future. The second stage relates each product platform with the different market segments to which the products were aimed and to which they were finally related in sales. The third stage identifies the building blocks that were used to achieve these changes in the product platforms: consumer insights, product technologies, manufacturing processes and organisational capabilities. An example of a general systematic grouping is shown in Fig. 1.2.



**Fig. 1.2** Systematic grouping of food products for use in product development (Source: After Meyer and Lehnerd, 1997).

The company can combine this product knowledge with knowledge of the predicted social and technological changes to identify the changes in the product mix for the near and distant futures.

**1.1.6 Level of innovation**

In product development, there is a variety of ‘new products’ and it is necessary to define ‘newness’ at the beginning of the project since the activities, risks, costs and indeed the product development process vary with the type of new product. The designation of a product as new is used to cover a wide range of product changes from major innovations to cost reduction leading to a lower-priced product (Fuller, 1994). Some of these categories are shown in Table 1.1. Generally the major innovation is followed in time by product improvements as product quality increases with production improvements, then perhaps new packaging, followed perhaps by repositioning in another market segment or a relaunch of the product, and finally ending in price reductions.

New product development provides a wide range of product changes, many of which may not be very marked either technologically or to the consumer. Innovation is most dramatically represented in the ‘new-to-the-world’ product. Even in cost reduction, however, there can be major innovations in processing to achieve the lower costs. In considering new products, it is necessary to look at the total product mix and to decide how this could be changed over time to maximise growth or return on investment or some other company objective. There is a need to develop a product strategy for the future. The innovation strategy defining the overall new directions for the company, and the product strategy defining the product changes and additions, are the bases for the new product development strategy. Both the product strategy and the innovation strategy need to be embedded in the company’s business strategy. In this book, we talk about product development and not new product development, as the company always needs to be aware of the effects of new product development to the product mix.

**Table 1.1** New product categories

New-to-the-world	Products are innovations to society.
New product lines	Products are new to the company.
Product line extensions	Additions to company’s existing product lines.
Product improvements	Replacement of a present product with an improved version.
Product repositioned	Products are targeted for a new use or application and usually a new market segment.
Product cost reductions	Repositioning as a cheaper product, with similar benefits but cheaper costs and therefore lower price.

Source: After Cooper, 1993 and Crawford, 1994.

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### ***Think break***

1. 'Innovation is a predictable process' Do you agree or disagree with this statement? How can a company organise to give 70–80% predictability to product development but allow 20–30% for the unknown?
2. Take one product family in your company, and identify the generations in the product platforms, and then the derivative products on each platform. What have you used as the basis for the family and for each platform – preservation method, other technology, nutrition and health, place in the food system or some other general family characteristic? If you have not used nutrition and health, try building up the platforms on this basis.
3. Identify the market segments that your company targets for this family of products, and relate them to the different platforms and if necessary particular products.
4. What building blocks has the company used to form these platforms?

## **1.2 Measures of product success and failure**

If a company is to build a successful product mix and product strategy, there is a need to study the company's history and current performance and also the history and current performance of the industry and indeed of other industries. The food industry can learn from successes and failures in other industries. The measures for determining success and failure can be for:

- individual new products (financial, market, production, consumer acceptability, targets);
- product development projects (efficiency and effectiveness);
- overall product development programme (success rate, sales and profits from new products, innovation level).

The measures are detailed in Table 1.2.

### **1.2.1 Individual product success**

Individual product success can be measured by financial success, consumer and market success, production success, product/consumer (customer) success.

**Financial measures** are usually the profits and return on investment. These appear quantitative but they are often fraught with problems. How is the measurement made? Is it the return on investment over one, five or ten years? Does it include the basic research that preceded the product development and perhaps spreads over several present and future products? What is the method of discounting the returns over the 10-year period? There is a great deal written in the product development literature about predicting financial success before launching but not a great deal on financial evaluation after the launch (Crawford, 1997). Obviously at the company level, the annual balance sheet for shareholders is where



**Table 1.2** Measures for product development success and failure

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<b>Individual new product measures</b>
<i>Quantitative targets</i>
Sales volumes and revenues
Market share
Profits
Financial performance
 <i>Qualitative targets</i>
Product qualities
Customer acceptance
Competitive position against other companies' products
Extending or completing a product line
Aiding a promotional effort
General company benefits
 <b>Product development project measures</b>
Efficiency in time and cost
Effectiveness in achieving product success
 <b>Overall product development programme measures</b>
<i>Comparison between old and new products</i>
Number of new products in the last five years
Number of improved products in the last five years
Growth of market due to new product introductions
Proportion of sales related to new and improved products
Profitability of new products compared to old products
Contribution to net margins of new products
 <i>The effect on company innovation level</i>
Newness of production technology compared with the industry norm
Newness of marketing technology compared with the industry norm
Newness of markets for the company's products
Innovative advance of company's new products on competing products
Customers' view of the company as innovative

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Source: After Earle and Earle, 2000.

the company is judged. But how does this relate specifically to the product development? If it has a product family financial analysis, showing different product families as percentages of the profits, then how the product changes are affecting profitability can be analysed. If the investments in the various product families are recorded then the return on investment in various product families can be determined. But it is seldom possible to track individual products from the annual balance sheet. In product development, a financial benchmark is set which takes into consideration not only the company's own financial needs from a product family but also the financial standards being set by other companies. All the individual products in a product family are often set, for simplicity, the same financial targets, but this may be a false assumption as specific products may have different aims.

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**Market success**, achieving target sales volumes and revenues, is often the measure of success and failure for the overall company, the product families and the individual product. They are usually easy to measure – or are they? Sales are related to time, the marketing effort and the conditions in the market. A simple yearly sales achievement may not relate to the quality or the uniqueness of the product, nor give a true indication of the product development success. Sales over time need to be measured, along with any competing products in the market, and also the other products in the company's product family, together with a breakdown to the different market segments. In industrial marketing to the food manufacturer and the food service company, not only are the actual ingredient sales monitored but also the sales of the resulting consumer products to confirm if the company is achieving its percentage of a growing or static market. The efficiency of the marketing effort to achieve these sales is also a product success measure – the costs of the marketing effort including distribution, advertising and promotion and selling are measured and related to the sales achieved.

**Production success** is usually analysed by quantity, quality and costs. It has to achieve the product quality in the product specification consistently with only a prescribed variation, to ensure product safety, and also to produce at the correct quantity and time. It has basic production costs that have to be achieved, and the investment capital and the working capital of the process and production development have to be within budget and time. One of the most important measures is the production yield, the ratio of the product output to the raw materials input. The distribution losses and the returns from the retailers are also measured and are very important in the food industry.

**Product and consumer (customer) success** is measured by the level of consumer or customer acceptance and also by the position of the new product against the competing products. The total product success is determined by how quickly it is bought, how often it is bought and how much is bought, but there needs to be more detailed analysis. The product is set target standards in the product design specifications, and its success is rated according to how it achieves these specifications. It is not just a consumer rating of the product's acceptance but in particular how much it has incorporated the benefits identified as the consumer needs, how much it has achieved uniqueness to the consumer, how much value it is to the consumers. There will also be specific quantitative measures of the product characteristics as identified in the company's product specifications – have they been met? The consumer and the manufacturer's benefits as shown in Fig. 1.3 need to be identified and measured.

In the case of the industrial product, the criteria for success are based on how the product performed in the buyer's process and how it related to the quality of the final consumer product. Very often for industrial ingredients for food manufacturers and for large food service companies, there are strict product specifications and the product quality has to be within a specific range.

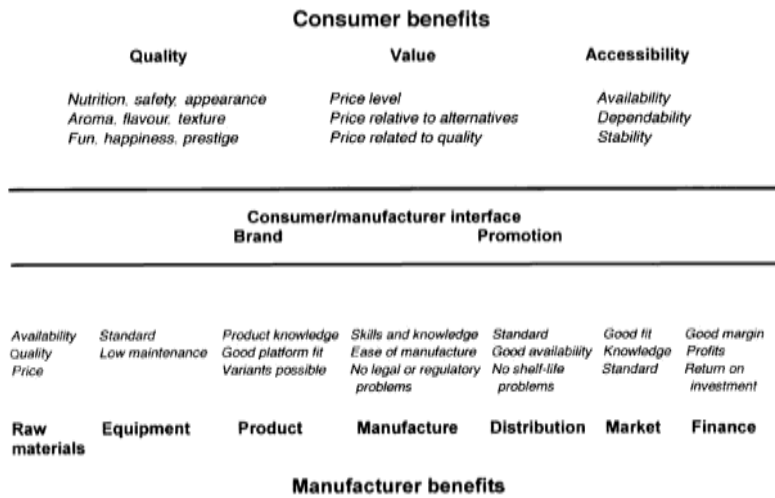


Fig. 1.3 Benefits as seen by the consumer and the manufacturer.

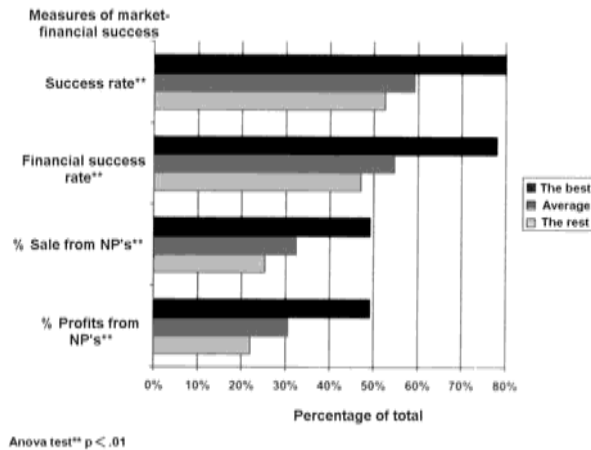
### 1.2.2 Product development project success

The product development project is also part of the success analysis – its efficiency and effectiveness. The project’s efficiency as regards time and costs and use of resources is a basic part of product development. But it is also judged on its effectiveness – the success in developing the product. How often is the product not quite the right quality, does not have the optimum product characteristics, is not what the consumer needs and wants? How near does the new product come to meeting these targets? Companies need to evaluate the success of the product development process (PD Process) at the end of each project, so that they can learn from success and failure, improve their PD Process and achieve better outputs.

### 1.2.3 Product development programme success

The long-term success is related to the changes in the company’s product mix – the structure of the product mix, the sales and profit relationships between old and new products, the growth of the market and the market share. It affects the company value in terms of goodwill, product range depth and potential, brand power, market impact and morale. Product success has also an effect on the innovation level in the company and the technological standard of the company compared with competitors (Campbell, 1999). Weak product development has a long-term effect on the production facilities, which are not renewed or updated regularly, and also on the marketing technology, which tends to become conservative. Most important is the slow growth in company knowledge. With little active product development for a number of years, the knowledge in a company is certainly less than the knowledge in the most innovative companies, and may even be less than in the direct competitors. Griffin (1997), in surveying

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**Fig. 1.4** Long-term success of a product development programme.

Success rate: % of products categorised as successes in the last five years.

Financial success rate: % of products categorised as financial successes in the last five years.

% Sales from new products: \$ sales of products commercialised in the last five years as % of total sales.

% Profits from new products: \$ profits of products commercialised in the last five years as % of total profits.

(Source: From Griffin, 1997 by permission of Product Development and Mangement Association, Moorestown, New Jersey.)

nearly 400 companies in America, used four product programme criteria to measure financial and market success of their product development programmes – product success rate, financial success rate, sales from new products (NPs), profits from new products and the number of new products in the last five years. Figure 1.4 shows a comparison of the best 85 firms and 298 other firms.

The best companies had a higher percentage of successful new products, and also higher percentages of sales and profits from new products. In research with 800 companies in 26 industry sectors in seven countries, the food and drink industry as a whole had 21% of its turnover as new products and services, far below the leader, technology, with 69% (Anon., 2000). This survey showed that a 10% increase in the proportion of turnover generated from new products and services led to a 2.5% increase in revenue growth, year on year.

### 1.2.4 Selecting success measures for product development

The measures selected are related to the company's business strategy and the level of knowledge and skills in the company. The company must be clear about the measures and if possible choose quantitative measurements (Beaumont, 1996; Hultink and Robben, 1996). The degree of detail in a measure can be very specific, such as the time taken for product design, or can be general such as the percentage of sales that are new products, but it needs to be appropriate, considered, specified and agreed. There is a need to set the measures,

benchmarking and targets before the product development programme and the individual product development project are started, so that everyone involved realises how the final success and failure is to be judged (Zangwill, 1993). Benchmarks set beforehand tend to be less influenced by particular events and circumstances.

Performance measures --- Benchmarking --- Targets against performance measures

There is a need to look forward, to set up measures for the project's likely success; and also to look backward to assess actual performance against the predicted targets. Once the targets are set, they need to be communicated to all the people and departments involved in product development. At the end of the project, the data from the project are collected and analysed, and improvements identified. For every project, the measures need to be reviewed and set again (Beaumont, 1996). The aim is to have one of the highest success rates for product development in the industry and measures, benchmarks and targets have to be set for the product development programme to achieve this.

The balance of products in the product portfolio, on which the product development programme is based, is also another important measure. The product portfolio is the collection of products manufactured and/or marketed by a company, and it needs to be analysed to give the maximum long-term effects from scarce company resources. The long-term success of the company depends on having some products that generate cash now and other products that use cash to develop the future. All product portfolios include the new product, the growing product, the present breadwinner and the dying product; this succession needs to be preserved for long-term company viability. The product development programme needs to be measured to see it is ensuring the entry of new products and helping the growing product by quality improvements and variety, the mature product by major relaunches, and the dying product by cost reductions.

The techniques used to measure success depend on the knowledge already in the company and the amount of information that can be collected during the project and product launch. Obviously some large companies have detailed databases, extensive staff knowledge and money to collect and summarise the project data. Their measures are more quantitative than with the small company, but for a specific market, the small company can have as accurate a success measure because of close relationships within the market and the company.

***Think break***

1. Speed to market is the most important performance measure for product development. Do you agree with this or are there other performance measures that you think are important or maybe even more important?
2. For two product families in your company, mark the relative success of their product development programmes on the following scales (from Griffin, 1997):

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Programme is a success	1	2	3	4	5	6	7	8	9
Programme meets objectives	1	2	3	4	5	6	7	8	9
	Completely disagree			Neutral			Completely agree		

Are the scores similar? If not, what has caused the difference?

- Now studying the individual products in each family, calculate the percentage of:
  - financial, market, production, product/consumer successes in each family for the past 5 years,
  - the sales, and the profits, from new products in each family for the past year.
- What are your conclusions on these two product families? How would you develop measures to guide the future product development in each product family?

### 1.3 Key factors in product success

In the past 30 years, there have been many studies on the factors causing success and failure in product development (some reviews are Ali, 1994; Balachandra and Friar, 1997; Cooper, 1996a). Balachandra and Friar's review in 1997 of R&D and new product development studies found:

- there were many different factors identified;
- the magnitude of the effect and even sometimes the direction varied in different studies;
- the meaning of similar factors in different studies varied.

They did state there were three common contextual variables, which need to be considered when identifying important factors for product success:

1. Nature of the innovation.
2. Nature of the market.
3. Nature of the technology.

The importance of the market, technology and organisation factors varies according to whether the product is an incremental or radical innovation, the technology is low or high and it is a new market or an existing market as shown in Table 1.3. The market factors are more important in the incremental innovations than in the radical innovations. The technology factors are important in products that have high technology, and the organisational factors in products with low technology in existing and new markets, and high technology in new markets. Balachandra and Friar noted that this was their best guess in 1997, but certainly it is a good basis for starting analysis of product successes and failure in the company.

Many of the factors either identified as leading to success or differentiating between success and failure are under the control of the company. Some *overall company factors* in the product development programme are:

**Table 1.3** Important factors for different levels of innovation, technology, market

Technology	Market	Factors		
		Market	Technology	Organisation
<i>Incremental innovations</i>				
Low	Existing	Very important	Less important	Very important
Low	New	Very important	Less important	Very important
High	Existing	Very important	Very important	Important
High	New	Important	Very important	Important
<i>Radical innovations</i>				
Low	Existing	Important	Important	Important
Low	New	Less important	Important	Important
High	Existing	Important	Very important	Important
High	New	Less important	Very important	Very important

Source: After Balachandra and Friar, 1997.

- product development integrated with a clear business strategy;
- systematic PD Process;
- relating the product to the consumer and the marketing;
- knowledge and skills of people;
- regular evaluation.

Many studies have shown that the product development programme needs to be built from the business strategy of the company, and detailed in the innovation and product strategies. If this is not done there is a lack of direction and focus in product development that leads to failure. Over the last 20–30 years, a recognised product development process has developed which is the basis for successful product development; specific activities may vary from company to company but the overall structure is the same. A basic factor that the company needs to recognise is that the product is being designed for specific consumers or industrial customers, and success will be realised if a strong consumer relationship is built up with the product. Several studies have confirmed that the product qualities are important to success, and that there is indeed demand for a superior product that delivers unique benefits to the user (Cooper, 1993). Knowledge of the people in the company is important, with factors identified such as ‘marketing and technology are strengths’, ‘training and experience of own people’, ‘commitment of project staff’. The product development programme is a complex mixture of specific product development projects that need to be integrated for overall success of the programme and the programme needs to be evaluated regularly for overall success of products as well as efficiency in the running of the programme.

There are also important factors for successful products in the successive stages of the PD Process:

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- Stage 1: Product strategy development – integration of the product development programme with the business strategy, clear description of the market and consumers, identification of market and consumer needs.
- Stage 2: Product design and process development – quantitative design specifications, multidiscipline integration, use of new techniques, feasibility analysis.
- Stage 3: Product commercialisation – multifunctional integration, planning and scheduling, market testing, business analysis.
- Stage 4: Product launch and evaluation – organisation and control, fast problem solving, evaluation of launch, production, distribution and marketing, evaluation of outcomes.

Throughout the PD Process there is a need for clear direction at the beginning of each stage, for example at the beginning of Stage 2: Product design and process development, the product design specifications state the consumer's product concept, the quantitative targets for the product qualities, processing parameters and marketing needs. There is also a need for integration of people with different skills and knowledge from different departments. Most important there is a need for constant evaluation throughout the project in feasibility studies, business analysis and post-launch studies.

Fundamental factors in the planning and organisation of the product development project are:

- on-going communication;
- clear aims, objectives and constraints;
- quality assurance of the development;
- final evaluation of the project.

The people in the project need to know what is to be achieved and what other people are doing; this gives an integrated focus to the project, which will lead to success. Studying the quality of the project in its execution and in the end results will increase the chance of success in the future.

To summarise, there are many company-controllable factors related to product development success; the importance of each can vary from project to project. Some important factors, shown in Table 1.4, are common to many projects. Although the company's capability factors are the dominant factors related to product success, they need to be combined with the environmental/situational variables, such as the market characteristics, in selecting products for development (Cooper and Kleinschmidt, 1987). The interrelationships of the product development with environmental factors such as society, consumers and technology need to be considered not only in project selection but also throughout the project and particularly before the product launch. Environmental factors are more important with pioneering innovation than with incremental product development, because often the environment is unknown (Ali, 1994).



**Table 1.4** Company-controllable factors in product success and failure

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**Consumers and markets**

*Consumers*

Closeness to the customer/consumer in product development  
The product designed for the consumer's needs, wants and value

*Marketing*

A strong market orientation

**Product**

*Product*

The product superior to competitors  
The product has different, unique benefits

**Project development process**

*PD Process*

Multistage, multifunctional disciplined process with clear decision points  
Integration of product, marketing, production, testing and evaluation

*Stage 1. Product strategy development*

Product strategy related to business and market strategies  
Clear and early product definition  
More predevelopment work before product design  
Product evaluation and screening to give sharper project selection decisions

*Stage 2. Product design and process development*

Clear product design specifications  
Creativity in design  
Integration of product design and process development  
Consumer/customer involvement in design

*Stage 3. Product commercialisation*

Pre-commercialisation business analysis  
The new product marketed by the design team to the production and marketing personnel  
Integration of production, distribution and marketing planning  
Costs definition and reduction

Product quality sustained

*Stage 4. Product launching and evaluation*

A well-conceived, properly executed launch with a solid marketing plan  
Evaluation measures set before launch  
Timing of launch optimised  
Good control methods  
Post-launch evaluation and follow-on.

**Product development management**

Good technical/manufacturing/marketing interfaces  
The right organisational structure and environment  
Project evaluation and decision-making procedures  
Completeness, consistency and quality of execution of project  
Good project leaders and a core group  
Time and cost control; continuous evaluation of project and process

**Company**

*Company management*

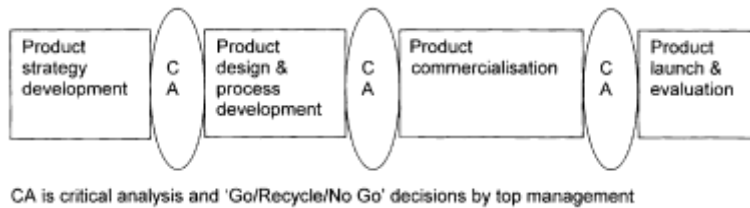
Top management support  
Product development in business strategy  
Resources in place – time, money, people  
Top management in major decision making

*Company knowledge*

PD project synergy with company's resources/skills/knowledge  
Technological synergy and market synergy with company resources/skills

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**Fig. 1.5** The fundamental PD Process.

### 1.4 Product development process: the basis for success

The PD Process is important in the food industry, as in all other industries. There is a need for a multidiscipline, multifunctional, well-defined process frame on which the company's different projects can be planned (Rosenau, 1996). In an American survey (Griffin, 1997), 60% of the firms surveyed used formal stages with inter-stage reviews and recycling such as the *Stage-Gate*<sup>TM</sup> process (Cooper 1990, 1996b), but most companies had developed relatively flexible gates and stage structures. Earle and Earle (1999) suggested a simpler version of four stages – product strategy development, product design and process development, product commercialisation and product launching and evaluation which more clearly delineated the skill and knowledge areas required as shown in Fig. 1.5.

*Decisions* between the stages are identified and then the necessary knowledge *outcomes* from the stages for these decisions are identified. Then the *activities* within the stages are identified and finally the *techniques* for these activities chosen. This gives a clear basis for planning the project:

*Decisions --- Outcomes --- Activities --- Techniques*

which will give the sequence leading to the critical analysis and decision making:

*Results --- Analysis --- Reporting --- Decisions*

In other words, at the start decide on where the project is going, identify the resources available in people, equipment, time and money, then decide how to get to the successful outcome and have an efficient PD Process.

#### 1.4.1 Stages in the PD Process

PD Processes vary according to the level of product innovation, the company's knowledge and resources, the time constraints and the level of risk taking in the company; but there are basic, necessary activities in every stage of the process.

##### *Stage 1: Product strategy development*

This has received a great deal of attention in recent years – as one might say taking the 'fuzziness' out of it has been the aim. There is a need for a clear focus; a business definition and a product definition have to be developed in the early stages (Kmetovicz, 1992). The activities of product, market and technology

research in this stage are often recognised as vital for successful product development. The product concept and if possible the product design specifications plus a report on the feasibility of the project are the outcomes of this stage. Many times it has been stressed that there should be early definition of what the new product should offer the consumer/customer, that is the benefits, desired product characteristics, uses, safety, value. With the consumers/customers, a product concept is developed describing the product as the consumer sees it and wants it. This product concept is developed into more quantitative descriptions by relating the product concept to both the product metrics, which can be measured by physical, chemical, microbiological or sensory tests, and also the processing, production and marketing methods. The resulting product design specifications give clear directions to the designer. There is an interaction often between the building of the product concept and the product design specification and the initial design of the product.

*Stage 2: Product design and process development*

This stage is important because a unique product is a key element in product development success. It all depends how one defines uniqueness, but it is mostly a noticeable change that is being achieved rather than a completely new product, as illustrated by Griffin's (1997) comments from the Product Development and Management Association (PDMA) survey in Box 1.1. In the food industry, where thousands of new products are placed on the shelves in a year, the newness can be quite minor such as a different flavour, a package face change, a different slice thickness. It may be opportune to look at the degrees of product

**Box 1.1 Efforts target product improvements**

Over the last 13 years, firms have increased slightly the percentage of projects which improve the performance of already-commercialised products at the expense of projects which merely reposition current products, extend product lines, or reduce product costs, although these trends are not statistically significant. Over half of all NPD [new product development] projects undertaken today represent significant efforts rather than incremental ones. The goal of over  $\frac{1}{3}$  of all NPD projects is to add performance capability to current products. There has been no change in the proportion of the new-to-the-world projects, which has been constant at 10% of the total or in new-to-the-firm (but not the world) projects, which has been constant at 20%. The consistently small proportion of new-to-the-world projects may reflect the difficulty of uncovering and delivering radically new solutions for unmet needs, or a bias in firms against very high risk projects. This research was not designed to resolve which alternative is more likely.

Source: From Griffin, 1997 by permission of Project Development and Management Association, Moorestown, New Jersey.

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difference being achieved in food design and to decide if the expensive launches are worthwhile for such minor product changes.

It has been noted many times that a unique, superior product is a key issue, but seldom have the methods to achieve it been identified. Industrial design in general is moving away from the traditional belief that it is the creative workings of one person, to the concept of a design team. Industrial designers are also moving into the area of food design, bringing their more aesthetic attitudes in design. The food designers (often called food developers) are much further ahead than other designers in bringing consumers, or at least consumer needs, into the design process. Also because of the close connection between the process and the product qualities, they have often a closer interrelationship between product design and process development, using computer-based experimental designs and analysis. For successful product design there need to be multidisciplinary skills closely integrated, consumer involvement and creativity, combined with the functional areas of marketing and production. In the food industry, the term product design is seldom used, it is more commonly called food product development. Increasingly, there is a need to recognise the principles of design, as the industrial designers become more involved in food design. 'Design and food have decidedly embarked on a union that will forever change the course of both' (Pearlman, 1998). As an example 'Snackitecture', with shapes and colours such as Trix wildberry corn puffs, Heinz Barbie Pasta Shapes in tomato sauce, or pizza-flavoured goldfish, is recognised in design journals (Kalman, 1998).

Product design is the central, creative part of product development and it is important that the different factors influencing it are recognised and integrated into the design process as shown in Fig. 1.6. Product design is based on the tacit knowledge of the designers but it has input from many disciplines and functional areas. It is a blend of creativity, research and testing.

### *Stage 3: Product commercialisation*

This has two activities identified as related to product development success – business analysis and marketing the product to the people in the functional areas (Cooper, 1993; Crawford, 1997), but there are many other aspects of product commercialisation that lead to product success. Business analysis is essential for the decision making at this stage but amazingly there are still companies who never do this before spending large amounts of money in commercialisation and launching. Communication between the design team and the functional groups that will carry the product into production and marketing is essential – this is often called technology transfer, but is better called technology cooperation or technology integration. There are two important facts to recognise in commercialisation – firstly it is still a design process and secondly integration of the functional areas is vital.

The key issues are:

- maintain the product qualities at the same standard as in the design through the process and the distribution;

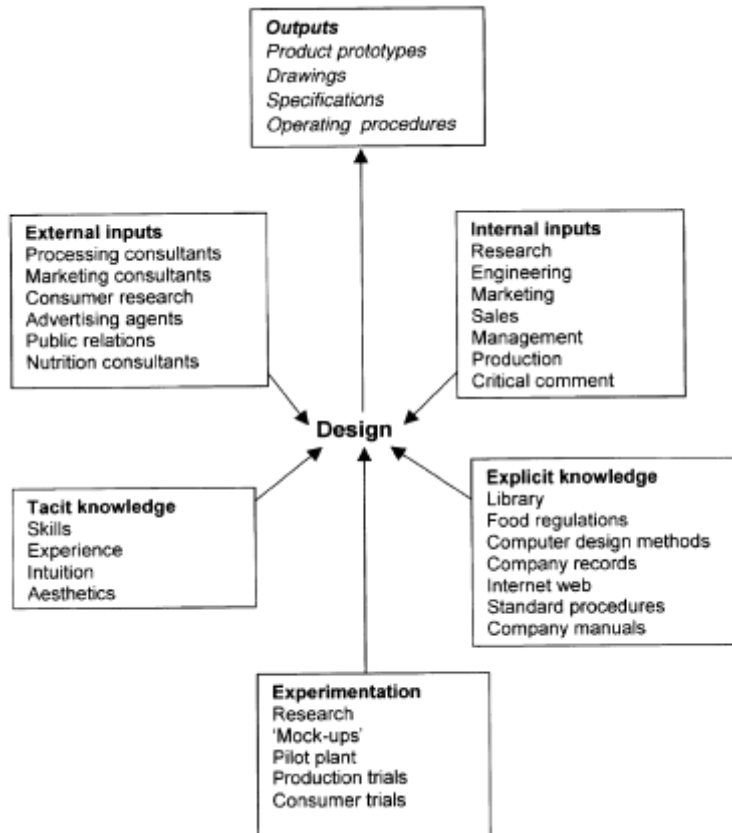


Fig. 1.6 Design components in food product development.

- produce and distribute at the quantities needed;
- develop a total product concept for marketing that agrees with the consumer needs and wants and creates unique value for the chosen target market;
- organise a distribution channel which ensures quality, quantity and costs;
- reduce uncertainty and risk in the launching;
- reach the predicted sales and profits.

In product commercialisation, the product prototype and the preliminary product specifications and marketing strategy have to be developed into a commercial product and production and marketing plans.

*Stage 4: Product launch and evaluation*

This is the most expensive and risky part of product development. The key issue is to have a fast and effective launch as this can generate the same or more incremental profits as reducing the time for the early stages of the PD process (Ottum, 1996; Stryker, 1996). The targets for the launch should be clearly set to

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Analysis	Launch	Communication	Production Marketing	Product Attributes Benefits Advantages
			Quantity Timing Placement Packaging Distribution	Costs Pricing Promotion Quality
		Presentation to management Presentation in company Presentation to distributors		Publicity Advertising Sales promotion
	Timing Resources Size	Personnel Operational plan Staging	Back-up	
Production yields, costs Sales Profits Competition Consumer reactions		Market share Return on investment Problem areas for launch Distributor reactions Buying patterns		

**Fig. 1.7** Key factors for launch

provide the basis for the evaluation. It is important for the company to decide on the measures for the launch so that success and failure are clearly defined and measured. The goals might be selected revenues over time, or the market share over time, or profits over time, or for the product to be long term in the product mix. The environment is also important; competition and possibly social, political or economic changes should be monitored. The operational plan for the launch is a key for success but it needs to be sensitive to the situational and operational conditions. Another key factor is the launching to the company and to the trade (distributors). People can easily slow or divert a launch and on the other hand can quickly and successfully overcome any problems that may arise. In industrial product development, it is important to have different departments in the buying company knowledgeable and enthusiastic for the product, and in consumer product development, the retailer as well as the consumer must not be fearful or bored about the product, but encouraged to buy it. Evaluation is continuous so that improvements can be made quickly. The key factors for the launch are shown in Fig. 1.7.

### **Think break**

1. 'The launch is designed for the end user, but considers also the company personnel, the distributors and the society.' Discuss how these people may have

different aspirations for the launch How can the launch be planned and organised so that the aspirations are integrated to give a successful launch?

2. Choose two of your company's recent new products that were successes What were the key issues in leading to these successes?

	Not important	Very important
Market orientation	_____	_____
Consumer focused	_____	_____
Product design	design	specifications
Product design	_____	creativity
integration	Product	commercialisation
organisation	Product	launching
Other .....	_____	_____
Other .....	_____	_____

3. What do you identify in your company as product design? How do you think food product design will change in your company in the future?

4. What do you think is the quality of the execution of the product commercialisation in your company? Do critical activities happen as they should, or are they slow and late or sometimes do not happen at all? Do you see any changes that could be improved in the product commercialisation to improve the outcomes?

### 1.4.2 Product development processes for different products

Products can be classified as business-to-business (or industrial), service and consumer. All have the same basic product development but there are significant differences, and the food industry has added differences to each type of product development.

In business-to-business product development there are usually only a few customers, but each customer is a company with a group of people interested in the product, who usually have technical knowledge of the product and its relationship to their processing and product. Not only has the immediate customer to be considered but also the ultimate customer/consumer of the buyer's product. Product specifications are very important and the customer may detail the product design specifications that will then limit the area for product design. The total product of quality, quantity, delivery, price, service has to be recognised in the product design, but the product quality and price are usually the dominant factors. The PD Process has four important features: detailed, quantitative, product design specifications; customer testing of product prototypes; pilot plant and then production testing with the customer; final contracts for supply (Earle and Earle, 2000; Fuller, 1994; Haas, 1995).

Food service can be divided into two parts – marketing of the ingredients or part meals to the food outlet and of the meal/snack to the consumer. Both types of

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marketing are a mixture of product and service; but in the restaurant, the service can be the major component. Eating meals in a McDonald's or a fancy restaurant is an experience for the individuals and includes intangible experiences such as fun and sophistication. The service is produced and delivered in close proximity, and there are direct reactions between the supplier and the consumer. In both types of food service development, there is participation of the supplier and the buyer in the product concept development and in the product design, because the interaction with the product and each other need to be part of the design (Johnes and Storey, 1998; Shekar and Earle, 1997; Terrell and Middlebrooks, 1996). There is a degree of heterogeneity in food service development because people are different but as can be seen in McDonald's product design this can be reduced if the complete product plus service is developed. In developing ingredients for the food service customer, there are fundamental product qualities such as price, quality and safety, but also one must consider the buyer's food preparation and storage facilities and use of labour and energy. The consumer buying the meal or snack has the needs shown in other consumer products but also wants a social eating occasion. 'Food must please; food must entertain; food must satisfy; food must comfort' (Fuller, 1994).

Developing consumer products for marketing in supermarkets is the product development usually described in textbooks (Stinson, 1996). The development of the consumer products is mostly concerned with the design of the physical product, and there are minimal services for example information on the package; so that there is concentration on the consumer/product relationship in the design.

Management has to recognise the difference between the different types of product development and develop the product strategy and the company organisation to work efficiently in each area.

### 1.5 Managing for product success

There are two very important management inputs for product development success (Cooper, 1993; Crawford, 1997):

1. Company management's involvement in product development.
2. Direct management of the product development programme and project.

General management needs to provide direction from the business strategy, resources and major decision making on the programme and the individual project. Product development management needs to provide the plan, the multidisciplinary cooperation and the quality assurance to product development that will result in an effective outcome and efficient procedures.

Many textbooks have been written about PD management in general (Twiss, 1986; Cooper, 1993; Zangwill, 1993; Crawford, 1994, 1997; Urban and Hauser, 1993; Jackson and Frigon, 1996); a list up to 1995 is in the *PDMA Handbook of Product Development* (Rosenau, 1996). Some key elements identified by three different authors are shown in Box 1.2. From all of these books and research, and also from Griffin's 1997 summary of the PDMA survey on American



**Box 1.2 Some key elements in product development management**

**After Vrakking & Cozijnsen (1997)**

*Failed scenario*

Lack of strategic control  
 Vague innovation objectives  
 Competence conflicts between disciplines  
 Defective decision making  
 Company culture: survival of the fittest  
 Weak role of marketing

*Success scenario*

Enhancing strategic control  
 Clear innovation objectives  
 Cooperation between disciplines  
 Effective decision making  
 Company culture: consensus about objectives  
 Initiating role of marketing

**After Zangwill (1993)**

Expertise and technological foundations, cultural foundations, managerial foundations, planning foundation and risk management  
 Eradicate fumbles, place customers first  
 Develop a business strategy, design the product, improve continuously

**After Kmetovicz (1992)**

Make new product development a controlled process  
 Keep an eye on the world  
 Involve all relevant people from the start  
 Collect information together  
 Use information cooperatively  
 Have a representative object of the end product in view  
 Learn how to make decisions quickly  
 Work with competitive tools and methods  
 Entrust execution to competent people  
 In the event of problems, adjust only the affected areas  
 Maintain the 'can do' vitality in the organisation

companies, there are some fundamental needs in product development management in general which are also applicable in the food industry. Firstly there is involvement of the general management, which is crucial and then there is the management of the product development programme and projects.

**1.5.1 Company management and product development**

Top management leads product development by defining the focus, setting up a system and organisation, ensuring resources and making the critical decisions. It

**Table 1.5** Product analysis in developing the product development programme

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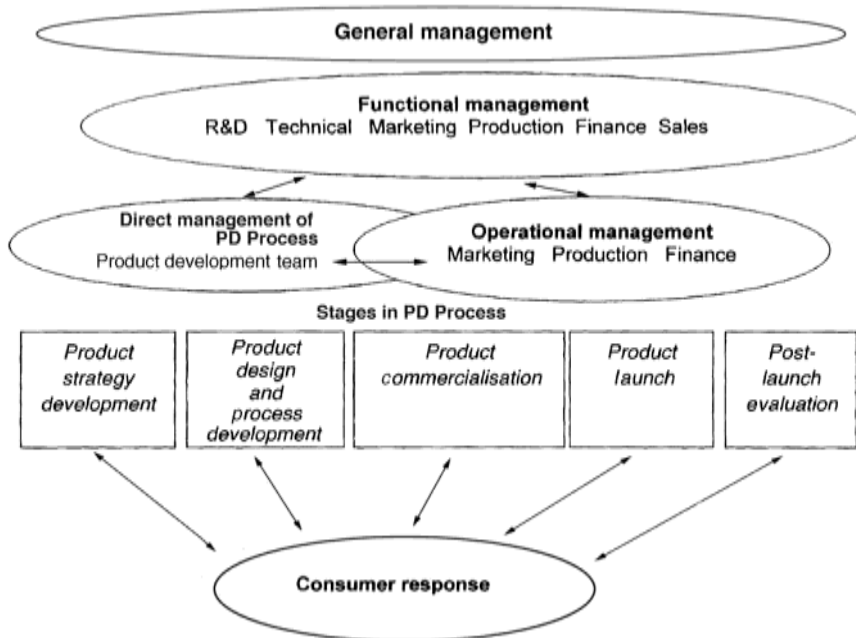
<b>Demand for products and services</b>
Long-run growth or decline
Stability of demand for products
Stage in product life cycle
<b>Supply of products and services by the industry</b>
Capacity of the industry
Availability of processing technology
Availability of raw materials
Food regulations and other industry constraints
Social constraints
<b>Competitive conditions of the industry</b>
Structure of the industry
Market shares
Finance availability
Relative technologies
<b>Analysis</b>
Probabilities of sales volume and revenues
Key factors for success of the product development

---

needs to include the innovation strategy and the product strategy in the business strategy, and also to identify any deficiencies in innovation culture, knowledge, management and resources.

In company planning and in the building of the business strategy, the changes that drive innovation are predicted so as to give a long-term direction for the business strategy (Earle and Earle, 2000). It is important to study technological changes and social changes, including political and economic changes, and these give the basis for the innovation strategy. A checklist for analysis of the company and the industry, as shown in Table 1.5, is the basis for the changes to be made in the product mix and the associated services. These two studies – innovation and products – lay the basis for the product development strategy within the business strategy. This analysis is balanced by the company's capabilities – the market position, the supply position, the product, production and marketing knowledge and skills, the plant, marketing and financial resources. Then the product development strategy and the plan for the future can be developed. Planning in this way ensures that the strategic management of product development is connected with the company's overall business strategy. The product development strategy is then an amalgam of the company's innovation, product and technology strategies and gives direction to the whole product development programme.

From the strategy is developed a product development programme and top management sets the budget and the other resources for this programme. The question is how to set this budget. For example on past sales and profits, on the predicted sales and profits if the product development is successful or on the predicted costs? This is an important decision as too tight a budget restricts the project and also the breadth of changes in the final product; too expansive a



**Fig. 1.8** Management for product development.

budget can lead to a wandering programme and too much research for research sake and not for development of the product.

The top management has to be ultimately responsible for setting up an organisation for the product development programme, a diverse activity involving general management, production, marketing and finance, with the product and process development team. Today product development is recognised as an integrated multifunctional process, which combines and coordinates the work in all departments and groups as shown in Fig. 1.8. The organisation has to be structured to give an efficient process with an effective outcome. Companies often place the incremental improvement projects in functional areas or in a strategic business unit, and the major innovation projects in joint committees or separate venture groups (Griffin, 1997). The top management introduces integrated procedures, aims, attitudes and methods into product development. It also indicates the decisions that it will take at specified times and the knowledge it needs for these decisions.

### 1.5.2 Product development programme management

There are two areas of product development management – of the whole programme and of the individual project. If there is a focused product development strategy, the projects in the programme are more clearly defined and there is less need in the initial stages to do a great deal of research to cull the projects that will not be successful. There is an interaction between the product

strategy and product development strategy in which there is product, market and production analysis, and this eliminates projects before they are absorbed into the product development programme.

Management of the product development programme involves the effective use of the available skills, knowledge and other resources between the different projects. Timing is vital not only for the efficient use of resources but to ensure that the outcome – the product – is launched at the optimum time. Planning and control and costs within the programme budget are not always easy when there is a variety of projects whose progress cannot be exactly predicted. But the most important facet of programme management is to ensure the quality of the development and in particular the total outcome of product, production, marketing and finance.

### **1.5.3 Product development project management**

Management of the individual project has the same overall parts of the programme management, but it is very much ‘hands-on’ management with day-to-day supervision of the development as regards the activities, the techniques and the quality of the results. This is the basis for the quality of the outcomes and the project management’s responsibility is to organise the team and its work to ensure this quality. It is a skilled task, as the project manager has to balance the quality of the outcomes against the costs and time. Also personnel management is very important, as the creative designers have to be integrated to work harmoniously with the more pragmatic functional groups. The leader is usually a formal project manager, but sometimes a project champion with a less formal position leads the team.

To summarise, there are some key questions to be answered by management especially when organising the product development programme, but also at the beginning of major projects, as shown in Table 1.6.

#### ***Think break***

1. ‘Product development is a top management responsibility.’ Discuss this statement and delineate top management’s areas of responsibility and how it can coordinate this responsibility with other people in the company.
2. In your company, identify the management roles in product development and the various people in these roles – their positions in the company, their expertise and knowledge
3. Draw a diagram to show how these people interact in the overall product development programme and in the individual product development projects, to ensure project coordination and staff coordination.
4. What methods do top management, product development programme managers and product development project managers use to ensure the quality of the outcomes from product development and the efficiency of the product development?

**Table 1.6** Key questions in product development management

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**Business strategy:** does it focus on product strategy and innovation strategy?

**Product strategy:** is it a predicted, continuous development of the product mix? Does it show the product improvements and the major product innovations, which will be the basis for the product development programme?

**Product development programme:** is it based on the business strategy and on predicted social and technological changes? Does it specify outcomes needed, time and costs? Are there clear objectives?

**Product development organisation:** is there a multifunctional, integrated organisation uniting teams and functional groups? Are there identified organisations for incremental product improvements and for major innovations?

**Top management control:** has top management agreed to the programme and the individual projects? Has top management set the decisions it will make throughout the project and indicated the information it needs for these decisions?  
Has top management identified the resources needed for the programme?

**Knowledge:** is there the level of product, processing and marketing technologies for the planned product development? Is there product design knowledge and creative abilities to create unique products?

**Consumer/product relationship:** does the company recognise this relationship as a major factor in product development success? Are the consumers integrated into the product development process?

**Systematic product development process:** has the company recognised the important stages in its planned product development and designed a suitable basic PD Process, and identified variations for different products?

**Product design and process development:** are there clear definitions of the product concept and the product design specifications? Is there integration of the product design and process development?

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## 1.6 Relating to consumers and markets: the key to product success

There is no doubt that in the food industry the consumer's concept of the product and the relationship of the product to the consumer's needs, wants and behaviour, are critical to success of the product (Saguy and Moskowitz, 1999). There needs to be a clear target market segment(s) identified early in the project. The interaction of the consumer or customer with the product must be identified in the early stages of the product development project, and then followed through each stage of the product development process and finally evaluated after the launch. Knowledge from the evaluation needs to be built up as a knowledge base for incremental product changes, so that a great deal of knowledge on the product/consumer relationship is known at the start of the next project. With a major innovation, there is a need for a great deal of research on the consumer/product relationship in the early stages and constant consumer testing throughout the project.

Relationships between the manufacturer/supplier/user vary a great deal between industrial selling of ingredients, the food service selling of meals and

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snacks, or the retailing of consumer products in the supermarket. In each there is a blend of product and services, but the proportion of each varies. In industrial and food service product development, there is a need to combine product development and service development, as both are related to the product success. In marketing meals in a restaurant and ingredients to a food manufacturer, there is usually personal involvement of the supplier with the user. Food manufacturers may not have much direct contact with the consumer of their products who experience the product in a supermarket or other retail setting. Therefore the product/consumer relationship is all-important in product development. The level of manufacturer/user involvement is related to the ratio of product quality to services in the total product, and to the blend of product and service development.

Grunert *et al.* (1996) showed, by extensive studies in the European food industry, that a strong marketing orientation is vital for successful product development. Grunert *et al.* (1997) found in examining a number of case studies in the food industry that sometimes innovation was driven by process development and sometimes product development, but the common need was for a marketing focus.

### **1.7 Knowledge of society, industry and technology**

Product development practice is surrounded by a complex environment, which is constantly changing (Earle and Earle, 2000). A product development practitioner must have knowledge of the changes that are taking place in society as a whole, and in the industrial environment including technology and market environment, as well as the changes that are occurring in the company.

#### **1.7.1 Knowledge of societies and their changes**

Societies with their social and political systems and their economic, environmental and future needs affect the consumers' behaviours and attitudes in addition to the legal controls on foods and so need to be integrated into product development. To ignore these in product development can lead to product failure and indeed sometimes to violent, anti-product reactions by the society. Innovation is related to change in society; there may be:

- change in economic status of the society so that there is first increased calorie and then increased protein consumption;
- decrease in the size of households causing a shift from bulk foods and jumbo packs to specialised foods and small packs;
- change in knowledge of the consumers causing change in the nutritional and aesthetic qualities of foods (Earle and Earle, 2000).

It is important to recognise changes that are occurring in economic status, society's behaviours and attitudes, so that products can be designed to fit into

### **Box 1.3 Political effects on product development**

Over a number of years, the New Zealand dairy industry developed a truly spreadable butter. Significant time and effort was put into the technical development of this product and into consumer testing in the target market, the United Kingdom. The launch of the product was a great success with good market up-take and repeat purchases. The signs for on-going market growth were very good. Then, with only little warning, the UK Customs banned the import of spreadable butter, based on a claimed non-compliance with regulatory requirements for butter. Subsequently, after a lengthy court battle and significant loss of market share, the decision was overturned.

these changes (Earle and Earle, 2000). Specific attitudes can rapidly develop into political action, which can impose new regulations or indeed ban the new product. An example of the effect of political country barriers on new product development is described in Box 1.3, showing the British attempts to stop a new product – spreadable butter from New Zealand.

#### **1.7.2 Knowledge of industry and technology**

Knowledge of the food system, industry and markets with their technologies and organisation is basic to successful product development. How the new product and the product development project relate to the total food system from the producer to the consumer is a key issue in food product development. What does the project want from the system? What is it putting into the system? Obviously a minor product improvement such as a flavour change affects the company's place in the system very little – it is just a case of sourcing new flavouring material, and adjusting the process a little. But if the aim is to launch a new line of frozen fish snacks, then supply becomes a major problem:

- How to find the right species in the right quantity.
- How to have controlled temperature distribution to supply the factory and then for the distribution to the retailer.
- How to organise freezer space with the retailer.
- Has the target consumer suitable freezer space?

So the whole system from producer to consumer is part of the product development project. It is even more complicated if the new product is live crayfish! Today the food system is an interwoven, international network with raw materials and ingredients going from country to country, so that a formulated product may have ingredients from at least five or six countries and maybe every ingredient except for the basic raw material is from a different country. This makes product development very complex, as materials have to be

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found from many sources. The food system has regulations and controls which may be different, in fact probably are, from country to country. For international marketing, this means product development has either to be aimed at one country or to work in an amalgam of regulations from different countries.

The sizes of companies in an industry and in particular their related market shares lead to a structure that defines the types of innovation (Ali, 1994). The food industry very often has developed from monopolistic to national oligopoly to international oligopoly with large multinational companies dominating the food system in ingredients processing, food manufacturing and retailing. The small company may therefore be forced into pioneering new products, targeting niche markets, or considering late entry when markets are too small for the large companies. The large company has the resources for innovative product development but its total system may be too slow, so that it often gains innovation quicker by buying the small company. Also it may think it should wring everything from the present products before seeking the innovation – but it may then be killed by the innovation from another company.

The infrastructure of suppliers and distributors also has an important effect on product development; the quantity and quality availability of raw materials limits or enhances product development, as do the buying capabilities and product selection of supermarkets and food service outlets.

The food industry, typical of non-durable products, has fewer pioneering innovations than some other industries such as communications and electronics, and mostly pursues incremental product development. The technology of improvement is comparatively simple but can be easily copied. New technology can be difficult, needs increased knowledge and resources, and can be risky because of the intimate relationship of the products with the consumer (Galizzi and Venturini, 1996). Even large food manufacturing companies with large resources tend to veer away from the pioneering innovation, and take the easier path of competing on simple product differentiation. Many small companies are still near the craft stage in their development and have insufficient knowledge of recent food technology for major innovation. So the technology has only changed slowly in the past, but one wonders what will happen in the future with the developments in genetically modified raw materials and in information technology.

It is important to recognise in product development that there is also an internal company environment for product development practice that sets the atmosphere for product development – management, resources, philosophy, beliefs, skills, knowledge and behaviour. The product developer ignores this at their peril.

### **1.7.3 Creating knowledge for product development**

Knowledge is the basis for success in a company and is fundamental to product development. Although knowledge and information are often used interchange-



ably, there is a clear distinction. Information is a flow of messages, while knowledge is created from information received. There is basic knowledge in the company – both tacit knowledge in people’s heads, and explicit or codified knowledge that is transmitted in formal, systematic language. Knowledge can be a major part of the capital structure and is recognised as such in the successful modern company.

Knowledge is becoming more highly regarded in the food industry, and from this can develop new synergy with developing technology and markets both inside and outside the industry. There needs to be inside the company:

- synergy between the knowledge in the differing functions, such as marketing, R&D and production;
- synergy between the functional knowledge and the knowledge needed for the product development.

In recent years, there has been increasing recognition that knowledge creation and management is important in product development (Clarke, 1998).

Nonaka *et al.* (1996) developed the theory that there is knowledge stored and knowledge created in individuals; and the organisation can amplify this and then crystallise it as company knowledge. This bank of individual knowledge in the company, often called tacit knowledge because it is within individual minds and not recorded, is the basis for innovation in the company. In product development, this bank of company knowledge, together with sources of information, is used to create the ideas throughout the PD Process. There are different types of knowledge, some from general experience and education, some from experience in a specific area of the company’s technology and some from working in the company and the industry’s organisation and environment. Therefore companies have different levels of company knowledge and this is directly related to the level of product development that they can undertake (Court, 1997). Tacit knowledge is important in product development because much of the experience in projects is not recorded; so experienced personnel are important in the project teams as well as in the management decision makers.

***Think break***

1. ‘The consumer is paramount to product success’ Is this statement true for your company? Can you identify successful projects that were based on ensuring an optimum product/consumer relationship? Successful projects that took little consideration of the consumers’ needs, wants and behaviour?
2. Take two PD projects that you would identify as failures and two as successes Place the four projects on the following scales:

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	Weak	Strong
Marketing orientation	_____	_____
Product/consumer relationship	_____	_____
Knowledge in company	_____	_____
Information sources	_____	_____
Marketing capabilities	_____	_____
Production capabilities	_____	_____
Product differentiation	_____	_____
PD Process	_____	_____
Product development management	_____	_____
General management	_____	_____

3. What are the differences between the successful products and the failed products? Can you identify places that the product development could be improved?

4. What is the level of tacit knowledge (knowledge within the individuals in the company) in your company of product, production, marketing technologies and of markets and consumers or customers? How does this restrict or widen what your company can do in product development?

### 1.8 Product development management in the food industry

The food industry has its own specific problems in managing product development:

- Biological raw materials.
- Seasonality of raw materials.
- Complex interactions in the food system.
- Interrelationship of processing conditions and product qualities.
- Direct relationship between the product and the nutrition of the consumers.
- Complex relationships between products and health for different groups of people.
- Instability of food products.
- Continuous supply and buying of food products.

There are problems in designing new fresh fruit and vegetable products because it takes time to develop new types, new varieties – by the time they are developed the consumer may have other needs and desires, or food retailing may have changed. Predictions have to be long term and there is usually the need to develop a range so that changes can be accommodated. There is usually only one season a year, or two by incorporating northern and southern hemispheres, so that development and testing is difficult. Fresh fruit and vegetables and whole chilled fish and now live fish, are growing markets and there is a need to study the management of product development for these fresh products.

Because of the product/process interaction, product design is integrated with processing development. Often in other industries product design and production design are two separate activities, done in series; but this is not possible in the food industry. Hence the second stage is called product design and process development. The consumer nutritional and health relations with the product are a vital part of food product development, especially in the future when products are going to be designed for specific effects in the human body instead of general nutrition. This will mean an ethical responsibility and will lead to product development similar to the pharmaceutical industry with a great deal of ethical testing. Because of food instability, the research on distribution is vital in food product development. The shelf-life in storage and the change in quality during transport are important parts of the product development process. Many products have failed because of a rush to the market without shelf-life trials, with disastrous quality results – better to spend time on testing than money on removing from the supermarket shelves.

Finally there is the continuous buying of food which leads to placing of more new products on the market. There usually is need for a continuous product development programme, which leads to more forward product planning and a rolling product mix. This needs efficient and effective planning and control in product development (Stinson, 1996).

## **1.9 Basis and structure of the book**

Managing innovation is a necessary skill for senior management of all food companies producing new raw materials, new ingredients or new consumer products. Company growth and even survival depends on the continuing introduction of successful new products into old and new markets. Product success or failure depends on many factors, but the most important are the product, the skills and resources of the company, the market and the marketing proficiency, and an organised product development process. There is a vital need to understand the consumers' behaviour and attitudes and to be able to design a product to meet the users' needs. But it is also necessary to have the technological knowledge, and the skills, and the organisational ability to bring a product to a successful commercial conclusion in the marketplace. This book studies these key issues in product development and outlines the methods of managing them. It differs from other books on product development because it recognises:

- different approaches to product development at different stages in the food system;
- supply of biological raw materials that affects food product development;
- central place of the consumer in all aspects of food product development because of the close, daily relationships between the consumer and food;
- very fast turnover of food products;
- the political effects on food products and their marketing.

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*Food product development* aims to develop:

- understanding of the place of product development in the company's business strategy and how this is related to the technological, political, societal and economic changes occurring in the environment;
- ability to analyse the complex food system as the basis of delivering food products to the final consumer;
- understanding of the customers' needs for food commodities and for industrial ingredients as a basis for production research and for product development of ingredients;
- understanding of the food consumer's needs (nutrition, safety, sensory, social and psychological) in different cultures and societies as a basis for consumer product design;
- knowledge of the product development process and the ability to select decisions and outcomes for the various stages;
- knowledge of the activities in product development and the techniques related to these activities;
- ability to plan and manage a product development programme and specific product development projects;
- ability to evaluate the outcomes of product development projects and design improvements to the PD process so as to raise the level of success.

The material in the book is divided into three sections:

- Part I Introduction
- Part II Key requirements for successful product development
- Part III Managing and improving product development

Part II explores four basic aspects of product development – developing an innovation strategy, the product development process, the knowledge base for product development, the consumer in product development. Part III studies the management of product development in general and in different parts of the food system and in different types of food companies. It also discusses the evaluation of the launch of a new product and also the outcomes of a complete product development programme and how changes can be implemented to improve the outcomes and the efficiency of product development in the company.

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